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**REPORT ON THE INVESTIGATION OF THE EXTERIOR
PAINTS: CONDITIONS AND TREATMENTS.
ARLINGTON HOUSE, ARLINGTON, VIRGINIA**

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REPORT ON THE INVESTIGATION OF THE EXTERIOR PAINTS: ARLINGTON
HOUSE, ARLINGTON, VIRGINIA

A. OBJECTIVE

An examination of the exterior paints of the Curtis-Lee (Arlington) House was conducted on June 6, 1979, in order to evaluate the present conditions of the exterior finishes and to prepare recommendations for the cleaning, surface preparation, and repainting of the exterior.

B. DESCRIPTION

Site investigation (including surface moisture testing) and laboratory analysis of selected samples was conducted in order to determine the causes of the deterioration of the existing exterior finishes.

A review of the restoration files at the site and discussions with Mr. Lee Arnest of the National Capital Region Office, NPS, was undertaken in order to gain information about the historic finishes as well as the restoration/maintenance of the house over the years. According to views of the house (east facade) dated between c.1967 and c.1973 and correspondences on file regarding exterior paint investigation and analysis, it appears that the house was repainted twice during this period, the latter being the present finish (1973). In both instances, an alkyd resin- solvent thinned masonry paint (Re-Nu-It) was applied. In addition, the west(rear) and north facades were re-surfaced in 1964. Photodocumentation indicates that these areas were sandblasted and received a Portland cement stucco applied over inserted wire mesh.

Visual inspection of the exterior surfaces was made from the ground with the aid of field binoculars where necessary. Access to the portico entablature for inspection and moisture testing was conducted on an extension ladder.

C. OBSERVATIONS ON THE EXTERIOR FINISHES

Examination indicated that in general the exterior paint film is in sound condition; however localized adhesion failure, characterized by peeling, blistering, and surface checking was observed in the areas outlined below:

Central Block: East facade (figs. 1 & 2)

- a. portico cornice and pediment soffit,
- b. column capitals
- c. column shafts: upper third of eastern exposure,
- d. south portico pilaster (southern exposure),

South Wing: East facade (fig. 3)

- a. southeast corner (upper wall and soffit).

General:

- a. all window sill ledges and water table.

Paint failure in these areas can be attributed to several factors: improper surface preparation and paint application, unusual weather exposure, and faulty construction detailing. No indication of the deterioration of the paint film itself was observed due to masonry alkalinity or improper paint selection.

1. An examination of the wooden cornice and entablature of the east and south sides of the portico (south facade) exhibited an excessive build-up of paints characterized by severe peeling, cracking, and cross-grain checking (Figs. 2 & 4).

These conditions can be attributed to the differential expansion and contraction between the many paint layers and the wood substrate. In addition, these openings have allowed water to penetrate and swell the wood fibers thus breaking the bond between the paint and wood and causing further deterioration of the paint film.

2. The elastomeric sealant used to caulk the joints in the cornice area has lost its adhesive qualities and has pulled out of the joints thereby allowing water access into the wood and behind the paint film.

3. Moisture meter readings taken in this area indicated a low though unacceptable (approx. 15%) moisture content in the wood. Higher readings (15-20%) were found in the lower architrave area and the abaci of the capitals. This high moisture condition has caused excessive peeling and general rot in this area and can be attributed to the retention and absorption of water caused by a metal flashing sleeve which was installed over the tops of each capital and around the lower edge of the architrave(Fig.5).

4. The most widespread example of adhesion failure found on the masonry and wood surfaces was observed as a consistent peeling between the last finish coat and the present primer-finish coats. This condition can be attributed to improper surface preparation or incorrect paint application at the time of the last repainting (1973).

5. An examination of the window sills and upper ledges of the water table indicates severe blistering and paint film deterioration due to water penetration. Poor run-off detailing, minor structural cracking, and inflexible paint build-up are responsible.(Figs.6 & 7).

6. In addition to the factors already cited, it is important to note that the heaviest concentration of peeling and blistering on both the wood and masonry has occurred on the unprotected south facade where extreme temperature cycling has accelerated the deterioration processes.

D. RECOMMENDATIONS

In order to correct the problems cited as responsible for the deterioration of the exterior paints, a comprehensive preservation/maintenance program should be developed and carried out as outlined below.

1. Surface Preparation

a. General

Proper surface preparation is extremely important to the success of any paint job. Without proper surface preparation, peeling and blistering of the paint may occur soon after the painting. If the old surface coatings are sound and show no peeling or blistering, they may be repainted readily after cleaning and cracks and breaks have been repaired. If the surface shows extensive flaking and peeling, then it will be necessary to remove the old coating completely by controlled abrasive blasting. This will provide a firm surface to which paints will adhere. Before repainting, all surfaces should be washed with a non-ionic detergent.

b. Wood

The preparation of previously painted wood surfaces is more difficult than for new surfaces. The substrate, together with any coats of paint that may be on it is the foundation for the new coating and must be in sound condition to support it. Paint removal is therefore essential and should be conducted in those areas where the paint is no longer well-bonded. Total paint removal destroys the historical record of paint colors

and painting techniques (marbleizing, graining, etc.). It is therefore strongly recommended that paint not be stripped off those areas where it is securely bonded. After removal, but before repainting, areas should be photographed to show future researchers where old paint remains.

