

602 N. 5th Street Case Study House



This center entry, Greek Revival house was built around 1846. When purchased by the present owner in June 1993, the house was in very poor repair. It was clad with cement-asbestos siding. The house was completely renovated and restored internally and externally to as nearly as possible the original as-built condition. Also at that time a two-car garage with breezeway connecting to the original house was constructed.

After removal of the cement-asbestos siding, it was observed that most of the original yellow poplar lap siding was intact. In general, there was a heavy accumulation of multi-coats of oil-base paint. Many colors of paint were represented: white was the original coat. Colors of subsequent paint coats included tan, olive green and burgundy. The latter colors may have represented the Victorian period (1880-1900) of decoration of the house.

Construction of the wall of the original house was of the balloon-type. Studs were spaced approximately 16 inches on center. The interior surface was original horse hair plaster and wood lath construction. The stud cavity had hit-and-miss distribution of blown-in cellulose insulation. The attempt at wall insulation was done an unknown number of years prior to 1993. Because the distribution of loose fill cellulose insulation in the exterior walls varied from little to none, for future thermal analysis it was assumed that the walls were not insulated. There was no sheathing so the 5-1/2 inch yellow poplar clapboards were nailed directly to the studs.

The thick accumulation of oil-base paint was alligatored. It also tested at a very high concentration of lead. Because of the alligatored condition it was decided it was necessary to remove the paint before repainting. Heat in the form of heat plate and heat gun was the first stripping technique tried. Production was very slow. In addition this form of stripping leaves the surface with a heavy glaze of re-hardened paint. It was imperative that this glaze be removed to promote paint adhesion. A high speed disc sander removed the glaze to expose virgin wood fiber. The use of heat for paint stripping came to an abrupt halt on Memorial Day 1994. Unintentionally, the heat gun ignited small clusters of loose fill cellulose insulation that were lodged directly behind the siding. The Lafayette Fire Department extinguished the smoldering insulation. It is unknown if the loose fill cellulose insulation had been treated with a fire-retardant. If it had been, the treatment was ineffective.

Paint stripping then continued with the use of a 1993 model of Paint Shaver®. The Paint Shaver is a disc grinder type of tool fitted with a suction head to vacuum abraded debris into a container for proper disposal. The depth of cut for the Paint Shaver was set to maximize paint film removal while minimizing wood fiber removal. A high speed disc sander then was used to smooth the rough surface in preparation for the application of a “paintable” water-repellent preservative (WRP) (Solvent –base Woodlife Classic 1993 formulation). It was standard practice to minimize the time of exposure of the bare surface before application of the WRP. In general, minimization of exposure time between successive applications of coatings was the rule. The bare wood surface was liberally brushed with WRP with joints receiving additional treatment. After required drying, the primer was brushed on. A 100 percent acrylic primer was used. The two top coats of semi-gloss paint was applied. It was intended that the top coat paint was to be 100 percent acrylic resin. The brand of primer and top coat paint had been purposely selected based on prior knowledge of its outstanding weathering performance on a government research paint fence. However, unbeknown to the author/painter the manufacturer had “optimized” the formula for their top coat paint in the period of time between the paint fence weathering test and the purchase of the paint for the case study house. The formula for the purchased top coat paint was a combination of acrylic vinyl polymer and acrylic resin, not the intended 100 percent acrylic resin formula. But this discovery was subsequent to painting the case study house.

Old paint was removed from the original house 1993-1994 and painting was done during the 1994 season. During the interim 1994 to the present (2007), no paint failure of any type has been observed, with one exception. The windowsills on the eastern, southern and western exposures have varying degrees of paint failure. It is recognized that these surfaces are inclined to the sun and, therefore, are subjected to more intense solar exposure than the lap siding in the vertical plane. In most cases hail stones ruptured the paint film allowing water incursion and subsequent paint film failure. ‘Also paint failure of square edges of the window sill parts was common. Rounded edges of these parts would have allowed for greater paint accumulation and longer service life.

