NEW HAMPSHIRE DIVISION OF HISTORICAL RESOURCES

State of New Hampshire, Department of Cultural Resources 603-271-3483
19 Pillsbury Street, 2nd floor, Concord NH 03301-3570 603-271-3558
Voice/ TDD ACCESS: RELAY NH 1-800-735-2964 FAX 603-271-3433
http://www.nh.gov/nhdhr *preservation@nhdhr.state.nh.us*

SECOND REPORT ON THE WEEKS ESTATE
LANCASTER, NEW HAMPSHIRE

JAMES L. GARVIN
14 AUGUST 1998

The following report is based on an inspection of the Weeks Estate on June 24, 1998. Also present were Mary Sloat, site manager; P. Russell Bastedo, State Curator; and Paul Graney, intern at the Division of Historical Resources. The purposes of the inspection were 1. to examine the clear finishes on the woodwork of the dining room and on the floor of the hall of the house, and 2. to evaluate water damage and moisture conditions on the interior and exterior of the building. This report also includes comments on moisture conditions in the house, received on August 13, 1998, from Robert S. Bast of Bast & Rood, Architects, of Hinesburg, Vermont. This report supplements a prior report, dated July 22, 1992, which addressed 1. failure of stucco on the main house and the automobile garage, and 2. water and moisture problems of the main house.

Summary: 1. The woodwork of the dining room of the house is in original condition and shows some deterioration of its original shellac finish. 2. The finish of the floor of the great hall of the house has defects resulting from improper workmanship in the last refinishing of the floor. 3. The house suffers from chronic moisture problems that have caused structural and cosmetic damage in the past and will continue to do so until corrected. This report recommends a straightforward method of stopping basement condensation, accompanied by study of the feasibility of controlling relative humidity throughout the entire house.

History: The State of New Hampshire acquired the Weeks Estate from members of the Weeks family in 1941, when the house was twenty-nine years old. The state undertook a major program of rehabilitation at the house in 1964 under the supervision of Malcolm Chase, special projects engineer for the New Hampshire Department of Public Works and Highways, and architect Guy Wilson. According to Mr. Chase, a great deal of water-related deterioration was evident in 1964, and repairs to the house were largely focused on overcoming these problems.

Among other projects carried out in 1964 was the installation of a pair of DRYOMATIC 500™ dehumidifiers, which were intended to overcome chronic dampness and condensation within the main house. These dehumidifiers are large central units that draw humid air through ducts from various parts of the interior of the house, pass that moist air to a pair of 150-pound beds of silica gel in each machine, and then deliver the dried air back to the rooms of the house. Together, the two machines contain 600 pounds of this moisture-absorbing chemical compound. The operating manual that was supplied with the machines notes that each machine could deliver 500 cubic feet per minute of dried air, dehumidifying up to 240,000 cubic feet of enclosed space. Presumably the two machines installed in the Weeks house, if operating simultaneously, could dehumidify 1,000 cubic feet of interior air per minute and could control the humidity in 480,000 cubic feet of enclosed space.

The DRYOMATIC™ machines operate on alternating cycles. After one of the two 150-pound beds of silica gel has absorbed moisture from household air, circulation of interior air through that bed of gel is stopped. At this point, a second operating cycle draws outside air into the machine, heats that air, blows the heated air through the bed of gel, and exhausts the heated and now moisture-laden air back to the outside of the building. Meanwhile, the second 150-pound bed of silica gel in the same machine is operating on the absorption cycle. At any one time, then, each machine is simultaneously absorbing moisture from the inside air and exhausting moisture to the outside air.

Advantages of the DRYOMATIC™ technology are 1. the machinery can collect moisture from throughout the building through a network of registers and ducts, and 2. the machinery can operate under cool conditions, not being subject to icing below an air temperature of about 50° F. like most portable dehumidifiers that operate by condensation of water on refrigerated coils.

The great disadvantage of the DRYOMATIC™ technology is reportedly its excessive consumption of electrical energy. The amount of electricity needed to heat the outside air and dry the silica gel, and to operate the blower motors, has reportedly made it financially impossible to operate the two dehumidifiers since the price of electricity became a limiting factor in the early 1970s. For this reason, the machines have reportedly seldom been run during the past twenty-five years.