Methods of paint removal should be selected which are most appropriate for each location. Areas of peeling and flaking paint can be best removed by careful conscientious scraping and brushing avoiding any damage to delicate mouldings or carved detailing. Conditions such as checking or alligatoring which also require complete removal can best be accomplished by the use of a non-alkali (organic solvent) paint stripper or an electric rod burner. Under no conditions should a high temperature hot air gun be used due to the potential fire hazard involved.

Those areas found to have a high moisture level should be closely examined after scraping and a search made to determine the source of water penetration. Although no blistering or peeling could be traced directly to a faulty gutter system, this should nevertheless be examined in order to avoid future problems. It is recommended that the sheet flashing be removed from the abaci of the portico capitals in order to inspect and treat (if need be) the wood. After thorough drying, a low-viscosity epoxy (such as Seep and Seal, Arcon Products) used in conjunction with a water-repellant-wood preservative is advisable in these areas. Should new flashing be required, it should be designed to shed, not retain moisture and be as inconspicuous as possible.

c. Metal

During inspection of the building, it was observed that

the echini of the portico capitals were constructed (or sheathed?) in a sheet metal- presumably galvanized iron. Although only 1-2 layers of paint were evident, these had peeled due to improper surface preparation of the metal. In order to insure secure bonding of the new paints, the best method of paint removal and cleaning for these areas is by low abrasive blasting. Tests should be carried out in order to determine the abrasability of the metal and the type of abrassive selected; however this author recommends glass beads as the safest and most effective abrassive for metal cleaning.

d. Masonry (Stucco)

Microscopic examination of selected paint samples removed from the stuccoed walls and columns indicates in general that most of the previous paints were either removed or weathered(chalked) off over time. A heavy paint build-up was observed in the interstices of the coarse aggregate stucco of the raised basement. The earliest masonry paint layers found with any consistancy were ochre washes believed (according to Mr. Arnest) to date to the late 19th century.

Proper surface preparation is essential if the masonry is to be repainted. An examination of the exterior surface indicates that most of the previous paints are sound and have only lightly chalked. As mentioned earlier, areas of peeling and flaking between the previous finish coat and the present primer exist due to improper surface preparation. By far, the most efficient method to remove the old coating completely from these areas is by low abrassive blasting. Hand brushing with non-ferrous brushes will also remove loose paint; however not as effectively nor efficiently. Controlled field testing needs to be executed in order to assess the two methods.

All surface cracks and stucco loss need to be repaired prior to repainting. Surface cracks should be opened up in order to better receive the patching mix and cleaned of all dirt and loose debris. Curing time for all new stucco work should not be less than 30 days to allow sufficient though probably not complete carbonation of the lime before painting.

2. Painting

a. Wood

In order to insure a durable and well-bonded protective paint finish on all exterior wood elements at Arlington House, it is strongly recommended that a traditional three-coat/penetrating linseed oil primer system be applied as outlined below:

1. Apply by brush two thin coats of thinned raw linseed oil: First coat-50% raw linseed oil; 50% mineral spirits. Second coat-75% raw linseed oil; 25% mineral spirits.
2. After each application, rub linseed oil into the wood with burlap. This pushes the oil into the wood fibers.
3. Next apply one coat of paint; 75% finish paint or adjust to the weather. Add one-eighth teaspoon of Japanese Drier or Pratt and Lambert Drier on cloudy days.
4. Apply one coat of finish paint(s) thinned for brush mobility.

Both primer and finish paints should be an alkyd-long oil type. A fairly hard 'trim' alkyd should be used for all exterior woodwork (including shutters) so that chalking does not occur onto the masonry surfaces.

b. Metal

Should the metal-sheathed echini of the portico capitals prove to be galvanized iron upon closer inspection, then a chemical pre-treatment should be applied prior to repainting. After surfaces have been mechanically cleaned with either low abrassive blasting or wire brushing, a commercially available phosphate-phosphoric acid wash is recommended. After pre-treatment, a two-coat primer-finish system should be applied. In order to insure adhesion, a linseed-oil-zinc dust primer is recommended over a traditional alkyd primer.

c. Masonry

As mentioned earlier, there is no indication that the alkyd resin paint applied during the last two repaintings has failed due to vehicle breakdown by alkali attack. Discussions with Mr. Gene Goldsmith, Exhibit Specialist, National Park Service, have also verified the high quality performance of this paint when applied properly according to the manufacturer's directions.

