Indestructible: The Construction of Stormproof Concrete Hurricane Houses in the 1930s Florida Keys

Anne Marie Sowder1 and Edward Sowder2
1. City University of New York, City Tech, United States; 2. ERS Images, United States

Introduction

The Red Cross Hurricane Houses (Hurricane Houses), built between 1935-36, are unique early examples of Reinforced Concrete (RC) construction technique applied to residential building in the United States, made possible by the confluence of technology and institutional resources available to the project. A few examples of early twentieth century dwellings composed of cast cementitious materials in Bahamian or African building traditions are known to have been built in the area, but the steel-reinforced Hurricane Houses are among the first and best documented of the few known. The Hurricane Houses were a joint response to a devastating natural disaster by the American Red Cross (Red Cross) and the U.S. Federal Emergency Relief Agency (FERA). Houses rebuilt by the program were “owner-occupied, single family dwellings,” a distinct departure from the scope of other New Deal projects in terms of the federal government’s involvement in private home building. Matthew Hyland describes the houses as distinct from other New Deal projects in many ways:

“They are not the product of long-term planning from a federal agency. They are not related to a federal mortgage insurance agency. They have no connection to slum clearance or low-income housing. They are not public housing. They are a hybrid of emergency humanitarian relief, social concerns, work relief, and modern economic stimulus [1].”

Hurricane Houses were designed and built by “local workers, businessmen, and professionals” as “hurricane-proof housing …fortresses that withstand nature’s worst blow.” They were created using cast-in-place concrete foundations and superstructures with 30.5 cm (12-inch) thick steel-reinforced concrete walls [2]. Their rigidity distinguishes them from other approaches to Florida and Florida Keys dwellings, built for comfort under average conditions.

By the early twentieth century, concrete construction was widespread and even considered commonplace in home building by 1922 [3]. A compendium of concrete houses highlighted contemporary concrete-framed houses across the United States made of steel-reinforced cast-in-place concrete, pre-cast concrete, concrete masonry units, and concrete bricks; the concrete walls being brick-faced, stuccoed, or exposed [4]. At this time, steel-reinforced concrete (RC) [5] techniques also began proliferating in the United States [6]. By 1910, typical details were shared in popular media [7] and it was known to be used for hotel [8], boat [9], bridge [10], marine [11], and industrial [12] projects.
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Although use of RC construction was already associated with industry and progress, its use in Florida Keys homes would have been unusual. Prior to the 1912 completion of the Keys-spanning Overseas Railway, each island was noted for a distinctive architecture and appearance [13], but that architecture was almost universally wooden. There were some exceptions. Tabby, a cementitious material mixed with shells or other aggregate was occasionally used, as by the black Bahamian-American, George Adderley on Vaca Key in 1903. The mix included lime he made by burning shells and coral on site, a vernacular technique traceable through the Caribbean and back to Africa [14]. Others were like the 1930s Florida Keys storm shelters mentioned by writer, conservationist, and activist Marjory Stoneman Douglas (1890-1998) in “Hurricane”: one was a “small poured-concrete house set on a solid poured-concrete foundation, and over the whole thing two great chain cables flung and bolted into the concrete [15].” Sedimentary limestone, the Miami oolite comprising the Lower Keys’ bedrock, was sometimes used in piers, but only rarely in building superstructures [16]. Extraction of this material at local quarries was equipment and labor intensive, involving large gas-driven trenchers, dynamite to loosen stones, and transportation logistics to the final point of installation [17]. Mostly, homes were timber-framed, hewn from local Florida slash pine or cedar, cypress, or southern yellow pine. Archival records [18][19][20] support that Florida Keys homes in the early twentieth century were largely wooden, either bungalow-style or two stories with ventilating windows, dormers, and sometimes roof hatches at the second floor. Most were raised on piers in the style of cracker houses with covered porches, sloped roofs, and shading vegetation maintained close to the house. Outbuildings containing cooking facilities and covered cisterns for water collection were common for larger houses.

By the 1920s, RC structures had become more complex [21], its durability respected [22], and nondestructive testing using x-rays was even being pioneered for use on aging RC [23]. Concrete houses and RC construction techniques were compared favorably against the “national crime” of “flimsy construction” of timber-framed residences [24], but while that may have been the position taken by the editors of concrete trade journals, it did not make RC material readily available to the eclectic few thousand permanent residents of the Keys in the 1930s.

