HISTORIC STRUCTURES PRESERVATION GUIDE

Aztec Ruins National Monument

by

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January 3, 1983

United States Department of the Interior
National Park Service
Southwest Cultural Resources Center
Santa Fe, New Mexico
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- References, etc.
This document has been developed to guide the preservation of Aztec's prehistoric ruins. It contains instructions for adherence to policies and procedures governing historic preservation activities, methods for preservation, material specifications, maintenance and inspection schedules, and reference materials for historic preservation and Aztec in particular.

Instructions in this guide are to be followed by all park personnel for activities affecting cultural resources preservation.

Division 1, 01100


Division 1, 01200

This document and its use are subject to provisions of the National Park Service Cultural Resource Management Guidelines (NPS-28), National Park Service Management Policies, and the cultural resources management policies of the Southwest Regional Office Southwest Cultural Resources Center.

Preservation activities conducted by park personnel shall be limited to annual or routine maintenance.
Any preservation activity which, or having the potential to affect, cultural resources, including any type of structural maintenance, shall be reviewed by the Southeast Region SWRO Review Committee (Regional Archaeologist, Regional Historical Architect, Regional Historian). The proposed activity shall be documented on the XXX Impact of Effects Form (see Reference Materials) by the park and forwarded to the Regional Historian for registration and review. The activity shall not be undertaken or implemented until the park receives written approval from the Regional Director through the Regional Historian. This process normally requires forty-five to sixty days and the XXX form should be submitted well in advance of the scheduled start of the activity.

Division 1, 01300

Inspection Schedule

The inspection schedule is important in determining the preservation needs of a structure and for tracking problem areas or identifying new problems.

Section 2 contains specific information on the inspection schedule for the Aztec ruins. This schedule should be followed closely. The organization, however, can be changed to better suit the needs of the structures. Any such changes must be documented in the schedule organization portion of this document.

Division 1, 01400

Cyclic Preservation Maintenance Schedule

The cyclic preservation maintenance schedule details procedures for implementation of cyclic maintenance. This schedule is set by the SWRO in consultation with park and professional preservation personnel.

Division 1, 01450

Annual Preservation Maintenance Schedule

This schedule contains information on conducting annual ruins maintenance. It is very specific and is set by park and professional preservation personnel.
Division 1, 01564

Post Control

Rabbits, squirrels, mice, rats, badgers, insects, etc., do inflict considerable damage to ruin fabric and archaeological fill. These pests should be removed, as necessary, by a method or methods approved by the Southwest Regional Office Division of Natural Resources Management.

Division 1, 01720

Records

Pueblo structures were built by many different individuals. Each structure has unique masonry styles and there is variation even within each structure. It is therefore critical that repairs to original construction match the masonry style, the stone size and treatment, mortar color and treatment (e.g. spalls or chinking, etc.), and other such variables. To assist in matching prehistoric materials and workmanship and as documentation of your preservation work, two major pre-stabilization activities are required: (1) as-is photographs of areas to be repaired; (2) recording of architectural information and work requirements (see Ruins Preservation Form, Appendices). The work forms and photographs should be completed and placed in a binder for use on the job site. Be sure that your photographs are properly taken and developed before any work is done. Samples of stone and mortar should be taken for use in locating stabilization materials sources. These sources should be documented in your stabilization report for future reference.
It is also helpful, for later reference, to take work-in-progress photos. This assists in identifying personal and public areas of important visual information.

When the work is completed, a stabilization report is required to fully document the stabilization activities. This report must be completed in duplicate (one for the park and one for Region) and before the beginning of the next year's field season.

The report should contain (in order) a Table of Contents, a Project Narrative, any special documents (e.g. a Tree Cutting Permit), a plan map of the site (requires specific indications of where work was performed), and a Ruins Preservation Record form and photographs (before, during, and after shots) for each room worked on.

The project narrative should include any pertinent background information on the site, who supervised the project, workers and their positions, when the work was performed, how much was expended and under what account number, what materials and methods were used, unusual problems and solutions, materials and supply sources, a breakdown of work day expenditures, and any other information deemed relevant.

Reports should be permanently bound and each copy should contain photographic prints rather than xerox copies of prints.
The stabilization reports for the East Ruin are:

1949: Vivian, R. Gordon
1953 and 1956: Richert, Roland
1957: Vivian, R. Gordon, and Roland Richert
1960: Shiner, Joel L.
1965: Voll, Charles B., and Martin T. Mayer
1967: Mayer, Martin T.

The stabilization reports for the Hubbard Mound are:

1954: Vivian, R. Gordon, and Tom Mathews
1960: Shiner, Joel
1969:  Joe, John D., & Martin L. Mayer
1973:  Robert, William L.
1979:  Marc, Stephen S.
Several drainage jobs exist for the Arroyo Rules. The West Ruin contains a number of drain pipes, drain channels, and drain holes (see Reference Section). In 1977, a French double drainage system was installed around Kiva N. In 1979, a drainage system was installed to carry excess water from the Hubbard Pond, across park property, to the east, exterior boundary of the park. That system is built of 12" PVC pipe. Also built of 12" PVC pipe, in 1982, is a drainage system designed to carry excess subsurface water (see 1982 drainage project report) away from the ruins and dump it into the old 1933-34 interceptor line. The old interceptor is still in place and functioning. In conjunction with the 1982 drainage system project, a soil berm was built along the north boundary of park property to divert surface field irrigation water to the Hubbard Pond. At the same time, the irrigation overflow ditch, across the park from NW of the East Ruin to the SE corner of the park, was filled in.

Part 2: Inspect

Inspect man-holes, clean-outs, drain channels, and drain entrances and exits; inspect soil berm along north boundary. Look for clogged areas, signs of damage or vandalism, check berm for erosion.