For this reason, conditions within the house have largely returned to their status prior to the repairs of 1964. The basement of the house is chronically damp, and the dampness of the earth floor is exacerbated during the summertime by condensation of humidity from moist outside air that finds its way into the cool cellar. Evidence within the house suggests that interior surfaces of the first and second floors of the building, including framed documents and photographs, suffer from frost and condensation during the wintertime. These conditions are more fully described below under "**Moisture Problems**."

Chronic dampness and condensation on interior surfaces may also have an effect on the cosmetic treatment of the interior. The present dull finish of the dining room woodwork, for example, could reflect not only the deliberate choices of the original painters in 1912, but could also represent the slow breakdown of the shellac finish from years of condensation on the finished surfaces.

Finish woodwork, dining room: The dining room is one of the most carefully-finished rooms of the building, and remains nearly in its original condition. A letter of November 7, 1941, from State Forester John H. Foster to Sinclair Weeks, donor of the property to the State of New Hampshire, describes an understanding by which the dining room was to be kept as the Weeks family had known it:

> I fully understand that the dining room furnishings are left there by agreement with the idea that until or unless that room should be needed for public purposes we will keep the room as it is[,] reminiscent of the time when it was used as a dining room by the family. The public will not be allowed to enter.

The room occupies the southeast corner of the first floor of the house, and has doors leading out onto the front (south) patio. The room has a fireplace at its eastern end, and a built-in sideboard in its northern wall, opposite the doors leading to the patio. The dining room floor is paved with red terra cotta tiles, and the ceiling is subdivided by false (hollow) wooden beams that run north-to-south across the room.

To the left of the built-in sideboard is a window of leaded glass that lights a telephone room opening off the stairhall of the house. To the right of the sideboard is a door leading to a butler's pantry. The pantry communicates with the kitchen of the house, located at the northeast corner of the building.

All of the woodwork of the dining room is quarter-sawn white oak. This wood presently has a matte finish that appears almost like an untreated surface. The color of the oak is rather dark, harmonizing with the "fumed" finish of the "Mission"-style chairs and other furniture left in the room by the Weeks family.

The only areas that have a coating with a visible sheen are the horizontal, recessed counter of the sideboard, the top of the projecting mantelshelf, and the inside faces of the doors leading to the patio. Elsewhere, the surface of the wood has a slightly rough texture.

Only in a few areas did we detect a slight residue of old finish. This finish had beaded, as shellac beads over time. The lower zone of the baseboards, adjacent to the floor, has a whitened finish that suggests the appearance of shellac when wetted.

We tested the finish of the woodwork in several unobtrusive areas by applying denatured alcohol. In all cases, the alcohol dissolved the finish, although the finish on much of the "half-timbering" of the walls was so impalpable as to be changed hardly at all in appearance by removal with alcohol. In a few areas where reddish beads of finish were visible, suggesting a light coat of orange shellac, the finish was quickly dissolved and the red residue was removed.

On the oak-veneered doors leading to the patio, the more visible finish dissolved with equal readiness, suggesting that these doors had been treated with many coats of shellac varnish to give them added protection.

It appears that the oak woodwork of the room was finished with a light coat of orange shellac except in those few areas, like the horizontal surfaces of the sideboard and mantelshelf or the inside faces of the doors to the patio, where extra protection was needed. In those areas, presumably, additional coats of shellac were applied until the desired gloss was attained. The shellac on most of the woodwork may have broken down or crystallized over the years due to the effects of dampness and ultraviolet light. At the same time, it appears likely that the intention of the original painters was to create an unobtrusive matte finish that would suggest natural, unfinished wood.

It is possible that the oak was treated with a wood filler and not otherwise finished. More likely, the wood was simply given a few coats of shellac to seal it while retaining a matte finish. The sheen of a shellac finish can be governed by the number of coats applied to a wooden surface. Common practice in the early years of the twentieth century called for up to eight to twelve coats of shellac for a fully-varnished, glossy finish. A few coats of shellac would protect the wood but not build up a high gloss.

Because shellac breaks down under the influence of moisture, heat, or ultraviolet light from the sun, the present surface appearance of the oak woodwork in the dining room may not represent the intended finish.

Several methods might be used to return the room to what we may presume was its original appearance.