Since it appears that very little new masonry work will be required, the use of an alkali-resistant coating (latex water-thinned emulsion) is unnecessary. Moreover, switching to a latex emulsion system may impare penetration of the new coat into the old alkyd-oil where well-adhered previous paint remains. A penetrating type surface conditioner, supplied by the same manufacturer of the finish paint, should be applied to these surfaces in order to strengthen and bind the previous paints to the underlying masonry surface.

It is essential that the paint manufacturer's directions be followed closely, particularly with regard to thinning,

spreading rate, and application conditions, since all paints are not alike and surface conditions vary considerably.

d. Exterior Marbleization

According to early photographs of the house dated c.1867, (Fig. 8) the present marbleizing appears to be fairly accurate in its overall tonality, pattern, pattern location, and style. Lacking in the present restoration, however, are the beautifully marbleized panel insets above the first story openings on the main portico facade. These appear to have been painted out by the turn of the century as indicated in a southeast view of the house taken in 1904. A comparison of values between the stucco walls and coarse aggregate raised basement in the 1867 photograph indicates that the basement story of the wings was painted a darker color than the rest of the masonry. In addition, it is interesting to note that by 1867 the west (rear) facade and chimneys were still exposed brick, not receiving a stucco finish until some time before 1904.

According to a memo (June 18, 1973) concerning the exterior painting of Arlington House, no evidence of the original or 1867 stucco paint was found. Trim and entablature colors were reproduced based on surviving paint drips found under a moulding on an original shutter.

It is this author's opinion that before the exterior is repainted again, an extensive paint investigation and analysis should be performed in order to determine the original colors. Sufficient photodocumentation of the exterior of the house exists to identify surviving features of the house and aid in the dating of the paint layers.

E. RECOMMENDATIONS SUMMARY

Obviously several approaches are possible for the restoration of the exterior paints at Arlington House. Based on the conditions and treatments already discussed, it is this author's opinion that the entire exterior need not be repainted at the present time. After specified problem areas have been prepared for repainting, the marbleizing could be in-painted by skilled professionals. As summarized below:

1. Prior to repainting, all surfaces should be washed with a mild non-ionic detergent that rinses clean leaving no film. Washing should proceed from top to bottom using sponges followed by a final rinse with clean water.

2. All construction details suspected of causing water penetration should be examined and repaired or replaced if necessary. This includes the roof and gutter system, all caulking, flashing, and exterior stairway construction.

3. All exterior woodwork including the entablature, cornice, doors, windows, enframements, and shutters should be repaired, consolidated, prepared, and repainted. Paints in these areas were found to be the most deteriorated and/or subject to excessive weather or wear.

4. Only those areas of the exterior masonry where the paint is poorly bonded and/or surface cracking and stucco loss has occurred should be repaired, prepared, and repainted.

5. A comprehensive preservation/maintenance program should be established including an inspection and washing of the exterior surfaces as described in Item 1 every six months.

