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REPORT ON THE OLD PARSONAGE NEWINGTON, NEW HAMPSHIRE

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This report is based on an inspection of the Old Parsonage on the afternoon of October 19, 1999. The purpose of the inspection was to evaluate the general condition of the building, with particular reference to moisture conditions and exterior paint failure.

Summary: The Old Parsonage is a very important and unusual dwelling house, intricately bound up with the history of Newington. The building remains in good structural condition following extensive restoration work carried out by Malcolm MacGregor of Durham between 1987 and 1989. The structure exhibits excessive concentrations of moisture in a few areas, notably in the central chimney and the cellar. These conditions are detrimental to the structure itself and should be also corrected before the town incurs the expense of repainting the building, since internal moisture in a building frequently results in paint failure. Reduction of moisture levels within the building can be achieved through relatively simple and inexpensive means. When the building is repainted, the town should insist on traditional methods of preparation and paint application, and on use of the best materials.

SIGNIFICANCE OF THE HOUSE:

The Old Parsonage in Newington is a rare survivor from the 1700s. It is one of few “saltbox” houses to be found in the New Hampshire seacoast. Like most houses of this type, the parsonage has a lean-to that was added a few years after the house was built, rather than an integral lean-to. Like the nearby meeting house, the parsonage has long been inextricably connected to the public life and the identity of Newington. Unlike the much-altered meeting house, the parsonage retains the appearance of the 1700s, never having been remodeled in a wholesale fashion. The building reveals subtle evidence of internal changes from time to time, but is remarkable in having been preserved with little alteration over a period of more than two centuries. Few other houses of coastal New

Hampshire have survived with such integrity from so early a period. Standing close to the meeting house, the old town hall, the Langdon Library, the town forest, and the burying ground, the house is essential to the character and identity of Newington Center. The building was recorded with photographs and measured drawings by the Historic American Buildings Survey in 1935 and 1936, and was placed on the National Register of Historic Places as a component of the Newington Center Historic District in 1987.

DESCRIPTION OF MOISTURE CONDITIONS:

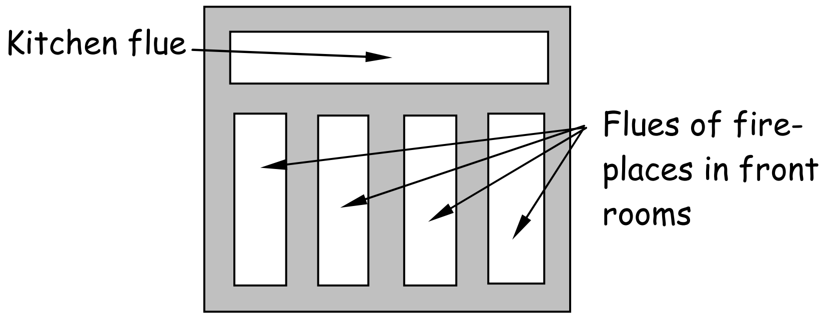
Chimney: The central chimney of the house exhibits high levels of moisture, as measured by a moisture meter. The chimney stack is very damp from the attic to the first floor level. The internal moisture of the chimney has saturated the walls of the stack in the attic, so that moisture meter readings on the outside face of the chimney are as high as those inside the chimney flues as measured in the rooms below.

As is typical of eighteenth-century houses in the seacoast area, the chimney bricks are laid in clay-sand mortar below the roof; above the roof, the bricks are laid in harder lime-sand mortar. The migration of moisture through the upper walls of the chimney has softened the mortar in the attic and caused it to fall out of the joints on the exposed faces of the chimney. While this poses little fire danger (since the fireplaces are not used), the continued erosion of the mortar joints will eventually weaken the chimney's structure to the point that the stack will have to be rebuilt, at least from the attic floor upward. Correction of the moisture problems in the upper chimney will give the chimney a greatly extended life.

High levels of moisture can also be read at the fireplace jambs and backs on the lower floors. The bricks within the flue of the kitchen fireplace are wet all the way down to the throat of that fireplace.