Maintenance of painted surfaces consisted of about every other year washing the siding with commercial type siding detergent. Mildew started to appear on the north facing

garage doors after about three years. The mildew appeared on the painted flat hardboard skins of the doors. Mildew was removed with a commercial mildew remover. However, the mildew reappeared the following spring-summer. Since then mildew has reappeared each spring-summer and has been removed with a strong bleach solution: 2 parts (5 percent) sodium hypochlorite bleach to 3 parts warm water. After eight years mildew appeared on the north exposure on some **replacement** boards of new-growth yellow poplar. Adjacent boards of original siding were not infected until recently (2006), after 12 years. As of the winter of 2007 the other exposures (sides) of the house appear to still be free of mildew. Much of the original siding was heartwood, whereas, almost all of the replacement siding was milled from sapwood of new growth yellow poplar. A strong bleach solution (2 parts (5 percent) sodium hypochlorite bleach to 3 parts of warm water) was used to periodically remove mildew.

As indicated earlier an addition to the original house was constructed in the summer and fall of 1993. The addition consisted of two parts: a two car unheated garage and a connecting breezeway that was incorporated into the living space of the original house. Construction was standard stick- built of that time: 2 x 4 studs 16-inch on center with 1/2-inch plywood or OSB exterior sheathing covered with TYVEK™ housewrap attached to the sheathing. In the breezeway the stud cavities were filled with glass insulation batts, plastic vapor retarder was fastened to the interior edges of the studs and gypsum board (sheetrock) nailed to the studs completed the wall construction of the breezeway. The interior of the garage was unfinished; no insulation, no vapor retarder film and no sheetrock.

The siding for the addition was manufactured from new-growth yellow poplar boards to resemble the original siding. Planed 5/4 boards were diagonally resawn to create tapered clapboards. The planed surface was used as the exposed side to be painted. (NOTE: later there will be discussion about problems introduced by the selection of the planed side as the painted surface and the geometry of the siding resulting from the resawing method of manufacture.) The siding was applied directly to the housewrap and nailed to the studs.

The new siding whether used for the addition or as replacement boards for the original house was treated the same. Water-repellent preservative was liberally brushed on the full weathering surface, drip edge and the back side (sawn surface). The installers of the siding were instructed to dip cut ends for 30 seconds in a can of WRP. It was not possible to monitor to determine that this instruction was carried out. Aluminum, ring shanked siding nails were used. After caulking /sealing, the siding was finished the same as previously described for the siding on the original house. Painting of the new construction was completed in fall 1993.

About seven years after installation rot was discovered in the band board and the drip edge of clapboard on the south wall of the garage. The problem is discussed fully in **M.O. Hunt's Painting/Repainting Workshop Presentation**. Water (probably wind driven rain and condensation hanging on the drip edge) penetrated under the overlap and was held by the TYVEK housewrap against the backside of the siding. The brush treatment with WRP of the backside of the siding and band board apparently provided

temporary protection at best. The geometry of the resawn siding probably accentuated the water penetration problem. The drip edge of the siding when installed is angled such that water of the drip edge actually drains toward the overlap where it would be wicked behind the siding.

The use of “rain screen” type of exterior wall construction is suggested as an alternative to prevent the siding rot issue. This type of wall construction is discussed in **M.O. Hunt’s Painting/Repainting Workshop Presentation.**

After 8 to 9 years of weathering, some small fissures in the paint were noted on clapboards on the south and west exposures of the garage. It appeared that the paint was “wearing out.” The south exposure of the garage was touched-up in fall 2006 – 13 years after painting. To touch-up, distressed spots were lightly sanded, primed and a top coat applied. The same paint products were used for the touch-up as were used initially. The west exposure of the garage will be treated similarly in the summer-fall 2007.

The difference in paint performance between new siding on the addition and original siding is hypothesized to be primarily due to the difference of respective surface textures of the new and original siding when painted. For the new siding that is being touched-up after 13 years of weathering, originally primer was applied to a planed (very smooth) surface. But for the original siding primer was applied to a sanded surface resulting from the mechanical removal of all of the paint accumulation. As previously reported there is no evidence of paint failure on the original clapboard siding after 13 years of weathering.