IV. Design Development and Recommendations

A. TRUMAN HOME (HS-01)

Introduction

The intent of the recommendations is to adequately stabilize the structure, make the building watertight, and preserve the building fabric as it existed during the Truman occupancy in the retirement years (post 1953) until Bess Truman's death in October, 1982. Cosmetically, it is recommended the interior of the house should not be restored to pristine condition. Cracks, bulges and water stains were present while the Trumans occupied 219 North Delaware. The cosmetic imperfections are a manifestation of certain events that occurred at the home, particularly the winter ice damage and severe July hail storm of 1969 as well as the Trumans' informal approach to the decorative treatment of the house and their sometimes limited financial resources. Thus the cracks, bulges, and water stains are significant in the historical interpretation of the house.

There are certain deteriorated conditions that if left unchecked, will eventually result in the loss of historic building fabric. Recommendations are provided for the treatment of these conditions by stabilizing the existing materials rather than by replacement of new materials that are made to look like the old. Minor cracks and bulges should be left as is for the near future but carefully monitored to assess any change in condition that would result in loss of building fabric.

Recommendations for Restoration Work

Outlined below are recommendations for treatment of the Truman house.

Topography

Regrade certain areas of the site adjacent to the house to promote drainage of water away from the building:

a) underneath front porch (101A), south porch (104B), kitchen porch (114A); and porch (114B-C).

b) at the north side of house particularly in vicinity of air-conditioning condenser units.

Install a surface drain between the air-conditioner condensing units and north wall of house. Connect to a 3 inch diameter p.v.c. pipe lead underground to the lower grade to the northwest.

Install a French drain parallel to face of front porch (101A) and lead to lower plateaus of site to the northeast.

Reposition existing splashblock so that it is under downspout at north side of front porch (101A).

Provide window wells at the basement windows (002:W4, 003:W-1, 004:W-1, 005:W-2) where soil is encroaching on the window frames.

There should be a termite examination on a regular basis.

Vegetation

A tree surgeon should be engaged to examine the maples and oak on the site in order to determine the health of the trees, and whether they are infested with pests or disease. Recommended treatment including pruning if needed, could be suggested.

Pavements

Dismantle brick paving underneath kitchen porch (114B-C) and stockpile for reuse. Approximately 20 percent of the bricks are severely spalled or cracked and will require replacement. Regrade area so that it slopes away from east foundation wall. Install a French drain at the east end and connect to a three-inch p.v.c. pipe lead to the lower portion of the site or driveway to the east. Relay brick to match existing pattern. In addition, there is a problem with the downspout at the northeast corner. Add leader to drain water from the structure.

Foundation

Repoint loose, cracked, or open mortar joints in exterior and interior foundation wall to match existing width, texture, color, and tooling. Replace damaged or missing stone.

Roof

Install cricket at back side of south chimney. Clean out leaves and debris from gutters. Install additional scupper at flat spot of built-in gutter, southeast corner of upper roof. Scrape off peeling paint at

same location, prime and paint. When asphalt shingles are replaced, consideration should be given to installing an elastomeric eave flashing manufactured by W. R. Grace and Company underneath the new shingles. In addition, install heat cables along the built-in gutter to minimize back-up of water under shingles during ice storms or heavy snow fall.

Floors

Reinforce floors in dining room (110) and central hall (103) so that squeaking of floors does not become more acute and public perceives floors as structurally sound. Install 2 x 2 ledgers tight to underside of floor on each side of floor joists. Fasten to joists with wood screws but leave flooring unconnected to new ledger. Add support blocking under seam at north side of storage room (213) where boards exhibit considerable deflection when walked upon. Remove three or four boards to gain access to joist space and renail in original position. Reinforce floors in central hall (202) and attic (303) above master bedroom (204) by installing new joists, full length, alongside the existing joists.

