

TEXAS HISTORICAL COMMISSION

HISTORIC COURTHOUSE MAINTENANCE HANDBOOK



Donley County Courthouse



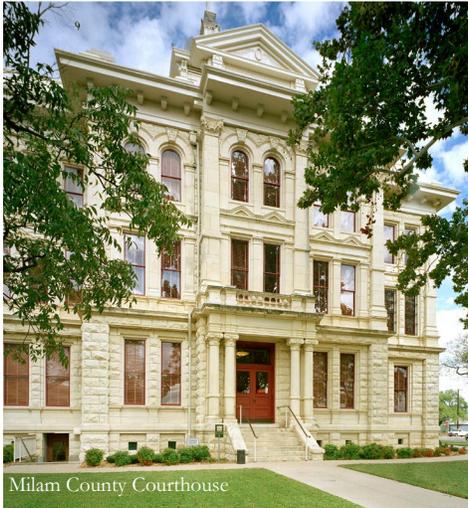
Cass County Courthouse



Newton County Courthouse



Potter County Courthouse



Milam County Courthouse



LaSalle County Courthouse



Maverick County Courthouse



Goliad County Courthouse



Fayette County Courthouse



TEXAS HISTORICAL COMMISSION
real places telling real stories

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

GENERAL INTRODUCTION ii-1

GLOSSARY iii-1

HARDSCAPE, STAIRS, AND RAMPS 1-1

LANDSCAPE AND IRRIGATION 2-1

DRAINAGE 3-1

MONUMENTS, STATUARY, AND OTHER SITE ELEMENTS 4-1

SLATE ROOFING 5-1

METAL SHINGLE AND SHEET ROOFING 6-1

CLAY TILE ROOFING 7-1

BUILT-UP/MEMBRANE ROOFING 8-1

ROOF DRAINS, GUTTERS, AND DOWNSPOUTS 9-1

BRICK 10-1

STONE AND CAST STONE 11-1

TERRA COTTA 12-1

STUCCO 13-1

WOOD WINDOWS 14-1

METAL WINDOWS 15-1

LEADED AND STAINED GLASS 16-1

EXTERIOR DOORS, GRILLES, AND SCREENS 17-1

HVAC 18-1

ELECTRICAL 19-1

PLUMBING 20-1

HOUSEKEEPING AND INTERIORS 21-1

THIS PAGE INTENTIONALLY LEFT BLANK

Why Maintain?

The Texas Historical Commission (THC) Historic Courthouse Maintenance Handbook is designed to help facilities directors, maintenance and housekeeping staff, and county officials in Texas maintain over 240 historic courthouse buildings throughout the state. Many of these buildings have been restored through the Historic Texas Courthouse Preservation Program. Both restored courthouses and those that may be restored in the future must undergo regular maintenance to preserve the historic materials and features that make them such important places in our communities. For some counties, budgets and resources for maintenance is generous, but for many, funding is a challenge and necessary (but often deferred) maintenance can become overwhelming. This handbook offers straightforward tools to assist counties in planning and conducting basic cyclical maintenance. If used as intended, this handbook also helps justify maintenance and staffing budgets, supports fundraising efforts for repairs and restoration, offers transparency for money spent, and helps make the case for the importance of maintenance.



Masonry repair on the Mills County Courthouse

THE IMPORTANCE OF MAINTENANCE

Cyclical maintenance, conducted according to a schedule, may seem like a daunting and expensive task, but letting a small routine maintenance item go without repair can lead to much bigger problems down the road. If not

addressed in a timely manner, simple and inexpensive items become costly repairs affecting other systems. In historic buildings especially, the failure of a system or deterioration of an element could mean that an irreplaceable and character-defining feature of the building is gone forever. For historic buildings, it is almost always better to repair original materials than to replace them with modern ones, and maintenance helps prolong the life of historic materials. Cyclical maintenance also helps with planning ahead and budgeting. Once the maintenance cycle is underway, budgets for routine items become more predictable, and over time will result in fewer emergencies.

Our historic courthouses are public assets, and it is the responsibility of public officials and staff to ensure their continued operation to allow future users to enjoy them. Maintenance protects the investment the public has made in its infrastructure, and contributes to intangible things like pride of place. A well-maintained building is one a community can be proud of. A historic courthouse is often the most prominent building in a community. Historic Texas courthouses are the locations of not only essential county business, but they are often assets to their communities in other ways. Courthouses serve as cornerstones for tourism, provide event space, are photo backdrops, and have even been used as film sets. They house historical documents such as birth, marriage, death, and property records and may also contain museum-quality local artifacts.

HOW TO USE THIS HANDBOOK

This handbook covers basic preventive and minor maintenance of major building materials and systems

present at the majority of historic Texas courthouses that will be undertaken by facilities staff. It does not cover major repairs or replacement of systems, structural deficiencies, capital projects, or restoration. For this level of work, suggestions for appropriate contractors, specialists, or other resources are provided.

This handbook is designed to be adapted to each courthouse. Sections are broken out by major building material or system, so users can select to use only the sections applicable to them. Within each section, a brief summary of the importance of the materials is presented, and the reasons that their maintenance is important are discussed. Steps for how to assess each material or component and the frequency of assessments are given. Next, the specific tasks to undertake basic maintenance of these materials are listed. The handbook assumes a basic knowledge of each material and repair procedures, but if more information or instruction is needed, users can refer to the resources provided in each section. Finally, each section has a fillable checklist containing each item that should be checked during the assessment, and space for staff to write in detailed information about each problem found, along with information about costs, contractors, and completion details. If utilizing the PDF version of the handbook, this can be filled out on the computer using Adobe Acrobat or Adobe Reader (a free download), and digital photos can be added to the document. The handbook can also be printed and filled in by hand, with copies of the checklists printed for every assessment. This handbook is intended to be copied, marked on, and expanded upon by the user.

Assessing Conditions

Prior to undertaking assessment or maintenance of any element, it is important to know if it is a historic or character-defining feature. Historic and character-defining features are the physical and visual elements of a building that give it identity and distinctive character and may include the building form, materials, decorative details, quality of craftsmanship, the site and environment, and interior spaces and features. Character-defining features are identified in the Courthouse Master Plan and Completion Report of each courthouse, prepared during its restoration. This handbook focuses on the maintenance of the character-defining features of the building.

ASSESSMENT INTERVALS

In order to reduce the long-term costs of the repair and replacement of historic features, inspections must be undertaken regularly. While assessments can take time and may not seem urgent, especially when budgets and staff are minimal, this approach will eventually save money and time by shifting priorities from emergencies to planned maintenance. Planned maintenance can be predicted and the costs more readily controlled than system breakdowns, which can result in an inconvenience to users or repairs that require a building be vacated while they are conducted. The intervals suggested for assessments assume each particular building element will be thoroughly assessed at that time, utilizing the checklists provided. For items that require more attention, supplemental inspections are also suggested, such as checking gutters after a rainstorm. Other items may be observed from casual walk-throughs of the site that occur daily.

PREPARING FOR ASSESSMENTS

Before conducting assessments, make sure you have all required equipment and tools on hand. Some assessments, such as exterior inspection of windows, may require a lift. A camera should be used in addition to the checklist to record conditions. A review of prior documentation and familiarity with previous repairs is also helpful. It is also helpful to have a set of drawings of the building available during the inspection to locate problems.

When performing an assessment, take a methodical and holistic view of the building. Buildings are made of discrete parts, but all of the parts act together. What may appear to



Stewardship resource library

be an isolated area of deterioration may have a root cause elsewhere that must be treated, or could be damaging another part of the building. If in doubt, record what you see on your checklist form and by taking photographs. Something that seems minor now may become more serious the next time an inspection is done, and a record over time will help you in making repair decisions.

Once conditions are assessed during the inspection, they should be prioritized. Safety issues, potential structural problems, and water infiltration should be addressed first. All required repairs should then be budgeted and scheduled with the Cyclical Maintenance Tracker included in this handbook. Work can be categorized into the following time frames: Priority 1: urgent, requires emergency maintenance, Priority 2: work required within 1 to 2 years, Priority 3: work required within 5 years, and work that does not require a particular time frame.

It should be noted that this handbook does not address workplace or site safety. The user should reference current safety guidelines for any work being undertaken.

THE ROLE OF PRESERVATION PROFESSIONALS

In some instances, a more detailed inspection can be performed by a contractor, engineer, or preservation architect. This is useful when the county does not have proper equipment, adequate manpower, or the specialized skills required to assess certain building elements. Preservation professionals should also be utilized when initial assessments indicate conditions that require further review by a specialist prior to contracting work. Each section of the handbook identifies some of the situations where professional guidance is recommended.

Maintenance

Maintenance is preservation, and preservation is maintenance. Regular maintenance is essential for any building, and is especially important for historic buildings. Everyone understands that regular maintenance extends the life of materials and systems and reduces hazards to the building and occupants, but many may not know that maintenance goes much further in serving not only the buildings, but the community at large.

No building is maintenance free, and the components of historic buildings were designed to be maintained. Many historic building parts such as windows, doors, and even brick walls, are comprised of numerous individual components that make up the element. Each component, such as a pane of glass, wood door panel, or individual brick can be repaired or replaced as needed without sacrificing the whole element.



Replication of missing cast iron column capital

MAINTENANCE VERSUS REPAIR

There are several categories of maintenance, and each has several terms to describe them. Cyclical (also called planned, preventive, or routine) maintenance is minor work done before breakdowns or failures to extend the life of existing systems or elements with the goal of reducing the need for corrective or emergency maintenance. A goal of every facilities manager should be to do mostly cyclical maintenance. Corrective maintenance is done after a component or system has deteriorated such that it requires extensive repair or replacement. Emergency (also called prioritized) maintenance must be done as a result of system failure; to maintain the health, safety, and welfare of building occupants; or after events like storms and natural disasters. Corrective maintenance should be needed only occasionally, and emergency maintenance should be rare. This manual emphasizes cyclical maintenance, although it is recognized that many counties will have outstanding corrective or even emergency maintenance that also must be addressed while implementing a plan for routine inspections.



Architects test stucco removal on the Wharton County Courthouse

WHEN TO SEEK ADVICE

When conducting maintenance, be aware and realistic about the skill set of in-house staff. When a repair is out of your area of expertise, seek help from experts or specialized trades people. When in doubt, err on the side of caution and seek advice as to the skills necessary to undertake repairs. Make sure the advice you seek is independent and objective, and ask for references for similar types of work on historic buildings. Beware of unsolicited advice or offers. Make sure that the correct materials, techniques, and good craftsmanship are used. This is not only good practice, but can also help prevent unintended consequences of inappropriate repairs.

Any time work may disturb potentially hazardous materials such as lead paint or asbestos; or interfere with life safety or accessibility, the THC or other appropriate experts such as preservation architects should be notified. For courthouses that have been restored, these issues were addressed at the time of the restoration to meet standards and laws in place at the time. Any alteration of these elements—including, but not limited to accessible parking, ramps, paths, or replacement of exterior or interior door hardware; egress paths and exits; disturbing paint coatings, flooring, or finishes that encapsulate hazardous materials; and other work—may render the building noncompliant with building and life safety codes and accessibility standards. This may result in liability and safety issues.

Resources

This manual is meant to help counties establish best practices in maintaining the historic materials of their courthouses. It does not take the place of operations and maintenance manuals for specific building systems. Maintenance staff should continue to use these manuals, as well as any other closeout manuals. Inspections of systems not covered by this manual, such as fire suppression and detection and others, should continue. The Courthouse Master Plan and Completion Reports contain guidelines for your specific building and should be kept in a safe and easily accessible place, and referred to prior to undertaking any major maintenance or repairs.

In addition to operations and maintenance manuals, old inspection, maintenance, and repair records should be retained in a safe and accessible place. Paint types and colors used, mortar repair mixes, and the like should be kept with these records. Old records can help you determine when a system has neared the end of its lifecycle; if certain issues are recurring or are part of a pattern indicating a more serious problem; and provide a recipe for repairs. Old records can also be helpful when preparing budgets and can have the contact information for previous contractors. They are especially important in a building where maintenance is performed by many people over time. If storage space is a problem, records can be scanned and stored digitally. It is good practice to retain a copy in the on-site facilities office and a second copy as part of the county records storage system. Each Resources section of the handbook provides a place to write in the contact information of contractors who have performed successful work at the courthouse, as well as contractors whose work was not satisfactory.

THE NATIONAL PARK SERVICE GUIDELINES AND PRESERVATION BRIEFS

Historic materials may be treated differently than modern materials and may require special care. Treatment of these features are held to a high standard and have specific treatment guidelines that have been accepted by preservation authorities and the THC. The U.S. Secretary of the Interior's *Standards for the Treatment of Historic Properties* outlines these standards. Each materials section in this handbook references the applicable standard. It should be noted that while only trusted references are given, website addresses may change and result in broken links.

A general search in the user’s website browser for the title of the document should usually locate the referenced document in case of broken links. For general standards, or for materials not covered in the handbook, see below.

The Secretary of the Interior’s *Standards for the Treatment of Historic Properties*:

<https://www.nps.gov/tps/standards.htm>

National Park Service *Preservation Briefs*:

<https://www.nps.gov/tps/how-to-preserve/briefs.htm>

National Park Service *Preservation Tech Notes*:

<https://www.nps.gov/tps/how-to-preserve/tech-notes.htm>

It is imperative that maintenance and housekeeping staff entrusted to perform maintenance are properly trained. Seek out training classes offered by trade organizations and preservation groups. Consider joining professional organizations that focus on building maintenance and historic buildings, such as the Association for Preservation Technology International, Building Owners and Managers Association, and by taking courses through the National Preservation Institute. Consider joining local preservation organizations to network with peers in the historic building field. Most major cities have preservation organizations. Contact the THC for a list of preservation organizations in your area.

THE ROLE OF THE TEXAS HISTORICAL COMMISSION IN COURTHOUSE STEWARDSHIP

The historic courthouses of Texas are recognized as an important collection of unique landmarks and part of our state’s heritage. Recognizing the need to preserve these ties to our past, the state of Texas enacted laws to protect these significant historic buildings from destruction and loss of their character-defining features.

The following Texas statutes and instruments serve to protect and preserve county courthouses by allowing the THC review authority over any work to the building beyond routine maintenance. All work to historic county courthouses is reviewed for conformance to the Secretary of the Interior’s *Standards for the Treatment of Historic Properties*. Rules for implementing the following laws and penalties for non-compliance are found in the Texas Administrative Code, Title 13, Part 2, Chapters 12, 17, and 26.

- Texas Courthouse Law is applicable to all courthouses determined to have historical significance (typically 50 years of age or older). The county must notify the THC at least six months prior to initiating any work by providing photos and a written description and drawings of the proposed work.
- The Antiquities Code of Texas is applicable to any courthouse designated as a State Antiquities Landmark (SAL)—see [Texas Historic Sites Atlas](#). The county must consult with the THC on any proposed actions through the permit process using an Antiquities Permit application for any non-routine work on the building or grounds of an SAL.
- Preservation easements are applicable for courthouses that received state grant funding. A legally binding document filed with the county clerk, an easement gives the THC an ownership interest in the property and its preservation, and the easement is enforceable in court. Counties whose courthouse is protected by a covenant or easement should remain in touch with the THC’s Division of Architecture throughout the duration of the agreement.

INSURANCE CONSIDERATIONS

A well-maintained building is a lesser risk for the property owner since it is more likely to be weather-tight and less vulnerable to severe weather. Additionally, insurance providers assume a lower financial risk when providing coverage for a historic building that has addressed maintained proactively. This can produce savings for the owner in insurance premiums and for the provider in claims.

Owners are responsible for working with their insurance providers to appraise their assets and determine the proper level of coverage. For historic courthouses, the coverage should be an amount equivalent to the full historical replacement value, or HPV, that ensures any in-kind repairs necessary to return the building to its pre-disaster appearance and functionality can be undertaken. The Texas Association of Counties (TAC) Risk Management Pool offers historic replacement-value insurance that covers the replacement of historic materials in-kind in the case of a loss; it’s important to note that most standard insurance policies will return a building to its pre-damage function, but will unlikely restore historic character-defining features or use in-kind replacement materials.

Therefore, the THC recommends that counties that own a historic courthouse utilize the historical replacement-value option.

Courthouses that have undergone a full restoration with funding provided through the Texas Historic Courthouse Preservation Program (THCPP) typically have new mechanical, electrical, and plumbing systems, in addition to current security systems and fire detection/warning systems, which all contribute to safer and more secure buildings. All of this creates less risk for the building and its users, and subsequently for the organizations that insure the properties. Keep those records for your restored courthouse available to show an insurance provider.

Note that counties participating in the THCPP have granted a preservation easement to the THC in perpetuity. This easement is a commitment to maintaining the property in a good state of repair, and includes a commitment to adequate insurance coverage in perpetuity to protect the county and state's investment should a disaster occur.

Checklists

This handbook includes checklists for each major common material and element encountered at historic Texas courthouses. The goal of each checklist is to identify the items that should be checked when assessments are done at the intervals suggested. The checklists provide a place to record the conditions expected to be found, and also provide space to record unusual conditions. The checklists can be used to track the costs of maintenance, as well as who performs inspections and maintenance. Checklists should be kept on file in a safe place and referenced as needed. Over time, the checklists provide a record of what has been done to maintain each item and provide documentation of the progression of ongoing problems. This can help in times of staff turnover, establish an expected lifecycle for systems, and provide a record of work in case of a warranty call. The checklists are not exhaustive, but do cover the most common materials and elements found at historic Texas courthouses. The checklists are intended to be used at each assessment interval (for example, a checklist would be used to assess the windows at each five-year interval), but a checklist would not necessarily need to be completed if a building occupant reports a broken piece of glass.



Window damage from Hurricane Harvey at the Refugio County Courthouse

The HVAC, Electrical, and Housekeeping sections do not have checklists. For building systems there are numerous manufacturers, system types, and components that could be present in courthouses, and the sheer combination of these factors cannot be easily summarized in a checklist. Instead, general guidelines for assessment and maintenance are provided, with the recommendation that manufacturers' operations and maintenance (O&M) manuals for each component should be referenced and utilized by maintenance personnel. The Housekeeping section also contains general guidelines for upkeep of historic interiors. It is understood that housekeeping staff will have numerous tasks beyond the historic finishes and fixtures, which may be already listed on daily housekeeping task charts. The user should incorporate any applicable historic interiors housekeeping into existing task charts.

Cyclical Maintenance Tracker

The Cyclical Maintenance Tracker is designed to help building maintenance personnel with scheduling inspections and maintenance activities, and making sure they are done on time and in accordance with best practices for each building element. It can also be used to help allocate staff and resources, and help establish reasonable budgets for routine maintenance. The tracker can be filled in electronically using Microsoft Excel or printed and filled in by hand.

About the Authors

This handbook was prepared by McCoy Collaborative Preservation Architecture of Dallas; assisted by Fran Gale, architectural conservator of Austin; and Reed Wells Benson, mechanical, electrical and plumbing engineers of Dallas. The THC's Historic Texas Courthouse Preservation Program staff envisioned, contributed to the content, and created the website access. The preparation of the handbook included consultation with many county courthouse facilities staff members through interviews, a survey, a roundtable at the 2018 Real Places Conference in Austin, and feedback on draft content. The input of these courthouse stewards was invaluable and greatly appreciated.