The chimney is so wet that it is affecting adjacent materials. The roof frame and sheathing boards in the attic register very low moisture readings in most areas, but those boards or members that touch the masonry show high readings due to absorption of water from the damp bricks. The new gypsum board wall that screens the chimney from the front staircase (probably constructed because moisture had damaged the original wall here) shows very high moisture readings and is covered with disfiguring mildew in its upper areas. Because gypsum is not impervious to moisture, a continuation of these high levels of moisture will eventually destroy the wallboard and the wooden framing that supports it. The presence of heavy mildew on this wall will prevent the painting or papering of the walls as long as these moisture conditions persist.

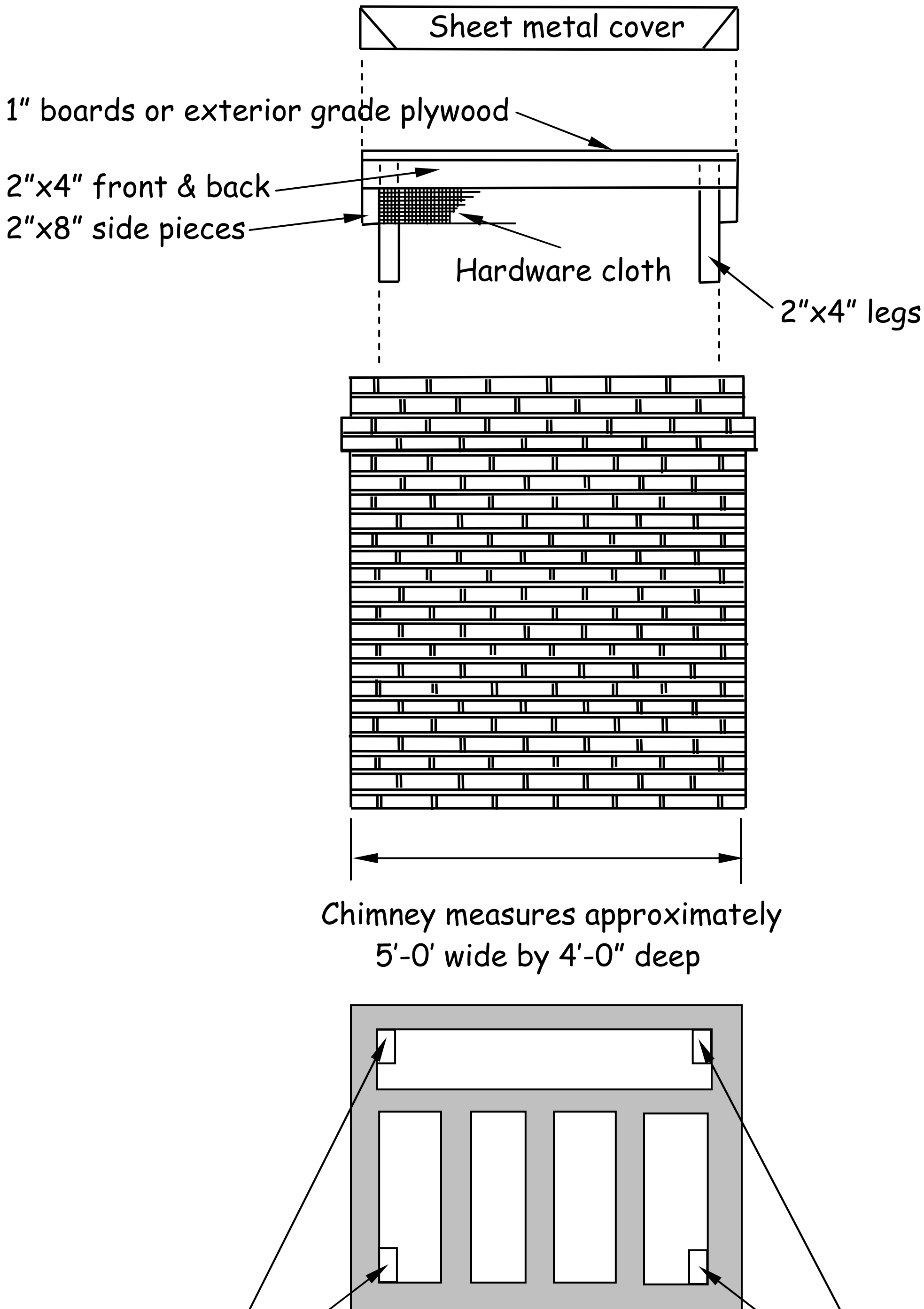
Most of the moisture that is saturating much of the chimney stack is almost certainly entering the chimney through the open flues that are exposed to rain. As seen from the top, the flue arrangement of a central chimney like that of the parsonage looks like this:



