A Case Study of the Stuart Richardson House (Glen Ridge, NJ, 1941)

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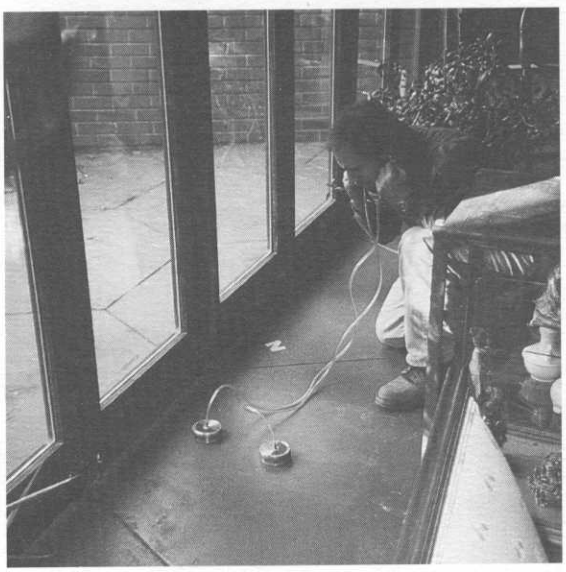
When John and Edith Payne purchased the Richardson House (designed in 1941 and built in 1951), they understood the importance of restoring the abandoned in-floor radiant heating system (see Conservancy BULLETIN, Volume 5, Issue 4, Winter 1996 "Growing up Wright" by Debra Pickrel and "Finding Mr. Wright," by John Payne, as well as the book written by John Sergeant, *Frank Lloyd Wright's Usonian Houses*). The previous owner had abandoned the house's original hydronic (hot water) system and removed the boiler. It had been replaced with an electric system, which required large white radiant panels to be installed throughout the interior of the house, detracting from the beautiful cypress wood facias and walls. Hydronic radiant heating systems are considered to be the most comfortable, clean and efficient types of heating systems, and they have the aesthetic benefit of being visually unobtrusive. Homeowners who have abandoned them for other systems are invariably disappointed with the compromise. For these reasons, and because the radiant heating system was an integral part of Wright's Usonian house concept, we decided to investigate all restoration possibilities before considering an alternate heating source such as forced air or baseboard radiators.



Lawrence Tarantino with electronic stethoscope.

Deteriorated pipe after concrete was removed.

When dealing with aged materials, the option to retain original building fabric is of great importance, but not always possible. Thorough research and planning are essential, and reevaluation at each step is imperative. It is important to take the time to research the history of the system as much as possible. This includes a review of all available documents, drawings, photos, correspondence (available from the Getty Institute), previous rehabilitation work, and other oral history from anyone who worked on or owned the house. These can be valuable aids in making decisions. In the case of the Richardson House, photographs of the construction indicated that the layout of coils were not the same as those on the design drawings.

Since the previous owner had removed the boiler, our first step was to connect the abandoned in-floor pipe system to the domestic water source and to install a pressure gauge, a pressure control valve, and a gate valve. The system's return manifold was inaccessible below the concrete floor slab and was not controlled by valves that would have allowed isolation of the various

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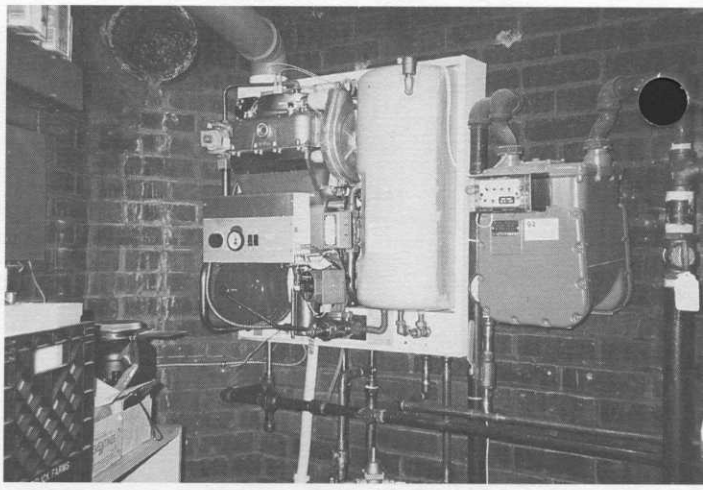
zones. Zone control valves would have greatly aided in locating the leaks and would potentially also have allowed undamaged portions of the system to remain functional. In order to evaluate the condition of the existing piping system, it was important to know how much water pressure the system was holding. Initially, 10 psi of water was maintained. However, after a few days, the system gradually began to lose pressure as evidence of a leak(s). At that point, we considered introducing a stop leak additive to the system, but decided instead to slowly increase the pressure over time. Under the increased pressure, the leak(s) began to worsen within a few weeks.

There are a number of different methods which can be used to locate pipes and leaks. Several area companies were contacted for equipment information and availability. A local municipal water department employee provided a service to locate underground water leaks with an electronic stethoscope. It was necessary to remove the flow control and pressure safety valves because of the amplified noise interference they emitted through the pipes. To narrow down the areas of examination, we relied on experience, background knowledge from research, visual inspection, and clues. The suspect areas included certain types of cracks and small spots of white efflorescent chalking. Once a suspect area was located with the electronic stethoscope, small holes were drilled through the concrete slab and probed to confirm the presence of moisture. A section of the floor was removed by cutting along the existing unit line joints with a saw and then hammering out the concrete, taking care not to damage adjacent pipe in good condition.

Once the floor was opened, the answers to previous questions were revealed. The concrete and the pipe location and material were not as specified in the original construction documents. In lieu of the monolithic 3" slab originally specified by Wright, the concrete floor had been placed in two pours. The top "finish" layer of concrete was 2" thick with another 4" to 6" thick layer beneath. This occurred frequently in Usonian homes with Colorundum finished surfaces to allow a smaller construction crew to control the time-sensitive finishing process. The area of the primary leak was immediately obvious and, although the pipe was found to be partially cast into the concrete rather than having been installed just under the crushed stone base, the failure did not appear to be caused from its contact with the concrete. The damage and the condition of the pipe in the vicinity of the leak were catastrophic, and the initial consensus was to give up any consideration of repairing it. After four sections of the floor were removed, we could identify a concentrated area of deterioration along the mid-section of the terrace doors

Final repair after (3) hex. units and (2) half hex. units of concrete were removed to repair additional deteriorated pipe.



New furnace.