THIS PAGE INTENTIONALLY LEFT BLANK

Historic Materials Maintenance Terms

Actuator: the part of a system component that moves and controls a mechanism, such as opening a valve; it requires a control signal and energy source to function

Air handling unit: blower or fan used to distribute conditioned air to a room, space, or area of a building

Astragal: the molding attached to one door in a pair of swinging doors, against which the other door strikes

Basin heater: a heating element that prevents water in the cold water basin from freezing during winter months

Battens: narrow pieces of wood used to cover joints in vertical siding

Belt drive fan: fan that is driven by a belt connected to sheaves and pulleys, which are connected to the fan motor

Blow down: also known as bleed-off; flushing sediment from the cooling tower or boiler system

Boiler: gas-burning appliance that supplies hot water or low-pressure steam for domestic and commercial space heating

Boiler flue vent pipe: the vent pipe that exhausts combustion air from the boiler through the building to the outdoors

Boiler stack: the vent pipe or chimney through which combustion gasses or flue gasses from the boiler are exhausted to the outside

Burner: the piece of equipment in which combustion takes place

Burner control: the system that controls the ignition of the burner of the furnace, and burner sequencing

Bypass control valve: a valve that controls the flow of water at the cooling tower; used for winterization of the cooling tower

Chiller: component of the HVAC system that removes heat from a liquid during the refrigeration cycle, which is then used to cool and dehumidify the air

Coil: cooling or heating element made of tubing or pipe

Compressor: component of the HVAC system that is used to move refrigerant through a system by transferring the refrigerant from the low-pressure side to the high-pressure side

Condensate pan: metal pan within the air handling unit or direct expansion unit that collects water that forms on the evaporator coil

Condenser: part of the HVAC system that removes heat from high-pressure vapor that causes the vapor to change back to a liquid; also refers to the tubing in which the compressed refrigerant is liquefied with the removal of heat

Condenser coil: the component of the refrigeration system where heat is removed from the refrigerant and transferred to the air

Control damper: valve or plate that regulates the flow of air inside a duct, variable air volume (VAV) box, or air handler

Control valve: valve used in piping to control the supply to any section of a system or piping

Cooling tower: component of the HVAC system that cools water by evaporation; water is sprayed into a stream of air where part of the water evaporates and lowers the temperature of the remaining water

Decking: covering over a roof structure to which roofing materials are applied, often wood or metal

Delamination: the separation of layers of a material such as stone or steel due to cyclical stresses, impact, or water or salt infiltration and crystallization

Direct-drive fan: fan whose fan shaft is mounted to a motor so that energy is directly transmitted from the motor to the fan

temperature could hold before saturation, expressed as a percentage

Roof vent cap: the cap that covers a vent pipe extending through the building to the roof

Sacrificial anode rod: a metal rod, usually made of magnesium or an aluminum and zinc alloy that preferentially dissolves with galvanic corrosion in a steel water tank to protect the steel from corrosion

Sash: the part of the window frame that holds the glazing, especially when movable

Scupper: opening in a wall of a building to permit water to drain off of a floor or flat roof; also can refer to a sheet metal device installed in a wall opening to allow drainage

Sheathing: structural covering, usually wood boards or plywood, used over studs or rafters of a structure that support another material, such as siding or roofing

Sheave: the grooved wheel in which a fan belt runs

Spall: fragments of a masonry unit that have detached from the surface by weathering, salt crystallization, impact, or chemical reactions of elements in the masonry unit, such as anchors

Stringer: a longitudinal structural piece in framework, usually a roof member

Subsidence: gradual caving in or sinking of soil

Temperature relief valve: device that opens when a pre-determined temperature is exceeded; can be fusible plug type or reseating/self-closing

Thermostat: an instrument for measuring temperature

Wet bulb temperature: the temperature read by a thermometer that is covered by a water-soaked cloth over which air is passed; it is used to estimate the effect of temperature, humidity, wind speed, and other factors

Wye strainer: devices that mechanically remove solids from liquid, gas, or steam lines by perforated wire mesh, which can then be cleaned out by removing a cover plate at the bottom of the strainer

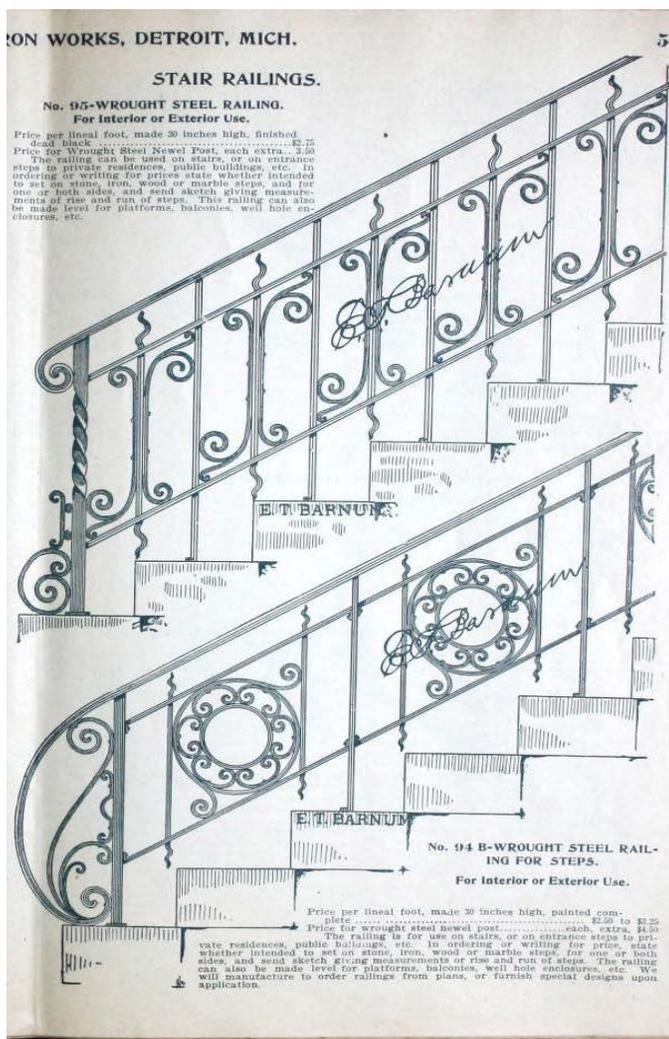
This glossary is adapted from sources including:
Construction Glossary, J. Stewart Stein, AIA, FCSI, John Wiley & Sons, New York, 1980.

1 HARDSCAPE, STAIRS, AND RAMPS

MAINTENANCE INTERVAL: EVERY YEAR

Why Maintain?

Hardscape, stairs, and ramps are present at most if not all historic Texas courthouses. These elements, which can be constructed of concrete or masonry and may also have metal elements like handrails, can be character-defining features of a building if they are historic. Historic pavement is generally durable, and if well-maintained, can be less expensive in the long-run than new paving. Courthouses that have been recently preserved have most likely been made accessible to those with disabilities and may have curb cuts, ramps, landings, and handrails. The maintenance of historic elements and more recent accessible features that are integrated into the historic materials is essential for not only preserving their appearance and material integrity, but also for helping keep the site safe and accessible for visitors and staff.



Stair railings available by catalog, 1883. Image courtesy of E.T. Barnum Wire and Iron Works and Association for Preservation Technology Building Technology Heritage Library.

Assessing Conditions

Hardscape, stairs, and ramps should be assessed every year, during which time small cracks, settlement, subsidence, and heaving can be identified and remedied before they worsen. Casual walk-throughs of the site may identify problems that require immediate attention, such as broken steps and handrails, or areas that have become tripping hazards. Assessing hardscape, stairs, and ramps involves checking these elements to make sure they are intact and in good repair. Especially vulnerable parts of these elements are construction and expansion joints in hardscape, which can open to form large gaps or allow plants to grow, stair treads that can shift or become chipped at the nosing, and handrails that can loosen or become corroded and eventually break. Generally, no special equipment is needed to assess these elements, but a level with a digital slope indicator can be helpful to track areas that appear to be shifting out of plumb. Things to check during the assessment include:

HARDSCAPE CONDITION

- paving should be generally smooth, without cracks, spalls, shifted sections, or missing pieces
- paving on either side of construction and expansion joints should be level, and joints should be free of vegetation and debris
- joint sealer and backing material, if used, should be intact and not cracked or pulled away from adjacent materials
- surfaces should be free of standing water

STAIR CONDITION

- treads should be level
- treads and risers should be free of cracks and spalls



Corroded post that caused crack in the step

- mechanically attached treads should have all screws and bolts in place and tight

RAMP CONDITION

- like hardscape, ramps should be smooth and without cracks, spalls, shifted sections, or missing pieces
- ramp sections on either side of joints should be level and joints free of vegetation and debris
- ramp transitions should be smooth
- ramps and landings should be kept free of obstructions such as planters and trash cans to allow full access of the surface and handrails

HANDRAIL CONDITION

- handrails should be tightly joined and well-attached
- attachment points at paving and walls should be free of standing water and debris
- paint should be intact and free of flaking, blistering, or “alligatoring,” where the paint cracks and splits from the substrate; note that failed paint does not always mean the substrate beneath has deteriorated and should be checked separately
- wood elements should not be split, spongy, or soft; this can be checked with a sharp awl or icepick; be sure to check the underside of the bottom rail
- metal elements should be free of rust, cracks, and splits, and all pieces should be intact

Maintenance

Historic hardscape, stairs, and ramps are important to maintain for a safe and accessible site that is properly preserved. Regular maintenance can help these elements

perform for many years without significant repairs. Regular maintenance of hardscape, stairs, and ramps includes:

- tighten bolts and screws of any mechanically attached elements
- repair or replace components that are deteriorated or missing with in-kind materials of the same size, shape, color, surface characteristics, and pattern; reuse paving materials such as flagstones or bricks that have shifted but are otherwise in good condition when making repairs
- replace deteriorated sealants and backing materials
- regularly remove vegetation growing in cracks and joints
- monitor tree roots adjacent to paving to prevent heaving
- monitor site drainage to help prevent settlement, pooling of water, and shifting paving
- patch spalls and seal cracks with suitable repair material compatible with the substrate
- when undertaking patching or repairs, maintain historic control joint grid patterns
- regularly repaint wood and metal elements, taking care to remove old paint build-up; when painting, protect adjacent walls and paving from overpaint or splashes, and never paint these elements; paint type should match the existing paint in color, type (i.e., oil, acrylic, etc.), and sheen; refer to completion reports for the correct paint type and keep paint can lids and swatches for matching in the future



Paint deterioration at wood handrail

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of historic hardscape, stairs, and ramps. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

National Park Service, *Preservation Brief #15: Preservation of Historic Concrete*:

<https://www.nps.gov/tps/how-to-preserve/briefs/15-concrete.htm>

National Park Service, *Preservation Brief #32: Making Properties Accessible*:

<https://www.nps.gov/tps/how-to-preserve/briefs/32-accessibility.htm>

National Park Service, *Preservation Brief #10: Exterior Paint Problems on Historic Woodwork*:

<https://www.nps.gov/tps/how-to-preserve/briefs/10-paint-problems.htm>

Experienced Sitework Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:



Paving settlement causing a tripping hazard

CALL AN EXPERT

- When hardscape is significantly cracked, shifted, or heaved, requiring resetting or new sections
- If hardscape is altered in any way, which could impact accessibility compliance and cause liability risks
- When staff is inexperienced with hardscape, stair, ramp, or handrail repair
- When paint removal requires disturbing hazardous materials such as lead paint, which could introduce liability and safety risks
- Possible experts may include: a paving contractor, mason, or historic metals specialist, who can help with repairs that staff cannot undertake themselves; a preservation architect when problems indicate a more serious issue; an arborist for tree roots that heave paving; or the THC when changes to the hardscape, stairs, or ramps are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When replacing pavement, stairs, ramps, or handrails is proposed for State Antiquities Landmarks a THC permit is required
- For any work or alteration that is not cyclical maintenance, including adding features to make a site accessible

THIS PAGE INTENTIONALLY LEFT BLANK

1 HARDSCAPE, STAIRS, AND RAMPS

Hardscape, Stairs, and Ramps Checklist

This checklist is used to assess hardscape, stairs, and ramps. Use a new checklist for each annual inspection, and retain it for future reference. (If completing by hand, make a copy of the front and back of this form prior to using it and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are damaged or deteriorated. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. Site plans and building floor plans are helpful to identify specific locations and possible sources of deterioration.

| | |
|--|--|
| INSPECTION DATE: | REFERENCE PHOTOS OF HARDSCAPE, STAIRS, AND RAMPS: |
| INSPECTOR: | |
| WEATHER CONDITIONS: | |
| HARDSCAPE CONDITION: | |
| Paving is smooth and free of cracks, spalls, and shifted or missing sections | |
| Paving sections are level with one another at joints | |
| Joints are free of vegetation and debris | INSERT PHOTO INSERT PHOTO |
| Joint sealers are intact and secure to adjacent material | |
| Surfaces are free of standing water | |
| STAIR CONDITION: | HANDRAIL CONDITION: |
| Treads are level | Handrails are tightly joined and well attached |
| Treads are free of cracks and spalls | Attachment points are free of standing water and debris |
| Treads are securely attached | Paint is intact and without blisters, flaking, or cracks |
| RAMP CONDITION: | Wood elements have no checks, splits, soft spots, or missing parts |
| Ramps are smooth and free of cracks, spalls, and shifted sections | Metal elements are free from rust, cracks and splits and all pieces are intact |
| Ramp sections are level with one another at joints | |
| Joints are free of vegetation and debris | |
| Path of ramp and landings are free of obstructions | |

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

MAINTENANCE OR REPAIRS COMPLETED BY:

2 LANDSCAPE AND IRRIGATION

MAINTENANCE INTERVAL: EVERY YEAR

Why Maintain?

The landscapes of historic Texas courthouses may be quite simple and seemingly unplanned, or have more elaborate designs, but are often character-defining features of the site, helping to create a sense of place at often the most prominent location in the county. Not only do landscapes need to be maintained in and of themselves, often the proper care of landscapes can be important for the health of the courthouse building and materials. Vegetation that grows near a building can hide deterioration and trap moisture at wall surfaces by blocking sunlight and reducing air circulation leading to rot, fungi, algae, and mold. It can also promote insect intrusion and block gutters and downspouts. Plants like ivy have roots that can penetrate into joints and create separations between materials, leading to water infiltration and even loss of bricks or stones. Irrigation systems can direct water spray onto building materials, resulting in some of the same conditions. Care should be taken when assessing or maintaining any trees on the site. Trees considered to be heritage trees, or those planted as memorials, should be identified so they are not inappropriately pruned or inadvertently removed.



Shaded damp wall with biological growth and vines growing against building causing deterioration of stucco

Assessing Conditions

Landscape and irrigation systems should be assessed every year. Casual walk-throughs of the site may identify problems that require immediate attention, such as broken or mis-directed sprinkler heads or vines beginning to grow on a building surface. Assessing landscape and irrigation involves checking the site and looking at plantings and trees from roots to leaves, and at the building for signs of effects of vegetation and irrigation maintenance problems. Especially vulnerable parts of the building are foundations, roofs, gutters, and downspouts (see Gutters and Downspouts section). Often a lift or ladder will be needed. Things to check during the assessment include:

LANDSCAPE CONDITION

- shallow tree roots should not grow near or under foundations
- tree limbs should not brush against the walls of the building or overhang the roof or gutters where leaves can drop or seeds can wash into the drainage system
- biological growth like moss, fungi, lichens, or algae should not grow on building surfaces
- vines and climbing plants should not grow on building walls
- weeds, saplings, and invasive species should not be allowed to grow
- shrubs and other plants should be located away from the building surface to encourage air movement and drying of the wall, and to help prevent damage to buildings and site elements from lawn mowers or weed-eaters

- building perimeter should be free of signs of insect or pest intrusion such as damaged wood, insect or pest nests or droppings, ant mounds, and termite tunnels

IRRIGATION SYSTEM CONDITION

- sprinkler heads should be intact and in good repair
- sprinkler heads should be directed onto plantings and water should not spray onto building materials
- there should be no evidence of ponding, which could indicate broken sprinkler lines or system components
- all irrigation zones should function properly
- controllers should be in good repair
- consider timers and rain sensors to avoid over-saturating the site or building materials during rain events



Tree growing into stone site wall causing displacement

Maintenance

Landscape and irrigation system maintenance consists of activities that require various levels of intervention. The entire landscape and irrigation system should be assessed every year, but some items will require inspection as needed during the growing season. Some of these maintenance interventions will be undertaken by groundskeepers, and others may require arborists or other professionals with special equipment. Heritage trees or memorial trees should be cared for by professional arborists or staff trained in proper mature tree maintenance. Regular maintenance of landscaping and irrigation includes:

- always use protective guards on weed-eaters and mowing equipment to avoid contact with building and site elements

- trim branches away from walls, roof, gutters, and downspouts; take great care to identify heritage or memorial trees so that they are treated appropriately; avoid “topping” trees
- clean biological growth from building surfaces using cleaners appropriate for the substrate (refer to the section of this manual on the applicable material for the building)
- remove vines or climbing plants from walls and near foundations and pull out roots
- remove weeds, saplings, and invasive species and pull out roots
- prune shrubs and plants away from walls
- treat for any pests or insects
- test all zones and check for broken or misdirected sprinkler heads
- repair broken sprinkler heads and irrigation system elements
- adjust sprinkler heads to face away from walls

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of landscape and irrigation systems. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.



Shrubs planted against wall trapping moisture and causing deterioration of stucco and paint coating



Biological growth and grasses growing on steps and stone railing

General Services Administration, *Selected Reading on Landscape*:

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88431

National Park Service, *Preservation Brief #36: Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes*:

<https://www.nps.gov/tps/how-to-preserve/briefs/36-cultural-landscapes.htm>

Texas Forest Service:

<http://texasforestservation.tamu.edu>

Experienced Landscape/Irrigation Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

CALL AN EXPERT

- When tree roots are growing under a foundation
- When staff is inexperienced with proper tree pruning techniques or lack equipment
- When staff is inexperienced with irrigation system repairs
- When the building has become damaged from vines, biological growth, or water from irrigation system
- Possible experts may include: an arborist or irrigation contractor, who can help with repairs that staff cannot undertake themselves; a preservation architect or landscape architect when problems indicate a more serious issue; or the THC when changes to the landscape are proposed or require excavation

CALL THE TEXAS HISTORICAL COMMISSION

- When work requiring excavation is proposed for State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance



Inappropriately pruned trees that have been "topped"

THIS PAGE INTENTIONALLY LEFT BLANK

2 LANDSCAPE AND IRRIGATION

Landscape and Irrigation Checklist

This checklist is used to assess landscape and irrigation. Use a new checklist for each annual inspection, and retain it for future reference. (If completing by hand, make a copy of the front and back of this form prior to using it and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. Site plans and building floor plans are helpful to identify specific locations and possible sources of deterioration.

INSPECTION DATE:

INSPECTOR:

WEATHER CONDITIONS:

LANDSCAPE CONDITION:

Foundation is not encroached upon by tree roots

Tree limbs are pruned away from roof, walls, gutters, and downspouts

Building surfaces are free from biological growth

Building surfaces are free from vines and climbing plants

Landscape is free of weeds, saplings, and invasive species

Shrubs are pruned away from building surfaces

Building and site elements are free from damage from mower blades and weed-eaters

Building perimeter is free from signs of insect or pest infestation

IRRIGATION SYSTEM CONDITION:

Sprinkler heads are intact and in good repair

Sprinkler spray is directed away from building

Site is free from ponding

Irrigation zones are functioning properly

Irrigation system controllers are in good repair

Timers and rain sensors function properly

REFERENCE PHOTOS OF LANDSCAPE AND IRRIGATION:

INSERT PHOTO

INSERT PHOTO

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

MAINTENANCE OR REPAIRS COMPLETED BY:

Why Maintain?