This paper draws extensively from site investigation; historical construction progress photos and reports; contemporary concrete manuals and publications; local archives such as the Historical Preservation Society of the Upper Keys, State Library and Archives of Florida, and Jerry Wilkinson Research Library; and national archives such as those of the United States Red Cross. Hurricane Houses have “much to tell about rebuilding community and modern construction techniques adapted to the imperatives of building and living in a hurricane environment [25].” In design and materiality, Hurricane Houses were meant to withstand worst-case weather scenarios, a novel departure from other Florida Keys residences built for comfort under average conditions and removal or abandonment under extremes. Over 80 years later, at least 20 still stand and none are known to have been destroyed in subsequent hurricanes. This paper expands on the environmental, political, and technical influences leading to the construction of Hurricane Houses.

The Labor Day Hurricane and Aftermath

New Deal projects left a lasting impact on the urban form, infrastructure, tourism industry, and even private construction of Florida [26]. The New Deal agencies, including Civilian Conservation Corps (CCC), Civil Works Administration (CWA), Federal Emergency Relief Administration (FERA), Public Works Administration (PWA), Works Progress Administration (WPA), and others operated in Florida, managing projects and funding state and local organizations to distribute relief and combat the despair of joblessness. The FERA agency was largely centered on job creation, granting relief to both white and black Americans in the form of $3 billion (roughly $45 billion in 2020 dollars) in aid to states [27].
Florida was in need of aid. The years 1928-33 marked an unusual drop in Miami’s assessed property values, a ten-year low for dollar value of new building permits, and the worst tourist season on record for south Florida. These hits were keenly felt in a region where construction rather than agriculture was central to the local economy and tourism was central to its identity [28]. Unique to the Keys perhaps and another blow from the Great Depression, was the collapse of Cuban trade [29]. President Franklin D. Roosevelt (FDR) signed into law the act creating FERA on 12 May 1933, shortly after his inauguration [30].

Measured by public approval, the Florida projects were a success; New Deal policies enjoyed widespread approval among Florida residents of the 1930s [31]. By 1935, FERA was working in south Florida on new buildings and infrastructure projects. They employed skilled laborers and often local materials. One project made use of unemployed veterans to fill gaps in the overseas transportation route to Key West, with over 600 World War I veterans stationed in the Florida Keys for that purpose. Many came from the ranks of the thousands of veterans who had marched on Washington to demand early payment of the wartime bonus they had been promised [32]. Douglas described the “strangers on the Keys” as “broken down army veterans, forlorn, stragglers from the bonus army that marched on Washington. Some were shell-shocked and half-crazy”; their camp: “Shack-and-barrack camps in the sun-blasted scrub between Snake Creek and the south end of Lower Matecumbe [33].” Each temporary structure housed four men and was supported by columns either self-ballasted with concrete blocks, or driven into the ground, rather like tent poles [34]. The camp buildings were near the ocean and lacked cover. Camps 1, 3, and 5 were between Windley Key and the Lower Matecumbe Key of the area known as the Upper Keys, located on the north-east end of the 257 km (160 miles) separating Miami from Key West.

Hurricanes are “natural phenomena but not natural disasters [35].” In some cases, where there is “nothing manmade to wreck or human to kill,” no disaster is registered. In other cases, as in the Labor Day Hurricane, cascading, manmade disaster is born out of misjudgment and mismanagement [36]. On Saturday, 31 August 1935, the Key West Citizen included two brief pieces on their front page regarding the small but intense storm east of the Bahamas, as reported by Weather Bureau officials out of Jacksonville, FL. On Monday morning, an American pilot based out of Cuba, went looking for the storm and found it, “a cone-shaped body of clouds, inverted, rising to an altitude of 12,000 feet” (nearly 3,700 metres). The storm was tracking north of the Weather Bureau’s prediction and it was headed for the Keys [37].

Accounts vary on the weather conditions in the hours preceding the hurricane’s landfall, but whether the eerie calm or pelting rain were remembered, witnesses described nervous preparations. In a 1935 Red Cross report, the atmosphere was described “as though nature were drawing in her plumage of pomp in anticipation of onslaughts expected [38].” Douglas wrote that the FERA veteran’s camp chief was nervously watching the barometer drop, calling Miami’s Weather Bureau, noting, “They knew that the hurricane must be coming nearer” as the rain outside intensified [39]. Ernest Hemingway wrote from Key West that “by five o’clock, the wind is blowing heavily and steadily from the northeast” and that the town’s hurricane warning flag was flying [40].