Part 3: Maintenance

A. Keep all drain lines clear and free of dead leaves, and debris. Keep surface area over drain line free of trees, large bushes and shrubs, and any other vegetation with deep penetrating roots. Grasses and minor bushes to grow along drain lines.

B. Monitor the soil berm for erosion. Minor erosion areas can be patched with tamped soil. Control vegetation as above.
Part A: Materials

Concrete, steel, and tile materials have been used in the age-old tradition at ASRU. These materials should be replaced in 1967 by additional soil needed for the basement be improved to the area (see C-50 for preservation guide for soil borrow procedures).
Part 1: Background

The visitor trail in the West Anasazi Center is constructed mainly of asphalt. Part of the walk is pea gravel and there are wooden, stone, and cement steps along the trail. Some of the trail is accessible to the handicapped. In 1977, the asphalt trail around Kiva M was removed for better control of drainage. It was replaced, after installation of the French double system, by pea gravel.

Part 2: Inspect

Inspect all trail surfaces, stairs, and stair/guard rails for loose or damaged surfaces.

Part 3: Maintenance

Repair damaged sections, reset loose elements, refill eroded pea gravel sections to grade.

Part 4: Materials

Repair or replace in kind. Stone must be imported (see RPG for procedure), wood should be walsmanized dimensional lumber, and cold, rolled asphalt used for patching. Pea gravel should not exceed 3/8" diameter.
Part 2: Inspect

Inspect room floors, open areas, walls, and wall tops for undesirable vegetation.

Part 3: Maintenance

Remove undesirable vegetation, by hand, when it is small enough to easily pull out. For well-grown plants, an approved herbicide might be necessary (check with SWRO Division of Natural Resources Management). Only small grasses and brushes should be allowed to grow, and no vegetation should be allowed to grow on or in wall fabric.
Part 1: Background

Capillary action is very damaging to ruin walls, at least--all bases are gradually eroded until they no longer provide support and thus cause the upper wall portions to collapse. In the early 1950's, hydropel concrete was found in-place along wall bases in many of the ruins in the ER section of the West Ruin. The waterproofed footing was supposed to prevent, or at least substantially decrease, capillary action. These foundations have been at least partially effective.

Part 2: Inspect

Inspect all hydropel foundations (see Reference Section) for damage, exfoliation, cracking, etc.

Part 3: Maintenance

Clean and repair damaged area with waterproofed concrete or cement patch (concrete for larger repairs, cement for small). Match surface treatment and form of existing foundation.

Part 4: Material

Use hydropel or other such compatible material for waterproofing Type I cement.
Division 4, §4110

Part 1: Background

The original mortar used in construction of the AZRU structures consisted of natural soil and water. Much of the wall surfaces of the buildings were covered with a soil plaster. A large amount of the original mortar remains in-situ. It is important that preservationists understand how this mortar was applied so that they can match it closely in color, texture, and effectiveness when repairing wall fabric or repointing eroded mortar joints.

Part 2: Inspect

Inspect all mortar joints and wall caps for loose, eroded, or missing mortar. Mortar joints should be flush and sound, however, generally, joints are not repointed until the erosion is advanced enough to allow at least one inch joint depth for the new mortar (or, if necessary, joints can be cleaned to that depth preparatory to repointing).

Part 3: Maintenance

A. Remove loose mortar, clean out joint to one inch depth, brush joint clean.
B. Wet joint well (do not soak) until all surfaces are moist.
C. Repoint joint with freshly mixed mortar. Be sure to match any spalling treatment, whether pressed or integral. The mortar should be dry as possible yet workable and should be packed into the joint as tightly as possible. The exterior surface of the mortar should match the surface of the original.

Part 4: Materials

Soil for mortar must be imported. Soil borrow procedure is outlined in the RPG for AZRU. It is often necessary to mix different soils to obtain the desired characteristics of composition, color and texture.
Part 1: Recognized

Cement mortars have been used extensively in portions of the West wall. This cement has a higher capillary potential than the building blocks and also has a different expansion/contraction rate. It is contributing to the rapid deterioration of the wall fabric. The use of Portland cement mortars in the rains is prohibited by WASO directive.

Part 2: Inspect

Inspect all mortar joints, vencers, and wall caps for loose or eroded cement.

Part 3: Maintenance

A. Remove all loose cement, clean out joint to at least one inch depth, brush joint clean.

B. Wet joint well until all surfaces are moist.

C. Repoint with plain soil mortar if area is below grade; repoint with chemically amended mortar if area is above grade (see Division 4, 04150).
Part 1: Maintenence

The Western Archaeological Center tested two mortars and found that Chem. Culture HMP indicate that chemically bonded mortars can have a longer maintenance cycle than unamed mortars. A longer maintenance cycle reduces the amount of funds necessary for ruin preservation.

Part 2: Materials

Rhoplex E330, manufactured by Rohn and Haas Company, 1920 South Tubeway Avenue, Los Angeles, CA 90040, (213) 722-5434, is currently recommended by WAC as the most durable (while compatible) amender for the soil mortars used at AZRU. Rhoplex E330 (be sure it is the E330 type) is an acrylic resin emulsion that is liquid and looks like milk. It comes in 500 lb. drums. Recommended dilution is one part E330 to 2 1/2 parts water by volume. A stronger mix is not economically productive. A weaker mix will not function properly. Therefore, do not dilute the E330 more than 2 1/2 to 1. The diluted E330 is then used to mix the soil mortar. The mortar should be the consistency of bread dough -- workable but not very wet. When repointing joints, pack the mortar in tightly by hand or with a rigid tool. This helps reduce cracking during the drying process. Once the mortar begins to dry in the bucket, throw the mortar away (once it reaches this stage, it is no longer effective, even if you wet it down and remix it). For this reason, small batches should be mixed. Rhoplex E330 is expensive and the more efficiently you use it, the less expensive its long term cost will be.