The most appropriate method would be to remove the remaining residue of shellac varnish and then apply a few coats of new orange shellac. Since the woodwork was washed last year to remove accumulated dirt, removal of the old shellac and preparation of the surface for new shellac would entail simply cleansing the woodwork with denatured alcohol.

When removing old finishes or smoothing coats of varnish between coats, painters of the early years of the century used pads of animal hair, excelsior, or felt, depending on the effect desired. Since none of these materials is readily available today, removal of the shellac residue might best be accomplished today with pads of coarse cloth or fine steel wool used in conjunction with alcohol, followed by rubbing with clean cloths.

After the old shellac (and any other residue) is removed, a few coats of new orange shellac varnish can be applied. Because shellac dries very quickly, two coats may be applied in a day, spacing the coats by six hours. If additional coats are applied, a drying time of at least two days should be allowed between coats.

If old shellac is removed with alcohol, it will be important to keep the dining room fully ventilated because alcohol fumes are both toxic and flammable. All materials containing alcohol or old shellac must be removed from the house at night to reduce fire danger.

An alternative treatment might be used *once only* to enhance the appearance of the finish. This treatment would be a rubbed oil finish. If we can assume that the optical quality of the original shellac has been altered by moisture, which may have created a "bloom" in the shellac over time, an oil treatment may temporarily restore the appearance of the original finish.

It is important not to apply oil to wood repeatedly, since oils polymerize or form molecular links with age. Polymerization creates an impervious coating on the wood that inhibits other finishing methods. Linseed oil also darkens with age (except where kept clear by strong natural light), and this darkening can alter the intended appearance of woodwork.

The traditional mixture for a rubbed oil finish is a mixture of 50% boiled linseed oil and 50% turpentine, mixed warm (usually in a double boiler) and applied warm, being well rubbed into the wood's surface with cloths. After the oil has rested on the wood for ten or fifteen minutes, the wood is rubbed dry with clean cloths to remove any residue.

It is highly important to remove all oil-soaked cloths or other materials from the house each night. Linseed oil and other oils are highly subject to spontaneous combustion during their drying or oxidizing process.

Tung oil, a vegetable oil derived from the nuts of certain Oriental trees, may be used as an alternative to the mixture of linseed oil and turpentine. Again, only one coat should be applied, and any remaining residue should be wiped off the wood after a brief interval. All cloths and other materials containing tung oil must be removed from the house each night.

A paste wax finish is usually more to be recommended than an oil finish on woodwork with a dulled varnish. Paste wax cannot be recommended in the Weeks dining room, however, because the oak has a slightly rough finish that would collect a wax residue and leave a visible wax deposit on the surface.

The two options for treatment are therefore removal and replacement of the existing light shellac finish, or a *single* application of an appropriate wood-finishing oil.

Finish woodwork, great hall: The entire second floor of the Weeks Estate is a single great hall. The walls of this room are divided into zones or panels by "half timbering" similar to that in the dining room below, and the ceiling of the room is composed of plaster panels that fill spaces between the roof trusses and purlins.

Virtually all of the woodwork of the walls and ceiling of the hall has been darkened artificially to a uniform color, which may be described as a dark, matte, brownish finish.

The woodwork of the wall trim and the "half timbering" of the hall appears to be cypress. Its natural color is light, but the artificial finish fully obscures this hue. It may be assumed that the structural members in the roof frame are pine or hemlock. These woods have been brought to the same color as the "half timbering" of the walls through application of the same stain.

This stain is soluble in alcohol. It is not water-soluble, but water creates a white bloom on the surface. The application of oil to the surface darkens the color somewhat but has little effect on the sheen after the residue of the oil has been wiped off.

It is likely that the stain is a shellac-based stain, or that it is a water stain overlaid with a few coats of shellac.

Because we do not yet know how the woodwork was treated, it is advisable to leave the wall and ceiling trim undisturbed in the great hall. Although sunlight has created some breakdown of the finish around the south-facing windows, it would be inadvisable to disturb these areas until further study has shown exactly how the finish of the woodwork was achieved.