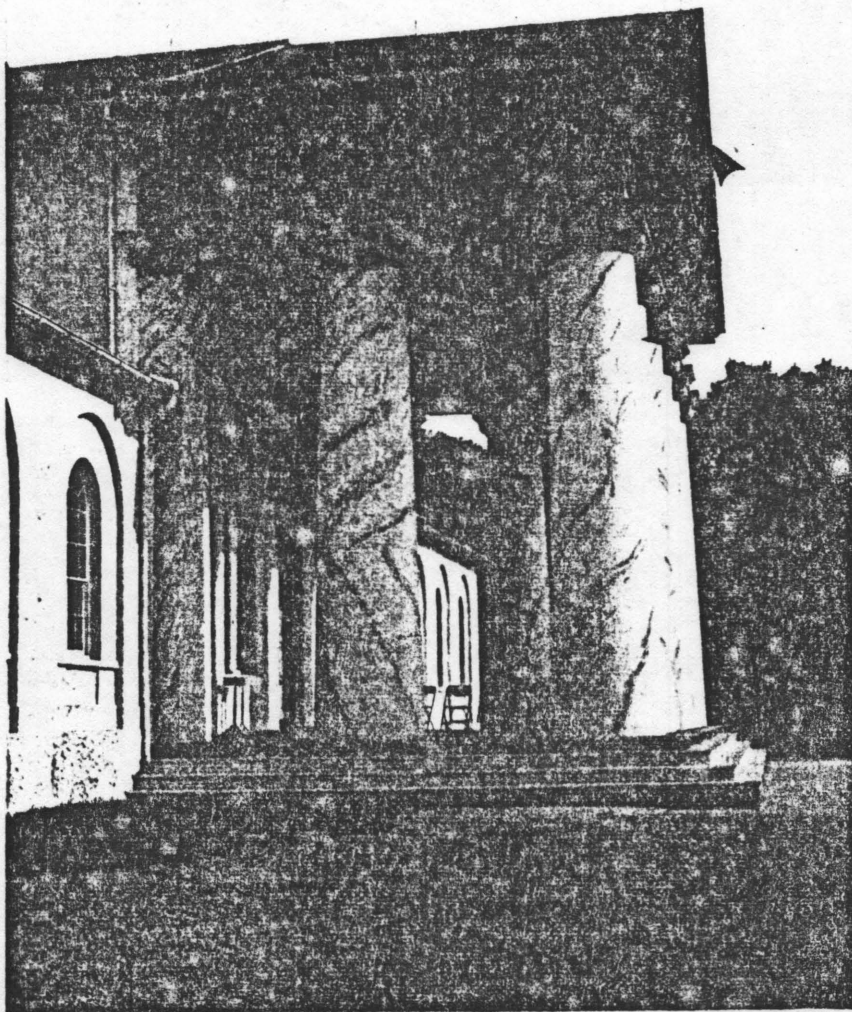


Figure 1

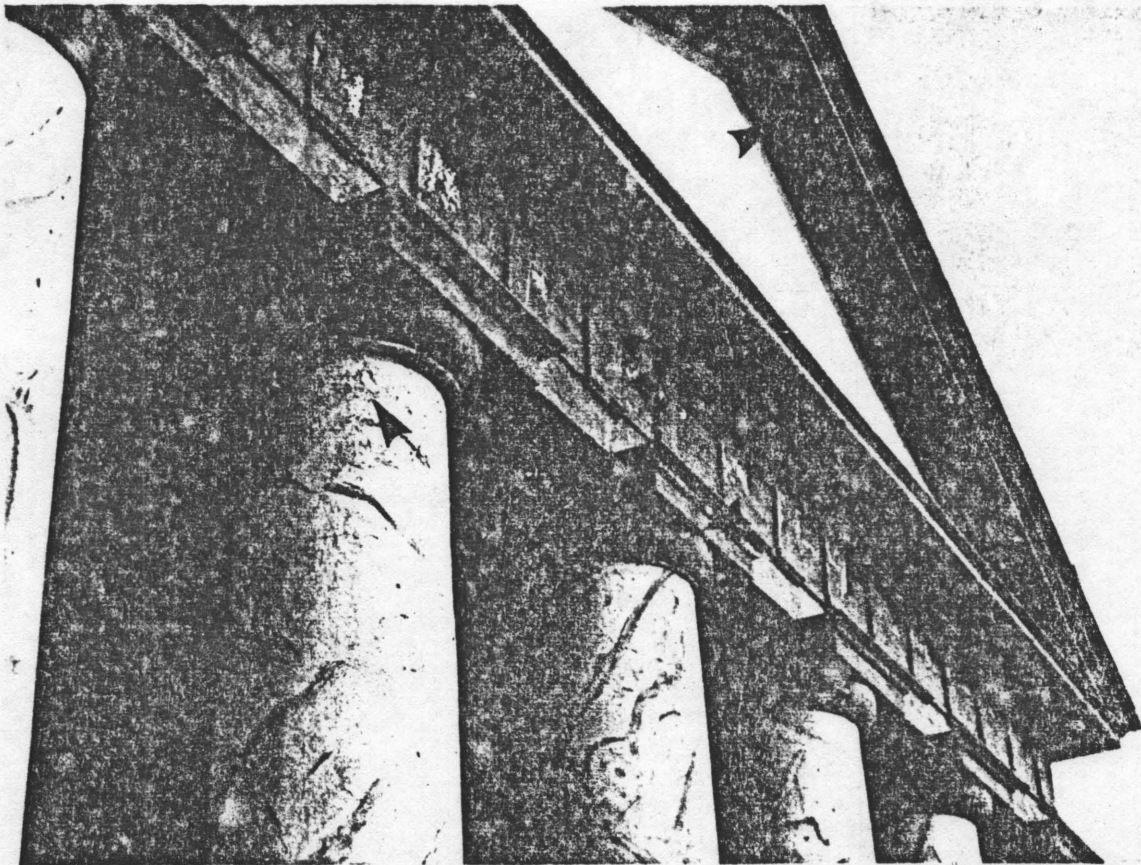


Figure 2

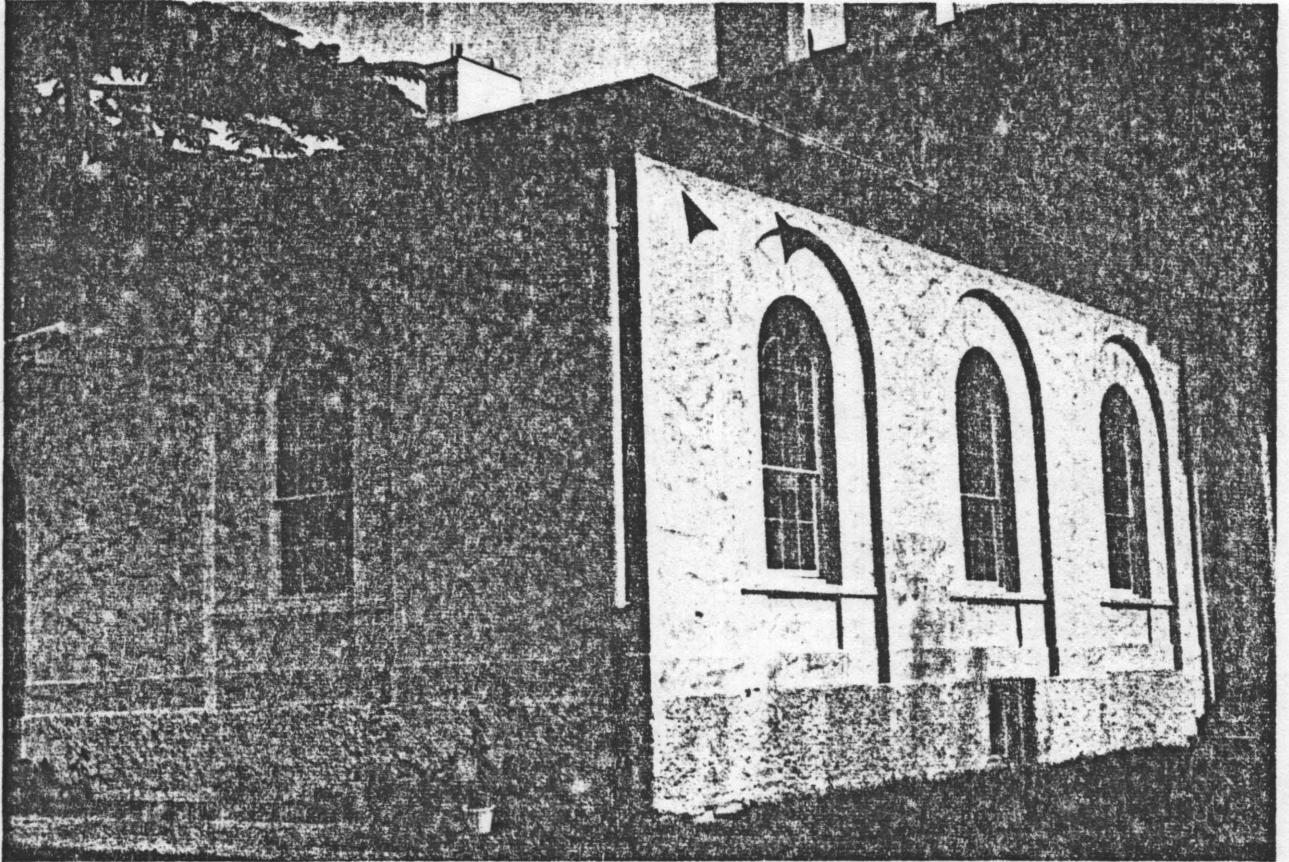