Exposed to the sky, these open flues absorb a great deal of water. When the chimney is inactive, as at the parsonage, this moisture saturates much of the masonry. The only means by which the chimney rids itself of the water is through evaporation in warm, dry weather. This evaporation is aided by convection currents that naturally rise through the chimney flues and help to carry off the moisture.

In a chimney that reveals the extreme moisture conditions seen in the parsonage, it is beneficial to exclude as much as possible of the moisture that falls into the open flues. At the same time, it is beneficial to permit the drying convection currents to continue to rise through the flues and to carry of moisture in the brickwork and also in the internal atmosphere of the rooms that are served by fireplaces.

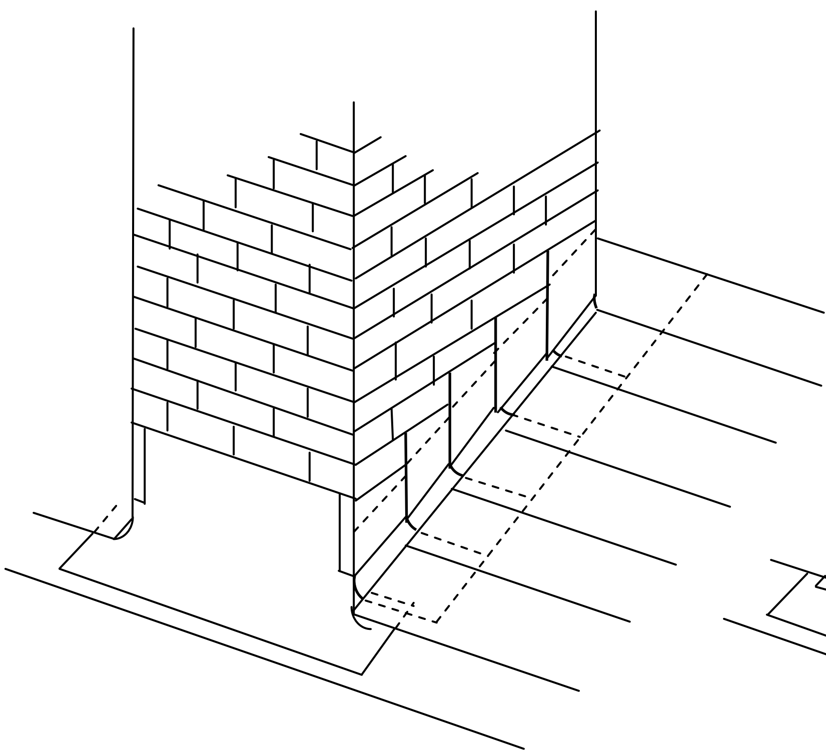
The drawing on the following page offers one suggestion (of many that might be devised) for a low-profile wooden cap that would exclude rain and snow from the flues while permitting some degree of air flow upward through the chimney flues.



