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ARCHITECTURAL INVESTIGATION AND ANALYSIS FOR HISTORIC STRUCTURE REPORTS

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Introduction and Overview

Architectural investigation and analysis for Historic Structure Reports is basically a process consisting of a number of related, and usually sequential, actions which build upon one another. The investigation and the analysis are not separate but integrated. The analysis is inherent in the process of investigations.

The actions or steps in an architectural investigation include:

1. Making a physical inventory of the building; that is, determining what the building is by identifying its elements.
2. Determining the building or structure's condition. This includes assessing the condition or integrity of the basic structure of the building, as well as its fabric — the materials of its body which give it form — and its finishes.
3. Identifying the building's historic characteristics, i.e., those particular features which makes it historic or unique.
4. Identifying modifications and additions since the structure was originally built, including clues as to its date of original construction and determining the sequence and date of any modifications and additions.
5. Recording architectural findings by means of measured drawings, photographs and written narratives or taping notes which describe the building, its condition, historical characteristics, and other information upon which conclusions regarding dating or sequence of construction can be based.
6. And finally, presenting the findings and conclusions in a usable form for planing future work.

The process can be divided into two phases; field work at the site and office work. Obviously, there are certain items which must be done in the field, the inventory for example. The condition survey is another item

which must be done on the spot. In regards to recording the building, most of the work, but not all of it, must be done in the field.

In the office, the process of recording the building is completed by preparation of final measured drawings and reports — often leading to further analysis and laboratory tests of materials samples — and the preparation for presentation of the data that has been obtained in the field from the investigation and analysis.

Since architectural investigation and analysis is a process, the best way to explain it is to “walk through” a hypothetical example. It should be noted that the details of the process depend on the type, size, age, complexity and, to a certain extent, the location of the particular building or structure.

Preparation for Field Work

The first basic rule for field work is never to go alone. Even though the particular building to be investigated may be in good condition, may be occupied, or is only a small structure, make it a rule never to make an architectural investigation alone. A team of three (3) persons is optimum. Most often the team consists of the principal investigator, usually an architect, an assistant experienced in taking measurements of existing building, and a drafter who is interested in working with older buildings.

In addition to the basic rule of never going alone for a number of obvious reasons which include not only safety, and the fact that three or more pairs of eyes are much more observant than one, there are a number of helpful ancillary rules to observe. These include:

- Wear old clothes and stout shoes, never sneakers. More than one field investigation has been suspended because someone fell through a floor or stepped on a nail and had to be rushed to a hospital for a tetanus shot.

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- Prepare a plan of attack, working out a sequence of doing things so that when arriving at the site time won't be lost deciding what to do first.
- Make sure that all the equipment and materials needed for field work are assembled and ready for use, particularly if the building being investigated is more than an hour's drive from the office. There is nothing worse than being 100 miles away from a source of supply and not having needed items. A list of things usually needed on a field investigation include the following.
 - A clipboard with pads, including both lined pads and graph paper and lots of sharp pencils.
 - A portable drafting board, paper and drafting tools.
 - Cameras — two are best; a polaroid with color film for instant photography and a single lens reflex (SLR) 35mm camera with lots of both black and white and color film for prints and slides.
 - A portable cassette tape recorder including extra tapes and batteries.
 - Tape measures. Usually a 50 foot tape and a 16 foot tape. Also, take a couple of folding rules for short measurements.
 - Flashlights or lanterns. In many buildings there either never was any electrical power or it has been turned off.
 - Tools for making removals, including items such as a hammer, crowbar, chisels, screwdriver and anything else that might be needed.
 - Room inventory forms; pre-prepared forms are very handy for noting down information.¹
 - A profile gauge for taking profile of moldings.
 - A hand level, as elevations can be deceiving and most buildings are not usually square or level.
 - Cellophane baggies, use the zip-lock type, for samples. And don't forget stick-on labels for identifying the samples.