Floor finish, great hall: The original finish of the hall floor was orange shellac. Undisturbed traces of this finish are found beneath the floor collars of the steam pipes of the one-pipe radiators. The finish flooring of the hall appears to be quarter-sawn southern yellow pine, the same wood used for the finish floor in the first-story stairhall. The present finish on the floor of the great hall is so dark that the grain of the wood cannot be seen clearly.

A shellac finish was a standard floor finish when the Weeks Estate was completed. Such a finish was built up of many layers of shellac varnish. The finish was kept in good repair by waxing with a paste floor wax and/or by monthly applications of a fresh coat of shellac.

The present finish of the floor of the great hall appears to be a polyurethane varnish applied over a dark wiping stain.

The intended appearance of the floor of the great hall has been greatly damaged by the methods used to apply the present finish.

In applying the present finish, the floor was crudely sanded with a drum sander. This machine was not always run parallel to the length of the floor boards, resulting in gouges that run at angles to the boards. The floor surface is also disfigured by chatter marks and by ripples where the machine was allowed to stand too long in one position. The perimeter of the floor was sanded with a rotary sander, which left curved striations in the floor boards.

Damage to the floor's surface was compounded by application of a dark wiping stain to the raw-sanded wood. This stain was applied in a blotchy fashion and not wiped off quickly, obscuring the natural grain of the quarter-sawn wood and creating areas that are excessively dark.

The polyurethane finish that covers the stain was not applied carefully. The finish has air bubbles in some areas, and the brush strokes are often visible and do not follow the grain of the floor boards. Polyurethane has a synthetic optical quality and is not an appropriate finish for a historic building.

Originally, the finish floor boards would have been hand-scraped to a perfectly smooth surface after laying. After careful cleaning to remove shavings and sawdust, these boards may have been stained to bring them to a dark hue that would have harmonized with the wooden finish of the walls of the room. The finish of the floor would have been built up of many coats of shellac varnish. The traditional treatment of a floor of high quality in the early twentieth century is described in Alvah Horton Sabin's *House Painting*, fourth ed. (New York: John Wiley & Sons, 1929):

> . . . shellac varnish . . . is the least discoloring of anything that can be put on a floor, and is a very good finish. It is not as hard or durable as a good oleo-resinous varnish, but a thin coat of it, which dries in a few minutes, can be quickly and easily applied once in a month or two (or much less often in rooms little used), and will keep it always looking well. White shellac is usually employed for floor-varnish. (p. 87)

As presently refinished, the hall floor thus varies considerably in its appearance from what was intended. The color is much darker than the reddish tone seen where fragments of the original shellac finish are intact. The stain is applied unevenly, with lighter and darker areas alternating across the surface. The opaque stain hides the quarter-sawn grain of the flooring. The surface of the floor has ripples and dips that catch the light and draw attention to the poor sanding job. The floor finish is a modern varnish that is much tougher than a shellac finish but also has a synthetic appearance that differs greatly from the organic resins of a shellac varnish.

The only real corrective for this inappropriate refinishing job would be to re-do the work entirely, stripping off the present varnish and stain, smoothing the rippled floor through hand-scraping or careful re-sanding by a professional, and applying either a shellac finish or a traditional oil-resin floor varnish, not a polyurethane.

Clearly, such a refinishing job would be expensive. Refinishing the floor in this way would also remove still more wood from the hard pine finish floor, thus shortening the life of the floor needlessly. Once such a floor has been sanded or worn to the point close to the tongue-and-groove joints of the floor boards, the heads of the blind nails become visible and the floor is essentially worn out. Replacement of such a floor today is prohibitively expensive, since first-growth, quarter-sawn longleaf yellow pine is now obtained only through salvage of old logs or structural timbers. From a practical standpoint, the expense of the job could hardly be justified, since the present finish, though inappropriate and unattractive, is still sound.

Since the main objection to the present appearance of the hall floor is the unevenly-sanded surface, visible wherever light from the windows reflects off the floor, it may be possible to minimize this reflection by applying a duller finish to the floor. If a coat of flat or eggshell polyurethane were applied over the present finish, the bothersome reflections would be minimized. The main objection to such a treatment might be that the polished appearance of the floor would be lost.

It should also be noted that polyurethane varnishes do not always bond well to other polyurethanes. If a flat or eggshell finish were to be applied over the present finish, it would be prudent to try to determine the brand of the product now on the floor and to apply a flat finish made by the same company, following the manufacturer's instructions carefully.