Plaster

Reattach sagging ceilings in dining room (110), eastern portion of bedroom (204); bathroom (211), and central hall (202) at opening to stair (202B), by injecting specially formulated acrylic-resin-based adhesives into the space between the lath and plaster. (Application of this technique, materials used and formulations are documented in

"Adhesives for the Reattachment of Loose Plaster" by Morgan Phillips, APT Journal Vol. XII No. 2, 1980, p. 37-63.) The flooring above the dining room (110) and bedroom (204) will have to be temporarily removed to gain access to the side of the plaster ceiling. Bathroom (211) is accessible since an unfinished attic is above it. Stabilize cracking plaster walls by injection into crack from room side of specially formulated acrylic-resin-based adhesives as noted above. Precautions should be taken to prevent adhesive from bleeding onto wallpaper. Specific locations requiring treatment are as follows:

- east side of fireplace, living room (104);
- northwest corner of music room (108);
- northeast corner of bedroom (207);
- northwest and northeast corner of bedroom (209).

Stabilize bulges in walls at the following locations:

- south and southern portion of east walls, bedroom (207);
- south wall near upper left hand corner of window W-1, bedroom (204);
- south wall of Truman dressing room (208) near west side of door (D-1).

Repair peeling wallpaper and cracked plaster in Gates' bathroom (106). Wallpaper should be carefully peeled back to point of adhesion; existing adhesive residue removed, cracked plaster removed, and existing wallpaper reattached. (Another possible solution is replacement.)

Reattach loose wallpaper seams with water soluble paste (such as wheat starch) injected behind paper with syringe.

Tile

Remove all ceramic tile in Gates' bathroom (106), remove mastic from tile and walls, and reset with new mastic in original position. Total removal and resetting is recommended rather than resetting only those tiles that have fallen off to assure that falling tiles will not be a continual problem.

Temperature and Humidity Control

Heat is needed in the vestibule to prevent further deterioration of crazed paint on walls. Install a small non-obtrusive electric heater.

Maintain a constant relative humidity of 35 percent in the winter time, if possible.

Lincrusta

Reattach either side of major cracks by injecting specially formulated acrylic-resin-based adhesive into crack. Precautions should be taken to prevent adhesive from bleeding onto lincrusta.

Plumbing Systems

A spring 1985 inspection of the non-historic domestic hot water heater, indicated some rusting out on the top and bottom at the steel jacket.

It was also found that galvanized pipe, used in some sections of the hot and cold water piping system had electrolytic build-up at the copper pipe connections. A few isolated areas where the pipe was leaking were also found. These items have since been replaced and updated. (See Appendix B).

To date, there are some sections of the waste piping system that have galvanized and lead piping installed. These sections of pipe should be replaced with cast-iron pipe if the waste system is to be activated. The exact routing of the underfloor waste piping could not be traced without removing plumbing fixtures and possibly removing part of the basement floor slab.

The technical data for all of the major mechanical equipment items in the house are shown in the mechanical schedule on the Existing Conditions Drawings.[1]

Electrical System

During the 1983-84 electrical renovation, some of the historic two-wire type plugs and switches were replaced. The remaining two-wire plugs and switches should be replaced with U. L. listed types and should be properly grounded.

The ceiling mounted lighting fixture located in storage room (213) consists of a brass base with a turn switch socket suspended by a brass

chain. The wire connecting the socket to the base appears to be brittle. This wire should be replaced with one of similar color and texture for historic purposes.

There is one outlet located on the east wall of kitchen (113) that has not functioned since the 1983-84 renovation. It should be determined whether or not this was reconnected to the new system and repairs made as necessary.[2]

Overall condition of in-place electrical, fire, security and communications systems is excellent. Routine maintenance should be performed on attic ventilation fan motor and porch ceiling fan motor even though these may not be in current use. The furnace blower and air conditioning condensing unit motors should be inspected and maintained regularly.

Heating and Cooling System

These have been replaced and updated in 1985. (See Appendix B.)