Prevention of flooding and water seepage into buildings is dependent upon maintaining proper site drainage. Pooling water around the building can penetrate through even the smallest of cracks in the foundation. Water pooling can be caused by improper landscape placement or lack of landscape and irrigation maintenance, soil build-up around the perimeter, ground sloping toward the building, and improper maintenance of drainage systems, which can include area drains, inlets, sump pumps, etc. Lack of drainage of the site can lead to deterioration of building materials and building contents, or can be a contributor to catastrophic damage in the event of heavy rains and storms if drainage systems fail.

Assessing Conditions

Site drainage should be maintained on a yearly basis. Supplemental inspections of the site, which should occur after heavy rains, may identify repairs that require immediate attention, such as pooling or water infiltration. Assessing site drainage involves checking the site, building perimeter, and drainage system components. The interior should also be inspected for water infiltration in basements and interior at-grade perimeter walls and spaces. The gutters and downspouts also impact site drainage (see the Gutters and Downspouts section for assessing these elements). Especially vulnerable parts of the building are basement walls and wall-floor intersections and joints where building components or different building materials come together at or below grade. Special access equipment is not generally necessary for drainage inspections, but site and building plans can be used to identify the locations of any problems and help to identify possible sources of water infiltration. Things to check during the assessment include:

SITE CONDITION

- site grade should be sloped away from perimeter walls and foundations
- building perimeter and foundations should be free of ponding water

DRAINAGE SYSTEM CONDITION

- area drains, inlets, and outlets should be free of debris and soil build-up that could cause backups in the drainage system
- downspouts should be directed away from the building, and downspout extensions and splash



Site sloping toward the building causing water infiltration and biological growth

blocks should be positioned properly (also see Gutters and Downspouts section)

- French drains, if used, should be in good working order and free of backups and clogs
- sump pumps should be in good working order (also see Plumbing section)
- floor drains should be accessible and free of debris and clogs (also see Plumbing section)

BUILDING AND CONTENTS CONDITION

- building joints and locations where different building materials come together are appropriately sealed and sealant is free of cracks, voids, and missing areas
- basement and first-floor walls and floors are free of leaks, standing water, dampness, water stains, and water damage such as peeling paint and wallpaper



Stone deterioration caused by ponding water at paved surface

- pipe penetrations and other openings through basement walls and floors or at grade-level perimeter walls are sealed
- basement and first-floor walls and floors are free of efflorescence
- basement and first floor are free of musty smells
- basement and first floor are free of rotted wood elements
- basement and first floor are free of corroded metal elements
- materials stored in basement and first-floor spaces, such as boxes and papers, are dry and free of mildew

Maintenance

Site and drainage system maintenance are vital to prevent flooding and water seepage. Regular maintenance of site drainage includes:

- clear soil and debris away from foundation and vents, taking care to maintain positive slope
- clear inlets and outlets in site drainage system
- flush French drain and clean clean-outs; check catch basins and clean out debris
- conduct routine maintenance of sump pump, making sure it is in working order (also see Plumbing section)
- clear floor drains of debris and clogs, and flush with water to maintain seal (also see Plumbing section)
- if damp conditions are found, immediately notify county staff so that any important documents or records can be relocated
- remove failed sealant and re-caulk at building joints with caulk appropriate for each material and condition

- seal penetrations through the building foundation, basement floor, and at-grade perimeter walls
- consider installing humidity monitoring sensors in basement and first-floor spaces, and regularly track readings

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of site drainage. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

National Park Service, *Preservation Brief #39: Holding the Line: Controlling Unwanted Moisture in Historic Buildings:*

<https://www.nps.gov/tps/how-to-preserve/briefs/39-control-unwanted-moisture.htm>

National Park Service, *Preservation Brief #47: Maintaining the Exterior of Small and Medium Size Historic Buildings:*

<https://www.nps.gov/tps/how-to-preserve/briefs/47-maintaining-exteriors.htm#foundation>

Experienced Drainage System Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:



Efflorescence and water seepage at weeps of site wall

CALL AN EXPERT

- When extensive site work is required
- When staff is inexperienced with drainage system repair or grading
- When flooding and leaks occur
- When building contents or materials have become damaged
- When failure of waterproofing systems is suspected, or cracks are present in the foundation or walls
- When sources of water or moisture cannot be identified
- Possible experts may include: a plumbing engineer, civil engineer, or preservation contractor, who can help with repairs that staff cannot undertake themselves; a preservation architect when problems indicate a more serious issue; or the THC when changes to the building or site are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When site work or regrading is proposed for State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance, including proposed applications of masonry sealers or water-repellent coatings
- If flooding or leaks occur, damaging historic interior spaces and building materials

THIS PAGE INTENTIONALLY LEFT BLANK

Drainage Checklist

This checklist is used to assess site drainage. Use a new checklist at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. Site plans and building floor plans are helpful to identify specific locations and possible sources of deterioration.

INSPECTION DATE:

INSPECTOR:

WEATHER CONDITIONS:

SITE CONDITIONS:

Grade slopes away from perimeter walls and foundation

Building perimeter and foundation are free of standing water

DRAINAGE SYSTEM CONDITIONS:

Area drains, inlets, and outlets are clear

Water from downspouts is directed away from building

Sump pumps are functioning properly

Floor drains are clear

BUILDING AND CONTENTS CONDITION:

Building sealant is free of cracks and is intact

Walls and floors are free from signs of water infiltration

Penetrations through walls and floors are sealed

Walls are free of efflorescence

Interior spaces are free of musty smells

Wood elements are free of moisture damage

Metal elements are free of corrosion

Papers and boxes are dry and free of mildew

REFERENCE PHOTOS OF DRAINAGE ELEMENTS:

INSERT PHOTO

INSERT PHOTO

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

MAINTENANCE OR REPAIRS COMPLETED BY:

4 MONUMENTS, STATUARY, AND OTHER SITE ELEMENTS

MAINTENANCE INTERVAL: EVERY YEAR

Why Maintain?

Art, such as sculptures, statues, and associated plaques; monuments or memorials to historic figures and events; and site elements such as historic fences, light posts, and benches are present at many historic Texas courthouses. The materials that these elements are made from can vary widely, but typically consist of stone, concrete, wood, and metal. If they are historic, they are almost always a character-defining feature of the site. Monuments will almost always have great significance to the community. If located outdoors, they are especially vulnerable to weathering, wear, and vandalism. While some conditions may require the expertise of specialists, regular maintenance and inspection can help keep them in good condition. Perimeter walls and fences should be addressed with the exterior of the building. If site walls are brick or stone, refer to the applicable section of this handbook for assessment and maintenance recommendations.



Historic sculpture of cast concrete; note soiling and deterioration of raised lettering

Assessing Conditions

Monuments, statuary, and site elements should be assessed every year. Casual walk-throughs of the site or building may identify repairs that require immediate attention, such as graffiti, other vandalism, or damaged elements. Assessing these elements involves a visual inspection of each item to make sure it is in good repair. Each item should be assessed individually and will involve close inspection. Inspections may also involve the use of a lift or ladder. Note that for fine art and some monuments, an expert should be involved with assessments and maintenance. It is important for facilities directors and staff to know which monuments require specialists and which can be safely tended to by in-house staff. Things to check during the assessment include:

MONUMENT AND STATUARY CONDITION

- monuments and statuary should be securely attached at all connection points and to their bases
- monuments and statuary should not lean or have other evidence of structural damage
- water should not collect on bases and horizontal surfaces
- armature or internal supports should not be exposed
- all parts should be intact and present
- monuments and statuary should be free from cracks, splits, breaks, or holes
- monuments and statuary should be free of dirt and bird droppings
- metal should be free of corrosion, which could be in the form of green, white, or black staining



Sculpture and historical marker, San Augustine County Courthouse

- external concrete and stone elements such as benches should be free of staining and biological growth
- painted elements should be free of flaking and chipped paint
- all pieces of each element should be intact and present
- all elements should be securely attached to their bases or other attachment points, as applicable

Maintenance

Like other parts of the building and site, historic site elements should be part of the regular inspection and maintenance routine. Regular maintenance of monuments, statuary, and other site elements includes:

- many monuments, statuary, and site elements such as stone or concrete benches can be cleaned with plain water from a low-pressure garden hose to remove dirt and bird droppings; never power-wash or use abrasive materials, bristle brushes, or chemical cleaners on monuments or statuary without the advice of a professional conservator or preservation architect
- monuments, statuary, and other site elements should be protected from damage from mowers and weed-

- bases of monuments and statuary should be free of metallic staining, which could indicate corrosion of internal rebar or cramps
- stone and concrete monuments, statuary, and their bases should be free of gouges and losses from lawn mowers and weed-eaters
- stone and concrete monuments and statuary should be free of biological growth such as algae and lichen
- stone and concrete monuments and statuary should be free of efflorescence
- the surface of stone and concrete should be free of powdering, cracks, flaking, and losses
- joints are closed and sealant, if present, should be intact and free of cracks and losses
- monuments and statuary should be free of graffiti and vandalism such as marker, paint, and incised/scratched marks

SITE ELEMENT CONDITION

- external metalwork such as iron gates and fences should be free of corrosion; note that attachment points are especially vulnerable to corrosion
- external wood elements such as fences should be free of rot, splits, soft wood, biological growth, and insect damage



Monument exhibiting deterioration of stone inscription and biological growth at base

eaters by always using the safety guards and settings that keep blades and whips from extending past the guards; if needed, metal edging may be installed to protect site elements from damage

- remove graffiti immediately with removal products specifically designed for each substrate and according to the manufacturer's instructions in order to deter other vandalism and to help prevent curing and absorption of graffiti deeply within the underlying material, making it more difficult to remove
- discourage people from creating "rubblings" or castings of incised monuments, as this could damage the surface of the material
- maintain paint coatings of external metalwork to help prevent corrosion; prior to priming and painting with an appropriate paint coating system, the metal should be scraped of flaking paint and treated for any corrosion; paint type should match the existing paint in color, type (i.e., oil, acrylic, direct to metal, etc.), and sheen; refer to completion reports for the correct paint type and keep paint can lids and swatches for matching in the future
- maintain paint coatings of external wood elements, scraping loose paint from the surface and prepping and painting with appropriate paint coating system
- repair minor wood deterioration with wood fillers or dutchmen repairs using in-kind wood material
- treat for insect damage using products that will not harm adjacent historic materials
- tighten any loose connections at site elements



Biological growth on a cast stone bench

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of historic monuments, statuary, and site elements. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

National Park Service, *Preservation Brief #38: Removing Graffiti from Historic Masonry*:

<https://www.nps.gov/tps/how-to-preserve/briefs/38-remove-graffiti.htm>

National Park Service, *Preservation Brief #48: Preserving Grave Markers in Historic Cemeteries* (also applicable to historic monuments and some types of statuary):

<https://www.nps.gov/tps/how-to-preserve/briefs/48-preserving-grave-markers.htm>

National Park Service, *Preservation Brief #10: Exterior Paint Problems on Historic Woodwork*:

<https://www.nps.gov/tps/how-to-preserve/briefs/10-paint-problems.htm>

Experienced Conservator familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

CALL AN EXPERT

- When monuments or statuary require work beyond simple water rinsing
- When staff is inexperienced with maintenance of monuments, statuary, or site elements
- When staff is inexperienced with graffiti removal, which could cause irreparable harm if performed incorrectly or with the incorrect product
- When paint removal requires disturbing lead paint
- When metal repairs require replication or reattachment of elements
- Possible experts may include: an art conservator, blacksmith, carpenter, or stone mason, who can help with repairs that staff cannot undertake themselves; a preservation architect when problems indicate a more serious issue; or the THC when changes are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When installation or removal of monuments, statuary, or site elements is proposed for State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance

4 MONUMENTS, STATUARY, AND OTHER SITE ELEMENTS

Monuments, Statuary, and Other Site Elements Checklist

This checklist is used to assess monuments, statuary, and other site elements. It should be duplicated and retained for future reference. Use a new checklist at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. Site plans can be helpful to identify the location of these features, and may be helpful when determining causes of deterioration. See your architectural plans for this information.

INSPECTION DATE:

REFERENCE PHOTOS OF ELEMENT:

INSPECTOR:

WEATHER CONDITIONS:

MONUMENT AND STATUARY CONDITION:

All pieces are securely attached to one another and to the base

Monument is structurally sound and not leaning

Horizontal surfaces are free of standing water

Internal supports and armature are not visible

All pieces are present and intact

Material is free of cracks, splits, breaks, and holes

Material is clean and free of bird droppings

Metal and bases are free of corrosion stains

Stone and concrete are free of gouges and losses from landscaping equipment

Stone and concrete is free of biological growth

Stone and concrete is free of efflorescence

Stone and concrete surfaces are free of powdering, cracks, flaking, and losses

Joints are closed and sealant is intact

No graffiti or other types of vandalism are present

INSERT PHOTO

INSERT PHOTO

SITE ELEMENTS:

Metalwork is free of corrosion

Wood is free of rot, splits, soft spots, biological growth, and insect damage

Stone and concrete elements are free of staining and biological growth

Painted surfaces are intact

All elements are present and intact

Connections are tight

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

MAINTENANCE OR REPAIRS COMPLETED BY:

Why Maintain?

Slate roofing is one of the most prominent features of some historic Texas courthouses, lending color, pattern, and a sense of craftsmanship to the building envelope. This roofing type is almost always a character-defining feature of the building and contributes not only to its appearance, but also to its weather tightness and preservation of the structure and interior. Slate is a naturally long-lasting material, often performing for over 100 years, but maintenance is critical to its longevity. Maintenance of slate roofs is generally simple and straightforward. Timely and regular maintenance, along with periodic assessments and replacement of damaged slates, can result in an attractive, well-performing roof that will last for decades.

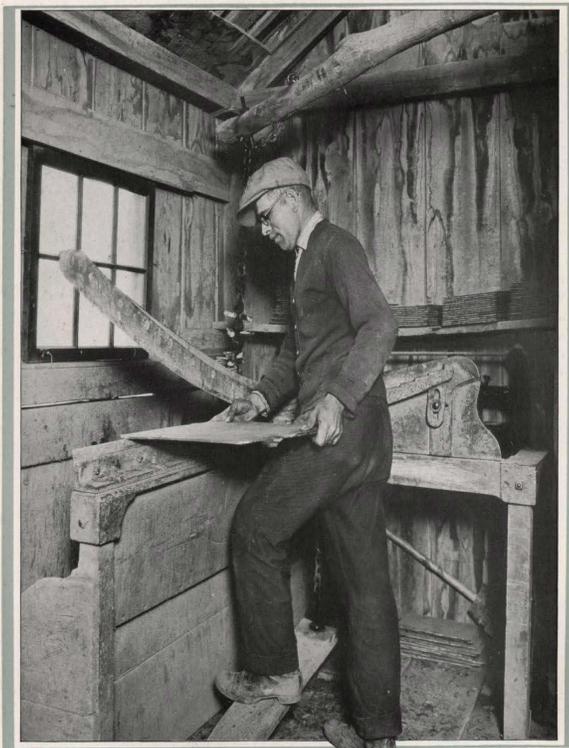
Assessing Conditions

Slate roofs should be assessed every five years, at which time repair of some slates is typically required. Supplemental inspections of the roof, particularly after storms or strong winds, may identify repairs that require immediate attention, such as broken slates or water infiltration. Supplemental inspections should also be conducted if leaks are reported. Supplemental inspections can be done from the ground with binoculars or from upper-story windows.

Assessing slate roofs involves checking the slates for cracks, breakage, surface deterioration, discoloration from leaching gypsum, or other mineral impurities within the slate that can cause delamination or breakage, and displacement, as well as for missing slates. It also involves checking drainage elements such as gutters and downspouts (see Gutters and Downspouts section), as well as flashing. In fact, flashing and connection failures are often the source of leaks as opposed to the slates themselves. Often a lift or special ladders designed to distribute the weight of workers and materials to prevent damage to slate roofs will be needed for assessments. Walking on slate should always be avoided to prevent damage to the slates, but also because slate roofs are typically steep and can be hazardous. The roof sheathing or decking, as well as roof structure should be inspected for leaks from the interior, which requires access to attics and upper-floor spaces where these elements are exposed. Things to check during the assessment include:

SLATE AND FASTENER CONDITION

- slates should be in position and not shifted



HAND DRESSING SLATE WITH GIANT SCISSORS

The final process in making roofing slate is hand dressing it to the proper sizes. The slate dresser's aid is a pair of giant scissors worked by foot power, leaving his hands free to guide the slabs of slate. The result is a rugged edge with that touch of irregularity which is the age-old charm of the hand-made product and the despair of machine reproduction.

Page Ten

Worker dressing slate shingles by hand, ca. 1930. Image courtesy of Pennsylvania Slate Institute and Association for Preservation Technology Building Technology Heritage Library.



Conical roof with slate shingles; note slates with missing corners

- slates should be fastened such that they hang from fasteners and are not restricted from expanding due to overly tight fasteners
- slates should not be brittle or cracked
- while some delamination is natural, slates should not be excessively thinned, spongy, crumbly, or soft
- slates naturally have variety in their color, but should not be excessively discolored or appear to have whitish haze or crust over most of the surface of the slate
- fasteners should be intact and free of corrosion
- no more than 25 percent of slates should be missing or damaged

FLASHING CONDITION

- flashings at ridges, valleys, and hips should be free of holes
- flashing should be free of open seams
- flashing should be tightly attached and aligned
- painted flashing should have no flaking, blistering, or peeling paint
- flashing should be free of corrosion
- counter-flashing should be intact

SHEATHING CONDITION

- sheathing and the roof structure should not show evidence of leaks such as rot, softness, water marks, or rust from nails, if wood sheathing is used or corrosion if steel structure is present

Maintenance

Replacing an entire slate roof is usually not necessary, and most of the time only selective portions should be replaced, along with any deteriorated decking and flashing. Only when more than 25 percent of slates are damaged should replacement of all of the slates be considered, and when roof replacement is necessary, slates in good repair should be salvaged for reuse. Replacement slates should always match the existing material in size, thickness, surface texture, color, and method of attachment. Only roofers experienced with slate roofs should undertake replacement of slates. Regular maintenance of slate roofs includes:

- keep trees near the roof pruned to minimize damage from fallen branches and debris
- if leaks are reported, it is important to determine the source of the leaks as it may not be the slates but rather gutters, valleys, and flashings that generally do not have as long of a life span as the slates
- if replacing sections of valleys and flashings, the metals must be similar to avoid galvanic corrosion that can deteriorate the weaker of the metals or even the fasteners attaching the slates



Slate roof at the Dallas County Courthouse, (Old Red)

- if replacement of slates is required due to leaks or missing and deteriorated slates, provide temporary protection of the roof sheathing until repairs are complete
- if undertaking repairs, care should be taken to distribute weight evenly and to avoid walking on the slates when protection is placed
- if undertaking repairs, use long-lasting replacement materials that match the existing in lieu of temporary repairs like roof mastic or roofing cement, which are not as durable and may cause deterioration of flashing materials
- if replacement of slates is required, match the existing material in size, thickness, surface texture, color, and method of attachment



Installation of roofing slates, Rains County Courthouse

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of historic slate roofs. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

National Park Service, *Preservation Brief #4: Roofing for Historic Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/4-roofing.htm>

National Park Service, *Preservation Brief #29: The Repair, Replacement, and Maintenance of Historic Slate Roofs*:

<https://www.nps.gov/tps/how-to-preserve/briefs/29-slate-roofs.htm>

National Park Service, *Preservation Brief #39: Holding the Line: Controlling Unwanted Moisture in Historic Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/39-control-unwanted-moisture.htm>

National Park Service, *Technical Preservation Services: From Asbestos to Zinc, Roofing for Historic Buildings*:

<https://www.nps.gov/tps/education/roofingexhibit/introduction.htm>

Experienced Slate Roof Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

CALL AN EXPERT

- When repair or replacement of slates or sheathing is required
- When staff is inexperienced with slate roofing repair
- When repair of other roof elements requires disturbing slates
- Possible experts may include: a slate roofing contractor, who can help with repairs that staff cannot undertake themselves; a preservation architect or structural engineer when problems indicate a more serious issue; or the THC when changes to the roof or roof replacements are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When replacing slate roofing is proposed for State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance

Slate Roofing Checklist

This checklist is used to individually assess the slate roof. It should be duplicated and completed for each inspection and retained for future reference. Use a new checklist at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. Roof plans of the building can be used to identify where problems are located. See your architectural plans for this information.