The storm struck on Monday evening, 2 September 1935, just four hours after a 4:30 pm advisory noting a change to the storm’s force and direction [41]. The Category 5 hurricane brought 320 km/hr (200 mph) winds and a 5.5-6-metre (18-20 foot) storm surge, [42] thrashing the Upper Keys. An ill-fated attempt by the Assistant Administrator to the Florida Emergency Relief Administration (Florida ERA) to call a special train from Miami at 2:00 pm to evacuate the encamped veterans saw the train arrive in Islamorada at 8:20 pm, coinciding with a storm surge that swept it from the tracks. Those caught by the storm without shelter were said to have lashed themselves to trees [43] or sheltered in their cars [44].
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Tragedy befell the permanent residents and veterans, reported in breathless coverage across the United States. At the time of the hurricane, the Florida Keys, including Key West, Middle Keys, and Upper Keys, had a population just over 13,000 [45]. The death toll from the storm was recorded between 500-700 men, women, and children. Among the dead were nearly half of the 600 veterans stationed there with FERA [46]. Those in Upper Matecumbe reported that their “frame dwellings and hospital crumbled like matchwood in the face of the storm.” At Tavernier, 60% of all houses were reported destroyed. Further west, at Camp 1, dozens of buildings were gone, including a hospital that had been housing 60 patients [47]. At Long Key, the Fishing Camp Lodge, including hotel, office, recreation and dining rooms, its post office, train station, 17 cottages, and post office were destroyed [48].

By the next morning, FDR had ordered the Army, Navy, and Red Cross to respond to the disaster site. One girl, aged 6, was rescued from Matecumbe Island with only her mother, having lost her father and three siblings to the storm, having survived by clinging to debris [49]. The Florida National Guard had been immediately deployed [50], and participated in searches and removals [51], as well as in such efforts as safeguarding FERA workers and the unburied dead [52]. Ernest Hemingway wrote in his “Letter to Maxwell Perkins” of a horrible excursion on Tuesday to Lower Matecumbe Key where he saw unburied dead stuck in trees, “foliage absolutely stripped as though by fire for forty miles and the land looking like the abandoned bed of a river [53].”

By Wednesday as the hurricane had been downgraded to a tropical storm near Georgia, one Islamorada Station Master reported personally counting 150 bodies, but even while aerial survey pilots still swept the area, the Red Cross Hurricane Disaster Relief Chairman estimated the death toll would come in under 200. While pleasure yachts were enlisted to transport the wounded to Miami, Pan-American Airways donated several planes to the relief efforts. In “heartrending scenes,” bodies were found pinned under collapses buildings [54], jammed into mangroves, floating in the water, or simply never found at all [55]. In one case, the remains of a house was shown to have crushed a family of four [56]. Rescue workers had still not reached Veteran’s Camps 3 and 5 on Lower Matecumbe Key, isolated when the bridges washed away [57]. One Upper Matecumbe Key Minister’s cracker house was swept from its foundations, nearly intact, to rest on top of the railroad tracks [58]. Cleanup had begun in earnest. Retrieval of bodies at land and sea mostly fell to the U.S. Coast Guard, with help from volunteers [59]. Work was hard and help was much needed. One image shows ten bodies, victims from Camp 5, collected near Flagler’s torn railroad [60]. Another shows men, sweating over cleanup efforts in tank tops or rolled up button downs, their faces obscured by gas masks [61]. By the following Sunday, September 8, mass cremations were in progress at the Snake Creek Red Cross headquarters [62] and mass burials with military honors were held in Miami [63].

A case worker for the Florida ERA surveyed damages from Matecumbe to Key West as of 11 September, noting that:

“The only things left standing on this particular section of key called Matecumbe are cisterns that were embedded in solid rock and parts of wrecked cars that were rolled over and over and evidently several hundred feet from where they originally stood. There are bathtubs, sinks and other heavy household things such as stoves, iron cabinets lying all around about 150 to 200 feet from where they originally stood [64].”

In concluding this report, the case worker notes that it is not yet known whether residents would wish to return to their homes if granted assistance in rebuilding. Further inquiry is recommended with the residents known to be in Miami in the care of the Red Cross or Florida ERA [65].
The hurricane and unfolding disaster attracted considerable national attention for its destructive forces, deadly outcomes, and media coverage. Additionally, the disaster involved perceived government incompetence. FDR requested an investigation by the Veteran’s Administration and FERA, resulting in the 1936 congressional hearings on H.R. 9486, “A Bill for the Relief of Widows, Children and Dependent Parents of World War Veterans Who Died as the Result of the Florida Hurricane at Windley Island and Matecumbe Keys, September 2, 1935,” meant to assign responsibility as well as provide for the widows and orphans of the tragedy [66].