Figure 3

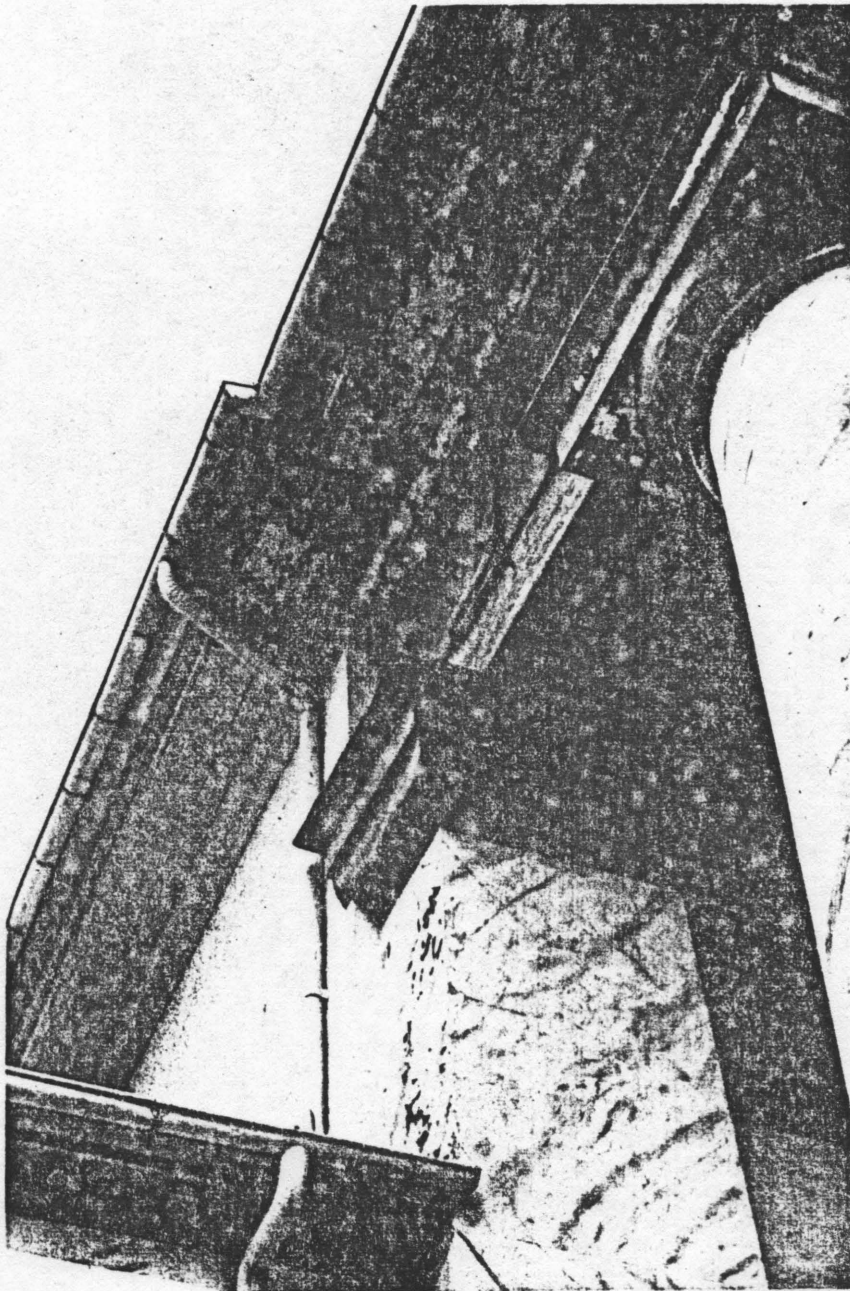
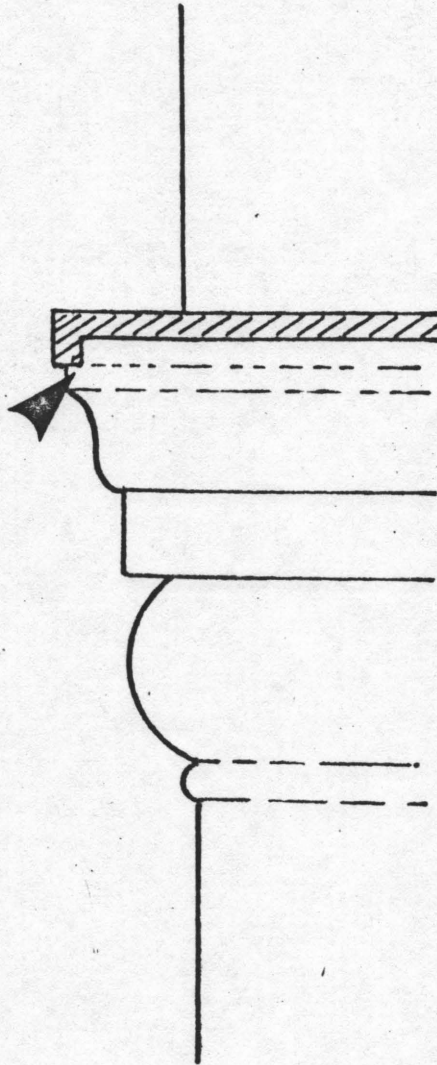


Figure 4



Representative portico capital showing metal flashing sleeve installed over the echinus. Arrow indicates point of greatest water penetration.