Remember, no matter what kind of mortar you are going to use, to test the mortar for texture and color to match, as closely as possible, the original mortar. Test patties should be made and allowed to dry on a flat, hard surface. Break open the dried patties -- the interiors will indicate true color and texture of the samples.
Part 1: Build-Core

The ruins are constructed of stone, wood, and wall core. Most of the building stone is a soft sandstone which is not-durable (shaped by hand to fit into place). This stone deteriorates rapidly in some parts of the ruins, particularly wall bases. When replacing this stone, it is necessary to dress the replacement stone in a manner which replicates the exterior finish of the original stone. The walls of the ruins have two vences and a rubble core. Thus, when replacing veneer stones, one usually has to do some work on the wall core.

Part 2: Inspect

Inspect all wall veneer surfaces for eroded or loose stones. Also look for voids (hollow spaces) in the walls. Look for stones that are causing or contributing to structural instability, or those so severe that they grossly detract from the aesthetic integrity of the structure. If the stone has deteriorated to the point of disfunction, it should be replaced. Do not replace the stone unless it is necessary according to the above criteria.

Part 3: Maintenance

A. Eroded Stone

Remove eroded stone and attendant mortar, brush dirt off exposed rock surfaces, dress fresh stone to size course at a time, wet in-situ rock surfaces, lay in fresh mortar, lay in stone, repeat process until all stones are replaced, dress joints to remove tool marks, finish joint exterior by hand to match original mortar. Work in sections small enough to avoid structural stress, trace large areas if necessary. Be sure to match masonry type/style.
1. Small voids.

Clean out bottom of void with high-speed motor; brush area clean as possible; wet all surfaces involved; funnel-in mortar or use caulking gun; relay stone and pack joints; dress joints. Viscosity of mortar can be adjusted for the particular application.

2. Large voids.

Procedure 1 (if no bulge in outer exterior to void): remove several stones from veneer at top of void, enough to be able to fit small stones into void; pump in small amount of slurry; plug flowing holes with oakum as they appear; begin filling void with small amounts of slurry with small, predampened stones thrown in to add strength and binding, the end result should be mortar slurry matrix with interspersed small stones -- this replicates the rubble core of the wall; when slurry has hardened, remove oakum and caulk and dress mortar joints.

Procedure 2 (veneer bulges, or if you are, for some reason, unable to form a slurry/rock core): remove bulged section of veneer; clean out bottom of void; rebuild veneer, forming the core behind the veneer as you work upward; dress joints.

Procedure 1 is preferred; Procedure 2 is more applicable to void areas creating severe structural stress; be sure to work with areas small enough to handle when you have to remove and rebuild veneer; be careful when pumping mortar -- tremendous pressures can be created.
Materials

Some stone for the ruins is stockpiled NE of the West Flim. Sometimes it is necessary to obtain more stone from AIM or private sources. Consult stabilization reports for borea procedures.
Part 1: Understand

Reinforcement is designed to ensure "the structural stability of a structure through the reinforcement of 'bearing surfaces'..." (IBC: 322:12). To this end, various stabilizers have added metal plates, rods, and bars to unstable portions of ruins, particularly doorway lintels. Some of these metal reinforcements rust and/or become loose thereby negating their value as loadbearers. When this happens, they must be replaced or reset, as appropriate.

Part 2: Inspect

Inspect doorway and ventilator areas and large wall holes for the presence of metal members. Look for rusted, loose, or failed units.

Part 3: Maintenance

A. Where possible, remove metal members and replace with fresh wood or stone loadbearers, as appropriate. Install stone as per section 04420; wood as per section 06450.

B. If metal unit is required: reset loose but otherwise sound units; replace loose or failed units in kind, if appropriate (if not, replace with appropriate unit).

Part 4: Materials

A. Metal. Reinforcement bar should be used where possible because it is small enough to be hidden by stone and mortar. Where spans are necessary, old grader blades can be used. In areas of moisture, stainless steel rods should be used.

B. Wood. Several different species were used in construction of the ruins. Primary beams are usually Douglas Fir, secondaries are aspen, and lintels cedar. Be sure to determine which specie is most appropriate to the particular application.
C. Some fogging was evident and a hint of gloom. In this case, replace in kind.
Part 1: Part 2
In 1979, 2" x 4" and 2" x 6" roof beams were installed in Rooms 20, 21, 22, and 26 to support the roof beam in the original roof.

Part 2: Inspect
Inspect all wood surfaces, articulation, and fastenings. Look for strain, damage, looseness, etc.

Part 3: Maintenance
Replace damaged portions in kind. Re-fasten loose members. Re-establish any loadbearing lost through brace settling.

Part 4: Materials
Use fir timber, 16¢ nails, and 3/8" to 1/2" x 6" steel bolts.
Part 1: Design and

Ceilings and extensively in the construction of the ruins at AZRU. Ceilings are wood, doorway and ventilator lintels are usually wood, and some wood was used as a primitive type of reinforcement bar inside walls. There are also wood transom rods in doorways. Douglass Fir, aspen, and cedar were the most common woods used at AZRU. This wood is subject to wet and dry rot, animal and insect damage, age, and structural strain.

Part 2: Inspect

Inspect all ceiling members, all doorway and ventilator lintels, and all exposed integral members for signs of damage, strain, or failure.

Part 3: Maintenance

Wood damaged severely or otherwise rendered disfunctional should be replaced in kind if it is a structurally important unit. If not structurally important, it should be preserved in place as best as possible by bracing/reinforcement and application of a wood preservative (see below). Wood preservatives will also arrest a certain amount of damaging activity by rodents and insects. Dendrochronological core holes should be treated with an approved insecticide (check with SWRO Division of Natural Resources) and sealed tightly with laboratory corks.