The Labor Day Hurricane was of one of ten hurricanes in as many years [67], the aftermath of which is relevant to the subsequent development of a bunker home meant to withstand their forces.

**Construction Techniques and Hurricane House Construction Documentation**

Soon after the storm, Red Cross officials initiated a plan for rebuilding while FERA negotiated participation, ultimately contributing funding and some oversight. The Hurricane Houses would provide relief to almost 30 households in the upper Florida Keys. The relief represented material aid but also peace of mind after the terror of the Labor Day Hurricane. Making these contributions only to those already well-off enough to have owned their own property was not a hidden gesture; it was in fact the stated goal of the officials involved to, at best, return residents to their previous conditions without any meaningful quality of life improvements. The possibility of extending stretched resources beyond this narrow scope was met with disapproval. While declining to use the rebuilding effort to improve the standard of living of residents, an “improvement in the type of construction” was acceptable to Red Cross officials [68]. As the Red Cross noted in its 1928 report, “Relief Operations in Puerto Rico,” following the 1928 West Indies hurricane, “Social problems survived the storm, which were wholly unrelated to the storm and so were not a proper charge against the restricted relief funds [69].”

Hurricane Houses were conceived as akin to anchors, with foundations tied to the islands’ coral rock beneath. Their plan for economy and safety included houses: “(1) relatively low in type; (2) firmly anchored to the ground; (3) more structural framing spiked or bound together as a unit; (4) frame soundly designed from an engineering standpoint, using probably diagonal wood or iron strengthening feature [70].” Underground cisterns would provide drinking water throughout the year as well as further hardening houses against hurricane-force winds [71].

In internal Red Cross communication, by 24 September 1935 the Director of Disaster Relief was in discussions of concrete construction and considering soliciting possible contributions from the Cement Companies of America [72], but as of 3 October, Red Cross project leadership wrote that a decision had been made to proceed with raised timber rather than concrete construction, with cost and logistics being the main considerations [73]. FERA employed Mr. Pringle, P.E. to produce drawings accommodating the different dimensions and configurations needed. Drawings showing timber-framed construction were completed in late September 1935, although were revised in October after community pressure for concrete. By 26 October, concrete house blueprints were completed, and ground was to be broken for foundations the following week. Concrete construction materials were being planned and purchased in bulk for potential cost discounts [74].

Each home was designed with a single story with a raised, cast-in-place foundation, and featured a sloped roof, half porch, and jalousie windows. They were of a modular width and expanded in length depending on the number of bedrooms. The framing was steel-reinforced concrete, an upgrade to the existing wood-framed housing stock. Hurricane Houses were raised on top of a water cistern divided by the central structural wall itself, which
extends below the floor into the cistern. Cisterns are used to supplement or replace utility-supplied drinking water, if clean enough, and irrigation water. In a typical layout, water passes through an initial catchment area, through filtration, and into storage. Their use in the Florida Keys can be dated to the early nineteenth century [75]. Their inclusion in the Hurricane House projects reflects the difficulty in acquiring clean drinking water after hurricanes.

Ground broke on the first house in October 1935, not two months after the Labor Day Hurricane struck. Speed of response may in part be attributed to some of the “preparedness measures” instituted by the Red Cross in the wake of the 18 September 1926 hurricane, after which a series of chapters and sub-committees made ready for future storms in order to become “an ever present vital element in community life…capable of organizing local resources so as to function effectively in the face of an overwhelming disaster [76].” By 26 October, the Red Cross reported that 42 new houses would be built: 26 concrete and 16 timber framed. The six new homes started and one completed during this week were likely to have been timber framed. Additionally, ten home repairs (down to the foundation) were underway [77]. On 9 March 1936, Red Cross representatives reported that 29 concrete dwellings “underway” would be completed around 1 June 1936 [78], about nine months after the storm struck. On 13 July 1936, Red Cross Representatives reported that four added timber framed building and repair projects would close out the hurricane repair cases, including residences and two businesses [79].