Evaluation of Visitor Impact

The condition of the Harry S Truman home was found to be generally good. The materials used in construction are for the most part as structurally sound as they were when installed. The problems discovered during the course of investigation and subsequent structural analysis were inherent in the methods of construction detailing. Most of these would pass

unnoticed and cause no major difficulties if the residence were to continue to be used as a private home; however, as an edifice of national interest and being subjected to loads similar to those placed on structures open to the public, it is recommended that those areas of the structure noted to have significantly reduced live load capacities be modified. It is felt that these modifications could be accomplished with a minimal visual impact upon the Truman home, the majority of these modifications being connection modifications or placement of additional support members in the basement area, under the porches, or within the attic spaces, areas that are unlikely to be open for general public inspection.

Recommendations (Visitor Impact)

The front porch is being used as an area for holding those persons waiting to join tour groups to view the residence during inclement weather. It is therefore recommended that modifications be made to this porch to increase the live load capabilities up to a uniform loading of 100 pounds per square foot. The other porches should be modified through the "exit pathway" if they are in fact designated as exits. With minor modifications to the several areas described in the report, the first floor is capable of sustaining a live load in excess of the residential 40 pounds per square foot, a loading which can be safe with tour groups limited to eight people that are escorted through the home and not allowed to accumulate in one area or by inviting the total number of people in the home.

Evaluation of Energy Conservation Measures

The physical investigation of the Truman home has disclosed that it would be very costly to remove exterior wall cladding for the purpose of installing a vapor barrier for interior climate control. All siding, sheathing, and brick nogging would need to be removed to install a membrane. If the siding were to be removed, a majority of it would have to be replaced due to splitting and damage caused by removal. There would also be a problem with running a continuous membrane over existing studs and bypassing porch roofs. The removal and replacement of the above mentioned materials would also alter the historical integrity of the structure.

Evaluation of Handicapped Access

Access for the handicapped visitor into the Truman home has yet to be developed. The visitor will need to travel up a 6 inch high curb, over an historic sidewalk constructed from large flat slabs of stone, and up another 6 inch step leading to the home itself. The home sits anywhere from 3 to 7 feet above grade with the front entrance being the least distance at 2 feet 4 inches above the front sidewalk. Four alternatives have been proposed by the National Park Service for making the home accessible to the handicapped visitor. Briefly these are outlined below.

Permanent Ramp

Uniform Federal Accessibility Standards require a ramp that is no

steeper than a 1:12 slope with handrails mandatory on lengths greater than 6 feet. Space sufficient to construct a ramp of a length required to meet a 1:12 slope is not available except at the west entrance on the front porch (101). Although there is sufficient room here for a ramp 30 feet in length, the sidewalk would have to be widened and a permanent ramp with handrails at this location would certainly have an adverse impact on the historic and aesthetic character of the home.[3]

Portable Ramp

Suspension of Uniform Federal Accessibility Standards would allow consideration of a single 36 inch x 10 foot portable aluminum ramp at the front entrance. However, the 1:4 slope may make it difficult for an adult to push an occupied wheelchair up the ramp and the absence of handrails - necessary to maintain portability - would require that a second employee walk beside the ramp to ensure that the wheelchair does not roll off the side. Advance notice is required for its operation.[4]

Stair Trac

A stair trac is a portable, battery powered, stair climbing device. A wheelchair and its occupant are strapped onto the frame of the device and then operated by a National Park Service employee, it ascends or descends stairs on steel belted rubber tracks. Its use can be emotionally unsettling for the disabled person and it may require a second employee to assist in case the device slips or slides. Advance notice is required for its operation.[5]

Wheelchair Lift

A permanent wheelchair lift could be located at the south porch (104-B). It would not require advance notice for its operation, but an employee would be required to operate it at the beginning and end of the tour and escort the wheelchair user through the living room (104) which is not normally open to visitors. A disabled person would probably feel comfortable using this device. It would create an intrusion into the historic scene that possibly could be softened somewhat through design.[6]