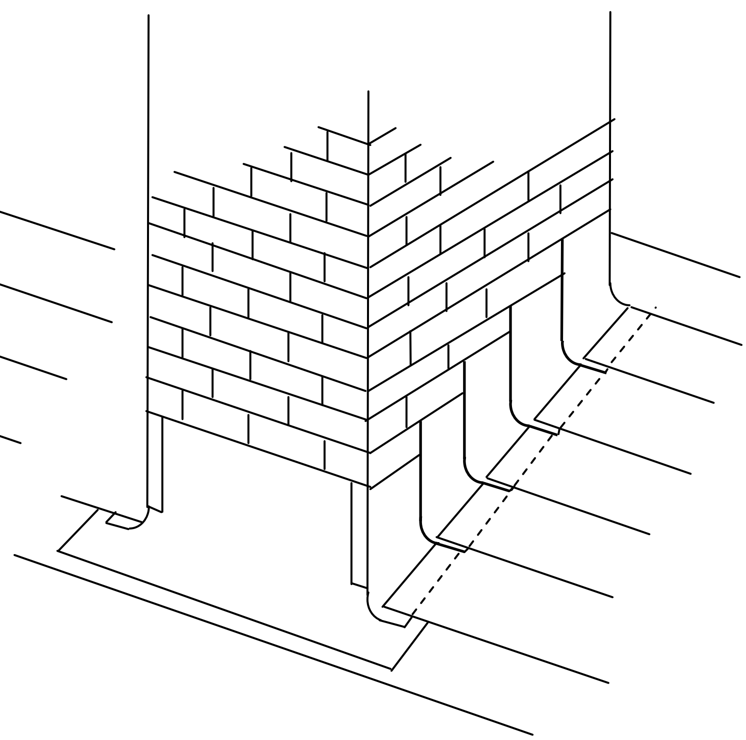
Suggested chimney cap:
2"x4" legs project into flues to hold cap.
2"x8" side pieces elevate cap to provide
ventilation at front and rear of chimney.
Cap should be wired to nails in mortar joints.

Another possible means by which water may be saturating the chimney is through the flashing at the juncture of the chimney and roof. When the present roof of asphalt shingles was installed, the lead flashing that is mortared into the joints of the chimney was simply turned down, folded out onto the roof, and interlaced with the shingles, as shown below at the right. This method of flashing, although common, is often a cause of leaks around the sides of a chimney.

The recommended method of flashing a projection through as roof is shown below at the left. This method uses two entirely independent systems of lead flashing sheets: cap flashing and base flashing. The base flashing is placed under each course of shingles, projecting well out onto the roof, and is folded up against the side of the chimney stack. The cap flashing, mortared into the joints of the chimney, is folded down over the base flashing, covering the vertical portions of the base flashing. This method prevents water from penetrating the juncture of roof and chimney even in torrential rains.



Cap and base flashing
The best practice



Flashing tucked under shingles
Common but poor practice

Moisture meter readings did not prove that rainwater is leaking through the chimney flashing at the parsonage—only that the outside faces of the chimney stack are saturated with moisture. Given the propensity of this flashing method to leak, however, it would be prudent to require a double system of cap and base flashing when the roof is re-shingled in the future.

Dampness in the Attic: At present, following the summer season, the roof sheathing and framing show only a low level of moisture, consistent with seasoned wood.

In most houses with a dirt-floored basement, however, enough moisture will emanate upward from the unfrozen soil under the house to condense and freeze as hoarfrost on many interior surfaces. This is especially common on the points of roofing nails that project through the roof sheathing and conduct cold from outside the house, and also on the undersides of the roof sheathing boards.

The present roof covering of the parsonage is composed of at least three elements. The original roof sheathing boards, with waney edges that are ideal for ventilating wooden shingles, remain in place. Over the sheathing boards, the roof is covered with plywood, probably C-D exterior grade, which was laid as a smooth base or "underlayment" for asphalt shingles. The joints between the sheets of plywood are sealed with some type of asphalt mastic, rendering the plywood covered nearly impervious to the passage of water vapor. Laid on the plywood is a roof covering of "architectural" asphalt shingles, having an irregular thickness of tabs meant to simulate the appearance of wood shingles. It is likely that the plywood was also covered with tarred felt, or even with a self-adhering, rubberized ice and water shield membrane before the shingles were applied.