Be sure that walls are braced, if necessary, before damaged units to be replaced are removed. Replacement pieces should be treated with wood preservative before installation. New wood and corks can be stained to render them less obtrusive (remember that wood will weather and blend-in to some degree).

Part 4: Materials

A. Cuprinol. Cuprinol brand wood preservative has worked well in ruins. Be
To apply only a clear, flat finish. It is available locally at
interface of paint/herb dealer's suppliers.

To prepare. A good wood preservative can be had at your area
and is less expensive than commercial products. It consists boiled lin-
seed oil, paraffin wax, and paint thinner (or turpentine or mineral
spirits). To make one gallon of preservative: melt 1 ounce of paraffin
in a double boiler arrangement (never apply direct heat to paraffin --
it will ignite); slowly pour the melted paraffin into 1/2 gallon room
temperature thinner, while stirring thinner; add 1 1/2 cups boiled lin-
seed oil, stir well; add more thinner until total volume of 1 gallon is
obtained; stir until mixture is uniform.

These materials should be applied directly by brush or, if possible,
soak the wood in the solution. The wood should be treated when it and
the surrounding air are warm (summer is best) and dry. The solution must
also be warm. Exercise caution in application. Wear proper clothing
and protective gear such as gloves and face shield.

For further information on USFS preservative, see Research Note, FPL-0124
available at Forest Products Laboratory, Forest Service, U. S. Department
of Agriculture, Madison, Wisconsin, 53705.
Part 1: **Background**

There are thirty-three roofs at Ruin 18 with either or partial protective roofs built during this century. Earl Morris poured concrete over the original roofs still in place, thinking this was a good preservation method. In addition to leaking heavily, these concrete roofs added tremendous weight and strain on the original roofs. These concrete roofs were removed in 1978 and 1979 and replaced with lighter, independent units (see Adams, 1979, West Ruin and Hubbard — available in park library) designed to reduce strain and to prevent moisture from leaking onto the original roofs.

Part 2: **Inspect**

Inspect roof hatches, exterior roof surfaces, ventilator pipes, roof drains, and room interiors. Look for leaks, material cracks, drain or ventilator obstructions.

Part 3: **Maintenance**

Clean and repair all cracks, gaps, and material damage; clear obstructions.

Part 4: **Materials**

Fill cracks and gaps with a tempered compound (joint compound temper plus two parts resin to one part hardener).

Resin: Shell 815 or equivalent.

Hardener: Vermil 140 (General Mills = equivalent.

Ventilator - 4" black PVC pipe.

Sheathing - 2" insulated urethane (Johns-Manville) or equivalent. From Goodrich Roofing Co., Farmington, NM.

Plywood - 5/8" CDX. GSA

Lattice timbers - 4" x 4" fir. Local purchase.
Part 1: Lighting System

In order to ensure visitor safety in dark areas, a lighting system was installed in Rooms 127, 128, 191, 195, 199, 205, and 201, and in the Great Kiva (also supplying power in the Kiva for musical recording playback). For location of the basic system, see drawing SWL-AZf, 2003, 5/66, Sheet 1, "Utility Systems as Maintained" in the park map file. For the Great Kiva, see appendices, Division 16, section 16100.

Part 2: Inspect

Inspect to ensure all lights are functioning and power system in Great Kiva is working. Check circuit breakers and GFCI in Great Kiva; test.

Part 3: Maintenance

Maintain and repair all materials, fixtures, and equipment to standard. Replace burned out or broken light bulbs as necessary.
SECTION I

INSTRUCTIONS

Periodic Preservation Task Time Schedule

Frequency: Each fiscal year during field season, mid-April to mid-October.

Location: in-situ, on-site, in East Ruin, Great Kiva, Hubbard House, and West Ruin. Occasional off-site borrow of stone and soil is necessary.

Time: Task time requirements (based on an average, trained crew familiar with resources; time includes support activities).

<table>
<thead>
<tr>
<th>Task</th>
<th>Time Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace eroded stone</td>
<td>1 sq. ft./hr.; 8 sq. ft./day</td>
</tr>
<tr>
<td>Reset loose stone</td>
<td>1 sq. ft./hr.; 8 sq. ft./day</td>
</tr>
<tr>
<td>Repoint fine to medium mortar joints</td>
<td>1½ sq. ft./hr.; 10 sq. ft./day</td>
</tr>
<tr>
<td>Wood treatment</td>
<td>1 sq. ft./min.; approx. 3 md/year</td>
</tr>
<tr>
<td>Clean 8&quot; interceptor drain (1425')</td>
<td>5 man days/year</td>
</tr>
<tr>
<td>Other drains (approx. 251')</td>
<td>1 man day/year</td>
</tr>
<tr>
<td>Replace wood sign</td>
<td>3 man hours</td>
</tr>
<tr>
<td>Replace wood trailer marker</td>
<td>1.5 man hours</td>
</tr>
<tr>
<td>Replace bulb in trail light</td>
<td>15 minutes</td>
</tr>
<tr>
<td>Sweep visitor trail</td>
<td>2 man hours</td>
</tr>
<tr>
<td>Snow removal</td>
<td>5 man days/year</td>
</tr>
<tr>
<td>Replace wood stair step</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Clean doorway sealer</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Remove intrusive vegetation</td>
<td>4 man days/year</td>
</tr>
<tr>
<td>Trim over grown vegetation</td>
<td>1 man day/year</td>
</tr>
<tr>
<td>Clear roof drainage, West Ruin (20 roofs)</td>
<td>15 minutes/roof</td>
</tr>
<tr>
<td>Clear Kiva N drainage (7 flush caps, approx. 220 ft. of pipe)</td>
<td>15 minutes/flush cap</td>
</tr>
<tr>
<td>Clear Great Kiva roof drainage (5 spouts)</td>
<td>10 minutes/spout</td>
</tr>
<tr>
<td>Clear East Ruin roof drainage (1 pipe currently exposed)</td>
<td>15 minutes</td>
</tr>
</tbody>
</table>

Task time requirements are based on the experiences of a few project supervisors. Once you begin performing these tasks, you may find that requirements vary from those listed. When this happens, document the actual time you expend. If your figures recur consistently, substitute them for the figures listed in the task time requirements. On your seasonal crews you will have individuals who exceed the rates and others that perform below the rates. It is the average rate of the crew as a whole that you must be concerned with.
When planning time required, take into consideration support activities: collection and transport to the work site of materials and tools; making of replacable items such as new trail signs; difficulty of access to the work site (i.e. is a ladder needed); temperature and precipitation conditions; etc.