INSPECTION DATE:

REFERENCE PHOTOS OF SLATE:

INSPECTOR:

WEATHER CONDITIONS:

SLATE AND FASTENER CONDITION:

- Slate is in position and has not shifted
- Slate hangs from fasteners and is not restricted from expanding
- Slate is not brittle or cracked
- Slate is not excessively thinned, spongy, crumbly, or soft
- Slate is not excessively discolored nor does it have a whitish haze or crust over most of its surface
- Fasteners are intact and free of corrosion
- Fewer than 25 percent of slate is missing or damaged

INSERT PHOTO INSERT PHOTO

SHEATHING CONDITION:
Sheathing and roof structure are free of water damage or other signs of leaks

FLASHING CONDITION:

- Flashings at ridges, valleys, and hips free of holes
- Free of open seams
- Flashing is tightly attached and aligned
- Painted flashing is free of flaking, blistering, or peeling paint
- Free of corrosion
- Counter-flashing is intact

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

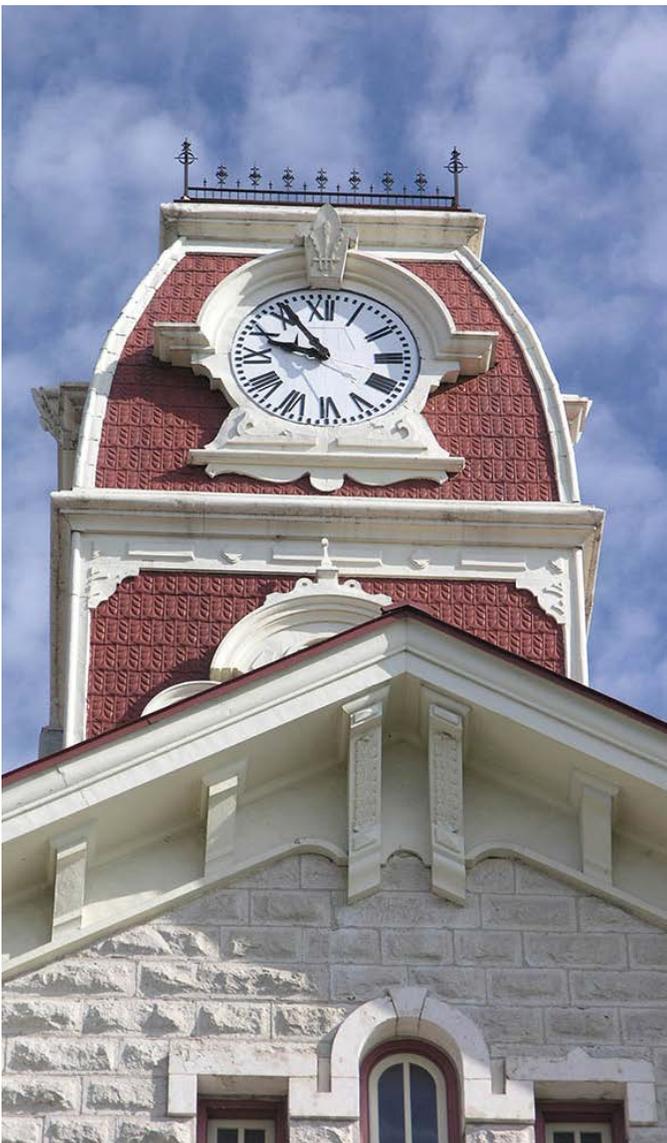
MAINTENANCE OR REPAIRS COMPLETED BY:

6 METAL SHINGLE AND SHEET ROOFING

MAINTENANCE INTERVAL: EVERY 5 YEARS

Why Maintain?

Metal roofing and metal roof components can come in several forms and types—shingles, sheets, copper, terne metal, lead, and more. They can have special patinas, paints, or finishes, and can feature soldered or mechanical attachments. Often, metal roofing is one of the character-defining features of a historic Texas courthouse. The color of patinated copper roofs, the pattern of standing seam metal, or the decorative cornices accenting the building not only provide protection of the building from the elements, but also contribute greatly to its appearance. While metal roofs generally last for many years, their maintenance is critical.



Sheet metal roofing at tower, Parker County Courthouse

Assessing Conditions

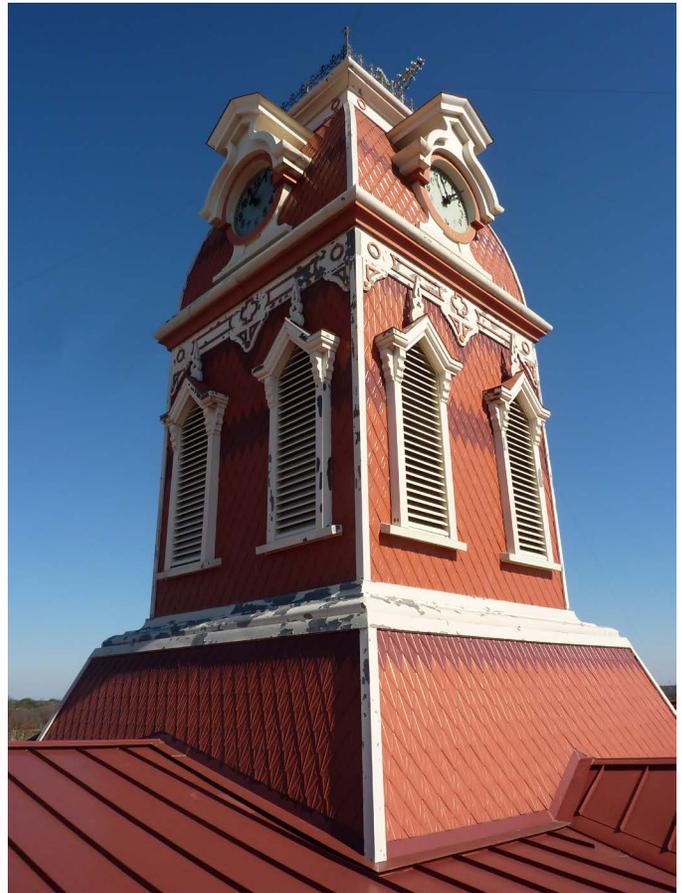
Metal roofs should be assessed every five years, at which time repair of some metal elements is typically required. Supplemental inspections of the roof, particularly after storms or strong winds, may identify repairs that require immediate attention, such as broken tree branches that have landed on the roof or water infiltration. Supplemental inspections should also be conducted if leaks are reported. Supplemental inspections can be done from the ground with binoculars or from upper-story windows and from attics and other spaces where the underside of the decking is exposed.

Assessing metal roofs involves checking the metal for corrosion and loss of patina, displacement, splits, dents and other storm damage, and open seams. It also involves checking drainage elements such as gutters and downspouts, as well as flashing and roof sheathing (see Gutters and Downspouts section). In fact, flashing and connection failures are often the source of leaks as opposed to the metal sheeting. Often a lift or ladder will be needed for assessments if the roof is not accessible or is too steep to safely walk on. If the roof is safe to walk on, wear rubber-soled shoes to avoid damaging the surface. The roof sheathing or decking, as well as roof structure should be inspected for leaks from the interior, which requires access to attics and upper-floor spaces where these elements are exposed. Things to check during the assessment include:

METAL AND FASTENER CONDITION

- shingles should be in position and not shifted

- shingles should be fastened so that they hang from fasteners and are not restricted from expanding due to overly tight fasteners
- shingle fasteners should be intact and free of corrosion
- metal should be free of rust or corrosion
- patina or paint should be intact
- metal should not show evidence of creep
- metal should not be lifted or detached from the sheathing or have other evidence of wind damage
- metal should be free of splits, tears, pinholes, and cracks
- metal should not be patched with tar or roofing cement
- there should be no condensation beneath metal
- metal seams and joints should be intact
- the metal surface should not be bouncy
- the surface of the roof should be free of standing water
- the slope of the surface should fall correctly so that water drains toward rainwater outlets



Metal shingles and standing seam roofing at Lampasas County Courthouse; note flaking paint

FLASHING CONDITION

- flashings at ridges, valleys, and hips should be free of holes, cracks, buckles, and splits
- metal should not be crumbled and powdering
- flashing should be free of open seams and cracked sealant
- flashing should be tightly attached and aligned
- painted flashing should have no flaking, blistering, or peeling paint
- flashing should be free of corrosion and pitting
- counter-flashing should be intact
- flashing should be free of roofing cement and tar

SHEATHING CONDITION

- sheathing and the roof structure should not show evidence of leaks such as rot, softness, water marks, or rust from nails if wood sheathing is used or corrosion if steel structure is present



Parapet with corroded and bent parapet cap and flaking paint on metal shingles

Maintenance

Metal roofs are susceptible to corrosion and metal fatigue. Corrosion can be due to standing water, bird droppings, atmospheric pollutants and soiling, and galvanic corrosion of dissimilar metals. Thermal expansion and seasonal temperature cycling can lead to metal fatigue. Even small holes or open joints can cause extensive deterioration, and should be repaired immediately.

Replacing an entire metal roof is usually not necessary, and most of the time only selective portions require replacement, along with any deteriorated decking and flashing. Often, the metal can be patched with material that matches the existing in metal type, size, thickness, surface texture, color, and method of attachment. Patching with tar can cause corrosion of the metal and should be avoided. Only roofers experienced with metal roofs should undertake repairs. Repairs should always be made with materials that match or are compatible with the existing metal and fasteners, as mixing incompatible materials can result in corrosion through galvanic corrosion from dissimilar metals or from materials like roofing tar. Regular maintenance of metal roofs includes:

- rinse metal surface with plain water under low pressure to remove dirt, biological growth, and bird droppings that can corrode the metal surface; do not use a pressure washer or any abrasive or corrosive cleaners
- painted metal should be repainted generally every 5-10 years; any rust should be removed and the metal treated with corrosion inhibitor prior to repainting; paint type should match the existing paint in color, type (i.e., acrylic, direct to metal, epoxy, etc.), and sheen; refer to completion reports for the correct paint type and keep paint can lids and swatches for matching in the future
- patch deteriorated metal with matching material, using techniques specific to the roofing type and material
- re-solder or re-caulk open joints, as appropriate
- secure loose cleats and fasteners
- replace fasteners with compatible metal
- keep trees near the roof pruned to minimize damage from fallen branches and debris
- if leaks are reported, it is important to determine the source of the leaks as it may not be the metal shingles or sheeting but rather gutters, valleys, and flashings
- if replacing sections of gutters, valleys, and flashings, the metals must be similar to avoid galvanic corrosion that can deteriorate the weaker of the metals or even the fasteners attaching the shingles
- if replacement of metal roofing is required, provide temporary protection of the roof sheathing until repairs are complete
- if undertaking repairs, use long-lasting replacement materials that match the existing in lieu of temporary repairs like roof mastic or roofing cement, which are not as durable and may cause deterioration of both roof and flashing



Sealing flashing after installation of new metal shingles on dome, Rains County Courthouse

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of historic slate roofs. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

General Services Administration, *Repairing a Metal Shingle Roof*:

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88051

General Services Administration, *Minor Repairs to Lead Roofing and Accessories*:

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88212

General Services Administration, *Making Repairs to Sheetmetal Flashing*:

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88168

General Services Administration, *Repairing Small Holes in Roof Flashing*:

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88161

National Park Service, *Preservation Brief #4: Roofing for Historic Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/4-roofing.htm>

National Park Service, *Preservation Brief #39: Holding the Line: Controlling Unwanted Moisture in Historic Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/39-control-unwanted-moisture.htm>

National Park Service Technical Preservation Services, *From Asbestos to Zinc, Roofing for Historic Buildings*:

<https://www.nps.gov/tps/education/roofingexhibit/introduction.htm>

Experienced Roofing Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

CALL AN EXPERT

- When repair or replacement of metal roofing or sheathing is required
- If metal patinas are worn or have become discolored
- When staff is inexperienced with metal roofing repair
- When repair of other roof elements requires disturbing metal roofing
- Possible experts may include: a metal roofing contractor, who can help with repairs that staff cannot undertake themselves; a preservation architect or structural engineer when problems indicate a more serious issue; or the THC when changes to the roof or roof replacements are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When replacing metal roofing is proposed for State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance

6 METAL SHINGLE AND SHEET ROOFING

Metal Shingle and Sheet Roofing Checklist

This checklist is used to individually assess the metal shingle and sheet roof. It should be duplicated and completed for each inspection and retained for future reference. Use a new checklist at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. Roof plans of the building can be used to identify where any problems are located. See your architectural plans for this information.

INSPECTION DATE:

INSPECTOR:

WEATHER CONDITIONS:

METAL AND FASTENER CONDITION:

- Shingles are in position and not shifted
- Shingles hang from fasteners and are not restricted from expanding
- Shingle fasteners are intact and free of corrosion
- Metal is free of rust or corrosion
- Patina or paint is intact
- Metal does not show evidence of creep
- Metal is not lifted or detached from the sheathing or have other evidence of wind damage
- Metal is free of splits, tears, pinholes, and cracks
- Metal is free of tar or roofing cement patches
- There is no evidence of condensation beneath metal
- Metal seams and joints are intact
- Metal surface is not bouncy
- Roof surface is free of standing water
- Roof slopes toward rainwater outlets

FLASHING CONDITION:

- Flashings at ridges, valleys, and hips are free of holes, cracks, buckles, and splits
- Metal is not deteriorated
- Free of open seams and cracked sealant
- Tightly attached and aligned
- Flashing has no flaking, blistering, or peeling paint
- Free of corrosion and pitting
- Counter-flashing is intact
- Free of roofing cement and tar

SHEATHING CONDITION:

- Sheathing and roof structure are free of water damage or other signs of leaks

REFERENCE PHOTOS OF METAL SHINGLE AND SHEET ROOF:

INSERT PHOTO

INSERT PHOTO

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

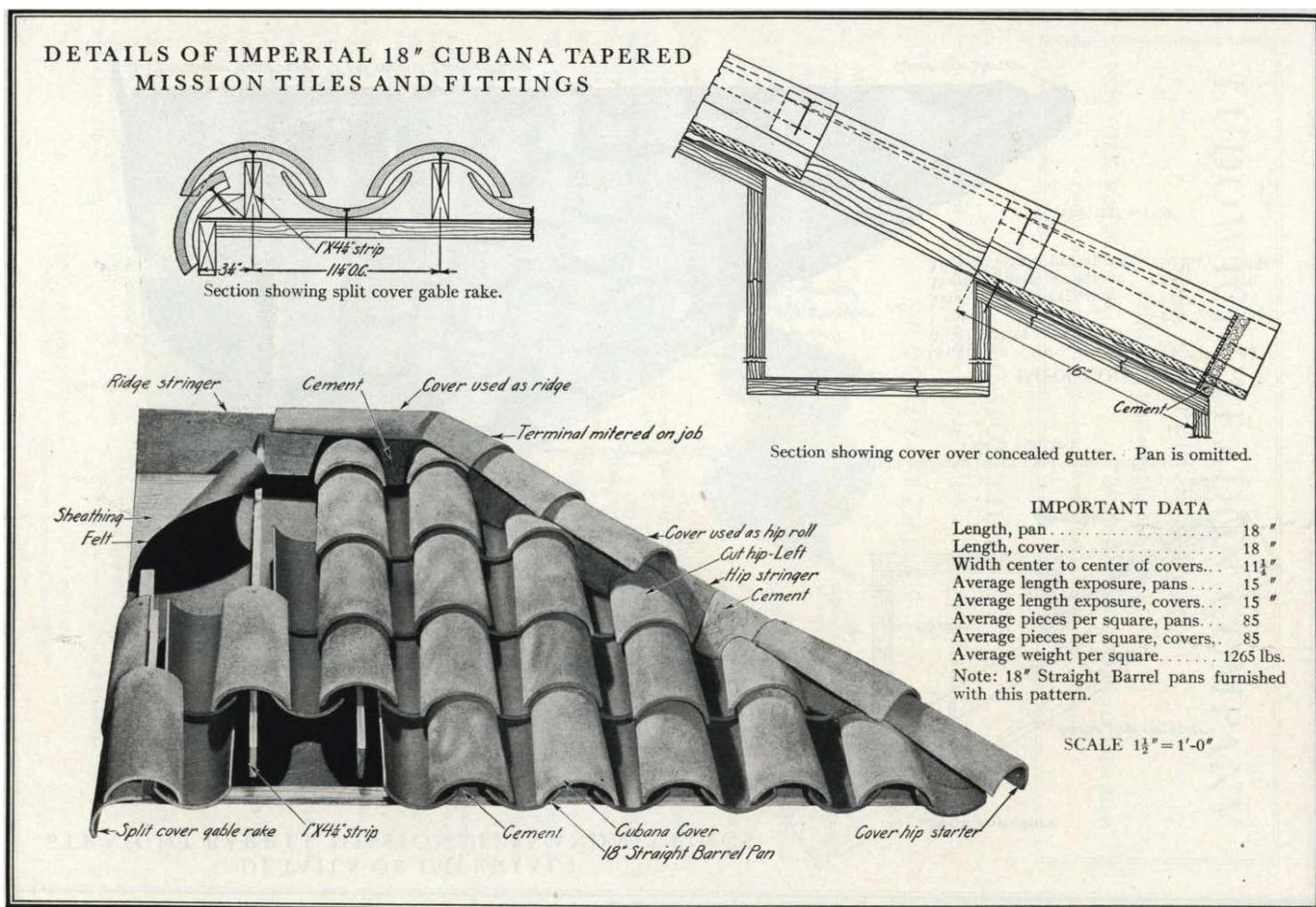
MAINTENANCE OR REPAIRS COMPLETED BY:

7 CLAY TILE ROOFING

MAINTENANCE INTERVAL: EVERY FIVE YEARS

Why Maintain?