All of these components ensure that the roof membrane is effectively impervious to the passage of water vapor. Since water vapor within the house is a principal enemy of an enduring paint job, and since water vapor cannot escape through the roof, it would be prudent to ventilate the attic space to whatever degree is feasible. Since warmer air rises, and can absorb more water vapor than colder air, the establishment of a continuous convection current upward through the house would be an effective way to carry off water vapor, thus keeping the entire fabric of the building as dry as possible. Venting the upper attic would be especially effective in the parsonage since the upper attic is open to the lean-to that runs across the back of the house. The lean-to, in turn, can be opened to the eastern bedchamber and to the first story (in the kitchen) simply by leaving doors open.

Ideally, ventilation in the attic would be accomplished by replacing the two small six-light attic gable windows (newly installed in 1986) with louvers. This would ensure cross ventilation throughout the attic, independent of wind direction. The recent installation of a drywall partition around the top of the attic stairs, however, effectively prevents access to the western attic window, and also cuts down on potential air flow from one end of the attic to the other.

It may, therefore, be most feasible to replace only the eastern attic window with a screened louver (carefully saving the six-light sash). This louver would be on the least visible side of the structure, and might be installed only in the wintertime, with the sash replaced in the summer. Being on what is usually the lee side of the building, such a louver should encourage a slow outward flow of moisture-laden air from within the house.

Dampness in the cellar: Most of the moisture that pervades the interior atmosphere of the parsonage originates in the basement. The basement extends under the main house, but not under the lean-to. At the center of the cellar, projecting from its rear wall, is a massive stone-faced pier that serves as the foundation for the central chimney of the house. The cellar walls of the house are laid in glacially-fragmented local stone, and the natural shape of this stone provides for considerable stability and for a plumb inner face of the walls. The walls are laid dry, with no pointing between the stones except at and above grade. In this upper zone, the stones are pointed with lime-sand mortar to exclude drafts and vermin.

Such a foundation wall is, of course, highly pervious to water, especially to the concentrated rainwater that drops from the eaves of the house. Photographs taken by the Historic American Buildings Survey in 1935 show that the front eaves were fitted with a wooden gutter at that time; the leaders or downspouts were then missing from each end of the gutter. Later photographs submitted with the nomination of the house to the National Register of Historic Places show that the front of the house had a gutter and two wooden leaders in 1986. These were removed during the restoration of 1987-89. Over many years and until recent times, there has clearly been some effort to control the rainwater that fell on the front slope of the roof. The 1935 photographs show no evidence of gutters at the eaves of the lean-to, probably because roof water falling so far behind the excavated cellar would be unlikely to find its way into the basement.

Today, the house has no gutters on front or back. Most of the water that falls from the front slope of the roof therefore finds its way into the cellar through the wall. Capillary action in the soil also draws water upward from the soil directly under the house, so that the entire cellar floor is constantly damp.

Such a floor seldom freezes except in the coldest weather. The unfrozen cellar floor therefore acts as a source of water vapor year-round. During the daytime, the warmer air in the upper rooms, being heated by the sun, is capable of absorbing some of the water vapor generated in the basement. Being a gas, this vapor is capable of migrating into the upper parts of the house, penetrating wooden floors and plaster walls with ease. At night, when the house cools, this water vapor condenses on all cold surfaces. It is not uncommon in unheated houses with dirt cellar floors to find hoarfrost covering all walls and furnishings at night or on especially cold days. As noted above, such frost is especially common in attics, which tend to become the warmest areas in any old house during sunny days, but to cool most quickly at night. On warmer days, this frost melts, often inviting mildew or creating damaging condensation on furniture finishes or behind the glass of framed pictures.

This cycle of migration and condensation of water vapor slowly saturates all the building materials of the house. At the parsonage, moisture meter readings on all wooden joists or subfloor boards were above the high end of the calibrated scale—above 20% moisture content. Moisture levels this high are conducive to decay in the wood, and nourish mildew spores and wood-destroying insects. The evaporation of this accumulated moisture during warmer weather is a chief cause of paint failure on the clapboards.