It should be emphasized that unless tasks are scheduled and the schedule adhered to as closely as possible, it will be virtually impossible to either keep track of time requirements or to accomplish the tasks. Organization is the key to timely execution. Organization also allows you to shift task schedules in order to circumvent unforeseen circumstances that would otherwise delay and confuse your maintenance program.

The more information you compile, the broader the base for your organization will be. Therefore, it is imperative that you keep accurate records. Not only will this help you, it will also prove invaluable to your successor. The more information he/she has, the more quickly and better the job will be performed.


Equipment: heavy duty, 2 1/2 gallon metal pails (2 for each), mixing trowels (2 for each), rock hammers (1 for each), 1" cold chisels (1 for each), brick chisels (1 for each), hard hats (1 for each), chipper's goggles (1 for each), work gloves (3 pair for each) -- purchase GSA; steel-toe boots (1 pair for each) -- Federal Prison Industries or local purchase -- with permission; metal scaffolding -- available at park, rent or purchase (Federal Contract) any additional necessary; various ladders -- available at park, purchase (GSA) any necessary additional ladders. Most of this equipment used every day.
Area should be graded, cleared of any, to facilitate scaffold and supply operation. This should be done at the end of the season between East Ruin and Road E. Actual work performed in situ, thus existing concrete must be utilized. Keep visitor trail clear of normal traffic only as long as necessary.

Personnel: area ruins maintenance worker acts as crew leader, takes pre-work photographs (complete and have on-hand before work commences), keeps work log and record, completes stabilization report at end of season; area Superintendent submits XXX form (Assessment of Effects) to Regional Historian 60 days before work is to commence; seasonal day labor performs actual stabilization work or in absence of crew, ruins maintenance worker performs stabilization. Skills needed require use of WG-5 or WG-8 Masonry Workers and WG-3 Laborers (see area P.D.'s for actual skills required).

Assistance: consultation on methodology, materials, scheduling, personnel, training, etc., available from Southwest Cultural Resources Center, Southwest Region, through incumbent, Farmington Area Archeologist.

Costs: initial -- initial costs already incurred; recurring -- consumables (GSA supplies, tools) and materials (Rhoplex E330). Soil and rock, if obtained from BLM, are free borrow.

How to accomplish: in-house; ONPS funding.

Priority: #1 health and safety, #2 severity of structural defect, #3 aesthetics.
Cyclic Preservation Schedule

Identical to Annual Schedule except in frequency and funding.

Frequency and funding: cyclic maintenance is designed to accomplish preservation tasks that build up over successive seasons due to inadequate annual maintenance. The cyclic funds are currently generated under the SEP program and projects should be implemented as they are funded. However, no more than five years should elapse between cyclic projects needed. Consult Regional Archeologist for current fiscal year cyclic funding for the area.
Inspect all of the structures of each room in each unit. Check concrete foundations, water joints, drain joints, veneer walls and windows, metal loadbeams, ceilings and other wood elements, protective roofs, electrical systems, and drainage. Inspect all drainage systems and ground cover. Look for leaks, structural damage, insect and animal damage, erosion, loose materials, structural strain or failure, vandalism, drainage system leaks or obstructions, and obtrusive vegetation. Note defects on the inspection form. All defects warranting repair should be recorded, room by room. Record all defects by category and by repair requirements in the form of work hours or work days. This information can also be used on the 10-377 Job Order Request. Record all defects needing repair even if they can't all be repaired in one season. This provides information on the dynamics of resource deterioration and can be used to plan future work and to use as justification for base funding increases.
<table>
<thead>
<tr>
<th>Item</th>
<th>Section</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
<th>Bi-annually</th>
<th>Periodically</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post damage</td>
<td>01064</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site drainage</td>
<td>02000</td>
<td></td>
<td>X(Winter)</td>
<td>X(Summer)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visitor trail</td>
<td>02630</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trees and Shrubs</td>
<td>02830</td>
<td></td>
<td></td>
<td>X(Other)</td>
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<tr>
<td>Cast-in-place Concrete</td>
<td>03200</td>
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<td>Mortar joints</td>
<td>04110, 04130, 04150</td>
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<td>Wall veneers and cores</td>
<td>04420</td>
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<td>Ceilings and wood members</td>
<td>06450</td>
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<td>Protective roofs</td>
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<td>Wiring systems</td>
<td>16100</td>
<td>X</td>
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</table>
Section 3

Reference Materials
ARCHEOLOGICAL SITES
IN
AZTEC RUINS NATIONAL
MONUMENT
A. Originating Office

1. Park:

2. Description of proposed action:
   [ ] Implementing action included in plan under POMA
   [ ] Other POMA Action
   [ ] Action not under POMA.