Recommendations for Handicapped Access

Stair Trac

The stair trac does not offer an advantage over a ramp or lift when its many attendant negative aspects are taken into account. "It takes considerable time to secure a wheelchair to the stair trac and access the disabled visitor up or down the steps, thereby possibly delaying tours and unnecessarily exposing the visitor to inclement weather. The process of being "strapped in" in the presence of other visitors is very embarrassing to the disabled person. It is extremely awkward for persons wearing skirts or dresses. The ascending or descending of stairs strapped to this device can be a very frightening experience for the disabled person when he/she has no direct control over its operation. It can be a safety hazard, particularly in winter conditions, and unlike a ramp or lift, it does not accept all models of wheelchairs."[7]

Consideration should be given to suspending Uniform Federal Accessi-

bility Standards and using a portable ramp at the front porch (101-A) or installing a permanent lift at the south porch (104-B) or preferably, at the north side of porch (114-B).

Portable Ramp

With careful attention to detail, a two piece, portable, aluminum ramp with integral curb at each side but without handrails, could be fabricated such that it would store under the porch and be accessed through a hinged (50 ss invisible hinges) section of the lower tread and two risers. The ramp could be held in place by two or three short pins that would fit into unobtrusive bushings recessed into the wooden deck of the porch. At a slope of 1:4 to 1:5, depending on its actual length, it would be practical for an employee to push a wheelchair up or down the ramp. Since the stair trac system requires two employees for its use, the differences between the two systems are the problems for the disabled user and the risk of liability inherent in the stair trac.

Wheelchair Lift

The wheelchair lift has the advantage of ease of use but at the expense of greater intrusion on the historic character of the home. An alternative to the south porch location is to place a lift at the north side of kitchen porch (114-B). It could be accessed at door (114B-D.1) at the porch and from the north side of the brick patio underneath. This location would require a lift with a travel of about 7 feet. Its presence, as viewed from the north and east, could be softened with the

addition of some landscaping. Installation would require cutting an opening in the brick wall at the north side of lower porch (005) and may impact adversely on the remains of the pergola. It is also recommended to consider the possibility of installing a lift at the southwest corner of kitchen porch (114A), but this would require modification of the structure's fabric, thereby compromising its historic character.

Recommendations for Further Research

Historical Research

Current research and analysis, including the examination of land values from the 1840s through the 1860s rejects the existence of any pre-1867 structure as part of the Truman home. Additional research, however, may disclose information which may lead to the substantiation of a pre-1867 structure.

Floor/Ceiling System Framing

Further investigation is recommended in the configuration of framing between the first and second floors, north and south elevation of kitchen wing to determine if second floor was built at a later date than the first floor.

Wall Structural Systems

Further study is recommended in the areas of structural stability. Other areas of investigation should include: the north facade of the

kitchen wing (113); the Gates' bathroom (106) addition; the foyer (102); the dining room (110) bay window; and the bay windows of the living room (104) and library (109).

It is also recommended that a better means of viewing the wall cavities be employed. Dental mirrors and a flashlight were very clumsy and the viewing depth limited when only a 2-1/2 inch view hole is used. A fiber optics view scope, or equal means, may work satisfactorily.[8]

In addition, a radiographic inspection should be made of the upper north and south walls of the kitchen wing to verify the theory that these walls were extended upwards after their original date of construction and the roof rebuilt (probably 1885) at the height and configuration as it exists today. A portable X-ray unit, used by veterinarians to examine cows and horses in pastures has been successfully used to document the structure of plank houses in Ithaca, New York. (Application of X-ray radiography equipment and materials used are documented in "Radiographic Inspection of Plank House Construction" by Mary Joan Kevlin, APT Journal Vol. XVIII No. 3 1986, p. 40-47.) This diagnostic technique is fast, non-destructive, and with proper precautions is safe. A licensed radiologic technologist should be involved with the operation.

Wallpaper

Throughout the home, a wallpaper study is recommended in order to

determine existing layering and to research historic patterns.

Investigation of Structure of Stair to Second Floor

Determination of the stair load capacity is essential prior to any future consideration of allowing public access to the second floor.