Moisture Problems: The main house at the Weeks Estate has long suffered from chronic moisture problems of several kinds. In a letter of November 4, 1941, Boston landscape architect Arthur A. Shurcliff wrote to State Forester John H. Foster, noting the “embarrassing condition of the brick pavement around the mansion.” Shurcliff recommended the removal of certain portions of the walls at the outer perimeter of the brick terraces in order to allow roof water to drain more swiftly off the terraces and thus do less damage to the pavement and, presumably, to the stuccoed lower walls of the house. Shurcliff noted that in 1941 the parapet walls “in themselves are suffering from frost action.”

Similarly, much of the work undertaken by the State of New Hampshire in 1964 was intended to control water and moisture. Comments made six years ago by former special projects engineer Malcolm Chase, who superintended the 1964 renovations for the New Hampshire Department of Public Works and Highways, indicated that deterioration due to water was then very severe. Installation of the DRYOMATIC 500™ dehumidifiers was one attempt to control internal moisture. Removal of an original terrace and projecting porch from the rear (north) of the house was apparently a reaction to severe deterioration that had occurred to these features, as well as an attempt to keep roof water from pooling against the lower walls of the house.

As noted in my report of 22 July 1992, the Weeks House was then suffering from severe deterioration of the stucco wall covering on the front (south) wall, from leakage in the flat roofs of the front porch and the kitchen extension, from deterioration of the wooden columns that support the roof of the western porch, and from water penetration through the walls due to the absence of leaders to conduct roof water from the flat roofs down to the ground and away from the house.

Most of these issues have since been addressed. The wall stucco has been repaired. Leaders have been installed on the roof gutters. The roofs of the front portico and the northeast kitchen extension have been covered with double-coverage slate-surfaced roll roofing underlaid with a self-adhering ice and water shield.

Today, the single most pronounced zones of damage from rainwater are 1. The front of the main house, where water from the portico gutters is evidently still overflowing the inner ends of the improperly-pitched gutters and running down the face of the stucco on each side of the porch; and 2. the southeast corner of the house, where roof water splashing off the coping of an intersecting stone wall saturates the walls and has caused damage to interior wall plaster in the dining room. The wall of the kitchen extension, adjacent to an internal chimney for a former kitchen range, is also damp. This suggests that water is continuing to penetrate the house around the massive and complex fieldstone chimney on the eastern end of the building. Similar problems around this chimney were noted in the report of 22 July 1992.

Perhaps the moisture problem of most immediate concern occurs in the cellar of the house. Here, the chronically damp dirt floor acts as a sponge, retaining water within the envelope of the house year-round and providing a source of water vapor that clearly penetrates the upper floors of the building and condenses on all surfaces, including framed pictures and other historical collections, during cold weather.

The temperature of the air and structural surfaces within the cellar also remains below the dew point during most of the summer. The coolness of the cellar causes pervasive condensation of water vapor from humid summertime air that penetrates the cellar. On June 24, 1998, we noted hanging droplets of water on all water pipes, conduits, metal dehumidifier ducts, and wooden floor joists in the cool and shallow basement at the western end of the house. Stones and ledges projecting through the dirt cellar floor were also covered with condensed water. Some of the moisture in the dirt floor of the basement may certainly be attributed to this pervasive summertime condensation as well as to the influx of roof water from outside the building.

All of these conditions were also noted six years ago. The same conditions reportedly necessitated the replacement of some areas of first floor framing during the repairs of 1964.

There are two ways to prevent condensation and its attendant damage in a house with a cool, dirt-floored cellar.

The first method is to seal the dirt floor against the emanation of water vapor and to warm all basement surfaces above the dew point, which may be as high as 65°F. in the summertime. Sealing of a dirt floor is most easily accomplished by laying a continuous layer of 6-mil black polyethylene over the floor, first removing all projections and objects that might pierce the plastic.

Mr. Robert S. Bast of Bast & Rood, Architects, of Hinesburg, Vermont inspected the Weeks House near the end of June, 1998. Mr. Bast has a dual interest in moisture conditions at the Weeks Estate. First, he specializes in the diagnosis and treatment of moisture problems in his practice as an architect. Second, Mr. Bast is the great-grandson of John Wingate Weeks.