3. Explain why the action is needed:

4. Cultural resources affected by proposed action (name and LCS number, if applicable):

5. The proposed action will (check as many as apply):
   ___ Destroy historic fabric.
   ___ Remove historic fabric.
   ___ Replace historic fabric in kind.
   ___ Replace missing historic fabric.
   ___ Add nonhistoric elements to a historic structure.
   ___ Remove nonhistoric elements from a historic structure.
   ___ Alter historic terrain, groundcover, or vegetation.
   ___ Introduce nonhistoric elements (visible, audible, or atmospheric) into a
     historic setting or environment.
   ___ Reintroduce historic elements in a historic setting or environment.
   ___ Remove historic elements from a historic environment.
   ___ Remove nonhistoric elements from a historic environment.
   ___ Disturb, destroy, impair, or render inaccessible archeological (surface or
     subsurface) resources.
   ___ Possibly disturb presently unidentified archeological resources or historic
     fabric.
   ___ Incur gradual deterioration of historic fabric, terrain, or setting.
   ___ Other (Describe briefly):

   Describe the indicated effect(s) here:

6. Identify supporting approved plan(s). Comment and/or action thereon by
   Advisory Council on Historic Preservation, dates of ACHP action and NPS
   approval, and section(s) of the plan(s) pertaining to the action. If none,
   so state:

March 1982
B. Regional Cultural Resources Staff Review and Certification

1. The foregoing assessment is adequate; the proposed action is consistent with all applicable NPS management policies, standards, and guidelines reviewed and concurred in by the Advisory Council; and the proposal incorporates all feasible measures to minimize adverse effects to cultural resources.

2. The proposed action is authorized by a planning document or program reviewed and concurred in by the Advisory Council.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
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<tr>
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(Negative certifications must be justified on attachments.)

[ ] Energy Consultation Held

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Regional Archeologist Date.

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<tr>
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Regional Historian Date.

Regional Energy Coordinator Date

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Regional Historical Architect Date

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<tr>
<td>2</td>
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Regional Curator Date

Additional requirements of the proposed action:

C. Regional Director Approval of Proposed Action including Additional Findings

[ ] The proposed action, including any additional requirements stated, meets all conditions in B.1 and 2.

Date Regional Director

D. WASO Record

Assessment received and noted:

Associate Director, Cultural Resources Management Date

March 1982
<table>
<thead>
<tr>
<th>Field</th>
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<tr>
<td>Critical comment</td>
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<tr>
<td>Structure</td>
<td></td>
</tr>
<tr>
<td>Repair location</td>
<td>Wall N S E W Roof Other</td>
</tr>
<tr>
<td>Last prior repair</td>
<td></td>
</tr>
<tr>
<td>Architecture</td>
<td>Standing stories Smoked</td>
</tr>
<tr>
<td>Standing roof</td>
<td>Burned</td>
</tr>
<tr>
<td>Standing roof material</td>
<td>Pueblo</td>
</tr>
<tr>
<td>Standing roof category</td>
<td>Jacal</td>
</tr>
<tr>
<td>Standing roof category (Specify)</td>
<td>Other</td>
</tr>
<tr>
<td>Room plan</td>
<td>Long axis Foundation</td>
</tr>
<tr>
<td>Room situated</td>
<td></td>
</tr>
<tr>
<td>Room/Kiva</td>
<td>N S E W</td>
</tr>
<tr>
<td>Other notes</td>
<td></td>
</tr>
<tr>
<td>Roof type</td>
<td>Pueblo (primary &amp; secondary beams, etc.)</td>
</tr>
<tr>
<td>Floor type</td>
<td>Adobe</td>
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<tr>
<td>General condition of this unit prior to this repair</td>
<td></td>
</tr>
<tr>
<td>Preservation materials, technique</td>
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</tr>
<tr>
<td>Standard masonry techniques</td>
<td>Special techniques</td>
</tr>
<tr>
<td>Further notes</td>
<td></td>
</tr>
<tr>
<td>Work started</td>
<td></td>
</tr>
<tr>
<td>Approximate work days</td>
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</table>
Defects: North wall: basal stone erosion (extreme, severe, heavy, medium, slight) 
veneer stone erosion
mortar erosion
other

South wall: basal stone erosion
veneer stone erosion
mortar erosion
other

East wall: basal stone erosion
veneer stone erosion
mortar erosion
other

West wall: basal stone erosion
veneer stone erosion
mortar erosion
other

Other notes, defects:
Architectural details
(Doors, ventilators, windows, etc.)

South wall:

South wall:
SIGNIFICANT RESOURCE PROBLEM*
"IMPROVE DRAINAGE TO PROTECT WEST RUIN"

PREPARED BY: Stephen E. Adams
Area Archeologist
Farmington Field Office

DATE: OCTOBER 13, 1982

*82 PR & IP
1. Installation of new, French type drainage system along a portion of the north boundary to intercept sub-surface water and divert it away from the ruins and into the 1945 drain line. Approximately 900' new line installed.

2. Backfilling of selected portions of the West Ruin to ease lateral structural stress and reduce maintenance costs. Five rooms backfilled to grade. Materials only charged.

3. Replacement of north boundary fence to prevent trespass of domestic stock onto park property and over the new drain line area. Approximately 1400' new 5' high chain link. Materials only charged.

TOTAL

$32,870.00
### Composition of Cost

#### Costs Charged to Funds Allocated to Field Finance Office

<table>
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<tr>
<th>Item</th>
<th>Amount</th>
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<tr>
<td>(1) Personal Services</td>
<td>$3,837.85</td>
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<td>(2) Travel</td>
<td>$62.50</td>
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<td>(3) Contract Work</td>
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<td>(4) Supplies and Materials</td>
<td>$17,205.08</td>
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<tr>
<td>(5) Other Direct Expenses</td>
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<tr>
<td>(6) Operation of Equipment</td>
<td></td>
</tr>
<tr>
<td>(7) Depreciation of Equipment</td>
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<tr>
<td>(8) Purchase of Construction Equipment</td>
<td></td>
</tr>
<tr>
<td>(9) Purchase of Other Accountable Equipment</td>
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<tr>
<td>(10) Other Costs Equipment Rental</td>
<td>$7,586.36</td>
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<tr>
<td><strong>(11) Total Cost Charged to FFO Funds</strong></td>
<td><strong>$32,870.00</strong></td>
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**Less:**