For serious technical analysis on site, such as paint seriation analysis or chromochronology², additional equipment is needed. Often, it is easier to do such analysis on site rather than to bring samples back to the office. In such a case, equipment would include a microscope — a binocular zoom lens type which magnifies from 10 to 30 power is the one most used by professionals³, Munsell Color Books, scalpels and tweezers for taking samples and, of course, containers for bringing back samples for checking later. The black cylindrical containers which 35mm film comes in make good sample containers. Take along a bag of cotton balls for packing the samples. Again, don't forget stick-on labels for identifying the paint samples by location⁴. When working indoors, flood or spot lights — or a bright portable lamp with a self-contained power source will be needed.

At the Site

If this is the first site visit to the building or structure, prepare sketch plans of all the floors and assign numbers to each individual room as all other steps in the process will relate to this. The plan need not be in scale or proportion as long as it shows all needed information. In assigning room numbers most investigators use a "B"

prefix for basement rooms, a "100" series for first floor, a "200" series for the second floor and so on. Usually start in the front, at the point in which one enters the building and go in a clockwise direction in numbering the rooms. For example, the front hall might be room 101, the first room to the left 102, and so on. However, any pattern can be set and rooms numbered in a manner which clearly delineates all spaces.

The reason for preparing the sketch plans — don't worry about elevations at this point — and numbering spaces is that it sets up a system for making the inventory in the field.

The normal sequence of inventory is to write out, or dictate into a tape recorder, a general description of the building. This is followed with a detailed description of the exterior, starting with the principal facade and moving around the building. Facades are usually identified by the closest cardinal points: north, east, south and west.

Then move into the interior and either using a tape recorder or prepared forms go by floors, room by room from the bottom up. If the building consists of a main block with a number of wings or additions, do the main block first and then go to the wings or additions. The items to be included or recorded are discussed in more detail below.

After finishing the interior inventory, make a similar inventory of the systems. These include structural systems, mechanical systems such as heating and plumbing, and if there is any, electrical, and then others, such as vertical transportation (elevators) in a multi-story building. While recording what exists, record its condition at the same time.

There are a number of publications which will be helpful in making an inventory of a building. These include: Harley McKee's *Recording Historic Buildings*⁵ and Orin Bullock's *The Restoration Manual*⁶. Also, there have been many articles published in the *APT Bulletin* over the last fourteen years which refer to architectural inventories and investigations, as well as analysis⁷.

Start by recording on tape or in narrative form a general description of the building. This includes its overall form and style which might be a New England Saltbox, a Pennsylvania Farmhouse or a Georgian Mansion. Note its size, the number of stories, and its general appearance. For example, a typical description might be a "two-story Federal Style Pennsylvania Farmhouse, built of brick, with three bays (windows or doors), about 40 feet — with a gable roof." This immediately gives one a mental picture of the building.

Then, go around all elevations of the house, again with a tape recorder or writing pad noting details. These might be such things as the brick color, type of bond, the color and thickness of mortar joints, type of windows, the number of lites, the types of doors — whether they are solid or glazed and the swing — and any porches that might be present. Also identify any features which give the building its historical character, such as cornice moldings, window shutters or door frame side lights, or a brick water table.

For recording interior spaces and systems use of the room inventory form for notes rather than a tape recorder saves transcribing recorded data at a later date.

It is usual to combine the architectural or technical description with comments on the observed conditions. These include such things as stone deterioration, spalled brick, missing mortar, rusted gutters, warped or deteriorated wood, loose shutters and other readily apparent items. Detail determination of conditions usually require more than a visual inspection. For example, peeling paint on a window frame may indicate a high moisture content in the wood. To determine the exact percentage will require testing with a moisture meter.

Whether using the tape recorder or a room inventory form, always note clues as to dating. These include things such as the style of the building, the window configuration, and specific details of hardware, moldings, nails, and other items.

The next, or a concurrent, step is to take and record measurements to prepare measured drawings. Recording these on graph paper helps to get the proportions and scale approximately correct⁸. One basic rule in taking measurements is always to take cumulative or running dimensions, not sequential. For example, across an elevation or within a room, start with zero in a corner and the first door opening may start, say at 3'-6" and end at 5'-10" and so on. This makes it much easier for layout and drafting later on. Record dimensions only to the closest ¼ or ½ inch. It is impossible to draft any closer than that except for doing large scale details.