Documentation was collected during the construction of the Hurricane Houses in the form of reports and site progress photos, providing many details about the building process. After the site was cleared, pneumatic or air drills were used to chisel forms for foundations and cisterns down into the coral rock below, in some cases three to five feet. Unlike the gas-powered trenchers used for quarrying, these chisels were handheld and operated by one or more laborers [80]. Carpenters then laid forms for foundation walls and floors, which were reinforced with steel rebar and filled with concrete. The floors, raised foundation walls, and structural walls were then framed and poured in monolithic sections using concrete delivered in batches by truck and conveyed through chutes for placement [81]: Work included 30.5-cm (12-inch) RC exterior walls, 25.4-cm (10-inch) RC interior partitions, and 15.2-cm (6-inch) RC gable roofs [82].

Perhaps given the speed of deployment, misjudgments became part of project planning. On 13 July 1936, Red Cross Representatives reported that concrete forming timber was anticipated to be usable for later framing of timber house building or repairs, but that it had not been usable for that purpose. They also noted that the material hauling for the concrete houses had been handled by FERA in lieu of the “curtail[ed]” Florida East Coast Railway service and that the materials had therefore come from a greater distance and at a greater cost than anticipated [83].

Hurricane House construction was affected by the great distances materials traveled for use in the Florida Keys. Historically, when used, cement might be brought from New York State for use above grade or Germany for use below the tide line. The need for ships too, for transporting sand and gravel aggregates, and lighters or dinghies to transfer materials at island locations lacking docking facilities [84], limited the feasibility of concrete construction to major civil engineering projects, such as construction of the Overseas Railway. Reinforced concrete piers built in Long Key in 1907 [85] as part of the Overseas Railway project included rock quarried in and transported from Clinton, NY at a material facility operational since 1880 [86]. On 9 March 1936, Red Cross representatives reported slow progress due in part to the project being “so far removed from the base of supplies.” The report noted an updated amount of rock required for the project, a total of 4,000 yards. The cement quantities were being actively updated but the supply line was “ample [87].”
Prior to the completion of the water pipeline from mainland Florida to Key West in 1942, freshwater needs were met through rainwater capture using cisterns; wells; or transported from the mainland by barge [88] or train, like water transported on open bed cars in approximately 26,500 litre (7,000 gallon) cypress tanks [89]. A large building project involving concrete like the Florida East Coast Railway’s Overseas Railway (1905-12) required transportation of fresh water by rail car for both the mixing of concrete and consumption of the labor force. Disruption of the rail lines by the Labor Day Hurricane also disrupted the freshwater supply line [90]. Malcom Miller, a Works Progress Administration (WPA) Field Representative, wrote in his October 1935 assessment of the total devastation in the Upper Keys related to the transportation routes to Key West that “about [64 km] forty miles of railroad was completely wrecked and the highway is seriously damaged and the ferry service was destroyed.” Further that “the only communication Key West has with the mainland is through unsatisfactory boat service to Miami and Tampa and a tri-weekly plane service, carrying mail and passengers between Miami and Key West [91].” Local historian Jerry Wilkinson writes that seawater was likely used in the concrete mix for the Hurricane House construction [92].

The American Concrete Institute (ACI) recommends against seawater for use in concrete mix and notes that durable concrete may “provide decades of service” while retaining its “original form, quality, and serviceability when exposed to the environment [93].” Research suggests that while “The presence of chlorides in seawater, particularly sodium chloride, increases the risk of alkali-aggregate reaction […] and can lead to extensive corrosion of reinforced concrete structures,” other environmental factors also lead to concrete deterioration [94]. Significant research exists on the use of saltwater (seawater) in building construction, including its impacts on curing and compressive strength [95], the durability of seawater [96][97][98] or seawater and coral [99][100][101][102] construction, and the relative sustainability of seawater concrete [103]. This is distinct from, but relevant to, the separate research regarding the instruction of or exposure to seawater of cured concrete, including on the differential diffusion of chloride ions from seawater based on concrete mix design [104]. Another relevant body of research includes the corrosive effects of different environments on steel reinforcement, including Florida reinforced earthen walls [105], the use of liquid applied coating for protection from corrosion of reinforcing steel at Florida’s Kennedy Space Center [106], and the predictive modeling of RC structure service life [107].

While it is generally acknowledged that seawater is less than ideal for concrete construction, research suggests that on island and post-disaster projects with difficulty importing materials, seawater concrete may be a viable option. There is not yet a definitive answer through archived reports or forensic analysis as to whether the concrete used for the Hurricane Houses made use of seawater in part or in full.