<table>
<thead>
<tr>
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<tr>
<td>(12) Residual Value of Construction Equipment on Line 8</td>
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<td>(13) Value of Other Accountable Equipment on Line 9</td>
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<tr>
<td>(14) Other Credits</td>
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<tr>
<td><strong>(15) FFO Funds Charged to Construction Project</strong></td>
<td><strong>$32,870.00</strong></td>
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#### Other Costs:

<table>
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<th>Item</th>
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<tr>
<td>(16) Non-Fund Costs (Includes &quot;free inventory,&quot; donated materials, etc.)</td>
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<tr>
<td><strong>(17) On-Site Construction Costs</strong></td>
<td></td>
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<tr>
<td>(18) PS&amp;S, AP, and/or Facilitating Services at _% of Line 17</td>
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<tr>
<td><strong>(19) Total Construction Costs</strong></td>
<td></td>
</tr>
<tr>
<td>(20) Equipment Included on Lines 12 and 13</td>
<td></td>
</tr>
<tr>
<td>(21) Line 14 Credits</td>
<td></td>
</tr>
<tr>
<td><strong>(22) Gross Work Order Costs</strong></td>
<td><strong>$32,870.00</strong></td>
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</table>

Identify other costs and other credits by line item entry, on an attached schedule, or explain in narrative.
The site has also suffered from subsurface erosion caused by farm
irrigation run-off onto and into, via a surface, the park
area. An attempt was made, in 1945, to intercept the subsurface water and
divert it across the north boundary and out of the park into a drainage
ditch. This system was placed deeply underground (some 10' at the west end)
due to the recommendations of a study conducted by the Soil Conservation
Service in 1944. The system functioned properly for awhile, but began mal-
functioning after years of not receiving annual cleaning and clearing.
Cottonwood trees thrived along the drain line and their roots punctured and
blocked the line. Additionally, no attempt was made to divert surface water
running onto park property from the west boundary fence. Therefore, a surface
drainage ditch was cut across the park, towards the southeast corner, to
accommodate this surface run-off. The Hubbard pond, north of the West Ruin,
was not maintained. It periodically flooded park property to the south
and east and created a literal swamp in which cattails and willows abounded and
multiplied. Over the years, the north boundary fence continued to dete-
riorate; no maintenance or up-grading was performed. Consequently, trespass
by domestic stock on park property and the ruins was not an uncommon
occurrence.

Thus, from approximately 1953, the last definable period of favorable report,
to 1978, deterioration from sub-surface and surface moisture and from trespass
stock continued. In 1979, with the permission of the lessee, Russel Miller,
a special drain was added to the pond to carry excess water over the park to
a drainage ditch on the east boundary. This 12" PVC system has functioned
very well and the swamp southeast of the park has dried up.

In 1979, the Regional Hydraulogist, Gary Moore installed some test wells along
the 1945 interceptor line. After two years of data were analyzed, it was
determined that flood irrigation of the hay field north of the monument was
causing the excess sub-surface water and that this water was being carried on
top of a very thick stratum of clay, the top of which was 4-5 feet underground.

The 1945 drain, repaired in 1978 by NALAA at considerable expense and trouble,
was again functioning but apparently only because the sub-surface water was
travelling down the sides of the 1945 trench surfaces and being ___ally picked
up by the drain line. Aside from being somewhat inefficient, this allowed
a considerable amount of water to escape from the old line.

In FY 1982, a new drain line was installed to intercept the surface water
at the aquifer level (see diagram of French Drainage System, volume).
This line was later extended to pick up water from the trail north of
Room 213, West Ruin and carry it directly into the new French drain (see plan
view of drain line). A soil berm was built up along the edge of the new line
where it parallels the north boundary fence. This berm will direct surface
water to the Hubbard pond where excess can be carried away by 1979 pond
drain line. The surface water ditch across the monument was filled in, since
it is no longer necessary, and a new 5' chain-link fence was installed along
the north boundary (except for the easternmost 80') to keep out domestic stock.
Several areas in the West Unit were backfilled (4's 12, 132, 32A, 22, and 23) by use of structural fill excavated by the internal fill in adjacent areas. The southeast side of the Buffalo 1 box was built up with clay soil for reinforcement.

The first phase of the new drain line was started and completed in April, 1982. The second phase was started in June and completed in July, 1982. The option of extending the new line to the west boundary was not exercised.

The drainage project was funded for $33,000.00 under FY 1982 PRIP account number 731-1001-202. Archaeologist Stephen E. Adams supervised the first phase. Facilities Management Specialist Sheldon L. Smith supervised the second phase. Laborers Ernest Yazzie and James Best participated in phase one. Engineer Technician Bobby Clark levelled-in the 12" PVC pipe in phase two. Gary L. Douglass, NALA VIP, photographed the project. Robert Yazzie of Yazzie Construction, Cortez, Colorado excavated the drain line trenches.

[Signature]
Stephen E. Adams
ARCHEOLOGICAL SITES IN AZTEC RUINS NATIONAL MONUMENT
Stair Steps: 6 rock steps with two wood railings at interior west wall of Room 101

2 rock steps, southeast exterior of Room 187

2 rock steps, southeast exterior of Room 216

2 rock steps, north exterior of Room 216

2 rock steps, east exterior of kiva W

1 rock step, southeast exterior of kiva N

7 rock steps, east wall of Room 205

9 rock steps, west exterior of Room 205

7 wood stair steps with the two wood railings and platform with wood railing situated in Rooms 6 & 15A

2 concrete steps and 4 wood stair steps with one wood railing, west interior of Room 197

1 concrete step, east doorway of Room 197

2 concrete steps, one in each of east and west doorways, Rm 198

2 concrete steps, one in each of east and west doorways, Rm 191

2 concrete steps, one in each of east and west doorways, Rm 195

2 concrete steps, one in each of east and west doorways, Rm 199

2 concrete steps in west doorway, 1 in east doorway, Rm 196

1 concrete step in west doorway, 2 in east doorway, Rm 201

10 rock steps, southeast corner of Rm 199

1 rock step, west exterior wall of Rm 199

3 concrete steps in east doorway of Rm 199

13 wood stair steps with two wood railings = north wall of Great Kiva.