The stair structure is inaccessible, therefore the condition or load capacity of the stairs cannot be determined. Radiographic inspection could yield useful information about the stair structure, but we believe that cutting out portions of the first floor floorboards from below to allow direct access to the structure would yield more accurate information.

Site Archeology at Foundation Walls

If implemented, several recommendations made in this report would involve ground disturbance around the perimeter of the structure. If the areas under the porches are regraded and a French drain installed, it is recommended that archeological investigation precede these actions.

Introduction to Cost Estimates

Since the restoration work required for this project is specialized and often unfamiliar to craftsmen, the cost estimates should be utilized as a guide to establish work priorities and general cost range. The following include General Contractor's overhead and profit as well as that of the subcontractor's. The estimates are based on June 1, 1986 costs. Inflation factors should be applied as appropriate when the work is contemplated.

Cost Estimate

TRUMAN HOME (HS-01)

Element Description	Deficiency	Recommendation	Quantity	Cost
1. Grading/ Sitework	Areas of negative drainage, includes under porch, tree condition.	Regrading, drainage improvement, tree treatment and pruning (all trees).	-	$14,000
2. Brick Paving Lower Porch 001	Brick paving deteriorated and doesn't drain.	Remove, grade and relay brick. Replace damaged brick.	274 s.f.	$ 5,100
3. Stone Foundation	Cracked and open mortar joints.	Tuckpoint with matching mortar.	300 s.f.	$ 2,500
4. Roof Repair	Peeling paint and detail deficiency.	Add cricket and scupper and paint where required.	-	$ 2,270
5. Floor Board/ First Floor	Squeezing floor boards, Room 110, 103, and 213.	Reinforce from below.	300 s.f.	$ 3,381

TRUMAN HOME (HS-01)

Element Description	Deficiency	Recommendation	Quantity	Cost
6. Plaster Ceilings	Sagging plaster ceilings, Room 110, 202, 204 and 211.	Reattach plaster with adhesives from above.	805 s.f. (4 rooms)	$17,625
7. Plaster Walls	Cracked and loose plaster.	Adhesive injection of plaster.	- Allowance	$10,000
8. Wall Tile	Loose and missing ceramic wall tile Room 106	Remove and reinstall wall tile.	114 s.f.	$ 2,126
9. Wallpaper and Lincrusta	Loose and damaged material and water damaged plaster in Room 106.	A. Repair and reattach existing with adhesive.	- Allowance	$10,000
		B. Replace wallpaper in Room 106.	-	$ 8,000
10. Floor Replacement	Deficient live load capacity of 2nd floor hall and ceiling over Room 204.	Increase live load capacity by doubl-floor joists.	-	$ 4,664
11. Temperature and Humidity Control	Lack of heat in vestibule. Ability to control humidity during winter.	Install heater in vestibule 101, humidity control on furnace.		$ 1,000
12. Plumbing	Existing galvanized and lead piping.	Replace where possible with cast iron.	Allowance	$10,000
13. Electrical	Miscellaneous outlets and wire replacement.	Replace as required.	Allowance	$ 5,000
	TOTAL			$95,666

B. TRUMAN CARRIAGE HOUSE (HS-02)

Introduction

Due to the structural configuration of this facility and the determination that the existing structural members are showing only minor above grade deterioration from various causes, it is the opinion that the Carriage house is not in any immediate danger with respect to normal day-in, day-out loading applications. However, there are several areas or items which could receive some immediate attention and add a substantial safety factor against possible damages which could be incurred by the failure of this structure and subsequent damage to the materials stored within.[9]

Recommendations for Restoration

Outlined below are recommendations for treatment of the Carriage house.

Topography

A swale along the south elevation should be installed so that water flows away from the face of the structure, eliminating direct contact of the wood siding with the soil. Likewise, the site of the east and west elevations should be regraded to promote positive drainage away from the face of the structure. There should be a termite examination on a regular basis.