Clay tile roofing is one of the character-defining features of many historic Texas courthouses. There are several types of clay tiles, from flat tiles to barrel and “S”-shaped tiles, and numerous color variations that occur due to the clays and glazes used to produce the tiles. The color, pattern, and shape of individual tiles all contribute to their distinctive appearance. While clay tile roofs have been known to last over three centuries, they are fragile and susceptible to damage and deterioration, and must be maintained. Much of the maintenance of these roofs is minimal and related to other site maintenance such as tree trimming and repair of rooftop mounted equipment, during which care must be taken to protect the clay tiles.



Clay tile installation diagram, 1931 Image courtesy of Ludowici-Celadon Company and Association for Preservation Technology Building Technology Heritage Library.

Assessing Conditions

Clay tile roofs should be assessed every five years, at which time repair of some tiles is typically required. Supplemental

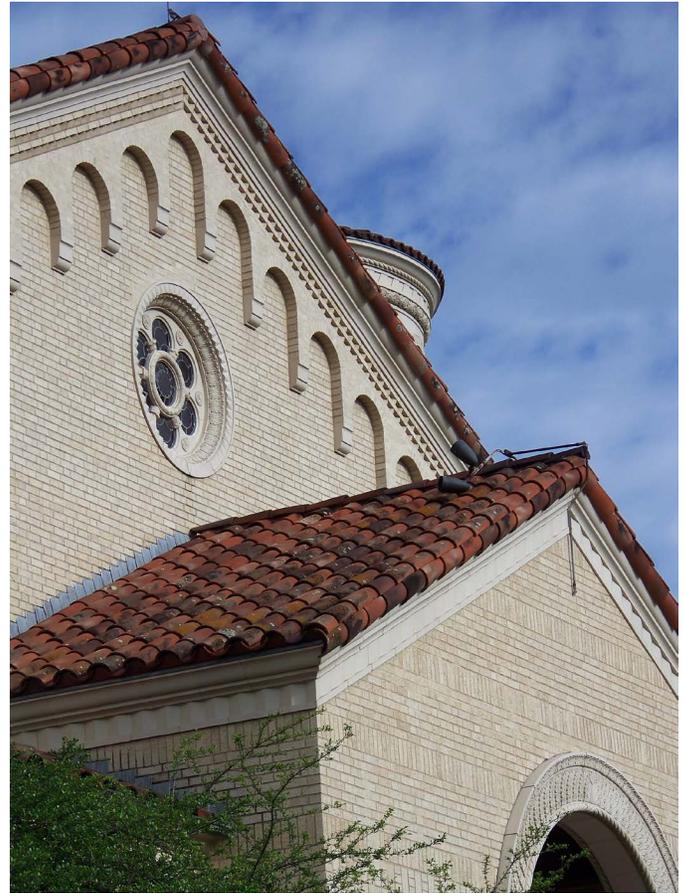
inspections of the roof, particularly after storms or strong winds, may identify problems that require immediate attention, such as broken tiles or water infiltration. Supplemental inspections should also be conducted if leaks

are reported. Supplemental inspections can be done from the ground with binoculars or from upper-story windows and from attics and other spaces where the underside of the decking is exposed.

Assessing clay tile roofs involves checking the tiles for cracks, delamination, breakage, and misalignment, as well as for missing tiles. Mortar beds of ridge and hip tiles and any mortar eave covers should also be examined. Inspection also involves checking drainage elements such as valleys, gutters, and downspouts, as well as flashing for tile pieces and for damage and deterioration of these elements (see Gutters and Downspouts section). In fact, flashing and connection failures are often the source of failures and leaks as opposed to the tiles themselves. Often a lift or special ladders designed for clay tile roofs that protect the tile from cracking by distributing the weight of workers will be needed for inspections. Walking on clay tiles should always be avoided to prevent damage to the tiles, but also because slate roofs are typically steep and can be hazardous. The roof sheathing or decking, as well as roof structure should be inspected for leaks from the interior, which requires access to attics and upper-floor spaces where these elements are exposed. Things to check during the assessment include:

TILE AND FASTENER CONDITION

- tiles should be in position and not shifted
- tiles should be fastened so that they hang from fasteners and are not restricted from expanding due to overly tight fasteners
- tiles should not be excessively brittle or cracked
- all tiles, including field tiles, starter tiles, eave closure tiles, ridge covers, and other special tiles should be in place
- while some delamination is natural, tiles should not be excessively thinned or crumbly, or allow water to penetrate through to the sheathing or stringers
- tiles should be free of coatings or temporary patches
- tiles should be free of biological growth
- roof should be free of dirt and debris including fallen tree limbs and leaves
- fasteners should be intact and free of corrosion
- no more than 30 percent of tiles should be missing or damaged



Clay tile roof with lichen growing on surface

FLASHING CONDITION

- flashing at valleys and hips should be free of holes
- flashing should be free of open seams
- flashing should be tightly attached and aligned
- painted flashing should have no flaking, blistering, or peeling paint
- flashing should be free of corrosion
- counter-flashing should be intact

SHEATHING CONDITION

- any sheathing, exposed battens or stringers (visible if tiles are missing or broken), as well as the underlying roof structure should not show evidence of leaks or moisture damage such as rot, softness, water marks, or rust from nails; if structure is steel, no corrosion should be present
- roofing felt, if used, should be intact and watertight



Intact eave covers or “pigeon caps” deter birds or other animals from nesting beneath tiles

Maintenance

Replacing an entire tile roof is usually not necessary, and most of the time only selective portions replaced, along with any deteriorated decking or stringers, connectors, and flashing. Only when more than 30 percent of tiles are damaged should replacement of all tiles be considered. When roof or fastener replacement is necessary, tiles in good repair should be salvaged for reuse. Replacement tiles should always match the existing material in size, shape, thickness, surface texture, color, and method of attachment. Only roofers experienced with tile roofs should undertake replacement of tiles. Regular maintenance of tile roofs includes:

- keep trees near the roof trimmed to minimize damage from fallen branches and debris
- if leaks are reported, it is important to determine the source of the leaks as it may not be the tiles but rather gutters, valleys, and flashings that generally do not have as long a life as the clay tiles
- if replacing sections of gutters, valleys, and flashings, the metals must be similar to avoid galvanic corrosion that can deteriorate the weaker of the metals or even the fasteners attaching the tiles
- if replacement of tiles is required due to broken, missing or deteriorated tiles, provide temporary protection of the roof sheathing until repairs are complete; care should be taken to distribute weight evenly and to avoid walking on the tiles when the temporary roof protection is placed

- if undertaking repairs, use long-lasting replacement materials that match the existing in lieu of temporary repairs like roof tar, caulk, asphalt, pieces of metal, mastic, or roofing cement, which are not as durable and may cause deterioration of flashing materials or the substrate; sealing tiles is not recommended and can cause deterioration
- if undertaking repairs that require removing sound tiles, salvage them for re-installation

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of historic clay tile roofs. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

General Services Administration Technical Documents, *Replacing Loose, Broken or Missing Clay Roof Tiles*:

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88544

General Services Administration Technical Documents, *Cleaning Blackened Clay Roofing Tiles*:

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88085

National Park Service, *Preservation Brief #4: Roofing for Historic Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/4-roofing.htm>

National Park Service, *Preservation Brief #30: The Preservation and Repair of Historic Clay Tile Roofs*:

<https://www.nps.gov/tps/how-to-preserve/briefs/30-clay-tile-roofs.htm>

National Park Service, *Preservation Brief #39: Holding the Line: Controlling Unwanted Moisture in Historic Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/39-control-unwanted-moisture.htm>

Experienced Clay Tile Roof Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:



Replacing "S" shaped clay tiles at the San Augustine County Courthouse

CALL AN EXPERT

- When repair or replacement of tiles, sheathing, battens, or stringers is required
- When staff is inexperienced with tile roofing repair
- When repair of other roof elements requires disturbing tiles
- Possible experts may include: a tile roofing contractor, who can help with repairs that staff cannot undertake themselves; a preservation architect or structural engineer when problems indicate a more serious problem; or the THC when changes to the roof or roof replacements are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When replacing a clay tile roof is proposed for State Antiquities Landmarks a THC permit is required
- For any work or alteration that is not cyclical maintenance

Clay Tile Roofing Checklist

This checklist is used to individually assess the clay tile roof. It should be duplicated and completed for each inspection and retained for future reference. Use a new checklist at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and "save as" a new document for each inspection.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the "Resources" section. Roof plans of the building can be used to identify where any problems are located. See your architectural plans for this information.

| | |
|--|--|
| INSPECTION DATE: | FLASHING CONDITION (CONTINUED): |
| INSPECTOR: | Free of corrosion |
| WEATHER CONDITIONS: | Counter-flashing is intact |
| TILE AND FASTENER CONDITION: | SHEATHING AND STRINGER CONDITION: |
| <ul style="list-style-type: none"> Tiles are in position and not shifted Tiles hang from fasteners and are not restricted from expanding Tiles are not brittle or cracked Tiles are not excessively thinned, crumbly, or allowing water to penetrate through Tiles are free of coatings or temporary patches Tiles are free of biological growth Roof is free of dirt and debris Fasteners are intact and free of corrosion Fewer than 30 percent of tiles are missing or damaged | <ul style="list-style-type: none"> Sheathing, battens, or stringers (if visible), and the roof structure do not show evidence of leaks or moisture damage |
| | REFERENCE PHOTOS OF CLAY TILE: |
| | <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">INSERT PHOTO</div> <div style="text-align: center;">INSERT PHOTO</div> </div> |
| FLASHING CONDITION: | |
| <ul style="list-style-type: none"> Flashings at valleys and hips are free of holes Free of open seams Painted flashing has no flaking, blistering, or peeling paint | |

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

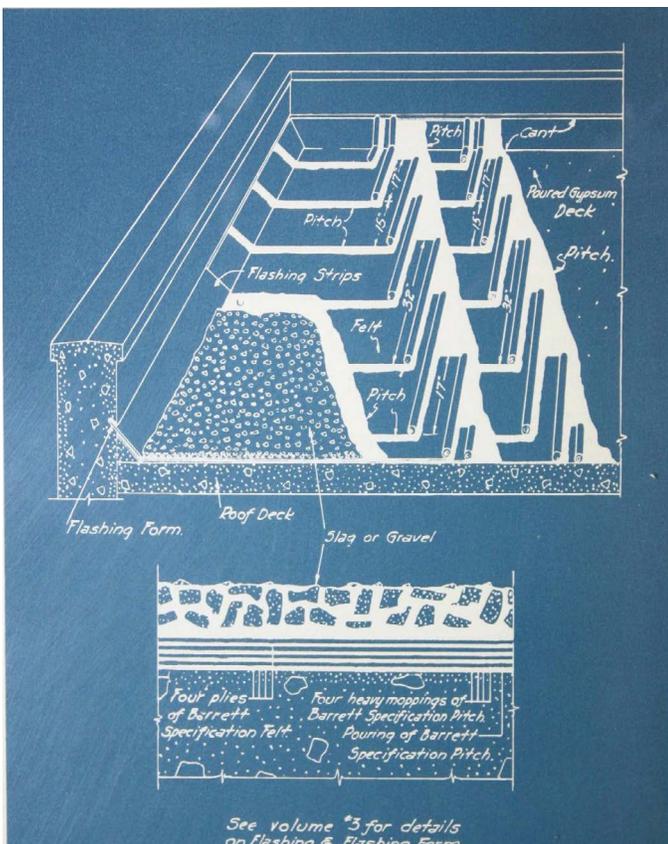
MAINTENANCE OR REPAIRS COMPLETED BY:

8 BUILT-UP/MEMBRANE ROOFING

MAINTENANCE INTERVAL: EVERY YEAR

Why Maintain?

Built-up and membrane roofing are usually thought of as recent roof types, but built-up roofs have been in use since first introduced in the 1850s. The typical built-up roof consists of several layers, or plies, of felt with alternating layers of bitumen that create a membrane, which is then topped with gravel or a top sheet containing crushed stone. Other membrane roofs include asphalt roll roofing, modified bitumen and single-ply PVC, EPDM, and TPO systems. The existing membrane is rarely the historic material, as these roofs must be replaced periodically, and so while the roofing material may not be historically significant, the form and the general principles of construction may be character-defining features. These roofs are susceptible to solar radiation, wear, and poor maintenance. The fact that they shield a mostly flat surface makes them even more vulnerable to water damage, which in turn can compromise the integrity of the building structure and interiors.



Built-up roof installation diagram, ca. 1924. Image courtesy of Barrett Company and Association for Preservation Technology Building Technology Heritage Library.

Assessing Conditions

Built-up and membrane roofs should be assessed every year. Supplemental inspections of the roof, particularly after storms or strong winds, may identify repairs that require immediate attention. This may include broken

tree branches that have landed on the roof or debris that can block drains and scuppers, leading to ponding and water infiltration. Supplemental inspections should also be conducted if leaks are reported. Supplemental inspections can be done from upper-story windows and from spaces where the underside of the decking is exposed.

Assessing built-up and membrane roofs involves checking the membrane for cracks, blisters, and ponding, as well as scuppers, flashing, and roof decking. In fact, flashing failures are often the source of leaks as opposed to the membrane itself. Assessments also involve checking the drainage elements, such as gutters, drains, and downspouts as applicable (see Gutters and Downspouts section for assessment of these elements). Typically, there is access to these roofs from interior hatches that open onto the roof, or from adjacent roofs with ladders. While walking on these roofs is usually safe, it should be minimized as careless traffic can damage the roof surface. It is recommended that traffic pads be installed around obvious paths for service to any rooftop equipment to reduce damage to roofs from foot traffic. The roof sheathing or decking, as well as roof structure should be inspected for leaks from the interior, which requires access to attics and upper-floor spaces where these elements are exposed. Things to check during the assessment include:

MEMBRANE CONDITION

- membrane should be free of blisters, wrinkles, shrinkage, splits, and “alligatoring” or widespread cracks
- membrane should be free of punctures or tears

- roof should be clear of debris, leaves, branches, and accumulated dirt
- membrane should be free of discoloration
- membrane should not have exposed areas of roofing felt
- gravel coating should be intact and any loosely laid gravel should be distributed well without bare areas or gravel that has washed into drains or gutters
- granule coated surfaces should not be excessively worn or have large areas of missing granules
- membrane should have no leaks
- membrane should not show signs of slippage or movement
- membrane seams should be tightly adhered without openings
- roof should be free of ponding or signs of previous ponding such as “tide lines” encircling drains or at scuppers
- membrane should be free of ridges or raised areas and “fishmouths” (openings at the edges of felts and cap sheets)
- membrane should be free of excessive patching, and all patches should have gravel embedded in the surface
- any patches should maintain roof slope toward drains
- the slope of the surface should fall correctly so that water drains toward rainwater outlets
- roof deck should not sag or be springy when walked upon



Blisters and discoloration at membrane roof

FLASHING AND COPING CONDITION

- metal flashing should be free of holes, cracks, buckles, and splits
- metal flashing should not be crumbled and powdering
- metal flashing should be free of open seams and cracked sealant
- metal flashing should be tightly attached and aligned
- painted metal flashing should have no flaking, blistering, or peeling paint
- metal flashing should be free of corrosion and pitting
- metal counter-flashing should be intact
- metal flashing should be free of roofing cement and tar
- asphalt or rubber flashings should be free of cracks and be flexible, without areas of brittleness
- asphalt or rubber flashing should be tightly adhered, with no openings or splits
- caulking and sealant should be flexible and free of cracks
- clamps and termination bars should be tightly attached
- flashing materials should be compatible with one another and with the membrane
- horizontal flashings should be free of ponding water
- pitch pockets should be filled
- equipment curb flashing should be well attached
- exterior walls near flashing and copings should be free of staining and efflorescence



Ponding, loss of gravel, and bent flashing

SHEATHING OR DECKING CONDITION

- underside of sheathing or decking and the roof structure should not show evidence of leaks such as rot, softness, water marks, or rust from nails, if wood sheathing is used; cracks, water marks, or leaks if the decking is concrete; or corrosion if metal decking or structure is present

Maintenance

Even small holes or improper drainage can cause extensive deterioration, and should be repaired immediately. Replacing an entire roofing membrane is usually not necessary, and most of the time only selective portions need to be patched or replaced, along with any deteriorated flashing. Often, the membrane can be patched, but excessive patches can eventually alter the drainage of the roof, directing water to locations that cannot drain properly (see Gutters and Downspouts section for maintenance of these elements). Due to the weight of water, ponding and lack of sufficient drainage can lead to not only leaks, but also to roof failure if water becomes trapped on the roof or under the membrane. Only roofing contractors experienced with built-up and membrane roofs should undertake repairs. Repairs should always be made with materials matching or compatible with the existing materials, as some incompatible patching materials can degrade roofing systems. Regular maintenance of built-up and membrane roofs includes:

- remove any fallen tree limbs, leaves, and other debris
- remove clogs and debris from scupper drains
- inspect roof for ponding, including standing water, tide lines, biological growth, and staining
- inspect roof and decking for leaks, keeping in mind that often leaks are located at flashings, roof penetrations, and parapet walls, and that water can travel far from the source of the leak before becoming apparent; infrared imaging or electronic moisture metering by a roofing specialist may be required to find leaks
- patch deteriorated or damaged membrane with patching material or roofing sealant as appropriate, using techniques specific to the roofing type and material and in accordance with the manufacturer's instructions; replace any gravel removed during the repair, and take care to maintain the roof slope toward drains
- reseal open joints at roof penetrations and at flashings

- secure loose or bent flashing and counter-flashing
- scuppers should be cleared of debris at least twice per year
- keep trees near the roof pruned to minimize damage from fallen branches and debris
- if replacing sections of gutters, downspouts, scupper liners, and flashings, the metals must be similar to avoid galvanic corrosion that can deteriorate the weaker of the metals
- if replacement of membrane roofing is required, provide temporary protection of the roof sheathing



Cracked and deteriorated roof sealant at roof curb

- until repairs are complete
- if undertaking repairs, use long-lasting replacement materials that are compatible with the existing roofing

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of built-up and membrane roofs. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

General Services Administration Technical Documents, *Minor Repairs to Asphalt Roll-Roofing or Built-Up Roofing*.