8 wood stair steps with two wood railings = lower part of south exit of the Great Kiva.

6 rock steps with two wood railings at upper part of south exit of the Great Kiva.
2 concrete steps, one on either side of the north doorway of Room 156.
Room 151: Exterior southwest, also interior northwest
211: Exterior of east wall (steel marker)
234: Exterior of west wall
205: Ext. of west wall
202: Ext. of west wall
197: Ext. of west wall (2 markers), also interior at east wall
220: Int. of west half of room
238: Marker on west side of trail south of this room
118: South exterior
120: South exterior
196: Northwest corner
58: West exterior

kiva E: East exterior
160: by northeast corner of altar

Great kiva: by northeast exterior of west "foot drum"
105: north exterior
107: north side of trail south of this room
212: south side of trail south of this room

Wood markers (unless otherwise noted) -
Covered rooms on or along visitor trail
Room 197: northeast corner of room
191: by northeast corner
195: on wall on east side of south doorway
199: at bottom center of north wall
196: on east wall of south doorway
Kiva B: trail sign on exterior of west wall
233: interpretive sign on exterior of west wall
Kiva H: by exterior of west wall (interpretive)
197: by exterior of west wall (trail sign)
Int. sign: on east side of trail between WERU and Hubbard
Int. sign: by south exterior of the cobble kiva south of Hubbard
238: metal trail sign in southwest corner
119: by southeast exterior (metal interpretive sign)
Kiva L: by north exterior
57: by southwest exterior (metal trail sign)
160: by east exterior (metal trail sign)
212: interpretive sign on north side of trail south of the southeast exterior corner of this room; int. sign in same location but on south side of trail; int. sign on south side of trail south of the southwest ext. corner of this room.

East Ruin: warning sign on west side of ruin by foot path up to Room 1.

Sealers for doorways (leading off trail (WERU)

Room 197: 3' x 3' glass with metal frame mounted with wall screws over south doorway
198: 3' x 5' glass with wood frame sealing south doorway exteriorally
191: same as 198
195: " " "
199: " " "
196: " " "
201: " " "
47: " " "
electrical (WERU)

Room 197: electrical conduit integral with west wall

198: trail light in center of north wall

191: same as above

195: " " "

199: " " "

196: " " "

160: trail light on east wall south of the doorway; music button for kiva music, mounted on wood pedestal in southeast corner of the room.

Great kiva: see diagram

Miscellaneous (WERU)

Room 160: 3 chains between pilasters on south end of room.
Foundation Form — 1' x 6'-8"

Hydropel & Aggregate mixed with concrete.

Floor Level —

Top Section of Mortar struck off at angle.

From Ulvian & Rixey, 1950: 5
THE EAST RUIN
AZTEC RUINS NATIONAL MONUMENT

SCALE, 1" = 30'
CONTOUR, 3'

roofed structures

AFTER T. ONSTOTT, 12/29/48

FIG. 1
"4" CONCRETE SLAB AND 1" LAYER OF LAP DEMENT

VENT

SIZE SPACING OF RODS #4 8" O.C. HOMES WAMS ON THE BOTTOM
#3 @ 16" TEMP.

DECKING

SIZE OF I BEAM 4" @ 7.7'
2 X 4" BRACKETS

4" BOLTS

8" AIR SPACE

EXISTING PROXIMITY VISTA

MUD & STONE WALLS 1' - 8"

Room: (4) 6' 10" CLEAR SPAN

1' @ 7 1/8" FAR SPAN

TYPICAL SECTION

ROOF # 2 (ROOM 14) # 3 (ROOM 13) EAST RUN, AZTEC RUNS

TWO Roofs -
1) 2' 1/8" (6' 4") X 7' 6"
2) 2' 1/8" (6' 4") X 7' 7"

REQUIRED:
SIZE & SPACING REINFORCING RODS
SIZE OF I BEAMS
FORM CANNOT BE SUPPORTED FROM INTERIOR
TO FORM SURFACE OF CONCRETE

PROFILE

2 x 4

2 x 4's to fit into 4 x 4 beam. Must be tight.

2 x 4's supports on 8' centers or as required.

PLAN

TO SUPPORT FORM FOR CONCRETE

5/8" reinforcing placed on 8' centers. Support reinforcing 2H above form on precast blocks "chairs" about 3" square.

Tie all joints.
House of the Great Kiva at the Aztec Ruin

Cross Section. House of the Great Kiva from Z to Z'
<table>
<thead>
<tr>
<th>Item</th>
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<tr>
<td>pest control</td>
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<tr>
<td>pest damage</td>
</tr>
<tr>
<td>drainage</td>
</tr>
<tr>
<td>visitor trail</td>
</tr>
<tr>
<td>remove vegetation</td>
</tr>
<tr>
<td>concrete foundations</td>
</tr>
<tr>
<td>mortar joints</td>
</tr>
<tr>
<td>veneer stone</td>
</tr>
<tr>
<td>wall core</td>
</tr>
<tr>
<td>metal load-bearers</td>
</tr>
<tr>
<td>roof supports</td>
</tr>
<tr>
<td>ceiling</td>
</tr>
<tr>
<td>other wood</td>
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<tr>
<td>protective roof</td>
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<tr>
<td>electrical system</td>
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<td>item total</td>
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REPAIR REQUIREMENTS
(inspection form)