For this reason, it is highly worthwhile to control the migration of water from the basement into the upper parts of the house. Experience has shown that this can be done by two means: excluding roof water from the cellar and placing a barrier between the damp soil and the air in the cellar.

Exclusion of rainwater can be accomplished by intercepting the water either at the eaves, with gutters, or in the soil below the drip line. While gutters often cause problems of ice damming and roof leaks in heated buildings in New Hampshire, gutters can be mounted on unheated buildings with no fear of ice dam formation. Ice dams form only when roofs are artificially warmed, and when the meltwater from snow on the roof freezes as it reaches the colder eaves or drops into a cold gutter. In an unheated building, the only melting of snow that takes place is caused by the sun, and solar melting normally proceeds up the roof from the eaves, leaving the latter clear of ice.

If acceptable to the custodians of the parsonage, an eaves gutter might be re-mounted on the front of the house, taking care to conduct the roof water away from the building by a drain or storm sewer that discharges at a point well away from (and below) the house. The field to the east of the building offers a good point of discharge—especially if an old well, said to be located in this field, can serve as a receptacle for roof water.

As an alternative, an in-ground collection trough may be placed along the front (and rear) drip lines of the building. Perforated PVC (polyvinyl chloride) pipes or pierced flexible drain conduits may be buried in the soil, usually cradled in a trough created by digging a trench, lining the trench with 6 mil black polyethylene, and filling it with crushed stone or gravel. The perforated collection pipes are usually connected to solid PVC piping that conducts the run-off to a distant point of discharge such as a dry well or an open-ended outfall.

As an alternative, a trench with a sloping bottom may be dug from the foundation wall forward a few feet, to whatever depth is deemed necessary. The trench may be puddled with packed clay and/or lined with polyethylene, with a perforated drain pipe placed at its lowest extremity, as above. While this method requires more excavation, it shields a greater area of earth from roof water than the simple placement of a collection line directly under the drip line.

Naturally, no excavations should be undertaken on the parsonage property without an archaeologist in attendance. W. Dennis Chesley, then a graduate student at the University of New Hampshire, undertook some archival investigation of the parsonage site in 1978. This was followed by archaeological investigations of a former barn site in 1979-80. These investigations revealed evidence of a wooden, wattle-and-daub chimney in the center of the barn area, demonstrating that the parsonage site contains the remains of very early buildings. This proof of the sensitivity of the site offers a strong reason to establish a policy that no disturbance of the ground around or under the house should be undertaken without professional surveillance.

The second means of controlling the migration of moisture from the cellar is by sealing the dirt floor. This can be accomplished by the simple expedient of covering all exposed soil with sheets of 6 mil black polyethylene, well lapped (and taped if possible) at the edges. Before the floor is covered, it should be cleaned of all sharp debris, organic materials, or anything that may tend to puncture the plastic membrane. A cushioning layer of clean sand should be spread across the dirt for the same reason, and traffic in the cellar should be limited to necessary occasions after the plastic sheets are laid down.

Again, if soil is removed from the basement floor in preparation for laying the polyethylene, an archaeologist should be in attendance. The floor presently reveals a number of ceramic shards, which are probably indicative of household furnishings at various periods.

Experience has shown that the laying of plastic sheeting on a dirt basement floor reduces the amount of water vapor dramatically in the house as a whole.

There is one other source of moisture that requires different remedies from those described above. This is condensation. Condensation may become a serious problem, and a source of much liquid water, during the humid summer months. Typically, an unventilated basement or crawl space under a house remains cool during the summer. When the outdoor humidity is high, the cool areas under the building are frequently below the dew point. In such a situation, humid air from the outdoors finds its way into the building, and the water vapor in that air condenses as water droplets on all surfaces, including wooden floor joists. Sometimes, a stratum of water droplets forms in the still air, creating a layer of fog in the cellar. Even with the dirt floor sealed against moisture, the infiltration of outside air can introduce damaging amounts of water that will saturate the first floor frame and eventually cause decay. Water from this saturated wood eventually finds its way into the upstairs rooms as well, causing problems similar to those created by water from an unsealed dirt floor.