Concurrently with taking measurements, take photographs. When taking exterior elevations, if possible get the whole elevation in one picture. Use polaroid shots for immediate use and mark on the back with a felt-tip pen the view, the date, etc., and other comments that are pertinent. Then go around again and take slides or black and white photographs using a wide angle lens, particularly of the exterior. For interior photographs try to take four photographs of each space, standing in opposite corners so as to get at least two walls and make sure to get a portion of the floor and the ceiling. Then photograph details. A zoom or telephoto lens helps with these⁹.

On an average project, say a house, the investigator may end up with anywhere from 100 to 150 photographs. On a large project there could be as many as 500 photographs. Using the 35mm, 36 exposure black and white or color prints, or transparencies is most economical. Polaroid photos are very expensive, so use those sparingly.

At this point field work is almost completed. The next thing to do, unless the building site is close to the office (over and back in 10 or 15 minutes), is to prepare draft, that is, *not* final measured drawings. If time allows try to prepare both plans and elevations at the site. This is the reason for having a portable drafting board along. No matter how careful or complete one is in taking measurements, there is always some critical dimension missing, like floor to floor or window sill heights.

Next, while still at the site, try to get as much information as possible for dating the original construction

and for identifying modifications and additions to the original construction. Often this requires some removals. Note that the structural systems and the materials of the basic structure provide some of the best clues to dating and identifying changes. Hand hewn beams in the basement or flattened logs with bark still on the round portion used as rafters predate sawn lumber. Notched construction or pinned or pegged construction, depending on the type of structure, predates construction where joists are toenailed into headers. Whipped or pitsawn lumber, where the saw marks are vertical, usually predates circular sawn lumber where the marks are curved. Hand forged nails predate cut nails which predate wire nails. There is an excellent pamphlet by Lee Nelson on nails¹⁰.

Back to removals. Often the structure is not visible and portions of the wall or ceiling finishes must be removed. This should be done very carefully and in as small an area as possible. Also, all removals should be photographed before and after. In addition, save samples of the plaster, mortar, nails, or anything that is removed. Put them in the baggies and label them for further analysis.

With practice one can become skillful at identifying original materials and systems and those added at a later date and get a feel for dating them. There have been many articles concerning dating published in the *APT Bulletin*¹¹.

This, in general, completes field work. In general, because very few architectural investigations have been made where it was not necessary to make a follow-up visit for something missing, or to confirm an item of analysis.

Depending on the size of the building, it takes two to five days in the field to do a thorough investigation and analysis.

Office Analysis

As the final architectural description is written, the final measured drawings prepared and the hundreds of photographs reviewed two broad categories of data will become apparent. These are the facts and the assumptions which require further confirmation.

The assumptions will usually involve dates and sequences of construction. Laboratory analyses of the material samples taken in the field such as mortar, paint, wallpaper, nails, wood and so on will help resolve some of the assumptions as well as reference to and comparison with the historical research and documentation regarding the structure.

If the budget can afford it (and it should) don't hesitate to use consultants for analysis and technical research for help in resolving these items. One of the advantages of APT membership is access to the APT members referral service which will assist in contacting persons with the skills required. Architectural analysis is a matter of training, experience and judgment, but if one accepts a definition of analysis — in this case architectural analysis of a historic building — to be a detailed examination of the structure made in order to under-

stand its nature or determine its essential features, then the analysis is inherent in the investigation. That is, in the process and in the presentation of the results of the investigation. Preparation of measured drawings is, in fact, one of the best forms of analysis of a historic building as many experienced preservation architects have noted.