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88323

General Services Administration Technical Documents,
Built-Up Roofing: Problems At Parapets:

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88442

General Services Administration, *Making Repairs to Sheetmetal Flashing:*

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88168

General Services Administration, *Repairing Small Holes in Roof Flashing:*

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88161

National Park Service, *Preservation Brief #4: Roofing for Historic Buildings:*

<https://www.nps.gov/tps/how-to-preserve/briefs/4-roofing.htm>

National Park Service, *Preservation Brief #39: Holding the Line: Controlling Unwanted Moisture in Historic Buildings:*

<https://www.nps.gov/tps/how-to-preserve/briefs/39-control-unwanted-moisture.htm>

National Park Service Technical Preservation Services,
From Asbestos to Zinc, Roofing for Historic Buildings:

<https://www.nps.gov/tps/education/roofingexhibit/introduction.htm>

Experienced Roofing Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

CALL AN EXPERT

- When repair or replacement of roof deck or sheathing is required
- When staff is inexperienced with built-up or membrane roofing repair
- When repair of other roof elements requires disturbing the roof membrane
- Possible experts may include: a built-up or membrane roofing contractor, who can help with repairs that staff cannot undertake themselves; a preservation architect or structural engineer when problems indicate a more serious issue; or the THC when changes to the roof or roof replacements are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When altering the appearance of the roof, including adding parapet flashing or rooftop mechanical equipment is proposed for a State Architectural Landmark, a THC permit is required
- For any work or alteration that is not cyclical maintenance

(form continued from previous page)

FLASHING AND COPING CONDITION (CONTINUED):

- Horizontal flashing is free of ponding water
- Pitch pockets are filled
- Equipment curb flashing is well attached
- Exterior walls near flashing and coping are free of staining and efflorescence

SHEATHING OR DECKING CONDITION:

- Underside of sheathing or decking and the roof structure do not show evidence of leaks

REFERENCE PHOTOS OF BUILT-UP/MEMBRANE:

INSERT PHOTO

INSERT PHOTO

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

MAINTENANCE OR REPAIRS COMPLETED BY:

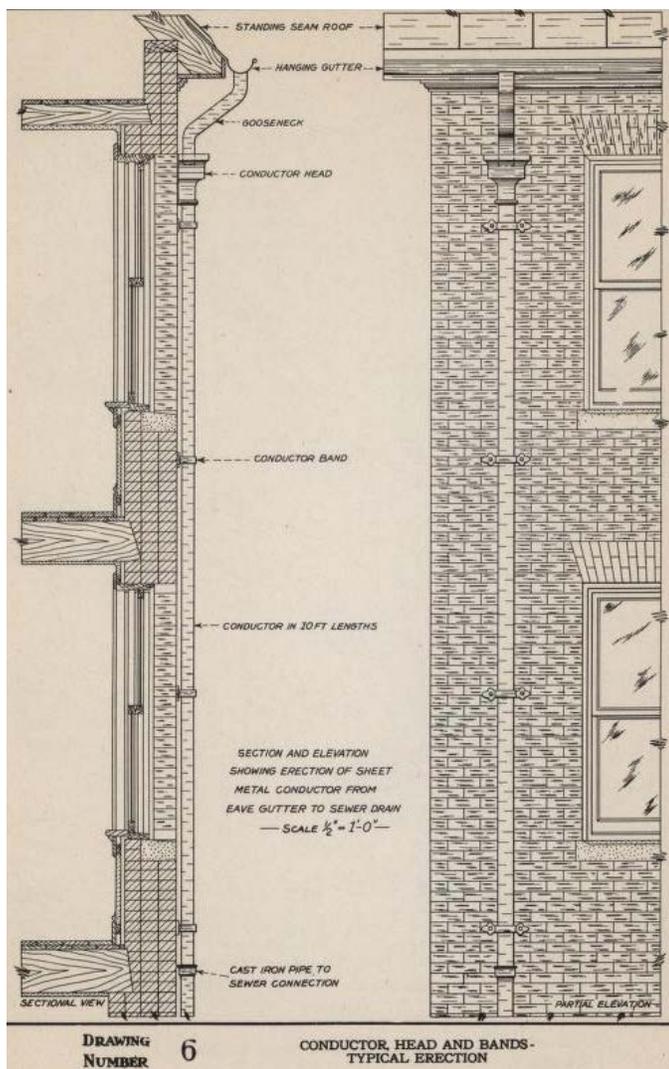
THIS PAGE INTENTIONALLY LEFT BLANK

9 ROOF DRAINS, GUTTERS, AND DOWNSPOUTS

MAINTENANCE INTERVAL: 6 MONTHS

Why Maintain?

Roof drains, gutters, and downspouts are one of the most important building components, as they take water (the greatest source of building deterioration) away from the building. They are a crucial part of building maintenance, and depending on the system used, can impact the roof, roof structure, site drainage, building facade materials, and interior materials if not properly maintained. Yet they are often overlooked and only addressed when deterioration is observed. Generally a purely functional part of the building, some can also be character-defining features of a historic Texas courthouse, even if the materials have been replaced. Common gutter and downspout materials may include copper, galvanized metal, aluminum, and iron, and these may be painted or unpainted.



Gutters and downspouts, 1958. Image courtesy of Sheet Metal and Air Conditioning Contractors' National Association, Inc. and Association for Preservation Technology Building Technology Heritage Library.

Assessing Conditions

Roof drains, gutters, and downspouts should be assessed every six months. Supplemental inspections, particularly after storms or strong winds may identify repairs that require immediate attention, such as broken tree branches that have caused damage. Another example is debris that can become trapped and retain water against building materials or block the flow of water, leading to backups of water beneath roofing materials, water infiltration into the sheathing, and ice dams in freezing conditions. Ideally, inspections of gutters and downspouts should be inspected using an aerial lift. Supplemental inspections, which can be done from adjacent higher roofs, should also be conducted if leaks are reported. Assessing roof drains, gutters, and downspouts involves checking for debris accumulation, cracks in the metal, open joints, broken fasteners, and corrosion.

Storm roof drain systems serving flat roof areas typically include primary roof drain, secondary (emergency) overflow roof drains, and the drainage piping that removes the rainfall from the roof. Typically, the primary roof drain is routed to below grade and ties into the storm drain system on site, and the secondary drain system is routed to above grade and terminated with a downspout nozzle. During the assessment of the storm roof drain system it is important to make sure all primary, secondary, and gutter drain systems are properly draining and that there is no ponding of water on the roof. Things to check during the assessment include:

ROOF DRAIN CONDITION

- use a water hose to make sure the roof drain system is draining properly; if water runs out of the



Debris blocking overflow roof drain

secondary drain system, that is a good indication that the primary system has failed and that the primary drain needs to be inspected immediately to determine the cause

- drain openings are free of debris, dirt, and leaves
- drain openings should be free of cracks and leaks
- drain cages should be intact and free of corrosion
- internal drain locations are free of leaks and signs of staining and water damage to materials below

GUTTER AND DOWNSPOUT CONDITION

- gutters and downspouts should be intact, clean, and free of debris (also see Drainage section)
- gutters and downspouts should be properly attached and not sag
- gutters should slope toward downspouts
- gutters, downspouts, roof drains, and scupper liners should be free of corrosion
- gutters, downspouts, and scupper liners should have no open seams
- rainwater should flow through downspouts without pooling at the base of the building
- splash blocks should be placed correctly to drain water away from foundation

Maintenance

Even small displacements or clogs can cause extensive deterioration and should be repaired immediately (also see Plumbing section). Replacing an entire system is usually not necessary, and most of the time only selective

portions need to be patched or replaced. Often, patches or new sections can be introduced into roof drains, gutters, and downspouts, but may require replacement in time. Repairs should always be made with materials matching or compatible with the existing materials, as some patching materials or dissimilar metals can degrade nearby materials through galvanic corrosion. Regular maintenance of roof drains, gutters, and downspouts includes:

- inspect and clean roof drain screens; roof drains should be cleaned of debris every month and after every storm
- flush internal drains to prevent clogs
- inspect roof drain seals and repair any cracks or leaks
- gutters and downspouts should be cleared of debris at least twice per year and after every storm; if trees are located nearby, more frequent cleaning may be necessary
- replace damaged or missing sections of gutters and downspouts
- keep trees near the roof trimmed to minimize damage from fallen branches and debris
- if replacing sections of gutters and downspouts, the metals must be similar to avoid galvanic corrosion that can deteriorate the weaker of the metals
- if undertaking repairs, use long-lasting replacement materials that are compatible with the existing materials
- consider installing gutter and downspout liners to extend their service life; this is especially useful for built-in or integral gutters and internal downspouts
- if ponding of the water on the roof is visible, a roofing contractor should correct the roof slope to



Biological growth and mortar deterioration from downspout disconnected from boot

allow the water to run into the primary or gutter systems; ponding of water on the roof can lead to roof leaks that can be costly and damaging to the building and its contents

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of historic wood windows. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

General Services Administration Technical Documents, *Clearing Blocked Internal Storm Drains:*

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88169

General Services Administration Technical Documents, *General Inspection and Maintenance of Gutters and Downspouts:*

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88052

National Park Service, *Preservation Brief #4: Roofing for Historic Buildings:*

<https://www.nps.gov/tps/how-to-preserve/briefs/4-roofing.htm>



Leader and downspout at parapet, Red River County Courthouse

National Park Service, *Preservation Brief #39: Holding the Line: Controlling Unwanted Moisture in Historic Buildings:*

<https://www.nps.gov/tps/how-to-preserve/briefs/39-control-unwanted-moisture.htm>

National Park Service Technical Preservation Services, *From Asbestos to Zinc, Roofing for Historic Buildings:*

<https://www.nps.gov/tps/education/roofingexhibit/introduction.htm>

Experienced Roofing Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

CALL AN EXPERT

- When extensive moisture damage indicates a problem beyond the gutters and downspouts
- When staff is inexperienced with gutter and downspout repair
- When a repair requires disturbing adjacent materials
- Possible experts may include: a roofing contractor, who can help with repairs that staff cannot undertake themselves; a preservation architect when problems indicate a more serious problem; or the THC when changes to the gutters or downspouts are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When replacing the gutter and downspout system is proposed for State Antiquities Landmarks a THC permit is required
- For any work or alteration that is not cyclical maintenance

THIS PAGE INTENTIONALLY LEFT BLANK

9 ROOF DRAINS, GUTTERS, AND DOWNSPOUTS

Roof Drains, Gutters, and Downspouts Checklist

This checklist is used to individually assess the roof drains, gutters, and downspouts. It should be duplicated and completed for each inspection and retained for future reference. Use a new checklist at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. Roof plans and elevations of the building can be used to identify where any problems are located. See your architectural plans for this information.

INSPECTION DATE:

REFERENCE PHOTOS OF ROOF DRAINS, GUTTERS,
AND DOWNSPOUTS:

INSPECTOR:

WEATHER CONDITIONS:

ROOF DRAIN CONDITION:

Roof drains are intact, clean, and free of debris, dirt,
and leaves

Drain openings are free of cracks and leaks

Drain cages are intact and free of corrosion

INSERT PHOTO

INSERT PHOTO

Internal drain locations are free of signs of water
damage and leaks

GUTTER AND DOWNSPOUT CONDITION:

Intact, clean, and free of debris

Properly attached and do not sag

Gutters slope toward downspouts

Free of corrosion

No open seams

Rainwater collects in gutters and flows through
downspouts without spilling over the roof edge

Splash blocks are correctly placed

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

MAINTENANCE OR REPAIRS COMPLETED BY:

Why Maintain?

The character of many historic Texas courthouses are often a product of the type, color, and design of their brick masonry construction. Brick can be the primary material of the building envelope, or it can be used for decorative accents. In some cases it is load bearing, but brick can also be used as a veneer over another structural system, as became typical after the 1950s. Brick is often manufactured locally, and has distinct qualities that reflect the location of its manufacture. While offering a distinctive appearance, brick walls also provide a weather-tight building envelope. Brick is generally a durable material, but is brittle and porous, and if not fired properly can be softer and less durable than modern bricks. Brick works in concert with mortar, which is the sacrificial part of the system, providing cushioning to each brick unit, allowing the wall to expel water vapor, and absorbing movement from the natural shifting of the building over time. Both the brick and mortar must be maintained to provide a sound brick masonry system while preserving the character of the brickwork.

Assessing Conditions

Brick masonry elements, including building walls, site walls, and accents, along with mortar, should be assessed

every year, at which time minor repairs may be required. Casual walk-throughs of the building may identify repairs that require immediate attention, such as graffiti removal, water infiltration, or cracks that have developed suddenly.

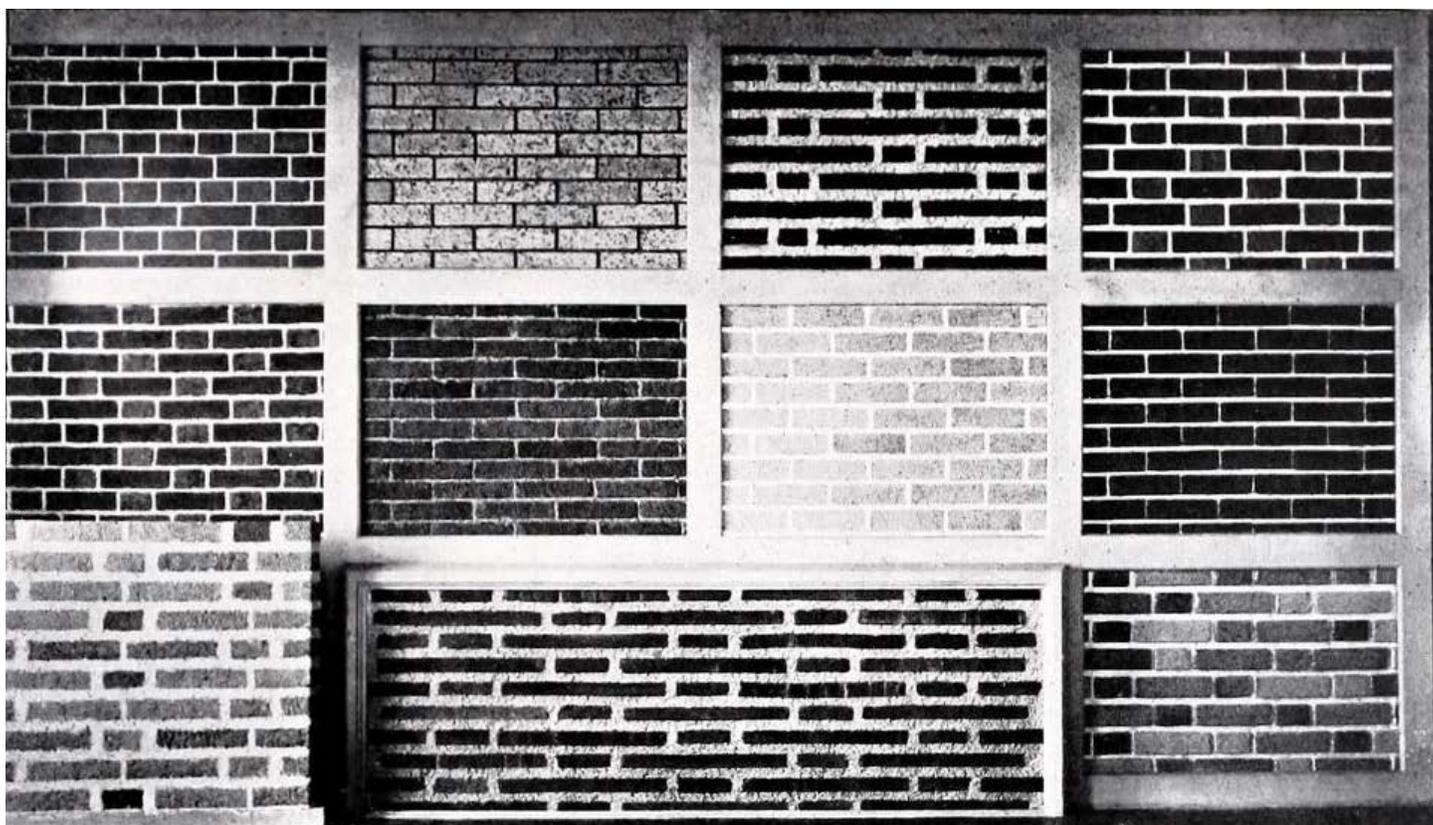
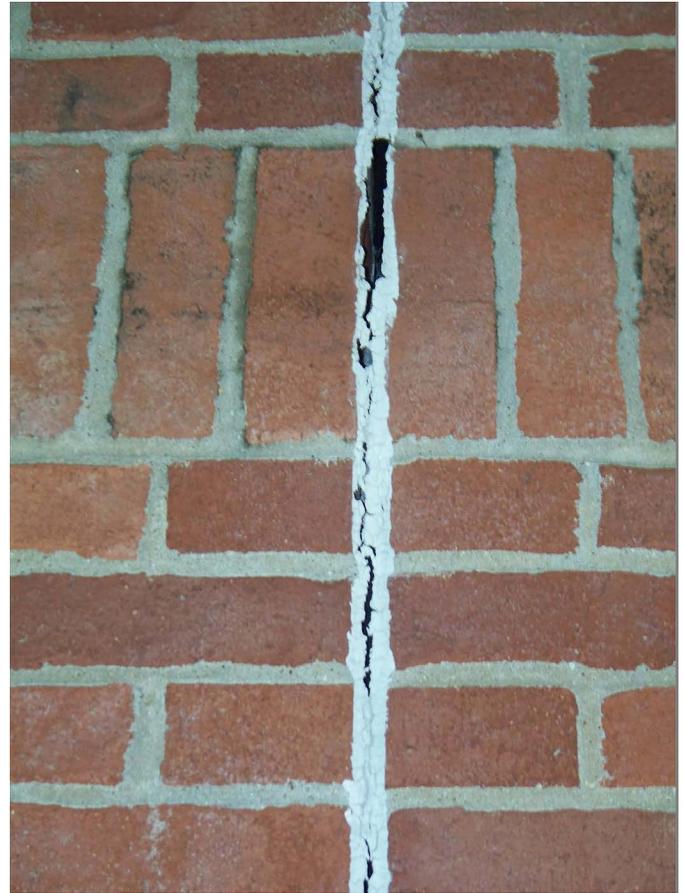


Exhibit of different brickwork, 1900. Note that the display offers 18 different colors, 7 textures, 5 bond styles, 5 mortar colors and thicknesses, and 5 types of joint tooling, each contributing to the character of the brickwork. Image courtesy of Fiske & Company, Inc. and Association for Preservation Technology Building Technology Heritage Library.