Figure 5

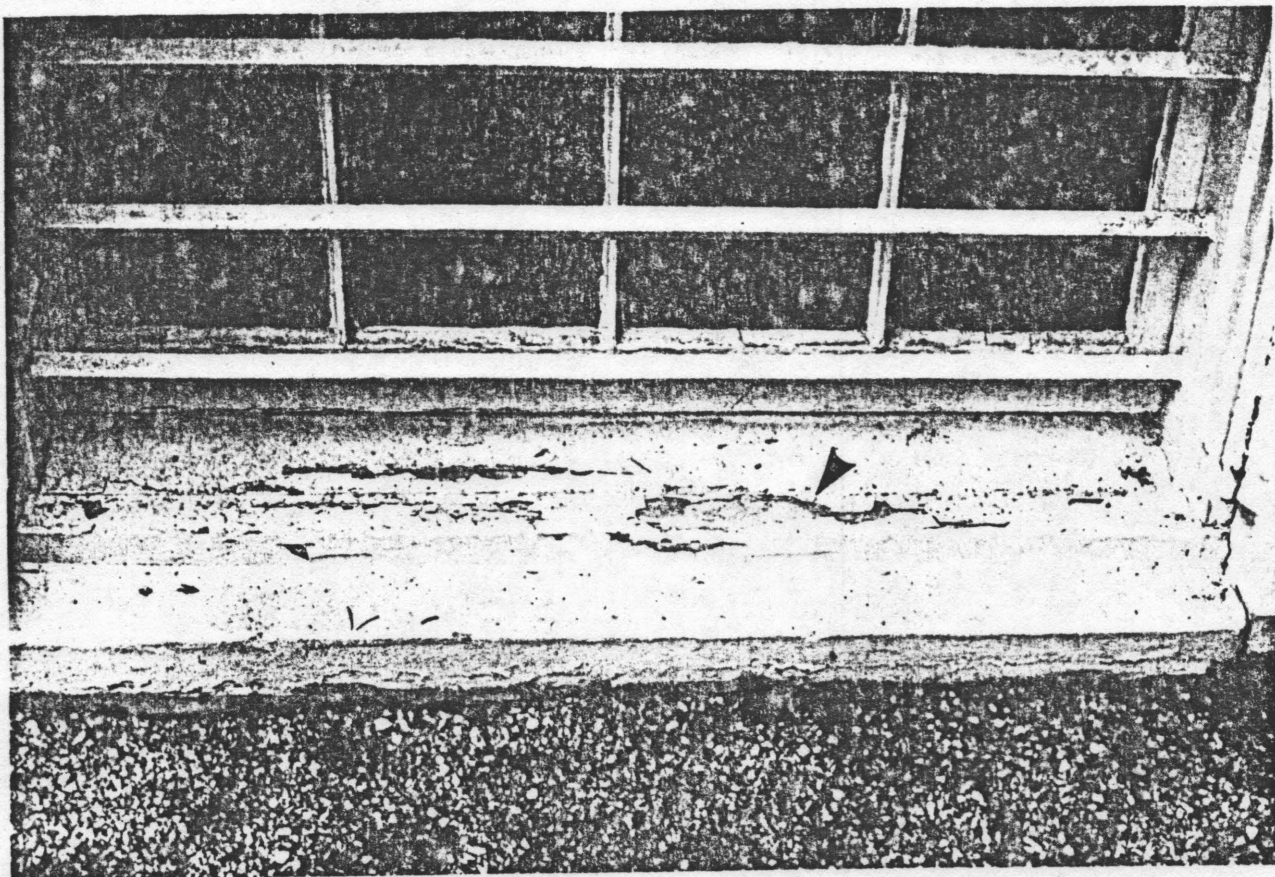


Figure 6

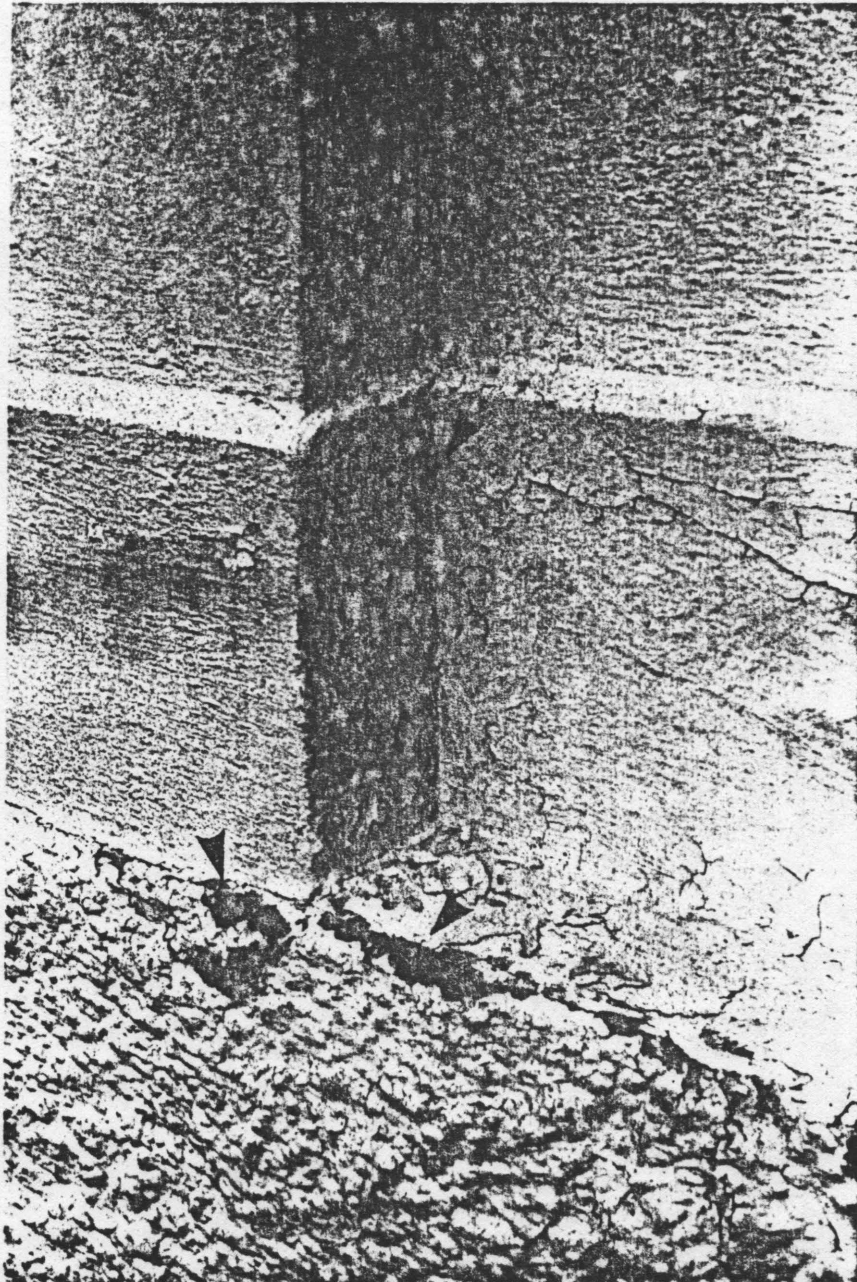