Presentation of Results

Primarily, the presentation will be in verbal form, a precise written narrative of findings and conclusions supported visually by drawings and photographs. In general, the narrative portion of the "Architectural Analysis" — which is itself only one section or element of a complete Historic Structure Report¹² should include the following items:

1. An introduction noting the dates when the architectural investigations were carried out (important for future reference), together with a brief description, or listing, of the approach or methods used in the investigation (e.g., visual inspection only, measured drawings prepared, samples taken, removals made, and so on) to be expanded upon in subsequent subsections.
2. A general description of the building noting style, size, form, features, general materials and other items discussed earlier in this article.
3. A detailed narrative describing as precisely as possible all the elements, materials and finishes and their condition, starting with the exterior then progressing to the interior and finally to the systems. For example, exterior descriptions would cover foundations, walls, windows and doors, porches, roof, chimneys, trim, gutters, downspouts and other items visible from the outside. Interior items include floors, bases, walls, ceilings, trim - both materials and finishes. Systems to be described include structural, heating, plumbing, electrical and others as applicable.
4. A detailed description of removals noting what was removed, where and what data was discovered.
5. A description or listing of any site tests made (e.g., moisture content) or samples taken for further analysis such as paint, mortar or plaster.
6. A chronology of additions and alterations with clues as to dating thereof based on the physical architectural investigation. A discussion of the reasoning or logic by which the chronology was developed should be included. The data presented should be coordinated with and related to the "Historic Analysis"¹³ and any supporting documentary evidence.
7. A brief summary of the investigation and analysis such as: "Based on the architectural investigation and analysis, it can be concluded that the building as it exists at present closely reflects its original appearance and condition. A great majority of the existing fabric is original."

Or more likely:

"... this building has been altered or added at least three, and perhaps more, times. Very little of the original fabric remains and that which does is badly deteriorated."

Graphics for the "Architectural Analysis" section such as reduced copies of measured drawings, key plans, sketches of details or molding profiles, and current photographs can be in an appendix to the section or interspersed throughout the text. All photographs should be captioned and referenced in the text as applicable.

In conclusion it must be noted that content and form of the presentation of the results of an architectural investigation and analysis can and does vary greatly depending on the investigator as well as the client for whom the Historic Structure Report is being prepared¹⁴. Thoroughness and clarity are the most important items.

Footnotes

1. Room Inventory Forms should include the following: Room number and name — usually its functional use — space for a small sketch or key plan and adequate space to fill in data regarding removals, and demolition made as required, and materials, finish and condition of floor, walls, ceilings, windows, doors, stairs, closets, fireplaces, trim and millwork, heating, plumbing and electrical.
2. See Carole L. Perrault, "Techniques Employed at the North Atlantic Historic Preservation Center for the Sampling and Analysis of Historic Architectural Paints and Finishes," *Bulletin of The Association for Preservation Technology*, Vol. X, No. 2, 1978, pp. 6-46.
3. See article by Frank S. Welsh, "Paint Analysis", in this issue.
4. Carole Perrault's article cited above includes an excellent system for identifying paint samples.
5. Harley J. McKee, *Recording Historic Buildings*, Washington, D.C., Historic American Buildings Survey, 1970.
6. Orin M. Bullock, Jr., *The Restoration Manual*, Norwalk, Conn., Silvermine Publishers, Inc., 1966 (also available in paperback).
7. See APT Publications Brochure available from APT, P.O. Box 2487, Station D, Ottawa, Ontario, Canada K1P 5W6.
8. The Historic American Buildings Survey, "Field Instructions for Measured Drawings" and the HABS "Field Note Book" are excellent references. For more information contact HABS/HAER, National Park Service, U.S. Department of the Interior, Washington, D.C. 20240
9. See article by Jeff Dean, "Photographing Historic Buildings", in this issue.
10. American Association for State and Local History Technical Leaflet 48, "History News", Vol. 24, No. 11, November 1968, *Nail Chronology As An Aid to Dating Old Buildings*. Reprints are available from AASLH, 708 Berry Road, Nashville, TN 37204.
11. See APT Publications Brochure cited above.
12. See first article in this issue.
13. See article by Paula Stoner Reed, "Documentation of Historic Structures", in this issue.
14. Most state and federal agencies, such as the General Services Administration and the National Park Service have their own requirements and guidelines for Historic Structure Reports. See article by Randall J. Biallas, "Evolution of Historic Structure Reports and Historic Structure Preservation Guides of the U.S. National Park Service", in this issue.