Vegetation

Leaves that have accumulated in the interior of the Carriage house should be removed. Shrubbery facing the west elevation of the structure should be trimmed back from the face of the building to prevent wet leaves from resting against the siding and to promote drying of the lower portion of the building and adjacent ground after rainfall.

Foundation and Structural Posts

The foundation of the Carriage house is in an extreme state of decay. Action must soon be taken to abate the progressive rate of settlement and the causes of deterioration before additional structural and cosmetic problems develop. Although an aggressive, overall restoration is not planned before the fiscal year 1987, it is recommended that repairs be made to the foundation and primary structural posts.

It is recommended that a partial concrete sill be slipped beneath each structural post in place of a wooden sill. In this way, the problem of sill decay would not occur. Siding could be fastened to a treated 2 x 4 anchored to the finished surface of the interior concrete slab. Post bases should be repaired using structural epoxy and fiberglass rods. In order to complete these repairs, siding will have to be temporarily removed and shallow holes excavated at each post. Portions of the concrete slab would have to be removed around posts 3, 4, 5 and 20 only to expose the base. The foundation wall should be stabilized at the bearing point of each reconstructed post base. Salvaged siding and trim

should be fastened back into place as existed.[10]

It is also recommended that the cracked concrete apron along the north elevation be replaced and expansion joints installed where the apron abuts the garage floor and driveway.

Wall System Framing

Assuming the hidden connections in the structure are similar to those visible, the garage has little ability to resist lateral forces such as those experienced during wind loading and to some extent the horizontal reaction produced by the gravity force and the eastward lean. It would be highly beneficial to install X-bracing to the vertical members, both in the garage and loft areas. In the upper area these should be 12 gauge by 3 inch wide metal bands attached to the existing columns using bent 1/8 inch steel plates secured to the column by four 1/2 inch diameter screw lags. In the lower garage area the connections would be similar to the above but a 12 gauge by 4 inch wide metal brace should be used. These braces should be installed on the perimeter columns of the east, south and west walls. The diagonal X-bracings would also minimize any further leaning of the structure to the east.[11]

Roof Systems

It is recommended to securely fasten the downspout (located at the north elevation) into the elbow. In addition, it is recommended to replace a 6 foot horizontal section with a 10 foot long section, and to install a

splashblock to minimize erosion where water empties onto the ground.

The roof is approaching the end of its life expectancy and should be replaced. New shingles and flashing should be installed, and shingles should be stained green. Replacements should match existing materials. To assure that the new shingles can adequately breathe and new flashing is properly seated, it is essential to remove existing wood shingles, valley and hip flashing.

A new gutter, downspout and splashback should be installed at the south elevation to remedy poor drainage. However, if a gutter and downspout were not extant during the Truman era, and maintaining a gutterless appearance is paramount, a French drain could be installed along the south wall to mitigate the impact of rainwater falling directly to the ground below the cove.

Floor/Ceiling Structural Systems

It is recommended to install vertical support in the loft to support the lower ends of the existing valley rafters on the north and south sides. Loading of loft floors should be limited.[12]

Building Envelope

Replace missing board, east side of cupola, or install lexan.

Replace all split battens with new wood to match existing. If replace-

ment is necessary where plain square battens occur, replace with in-kind.

Replace two lower window sills on the east elevation and set so that sills slope outward. If maintaining material integrity is critical, sills could be repaired with epoxy filler, epoxy consolidated where required, and repositioned to slope outward. Consolidate the bottom rail and lower portions of the stiles on the two lower windows.

Install a metal drip at top of the low windows and doors on the east elevation and above the loft doors on the south elevation. Consolidate the lower ends of the boards on the loft doors and replace the missing board.

Refasten the loose boards on the north side of the door at the east elevation.

Replace the missing cove molding at the pediment of the north window on the west elevation.

Cover holes in board and batten for previous electric service with clear polycarbonate glazings screwed into interior face of siding.

Consolidate decayed lower ends of wood siding.