By 30 September 1935, FERA leadership had committed to supplying $75,000 in labor forces from their relief rolls, believed to be the total amount needed to “complete the entire rehabilitation program to be undertaken by the Red Cross.” FERA expected that the Red Cross would be supplying “all materials, equipment, supervisions and any labor necessary which could not be secured from relief rolls [108].” Labor and supervision of the Hurricane Houses was therefore overseen jointly by the Red Cross and FERA but required significant recruitment and bore strong resemblance to that of other construction projects, both public and private.

Development projects, particularly federally funded construction, worked within existing frameworks of racial segregation [109], including of labor and responsibilities on job sites. Construction for white landowners was supervised by white foremen (with the exception of buildings in segregated black communities) and carried out by a black labor force, comprised of black Bahamian migrants and black former slaves or slave descendants from other parts of the south. According to Dorothy Jenkins Fields, whose research on the vernacular structures of the
black Overtown neighborhood of Miami is unusual for its focus on construction labor, these men were the “primary work force” in Florida construction projects from the 1890s through the 1930s, including railroads, highways, and private residences [110]. In his research on the construction of the Overseas Railway, Carlton Corliss describes the specific labor pool of the Keys in detail. In addition to the groups already described (he notes that black men were best at work such as clearing, grading, and shoveling aggregate), recruitment of skilled and unskilled labor occurred from pools of wider Caribbean Islanders, Spanish, Italian immigrants, and thousands of down and out city dwellers from New York City, Philadelphia, and other locations. Previous occupations of labor recruits included teaching, law, medicine, and many other professions, reflecting the scale of unemployment. Labor retention was a common problem, and often drunken excesses, which were known to scandalize some of the Keys’ permanent residents [111].

**Conclusion**

Historian Amy Slaton argues that RC construction technique was part of the trend of a modernizing American landscape that displaced skilled tradespeople with technically trained agents of mass production [112]. This may have contributed to the effectiveness of the deployment of so much unskilled labor to projects as technically demanding and locally unique as the RC Hurricane Houses. While the construction techniques may seem complex, already in 1869, concrete building techniques were described as “peculiarly adapted …for the construction of cottages for laborers, and also for farm buildings… Almost any material can be used along with the cement, and as we have already shown, the most ordinary class of country laborers are quite competent to carry out the details of the system [113].”

Early RC construction projects in the United States were touted as examples of modernization and technological progress, but their durability was also noted. While primarily seen in industrial and civil building projects, RC construction was made available in Islamorada because of the available technology, labor force, and institutional resources brought to bear in the hurricane rebuilding efforts. It was due to these factors that the project planners were able to primarily use RC in lieu of timber framed construction despite the higher cost and concerns surrounding using disaster relief aid to materially improve the lives of its recipients.

Regarding the Hurricane Houses, Red Cross officials predicted that “the types being built do provide reasonable assurance that the loss of lives will not be so great in the future [114],” but fretted that the structures were so stormproof as to set "an embarrassing precedent that could not be followed in other parts of the affected territory in Florida [115].” The rapidly deployed rebuilding effort and its durable product would be historically unique among New Deal projects. Miami was struck by a damaging hurricane in November 1935 and FERA declined to provide rebuilding support for private properties [116]. Public perception of the projects, project funding, and extreme logistics all challenged participants.

Two themes emerge consistently in the contemporary materials and archived documents used in compiling this paper: 1) Hurricanes are inevitable and 2) Houses built to stricter standards are more likely to survive hurricanes. Looking beyond the 1930s, these themes echo through to the present. Hurricane Andrew in 1992 demonstrated (again) that “many of the razed homes were shoddily built under weak standards” and provided a catalyst for new building codes mandating that Florida structures must be elevated above the flood plain and withstand winds of 179 km/hr (111 mph); Miami-Dade and Broward up to 209 km/hr (130 mph); and Keys up to 241 km/hr (150 mph) [117], one of the nation’s strictest storm-related building codes [118].
Hurricane Houses were built in the 1930s with unsophisticated labor according to local tastes. At least 20 remain today, and none are known to have been destroyed by anything besides a wrecking ball. Although their appearance varied significantly from neighboring dwellings, their modest, climate-responsive style reflected a growing new consensus about the home’s ability to do more than provide seasonal comfort. Their rapid deployment under a most extreme post-disaster scenario, ability to weather violent storms, and durability against the passage of time may qualify them to serve as models for future stormproof RC residential projects. Resolving remaining questions related to Hurricane House supply chain and concrete mix will help validate them as a model.

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