The cellar of the parsonage has no windows or other ventilation except for a few cracks in the foundation stones. In such a well-sealed cellar, infiltration of outside air may be so minimal that no condensation occurs.

If humid air does infiltrate, condensation can be prevented by two means: mechanical dehumidification or by warming the surfaces of the cellar above the dew point.

Mechanical dehumidification is usually achieved by one or more portable dehumidifiers. These units require electricity, and must be emptied by hand or else drained through a hose to some point lower than the machine. They may also ice up in a cellar that remains below 55ºF. during the summer. They have the advantage of actively removing moisture from the air, lowering the humidity in any space where they are run.

The second means of preventing condensation is by warming all surfaces of the cellar above the dew point—the temperature at which water vapor condenses to liquid water. In humid summer weather, the dew point may sometimes be above 70ºF. Condensation in a cellar may be prevented by heating the space above the dew point by some kind of heating element, or by drawing warm outside air through the space. Since the parsonage has no windows in its basement, the latter approach seems unworkable.

Both dehumidification and artificial warming of the cellar would require some equipment, surveillance of that equipment, and the consumption of electricity, as well as posing some degree of fire hazard to the building by the use of electrical appliances. I would therefore recommend sealing the cellar floor with polyethylene and then monitoring the cellar for a full summer to see if condensation is a problem. If not, no further work will be required.

DESCRIPTION OF OTHER CONDITIONS NOTED DURING INSPECTION:

Except for a failing coat of paint, the exterior of the house is in generally good condition. The wooden ridge board, applied over the tops of the asphalt shingles to simulate the kind of board used with wooden shingles, has lifted to the east of the chimney and should be re-nailed. Because the asp[halt shingles would have been folded over the ridge during application, the lifting of the ridge board should not have created a leak at the ridge, but the situation should be inspected.

The asphalt roof, apparently applied in the restoration of 1987, remains in good condition and still has a considerable expected life-span.

The stone areaway of the cellar bulkhead door has partly collapsed from frost action. While the upper area of the stone wall, supporting the wooden curb of the bulkhead door, remains intact above grade, the stonework below this area has been thrust into the excavated areaway by the pressure of freezing soil. This area of masonry needs to be rebuilt after removal of the earth that has slumped into the areaway excavation. Because frost expansion has damaged the lower wall of the areaway, it would be prudent to backfill a future construction trench with crushed stone, coarse gravel, or some other quickly-draining backfill.

EXTERIOR PAINT PROBLEMS:

The exterior paint on the parsonage, applied during the restoration of 1989, shows general failure. This is especially pronounced on the three sides most exposed to the sun; it is less advanced on the north side of the house.

All four elevations of the house were re-clapboarded during the restoration of 1987. The new clapboards were sawn from a good grade of wood, but no information is currently available about the species of wood, the type of sawing (radial-sawn or plain-sawn), or the type of primer and finish paint used in the initial painting of the new wood. Some wood species, notably spruce, often show poor paint adhesion.

Moisture meter readings on the interior and exterior walls of the house revealed a low moisture content in the walls on October 19, 1999—generally, below 10-12%. Although the moisture content of the clapboards may vary considerably over the course of a year, the present moisture level does not point to excessive moisture as the primary cause of paint failure on the parsonage. If the steps outlined above under "**Dampness in the cellar**" are followed, the migration of moisture from within the house should be still less of a concern in the future.

The most likely cause of paint failure on the parsonage is the quality of paint materials used in the initial painting of the new wood in 1987. It should be noted that many paints of American manufacture are now formulated for a longevity of only about five years. If such paints were used on the house in 1987, and if the building has not been repainted since, the paint on the house may have exceeded its expected life-span.

Where paint has lifted from the clapboards, it has separated cleanly from the wood. There is no evidence of a residue of primer in the surface of the wood. This suggests that a primer of poor quality, possibly a latex paint rather than an oil-based primer, was used when the clapboards were first painted. Even when latex paints are used for the finish coats on a house, most manufacturers recommend priming with an alkyd-based paint for better bonding with the wood.