Exterior/Interior Finishes

Strip paint from siding, trim, eaves, soffits, windows and shutters. Caulk gaps in siding. Prime and paint using historically accurate colors (See Appendix A, Marie Carden, Paint Analysis). Exterior and interior paint chromochronolgy should be done to verify colors, particularly on shutters.

Security System

Consideration should be given to locating an additional manual fire pull.

Recommendations for Further Research

Exterior and interior paint chromochronology.

Introduction to Cost Estimate

Since the restoration work required for this project is specialized and often unfamiliar to craftsmen, the cost estimates should be utilized as a guide to establish work priorities and general cost range. The following include General Contractor's overhead and profit as well as that of the subcontractor's. The estimates are based on June 1, 1986 costs. Inflation factors should be applied as appropriate when the work is contemplated.

Cost Estimate

CARRIAGE HOUSE (HS-02)

Element Description	Deficiency	Recommendation	Quantity	Cost
1. Grading/ Sitework	Grade in contact with wood, negative drainage, vegetation in contact.	Regrade to below wood and for positive drainage, replace vegetation, 6 bushes, and resod.	-	$ 4,575
2. Foundation/ Structure Posts	Wood sill and structure posts rotted.	Consolidate in place with concrete and epoxy.	20 Posts/ 114 ft. Sill	$ 5,000 NPS Labor
3. X-Bracing	Lack of lateral stability.	Install metal bands to stabilize wood frame.	-	$ 3,500
4. Roofing/ Flashing	Wood shingles and metal flashing deteriorated.	Replace with new wood shingles dipped in green stain, and metal flashing, gutters and downspouts.	1,150 s.f.	$11,000

CARRIAGE HOUSE (HS-02)

Element Description	Deficiency	Recommendation	Quantity	Cost
5. Carpentry	Deteriorated wood trim	Replace and/or consolidate wood trim and add metal drips over windows.	-	$ 4,000
6. Painting	Existing paint peeled and cracked.	Strip existing paint and re-paint exterior.	1,905 s.f.	$ 5,676
7. Concrete Apron	Deteriorated concrete apron at garage doors.	Replace with new concrete apron.	120 s.f.	$ 1,000
8. Fire Protection	No fire alarm pull station.	Add fire alarm pull station.	1	$ 500
TOTAL				$35,251

Notes to Chapter IV

1. Restoration Associates, a division of Solomon Claybaugh Young Architects, Inc., "Analysis of Condition Report HS-1 Truman Home, Truman Home National Historic Site" (Kansas City, February 14, 1985, bound copy), 4.5.

2. M. A. Panethiere, "Electrical Report, Harry S Truman House" (Kansas City: Associated Engineering Consultants, March 31, 1986, photocopy), 2-3.

3. United States Department of Interior. "Alternative to the Stair-Trac for the handicapped access of Harry S Truman National Historic Site" (National Park Service, Omaha, Nebraska, May 29, 1986 photocopy) 1.

4. Ibid.

5. United States Department of Interior. "Handicap Access Survey of Harry S Truman National Historic Site" (National Park Service, Denver, Colorado, March 22, 1985 photocopy) 5-7.

6. Ibid., 7-9.

7. Ibid., 5-8.

8. Michael Lee and Alan O'Bright, "Physical Investigation Report Truman Home (HS-01) Harry S Truman National Historic Site" (United States Department of the Interior, National Park Service Midwest Region, Omaha, Nebraska, July 24-26, 1984, photocopy), 4.

9. Lawrence S. Graham, P.E., "Truman Garage, Independence, Missouri" (Kansas City, Harper and Kerr Consulting Structural Engineers, P.A., July 26, 1985, photocopy), 4. Hereafter cites as "Harper and Kerr."

10. National Park Service, "Physical Investigation Report and Treatment Proposal, Truman Carriage House (HS-02) Foundation, Harry S Truman National Historic Site, Independence, Missouri" (Omaha, Cultural Resources Management Division, 1985, photocopy), 4.

11. Harper and Kerr, July 26, 1985., 4.

12. Ibid., 5.