After reading the first draft of this report, dated July 26, 1998, Mr. Bast wrote on August 13, 1998, to add his comments to the report. Regarding the use of polyethylene sheeting to suppress basement moisture, Mr. Bast wrote,

> The immediate step of cutting down the migration of water vapor from the soil should be taken. It is well established that a vapor retarding layer of 6 mil polyethylene, installed with reasonable care over the floor of a cellar, will dramatically reduce the infiltration of water vapor which can then condense on beams and walls inside the building. It is the necessary first step, enabling other measures subsequently taken to be more effective as well.
>
> The layer of 6 mil polyethylene should be set so as to avoid puncture, and to be a continuous membrane. This may mean smoothing sharp rocks or shale, filling voids and raking out the ground. The poly, which can be any color, can be ballasted with sand or pea stone, so one can move around on it if need be. This is the most bang for the buck, least-cost first step I can imagine. I strongly urge the State of New Hampshire to initiate this work immediately.

The method of ballasting the polyethylene sheeting with pea stone, described by Mr. Bast, was used at the Wentworth-Coolidge Mansion in Portsmouth, where damp cellar soil had long exacerbated condensation throughout the cellars. Applied in 1984, this polyethylene floor seal, covered with pea stone, has dramatically reduced condensation in the years since; see James L. Garvin, "Report on Moisture Conditions, Wentworth-Coolidge Mansion, Portsmouth, New Hampshire," November 14, 1996, pp. 8, 10.

The most straightforward method of warming the basement, where sufficient natural cross-ventilation through doors or windows is not available, is through installation of exhaust fans to pull warm outside air continuously through the cellar, raising the temperature of all surfaces above the dew point.

Some attempt to secure cross-ventilation may have been made in 1964. The shallow, cool western end of the cellar appears to be vented by metal ducts that penetrate the front and rear walls of the house and rise a few feet along the outside walls to terminate in grilles. We did not study these ducts; they may be intakes for outside air for the two dehumidifiers. In any case, it is clear from present conditions that the natural cross-ventilation of the cellar is insufficient to warm the area above the dew point.

It must be emphasized that this method of stopping condensation by forcing outside air into a basement does nothing to reduce the amount of water vapor within the building. The outside air that is pulled into the cellar is as moist as the outside air that enters the upper floors through doors and windows. Under extremely humid summertime conditions, this air may stand at nearly 100% relative humidity. Under such conditions, all organic materials within the house will absorb moisture, and most of them will swell or otherwise change in dimensions. In the wintertime, by contrast, the relatively dry, cold air in an unheated building will cause these organic materials to desiccate and shrink. The alternate seasonal swelling and shrinking of a building's materials and contents has always been regarded as natural and inevitable, but conservators warn that these seasonal changes are destructive to collections in a museum or a historic house.

Because of this damage, conservators recommend keeping a museum or historic house at a nearly constant relative humidity year-round.

In a museum or historic house that is occupied or visited year-round, the comfort of the occupants demands that the inside air temperature be maintained somewhere between 65° and 70°F., while the relative humidity of the inside air is kept somewhere around 50% for the benefit of the collections. Maintenance of both constant temperature and constant relative humidity calls for elaborate and often expensive systems of climate control within museum buildings.

In a historic house that is not occupied during cold weather, however, human comfort is unimportant.

Thus, the second method of controlling condensation in a building is to seal the structure as much as possible against the infiltration of outside air and to dehumidify the inside air. In the summertime, dehumidification can be accomplished by the use of either portable dehumidifiers or central units like those that were installed at the Weeks Estate in 1964. In the wintertime, control of relative humidity can be accomplished by heating the inside air enough to reduce its relative humidity to desired levels. This may be accomplished by controlling a furnace by a humidistat rather than by a thermostat.

It should be noted that it is usually not necessary to heat wintertime air to a high temperature in order to maintain its relative humidity at about 50%. Conservators point out, for example, that on a 30°F. winter day, the outside air may often stand at 50% relative humidity. As this air penetrates a building, it offers a nearly ideal level of relative humidity for historical collections if kept at 30°. If this air is heated to 45°, its relative humidity drops to about 30%. If the air were to be heated to 70°, the relative humidity would drop to about 10%, much too low for the wellbeing of the collections.