For the protection of any historical building of outstanding value, the New Hampshire Division of Historical Resources recommends traditional painting practices, coupled with the application of the best paints obtainable.

Traditional painter's practices place great emphasis on preparation for painting. Preparation should account for at least fifty percent of any paint job.

The choice of priming and finish paints is especially important during this era when the quality of many paints is declining precipitously. This decline is due in part to the understanding by many American paint manufacturers that Americans move from house to house, on average, every four years. When they move, they generally re-paint their new home. For this reason, manufacturers have designed paints with an expected longevity of only about five years. Traditional exterior house paints, formerly hand-mixed from paste white lead and pure linseed oil, often endured for twenty years.

White lead, the best pigment for exterior painting, has been unavailable in the American market since the 1970s due to its poisonous nature if ingested. The effects of the "Clean Air Act," which strives to reduce volatile organic compounds (VOCs) released into the atmosphere during paint production, has also had an ever-more-detrimental effect on the quality of the chemicals available for paint manufacture.

Attached to this report are generic specifications for exterior painting of a historical building. These specifications outline a method of work that has proven its effectiveness over several centuries. It is important not to attempt to repaint the parsonage until every effort has been made to control interior dampness. If the chimney and basement moisture conditions can be controlled during the summer of 2000, it may be possible to repaint the building in the late summer of that year. If the sealing of the cellar floor still leaves a problem of pervasive condensation on the cool surfaces of the basement, it would be prudent to design methods of preventing this condensation before attempting to repaint the house. For this reason, it will be important to monitor moisture conditions throughout the summer following the installation of a chimney cap and a polyethylene floor covering in the basement. Painting of the house before internal moisture is under control would be a waste of money.

On method of paint preparation to avoid at all costs is the now-popular “pressure washing” or “water-blasting” of the building. Washing a structure with a damaged paint film, even under moderate pressure, drives a great deal of water into the fabric of the building. A washed building requires weeks and often months to dry to a condition fit for painting, yet many of the painters who now employ this method attempt to paint the structure within a short time after washing it.

The easy availability of pressure-washing machinery has tempted many painters to employ this method of preparing buildings for painting, usually with the justification that blasting off the loose paint will save labor. Labor should constitute about 85% of the cost of a paint job, and it is false economy to try to avoid hand work during preparation. Some painters may believe that because latex or acrylic vinyl paints are water-based and water-soluble, they can be applied over damp materials. This is utterly wrong. Once such paints have undergone the chemical reaction of drying, they are as susceptible to failure from underlying moisture as are oil-based paints. Water is the great enemy of a long-lasting paint job. The drying of a damp, washed building invariably causes paint failure in both oil-based and water-based paints.

There is no substitute for the traditional method of dry scraping and sanding of a painted surface. All exterior house paints are perfectly adapted to cover a building that has been scraped, sanded, and brushed with a dust brush. No paint requires a washed surface for good adhesion. On the contrary, paint adheres best to a slightly roughened surface like that created by traditional scraping, sanding, and dusting.

In addition the American manufacturers listed in the attached paint specifications, there is a company in Woodstock, Vermont, that imports paints of unusually high quality made by the Hermann A. Schroeder Company (HASCO) of The Netherlands. While these Dutch paints are expensive, they are also enduring. Since the cost of materials constitutes only 15% of the expense of a good paint job, a higher materials cost may be more than offset by the longer life obtained by the use of the best quality of materials. For more information about HASCO paints, contact *Fine Paints of Europe*, P.O. Box 419, Woodstock, Vermont, 05091. [Tel: (800-332-1556; FAX: (802) 457-3984; http://www.fine-paints.com]. *Fine Paints of Europe* has at least one New Hampshire distributor: A&M Paint & Wallpaper, 46 Market Street, Portsmouth, NH, 03801 [Tel.: (603) 436-5366].