Figure 7

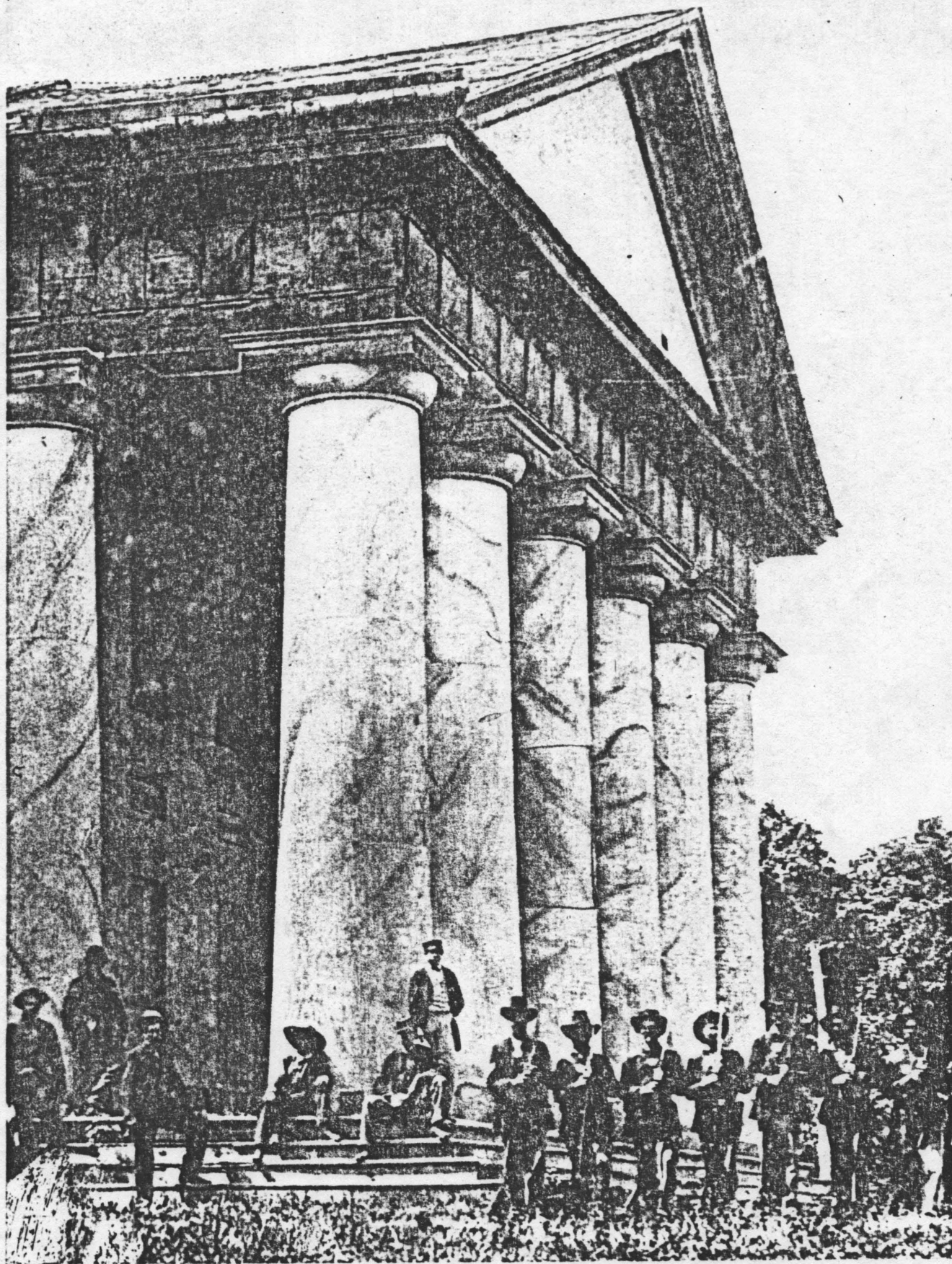


Figure 8