Assessing brick masonry involves checking the mortar for signs of deterioration, but since the mortar joints are intended to be the sacrificial part of a brick masonry system, it is by design more susceptible to separation, cracks, and weathering, and its assessment is also a primary focus during inspections. Especially vulnerable parts of brick masonry construction are the previously mentioned mortar joints, brick racking, locations where water can linger on the wall surface such as ledges and projecting elements, and areas where loads are not evenly distributed. Assessment will involve close observation of the exterior brick surface of each element. The interior perimeter walls should also be observed to check for signs of moisture penetration. Often binoculars, a lift, or ladder will be needed. Things to check during the assessment include:

BRICK CONDITION

- brick masonry should be free of extensive discoloration, soiling, staining, darkening, or otherwise inconsistent surface coloration
- brick should be free of biological growth like algae and lichen, and vegetation should not grow on or near the brick or mortar
- brick surface should be free of erosion
- the outside face of the brick or “fireskin” as well as the surface of glazed brick should be intact and free of spalls and chips
- cracks extending through the brick should not be greater than 1/16” wide



Deteriorated sealant at expansion joint in brick wall

- brick cracks should not be actively moving; cracks can be monitored with rulers or crack gauges photographed next to the crack on a periodic basis, or with “tell-tale” crack monitors
- brick units should not be displaced or missing
- brick walls should be free of bows or bulges in the wall plane and should not lean
- brick should not have mechanical damage from lawn mowers, weed-eaters, vehicles, etc.
- brick should be free of efflorescence, which is a haze or surface deposits of salts that indicates moisture in the brick wall
- brick walls should be free of signs of rising damp, indicated by “tide lines” of moisture extending up from the foundation or other damp conditions from broken downspouts, ineffective scuppers, etc.
- previous repairs should be intact and functioning
- brick walls should be free of graffiti
- interior walls and ceilings should be free of water stains and mildew



Inappropriate repair of crack using caulk instead of mortar; also note biological growth

MORTAR AND JOINT CONDITION

- mortar should be intact and not loose, crumbling, separated, or not adhered to brick
- mortar should not be cracked
- caulking and sealants should not be substituted for masonry mortar
- mortar should have a consistent appearance, strength, and porosity
- mortar should not be stronger than the surrounding brick

SEALANTS

- caulking or sealants should be intact, flexible, and not cracked or powdering

Maintenance

Historic brick and mortar were designed to be maintained, with mortar acting as the softer, sacrificial part of the masonry system that is simple to replace. A properly maintained brick masonry wall will perform well for hundreds of years with proper maintenance and will not require modern interventions such as waterproof or water-repellent coatings or paints, or hard pointing mortars, all of which can damage the masonry. Only when approximately 50 percent of the mortar has deteriorated should a building-wide repointing effort be undertaken. It is important to only allow qualified masons or personnel experienced with historic masonry repair to undertake any repointing or repairs, even minor ones. Regular maintenance of brick masonry includes the following:



Brick wall that has been damaged by abrasive blasting; note how paint applied in an attempt to seal surface has deteriorated and become unsightly



Loss of brick masonry units from mechanical damage; also note loss of surface of brick due to abrasive blasting

- if cleaning is necessary, rinse excessive soiling and biological growth from masonry using low-pressure water from a garden hose with spray attachment, mild non-ionic and pH-neutral detergent and soft nylon or natural bristle brushes; metal brushes, harsh chemical cleaners, and abrasive or high-pressure water blasting should never be used, and brick should only be cleaned when necessary
- efflorescence can be removed with soft nylon brushes and low-pressure water from a garden hose with spray attachment; if efflorescence recurs it should be investigated
- remove vegetation growing on brick by hand; do not spray brick with weed killers or other chemicals or use weed-eaters next to the brick
- trim trees and vegetation away from brick (also see Landscape and Irrigation section)
- remove and replace deteriorated caulking and sealant
- repoint and repair failed repairs using compatible repair mortars, as appropriate; maintenance staff should only undertake repointing and repairs if properly trained in repointing and if the compatible mortar mix is known
- avoid application of any waterproof coating, water repellent, paint, or other coatings, as they can trap water inside the masonry causing spalling and cracking of the brick and require periodic reapplication that can become a maintenance problem; if water infiltration is apparent, the source of the infiltration should be identified and addressed; typically water infiltration is due to deteriorated mortar joints

- avoid application of chemicals such as bird-repellent gels, or any type of acidic or caustic cleaners like muriatic acid or bleach
- remove graffiti immediately with removal products specifically designed for brick substrate and according to the manufacturer's instructions in order to deter other vandalism and to help prevent curing and absorption of graffiti deeply within the masonry, making it more difficult to remove

Resources

The following resources provide in-depth technical information and specific techniques for maintenance of historic brick and mortar. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

General Services Administration, *Technical Documents on Masonry*:

<https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents#Masonry>

National Park Service, *Preservation Brief #1: Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/1-cleaning-water-repellent.htm>

National Park Service, *Preservation Brief #2: Repointing Mortar Joints in Historic Masonry Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/2-repoint-mortar-joints.htm>

National Park Service, *Preservation Brief #6: Dangers of Abrasive Cleaning to Historic Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/6-dangers-abrasive-cleaning.htm>

National Park Service, *Preservation Brief #38: Removing Graffiti from Historic Masonry*:

<https://www.nps.gov/tps/how-to-preserve/briefs/38-remove-graffiti.htm>

National Park Service, *Preservation Brief #39: Holding the Line: Controlling Unwanted Moisture in Historic Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/39-control-unwanted-moisture.htm>

Experienced Historic Masonry Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

CALL AN EXPERT

- When extensive moisture or efflorescence is present, and is not solved by such measures as redirecting of water from sprinklers away from walls, or repairing broken downspouts (also see Landscape and Drainage sections)
- When moisture penetrates through the wall to interior spaces
- When brick must be repointed and staff does not have experience or adequate manpower to undertake the work themselves
- When pointing mortar is harder than the adjacent brick and appears to cause deterioration
- When cracks are larger than 1/16" and require repair
- When cracks suddenly appear, or existing cracks appear to be moving by opening and closing or get larger
- When cracks are stepped or diagonal, or settlement is apparent
- When staff is inexperienced with historic brick repair
- When bricks must be removed for repairs or replaced
- When the repair mortar mix is not known
- When repair of another building element requires disturbing brickwork
- Possible experts may include: an architectural conservator or a historic masonry contractor, who can help with repairs that staff cannot undertake themselves; a preservation architect when problems indicate a more serious issue; or the THC when changes to the brick masonry is proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When replacing brick, waterproofing, sealants, paint, or application of water repellents is proposed for State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance

THIS PAGE INTENTIONALLY LEFT BLANK

Brick Checklist

This checklist is used to individually assess the brick. It should be duplicated and completed for each inspection and retained for future reference. Use a new checklist at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. Elevation drawings of the building can be used to identify where the brick is located. See your architectural plans or elevations for this information.

INSPECTION DATE:

INSPECTOR:

WEATHER CONDITIONS:

BRICK CONDITION:

- Free of extensive discoloration, soiling, staining, darkening, or otherwise inconsistent surface coloration
- Brick and mortar are free of biological growth
- Free of erosion
- Outside face of the brick is intact and free of spalls and chips
- Free of brick cracks greater than 1/16” wide
- Cracks are not actively moving
- Bricks are not displaced or missing
- Walls are free of bows or bulges in the wall plane and are not leaning
- Free of mechanical damage from lawn mowers, weed-eaters, etc.
- Free of efflorescence
- Free of signs of rising damp
- Previous repairs are intact and functioning

BRICK CONDITION (CONTINUED):

- Free of graffiti
- Interior walls and ceilings are free of water stains and mildew

MORTAR AND JOINT CONDITION:

- Mortar is intact and not loose, crumbling, separated, or not adhered to brick
- Mortar is not cracked
- Caulking and sealants are not substituted for masonry mortar
- Mortar has a consistent appearance and strength
- Mortar is not harder than the surrounding brick

SEALANTS:

- Caulking or sealants are intact, flexible, and not cracked or powdering

REFERENCE PHOTOS OF BRICK:

INSERT PHOTO

INSERT PHOTO

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

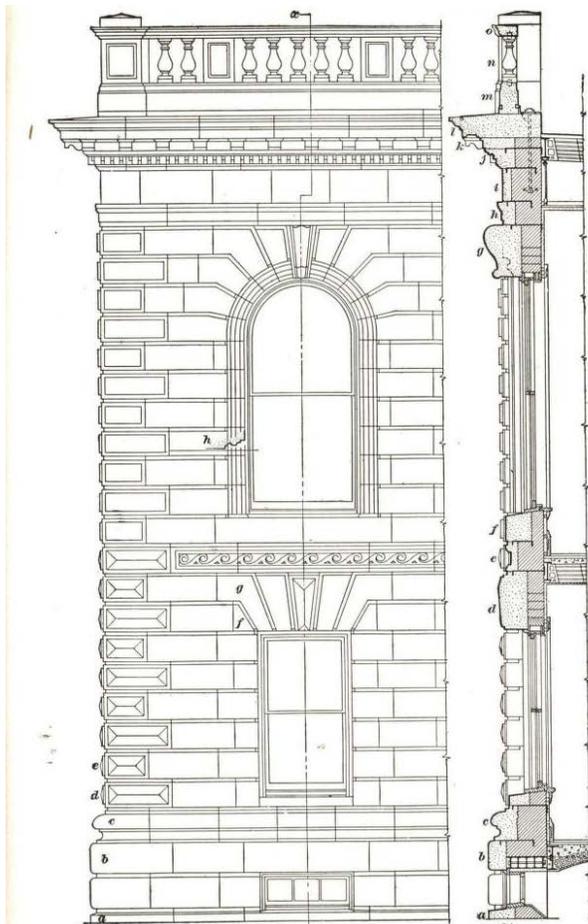
MAINTENANCE OR REPAIRS COMPLETED BY:

11 STONE AND CAST STONE

MAINTENANCE INTERVAL: EVERY 5 YEARS

Why Maintain?

Historic Texas courthouses constructed of natural quarried stone and cast stone masonry are among the most iconic buildings in the state, and are distinguished by the stone type, color, surface dressing or tooling, and coursing patterns. Natural quarried stone can be the primary material of the building envelope, or it can be used for decorative accents. In some cases, natural stone is load bearing, but is more often used as a veneer anchored to a backup wall of underlying material or the structural system. Numerous types of natural stone are used in Texas courthouses, and each has distinct qualities of the geological formation where it was quarried. While offering a distinctive appearance, natural stone walls also provide a weather-tight building envelope. Natural stone is one of the most durable building materials, but like any material is susceptible to both natural weathering and damage from outside forces or even from deterioration inherent in the material or construction itself. Accents are often cast stone, which are cement and aggregates cast in a mold to resemble carved natural stone. Cast stone has been in widespread use since the late 1800s and can be made to resemble almost any natural stone through the use of various aggregates, cement colors, and pigments, as well as surface decoration and tooling. For both natural stone and cast stone, the masonry unit works in concert with mortar, which is the sacrificial part of the system, providing cushioning to each masonry unit, allowing the wall to expel water vapor, and absorbing movement from the natural shifting of the building over time. Both the masonry unit and mortar must be maintained to provide a sound masonry system.



Section through a stone wall, 1921. Image courtesy of William S. Lowndes and Association for Preservation Technology Building Technology Heritage Library.

Assessing Conditions

Both natural stone and cast stone masonry elements, including building walls, site walls, and accents, along with mortar, should be assessed every year, at which time minor repairs may be required. Casual walk-throughs of the building may identify repairs that require immediate attention, such as graffiti, water infiltration, or cracks that have developed suddenly.

Assessing both natural stone and cast stone masonry involves checking the masonry for signs of deterioration, but since the mortar joints are intended to be the sacrificial part of a masonry system, it is by design more susceptible to separation, cracks, and weathering, and its assessment is also a primary focus during inspections. Especially vulnerable parts of masonry construction are the previously mentioned mortar joints, locations where water can linger on the wall surface such as ledges and projecting elements, and areas where loads are not evenly distributed.

Cast stone differs from natural stone in that it will exhibit different types of deterioration, which can be due to how it was manufactured. Often, metal reinforcement or anchors were cast into the cast stone units to provide anchors to the backup wall or for lifting the units, and corrosion of the anchors due to water penetration through deteriorated mortar joints can be a source of deterioration of the cast stone.



Biological growth and mortar loss on rubble stone wall

Inspection of both natural stone and cast stone will involve close observation of the exterior surface of each element, as well as observation of interiors where moisture could penetrate the walls. Often binoculars, a lift, or ladder will be needed. Things to check during the assessment include:

NATURAL STONE CONDITION

- stone should be free of extensive discoloration, soiling, staining, darkening, or otherwise inconsistent surface coloration; some color variation is a natural part of stone weathering
- stone should be free of staining from anchors and embedded metal elements, as indicated by orange or green streaks that do not readily wash off
- stone should be free of biological growth like algae and lichen, and vegetation should not grow on or near the stone or mortar
- stone surface should be free of erosion, flaking, peeling, or loss
- stone should be free of spalls or chips
- cracks extending through the stone should not be greater than 1/16" wide
- cracks through stone should not be actively moving; cracks can be monitored with rulers or crack gauges photographed next to the crack on a periodic basis, or with "tell-tale" crack monitors
- stone units should not be displaced or missing
- stone walls should be free of bows or bulges in the wall plane and should not lean
- stone should not have mechanical damage from lawn mowers, weed-eaters, or from equipment, doors, etc.

- stone should be free of efflorescence, which is a haze or surface deposits of salts that indicates moisture in the brick wall
- stone walls should be free of signs of rising damp, indicated by "tide lines" of moisture extending up from the foundation or other damp conditions from broken downspouts, ineffective scuppers, etc.
- previous repairs should be intact and functioning
- stone walls should be free of graffiti
- interior walls and ceilings should be free of water stains and mildew

CAST STONE CONDITION

- cast stone should not exhibit separation of facing layers and core layers if the dry tamping method of manufacture was used
- surface aggregate should be sound and not deteriorating or separating from the cement matrix
- the cement matrix should be sound and not deteriorating or separating from the aggregate
- surface of cast stone should not be spalled or have cracks greater than 1/16"
- ferrous reinforcement or anchors should not be visible or show evidence of corrosion, which can be indicated by staining of the surrounding cast stone cover or by spalling of the surface
- cast stone should be free of mechanical damage from lawn mowers, weed eaters, and from equipment, doors opening into cast stone, etc.
- cast stone units should not be displaced or missing
- cast stone should be free of efflorescence
- previous repairs should be intact and functioning



Flaking of facing layer in cast stone window sill

MORTAR AND JOINT CONDITION

- mortar should be intact and not loose, crumbling, separated, or not adhered to stone or cast stone
- mortar should not be cracked
- caulking and sealants should not be substituted for masonry mortar
- mortar should have a consistent appearance, porosity, and strength
- mortar should not be stronger than the surrounding stone or cast stone

SEALANTS

- caulking or sealants should be intact, flexible, and not cracked or powdering

Maintenance

Historic natural stone, cast stone, and mortar was designed to be maintained, with mortar acting as the softer, sacrificial part of the masonry system that is simple to replace. A properly maintained masonry wall will perform well for hundreds of years with proper maintenance and will not require modern interventions such as waterproof or water-repellent coatings or paints, or hard pointing mortars, all of which can damage the masonry. Only when approximately 50 percent of the mortar has deteriorated should a building-wide repointing effort be undertaken. It is important to only allow qualified masons or personnel experienced with historic masonry repair to undertake any repointing or repairs, even minor ones. Regular maintenance of both natural stone and cast stone masonry includes the following:



Soiling and deteriorated caulking in cast stone parapet cap



Failure of reinforcing in cast stone balcony element; also note discoloration of stone

- if cleaning is necessary, rinse excessive soiling and biological growth from masonry using low-pressure water from a garden hose with spray attachment, mild non-ionic and pH-neutral detergent and soft nylon or natural bristle brushes; metal brushes, harsh chemical cleaners, and abrasive or high-pressure water blasting should never be used, and stone should only be cleaned when necessary
- efflorescence can be removed with soft nylon brushes and low-pressure water from a garden hose with spray attachment; if efflorescence recurs it should be further investigated
- remove vegetation growing on stone and cast stone by hand; do not spray masonry with weed killers or other chemicals or use weed-eaters next to stone
- trim trees and vegetation away from stone (also see Landscape and Irrigation section)
- remove and replace deteriorated caulking and sealant
- repoint and repair failed repairs using compatible repair mortars, as appropriate; maintenance staff should only undertake repointing and repairs if properly trained in repointing and if the compatible mortar mix is known
- avoid application of any waterproof coating, water repellent, paint, or other coatings, as they can trap water inside the masonry causing spalling and cracking of the stone or cast stone and require periodic reapplication that can become a maintenance problem; if water infiltration is apparent, the source of the infiltration should be identified and addressed

- avoid application of chemicals such as bird-repellent gels, or any type of acidic or caustic cleaners like muriatic acid or bleach
- remove graffiti immediately with removal products specifically designed for the particular stone type and according to the manufacturer's instructions in order to deter other vandalism and to help prevent curing and absorption of graffiti deeply within the masonry, making it more difficult to remove



Corrosion of cast stone anchor, causing spall

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of historic natural stone and cast stone. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

General Services Administration, *Technical Documents on Masonry*:

<https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents#Masonry>

National Park Service, *Preservation Brief #1: Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/1-cleaning-water-repellent.htm>

National Park Service, *Preservation Brief #2: Repointing Mortar Joints in Historic Masonry Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/2-repoint-mortar-joints.htm>

National Park Service, *Preservation Brief #6: Dangers of Abrasive Cleaning to Historic Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/6-dangers-abrasive-cleaning.htm>

National Park Service, *Preservation Brief #38: Removing Graffiti from Historic Masonry*:

<https://www.nps.gov/tps/how-to-preserve/briefs/38-remove-graffiti.htm>

National Park Service, *Preservation Brief #39: Holding the Line: Controlling Unwanted Moisture in Historic Buildings*:

<https://www.nps.gov/tps/how-to-preserve/briefs/39-control-unwanted-moisture.htm>

National Park Service, *Preservation Brief #42: The Maintenance, Repair, and Replacement of Historic Cast Stone*:

<https://www.nps.gov/tps/how-to-preserve/briefs/42-cast-stone.htm>

Experienced Historic Masonry Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

CALL AN EXPERT

- When extensive moisture or efflorescence is present, and is not solved by such measures as redirecting of water from sprinklers away from walls, or repairing broken downspouts (also see Landscape and Drainage sections)
- When moisture penetrates through the wall to interior spaces
- When natural stone or cast stone must be repointed and staff does not have experience or adequate manpower to undertake the work themselves
- When pointing mortar is harder than the adjacent stone and appears to cause deterioration
- When cracks are larger than 1/16" and require repair
- When cracks suddenly appear, or existing cracks appear to be moving by opening and closing or get larger
- When cracks are stepped or diagonal or settlement is apparent
- When staff is inexperienced with historic stone or cast stone repair
- When masonry units must be removed for repairs or replaced
- When the repair mortar mix is not known
- When repair of another building element requires disturbing masonry units
- Possible experts may include: a historic masonry contractor, who can help with repairs that staff cannot undertake themselves; a professional conservator; a preservation architect when problems indicate a more serious issue; or the THC when changes to the brick masonry is proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When replacing natural stone or cast stone, extensive repointing, waterproofing, sealants, paint, or application of water repellents is proposed for State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance

THIS PAGE INTENTIONALLY LEFT BLANK

Stone and Cast Stone Checklist

This checklist is used to individually assess the stone and cast stone. It should be duplicated and completed for each inspection and retained for future reference. Use a new checklist at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and "save as" a new document for each inspection.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the "Resources" section. Elevation drawings of the building can be used to identify where the stone and cast stone is located. See your architectural plans or elevations for this information.

INSPECTION DATE:

INSPECTOR:

WEATHER CONDITIONS:

NATURAL STONE CONDITION:

- Free of extensive discoloration, soiling, staining, darkening, or otherwise inconsistent surface color
- Free of staining from anchors and embedded metal elements
- Free of biological growth, with no vegetation growing on or near the stone or mortar
- Surface is free of erosion, flaking, peeling, or loss
- Free of spalls or chips
- Free of cracks greater than 1/16" wide that extend through the stone
- Cracks are not actively moving
- Stone is not displaced or missing
- Walls are free of bows or bulges in the wall plane and do not lean
- Free of mechanical damage from lawn mowers, weed-eaters, etc.
- Free of efflorescence
- Free of signs of rising damp
- Previous repairs are intact and functioning

NATURAL STONE CONDITION (CONTINUED):

- Free of graffiti
- Interior walls and ceilings are free of water stains and mildew

CAST STONE CONDITION:

- Does not exhibit separation of facing layers and core layers if the dry tamping method of manufacture was used
- Surface aggregate is sound and not deteriorating or separating from the cement matrix
- Cement matrix is sound and not deteriorating or separating from the aggregate
- Surface is not cracked or spalled
- Ferrous reinforcement or anchors are not visible and do not show evidence of corrosion
- Free of mechanical damage from lawn mowers, weed eaters, and from equipment, doors, etc.
- Stone is not displaced or missing
- Free of efflorescence
- Previous repairs are intact and functioning

(form continues on next page)

(form continued from previous page)

MORTAR AND JOINT CONDITION:

Mortar is intact and not loose, crumbling, separated,
or not adhered to stone or cast stone

Mortar is not cracked

Caulking and sealants are not substituted for
masonry mortar

Mortar has a consistent appearance and strength

Mortar is not harder than the surrounding stone or
cast stone

SEALANTS:

Caulking or sealants are intact, flexible, and not
cracked or powdering

**REFERENCE PHOTOS OF STONE AND CAST
STONE:**

INSERT PHOTO

INSERT PHOTO

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

MAINTENANCE OR REPAIRS COMPLETED BY:

THIS PAGE INTENTIONALLY LEFT BLANK

Why Maintain?