Under wintertime conditions when the outside air stands at 30°F. and 50% relative humidity, then, a furnace controlled by a humidistat set at 50% relative humidity would call for no heat, and would leave the inside air temperature of the building at 30°. Thus, control of a furnace by humidistat may result in interior temperatures that are too cold for human comfort, yet are beneficial to the contents of the building.

Because the historic houses that are owned by the State of New Hampshire operate on very strict budgets for upkeep and staffing, the state has traditionally not attempted any control of relative humidity in these buildings. Reports from conservators have begun to document the detrimental effects of uncontrolled relative humidity upon the collections in these houses.

The Division of Parks and Recreation and the Division of Historical Resources have therefore begun to study the possibility of using simple methods of keeping relative humidity in a mid-range year-round. Because none of the historic houses is occupied or visited year-round (except for the servants' wing of the Wentworth-Coolidge Mansion in Portsmouth, occupied by the Seacoast Regional Manager for the Division of Parks), it appears possible to control relative humidity in some of these houses using a combination of portable dehumidifiers in warm weather and humidistat-controlled forced-hot-air furnaces in cold weather.

Two problems exist in the case of the Weeks Estate. First, the present dehumidifiers, installed thirty-four years ago, have reportedly proven too expensive to operate. It may be assumed, too, that units this old will have developed mechanical problems from age, disuse, or a combination of both.

Second, the house has no furnace or other means of central heating. As built, the house had a coal-fired one-pipe steam heating system. To heat the building as a means of controlling relative humidity, an entirely new heating system would have to be installed. This system would have to have an adequate fuel supply to operate all winter, when no fuel deliveries are possible, and would have to be monitored periodically.

I would recommend three steps to deal with moisture conditions in the house.

First, that the methods of eliminating basement condensation described on pages 9 and 10, above, be adopted as a temporary means of preventing harmful condensation in the cellar. The introduction of sufficient outside air into the cellar to warm the space above the dew point will require a study of means by which forced ventilation can be achieved, especially a means of venting a large volume of air.

Second, that close attention be paid to the success or failure of attempts at controlling relative humidity in other state-owned historic houses through a combination of dehumidification and humidistat-controlled heating. Experiments of this type, recommended by consulting conservators, are currently proposed at the Pierce Homestead in Hillsborough and the Wentworth-Coolidge Mansion in Portsmouth. Both of these experiments are contingent upon receipt of a federal grant. If the grant is received and the systems are installed, internal conditions will be monitored over the next several years. Data collected through this monitoring should tell us whether this combination of methods is successful and beneficial to the houses and their collections. If so, we will have an argument for installation of similar equipment at the Weeks Estate.

Third, that problems from roof water be addressed. As noted above on page 9, roof water is damaging the house at the ends of the gutters of the front portico and at the southeast corner of the building where a stone screen wall intersects the wall of the house. Rising damp is also evident along the front wall of the house, adjacent to the brick patio, where newly-repaired stucco is in danger of being damaged by moisture and frost. The complex stone chimney on the eastern end of the house continues to admit some rainwater, as well. Solutions to these problems, all of which result from the inherent nature of the design of the house, will not be simple except in the case of the improperly-pitched gutters of the front portico. Each area nevertheless deserves thoughtful monitoring and study.

In his letter of August 13, 1998, architect Robert S. Bast suggested another method of excluding water vapor from humid outside air: slightly increasing the air pressure within the house. He wrote:

> One other step which might be considered which you have not suggested is to determine the pressure differential between inside and outside. This can be readily achieved with the effective use of a manometer. Vapor will not migrate from a low to a higher pressure area, so some subtle mechanical adjustment of the air pressure in portions of the house may achieve a lot, along with low impact on the historic structure.

If the Division of Parks and Recreation wishes to consider this method further, I would suggest that Mr. Bast be employed for a brief consultation that would result in his developing recommendations for a straightforward means of raising the internal air pressure of the Weeks House enough to counteract the vapor pressure from humid outside air. He can be reached at:

Robert S. Bast, Architect
Bast & Rood, Architects

P. O. Box 220
Hinesburg, Vermont, 05461
Tel.: (802) 482-5200
FAX: (802) 482-3953