Terra cotta was most popular between the late 1800s and 1930s, and consists of glazed or unglazed clay fired at high temperatures to obtain a very hard material. It was usually cast into hollow blocks, or special decorative or repetitive shapes to mimic stone, with interior webs for stiffness, attached to a backup wall with metal anchors. The use of terra cotta at historic Texas courthouses typically consists of ornamental features at cornices, door surrounds, repetitive elements, and other elements that are expressive of the historic period in which they are constructed. Therefore, they are usually character-defining features that must be preserved and cared for. Terra cotta is one of the most complex construction materials, and while its maintenance is simple, repair should only be attempted by specialists with experience with this unique material.

Assessing Conditions

Although terra cotta resembles stone and is similar in composition to brick, it exhibits very different types of deterioration that requires a different approach for assessment. It may require assessment by a preservation architect or conservator with experience in terra cotta, but maintenance staff can act as the first line of defense in its preservation. Terra cotta should be assessed every year with the rest of a building's masonry. Casual walk-throughs of the building may identify repairs that require immediate attention, such as broken units, open or deteriorated masonry joints, water infiltration, or cracks that have developed suddenly.

Assessing terra cotta involves checking the units themselves for signs of deterioration, but since the mortar joints are intended to be the primary way the system remains water-tight and because it is susceptible to weathering, mortar joint assessment is a primary focus during inspections. Especially vulnerable parts of terra cotta construction are the previously mentioned mortar joints and the metal anchors that attach the terra cotta units to the backup wall. Failure of the anchors can cause terra cotta units to detach from the wall and fall. Inspection of terra cotta will involve close observation of the exterior surface of each element, as well as observation of interiors where moisture could penetrate the walls. Often binoculars, a lift, or ladder will be needed. Things to check during the assessment include:

TERRA COTTA UNITS AND ANCHORS

- terra cotta units should be free of glaze spalls, where the surface glazing blisters and detaches because of water trapped behind the surface, leaving the

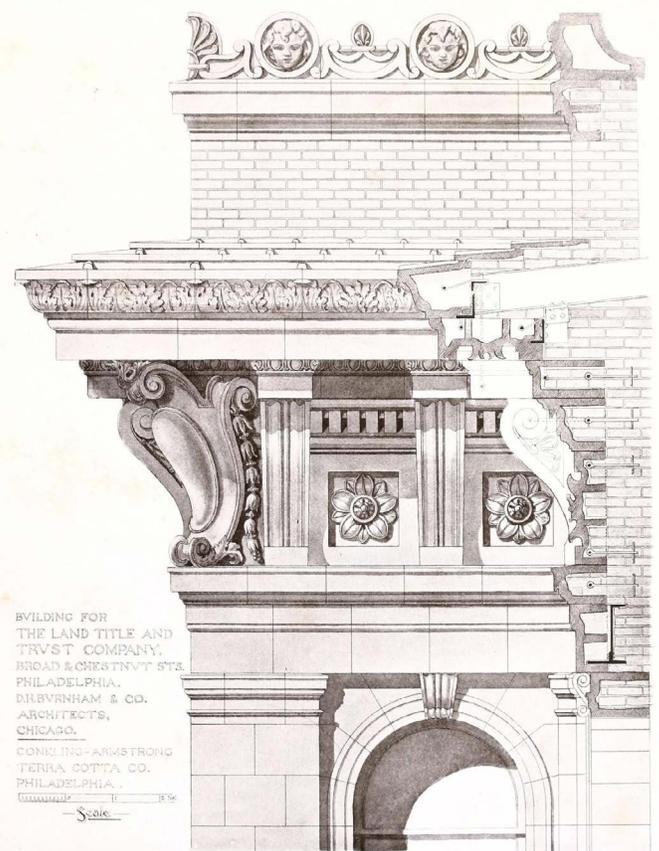


Diagram of terra cotta cornice and parapet cap, 1914. Image courtesy of Conckling-Armstrong Terra Cotta Co. and Association for Preservation Technology Building Technology Heritage Library.

clay beneath exposed and allowing further water infiltration

- terra cotta units and mortar joints should be free of any corrosion staining, which could be caused by corrosion of the anchors and should be addressed immediately

- terra cotta units should be free of cracks, holes, and losses
- terra cotta units should not be displaced, which could indicate a failure of the anchor
- previous repairs to terra cotta units should be intact, well attached, and functioning

MORTAR AND JOINT CONDITION

- mortar should be intact and not loose, crumbling, separated, or not adhered to terra cotta units
- mortar should not be cracked
- caulking and sealants should not be substituted for masonry mortar
- mortar should have a consistent appearance, strength, and porosity
- mortar should not be stronger than the terra cotta units



Terra cotta pediment, cornice details, and column capitals, Williamson County Courthouse

Maintenance

Unless deterioration is evident, cleaning is generally the only maintenance needed. Any repairs to terra cotta, including patching or repairs to its anchoring system, should only be undertaken by masons with historic terra cotta experience. Improper repairs, even if well-intentioned, could cause further deterioration of the units, or failure of the anchors that could cause units to fall. Regular maintenance and inspection of terra cotta is necessary to help prevent deterioration before it can begin, and includes:

- thorough inspections may require cleaning the terra cotta surface; this can be done by rinsing excessive

soiling and biological growth using low-pressure water from a garden hose with spray attachment, mild non-ionic and pH-neutral detergent, and soft nylon or natural bristle brushes; metal brushes, harsh chemical cleaners, muriatic or other acids, alkaline cleaners, and abrasive or high-pressure blasting should never be used, and terra cotta should only be cleaned when necessary

- repoint using compatible repair mortars, as appropriate; maintenance staff should only undertake repointing if they have been properly trained in repointing and if the compatible mortar mix is known

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of historic terra cotta. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

General Services Administration, *Technical Documents on Masonry*:

<https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents#Masonry>



Terra cotta loss at corner of unit, Williamson County Courthouse



Terra cotta column capitals, Harrison County Courthouse

National Park Service, *Preservation Brief #7: The Preservation of Historic Glazed Architectural Terra-Cotta.*

<https://www.nps.gov/tps/how-to-preserve/briefs/7-terra-cotta.htm>

Experienced Historic Masonry Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:



Replacement terra cotta units at the Williamson County Courthouse

CALL AN EXPERT

- When terra cotta must be repointed
- When pointing mortar is harder than the adjacent terra cotta and appears to cause deterioration
- When cracks, spalling, displacement, holes, loss, or other deterioration of the terra cotta units are observed
- If there is evidence of anchor deterioration or failure
- When repair of another building element requires disturbing terra cotta
- Possible experts may include: a historic masonry contractor, who can undertake repairs; a professional conservator; a preservation architect; or the THC when changes to the terra cotta is proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When replacing terra cotta units is proposed for State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance

THIS PAGE INTENTIONALLY LEFT BLANK

Terra Cotta Checklist

This checklist is used to individually assess the terra cotta. It should be duplicated and completed for each inspection and retained for future reference. Use a new checklist at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. Elevation drawings of the building can be used to identify where the terra cotta is located. See your architectural plans or elevations for this information.

INSPECTION DATE:

REFERENCE PHOTOS OF TERRA COTTA:

INSPECTOR:

WEATHER CONDITIONS:

TERRA COTTA UNITS AND ANCHORS:

Free of glaze spalls

No evidence of corrosion staining

INSERT PHOTO

INSERT PHOTO

Free of cracks, holes, and losses

Terra cotta is not displaced

Previous repairs are intact, well-attached, and functioning

MORTAR AND JOINT CONDITION:

Mortar is intact and not loose, crumbling, separated, or not adhered to terra cotta

Mortar is not cracked

Caulking and sealants are not substituted for masonry mortar

Mortar has a consistent appearance and strength

Mortar is not harder than the terra cotta

(form continues on next page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

MAINTENANCE OR REPAIRS COMPLETED BY:

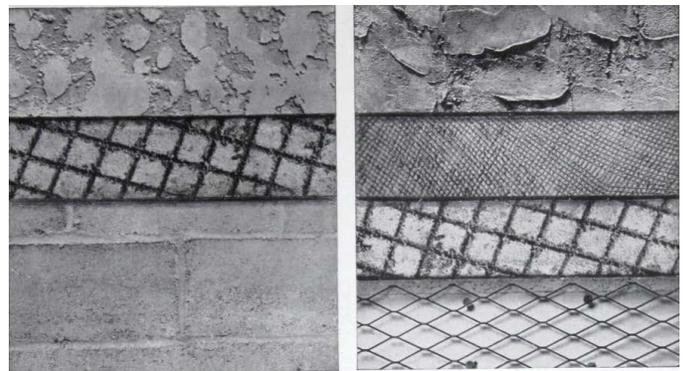
Why Maintain?

Stucco is one of the most common building materials. In the late 1800s, the introduction of Portland cement changed the composition of traditional lime-based stucco, and this coincided with the widespread availability of commercial building materials, as well as many of the revival and modern styles of architecture that used this facade material. Historic stucco coatings are not only aesthetically important to many historic Texas courthouses, they also act as protective coatings over exterior walls. Maintaining stucco coatings in good repair helps to prevent moisture intrusion into the underlying material, which can be brick, hollow clay tile, concrete, or wood or steel frame construction. Stucco may have an integral color, but is often painted, and keeping the surface painted with the proper type of paint for the stucco coating is one of the most important parts of maintenance.

Assessing Conditions

Stucco used in historic Texas courthouses is generally a two-coat or three-coat system of lime and/or Portland cement, sand, aggregate, and water with various additives to provide workability, texture, and color. It is applied directly to masonry substrates, or to wood or metal lath that is mechanically attached to the backup wall or frame. The first coats (the scratch coat and brown coat) generally have different percentages of cement and sand, and different aggregate types and sizes than the finish coat, which can have any number of textures from smooth to very rough, and with or without scoring to resemble stone. Exterior stucco walls and any other stuccoed elements such as site walls should be assessed every five years, at which time minor repairs may be required. Casual walk-throughs of the building may identify repairs that require immediate attention, such as graffiti, water infiltration, vegetation, or cracks that have developed suddenly. Especially vulnerable parts of stuccoed surfaces are locations where the stucco terminates at the ground, where it turns a corner, or where the building material changes, such as at window and door openings, flashings, or along the foundation. Most stucco deterioration is water-related, and so other vulnerable locations are where water can linger on the wall surface, such as behind shrubs or at downspouts that are not functioning properly. The paint coating over the stucco may be part of the protective coating system, and its maintenance is just as important as the stucco itself. Stucco deterioration is fairly easy to detect, as problems are almost always visible on the surface, taking the form of cracks, bulges, and discoloration. The cause of deterioration, however, is not always straightforward, and could be related to water infiltration from another failed building element, shifting

of the structure, or inadequate bonding of the stucco to corroded lath. Inspection of stucco will involve close observation of the exterior surface, as well as observation of interiors where moisture could penetrate the walls.

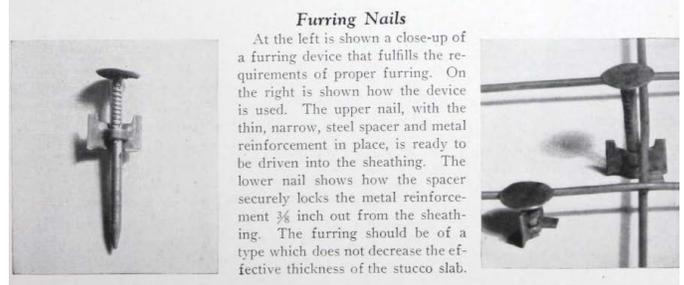


Portland Cement Stucco on Concrete Block

On masonry construction, if the base is smoothly laid up, two coats are sufficient, but each should be 1/2-inch thick. If different masonry materials are used in the same wall, as in clay brick with cement-lime joints, three coats will be necessary. All masonry backing should have the joints cut back even with the surface. If masonry surfaces are painted or waterproofed, they should be covered with reinforcing fabric before the first, or scratch coat of stucco is applied.

Portland Cement Stucco on Frame Construction

Three coats of stucco should always be used on frame construction. The first coat forms the slab of strength, completely embedding the metal reinforcement, which, if properly furred out 3/8 inch will give a first coat thickness of approximate 1/2 inch. The second coat builds up the thickness and produces an even surface for the finishing coat. The last coat decoratively finishes and seals the surface.



Furring Nails

At the left is shown a close-up of a furring device that fulfills the requirements of proper furring. On the right is shown how the device is used. The upper nail, with the thin, narrow, steel spacer and metal reinforcement in place, is ready to be driven into the sheathing. The lower nail shows how the spacer securely locks the metal reinforcement 3/8 inch out from the sheathing. The furring should be of a type which does not decrease the effective thickness of the stucco slab.

Two- and three-coat stucco systems, 1927. Image courtesy of Portland Cement Association and Association for Preservation Technology Building Technology Heritage Library.



Crack in stucco wall

Often binoculars, a lift, or ladder will be needed. Things to check during the assessment include:

STUCCO CONDITION

- stucco should be free of cracks over 1/16” wide
- stucco should be free of losses or blistered or bulged areas that appear to be ready to detach; imminent losses are often detectable by a hollow sound when sounded with the knuckles or a rubber mallet; metal hammers or tools should never be used to sound stucco
- stucco should not show signs of moisture infiltration (which can be detected by areas of stucco that remain damp), biological growth, vegetation growing in or on the stucco layer, efflorescence, or discoloration
- stucco should be free of incompatible patching materials that do not match in color, material, strength, or texture
- any lath made visible due to deteriorated or lost areas of stucco should be free from corrosion

PAINT CONDITION

- paint should be intact and free of cracking, flaking, blistering, worn areas, and peeling; note that failed paint does not always mean the stucco beneath has deteriorated and should be checked separately
- paint should not be chalky
- patches should be painted “corner to corner” of an element so they blend better with the surrounding material

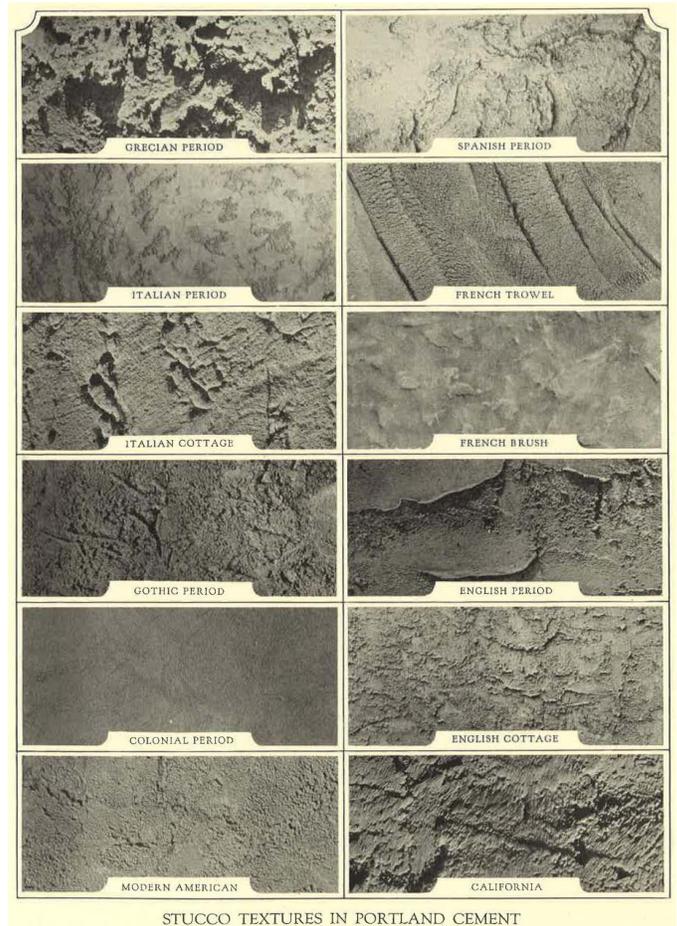
SEALANT CONDITION

- stucco surfaces are often divided into sections by expansion joints; caulking and sealants used in joints should be intact, flexible, and not cracked or powdering

Maintenance

Maintenance of stucco involves making sure the surface is intact and excessive moisture that could be damaging is controlled. Regular maintenance of stucco includes:

- repair minor cracks and losses with suitable stucco patching material that matches the original in stucco system type (two-coat or three-coat system) color, material, strength, and surface texture; patches should be applied to sound lath; if original stucco was scored



Examples of stucco finish textures, 1926. Image courtesy of Milwaukee Corrugating Company and Association for Preservation Technology Building Technology Heritage Library.

to resemble stone, the pattern should be replicated in the patched area; patched areas should be repainted from “corner to corner” of an element to avoid accentuating the patched area—for example if a stuccoed chimney is patched, the paint should extend from the roofline to the top of the chimney and from side to side; stucco should never be patched or covered with EIFS or similar stucco veneer systems, as these can damage historic walls

- any areas of moisture infiltration should be investigated and addressed immediately (also see Landscape and Irrigation and Drainage sections); stucco should never be coated with waterproof coatings or water-repellents, as this can trap water within the stucco layers
- clean stucco only when necessary to remove excessive soiling and biological growth that could retain moisture and harm the stucco surface; cleaning can be done by rinsing with low-pressure water from a garden hose with spray attachment, mild non-ionic and pH-neutral detergent, and soft nylon or natural bristle brushes; metal brushes, harsh chemical cleaners, muriatic or other acids, and abrasive or high-pressure blasting should never be used
- repaint if paint has become deteriorated, taking care to scrape old paint down to sound material and any repairs made to the stucco prior to repainting; paint type should match the existing paint in color, type (i.e., acrylic, mineral paint, etc.), and sheen; refer to completion reports for the correct paint type, and keep paint can lids and swatches for matching in



Cracked stucco with impending loss



Cracking and loss of stucco on masonry backup wall

the future; paint should be compatible with stucco and previous paint layers, and allow for water vapor permeability; not all paints are compatible with stucco

- re-caulk or reseal deteriorated expansion joints

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of historic stucco. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

National Park Service, *Preservation Brief #2: The Preservation and Repair of Historic Stucco*:

<https://www.nps.gov/tps/how-to-preserve/briefs/22-stucco.htm>

Experienced Finishes Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

CALL AN EXPERT

- When extensive moisture damage indicates a problem that is not easily identified or cannot be solved by redirecting sprinklers, or other simple measures
- When the composition of the historic stucco is not known and testing is required
- When cracks are deep or appear to indicate structural problems with the building
- When large areas of stucco must be repaired or replaced, or if lath has deteriorated and requires replacement
- When staff is inexperienced with stucco repair
- When repairs require disturbing hazardous materials, such as lead paint or asbestos
- When repairs to other building elements, such as windows, requires stucco to be disturbed
- Possible experts may include: a finishes contractor, who can help with repairs that staff cannot undertake themselves; a preservation architect when problems indicate a more serious issue; or the THC when changes are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When replacing stucco is proposed for State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance

Stucco Checklist

This checklist is used to individually assess the stucco. It should be duplicated and completed for each inspection and retained for future reference. Use a new checklist at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. Elevation drawings of the building can be used to identify where the stucco is located. See your architectural plans or elevations for this information.

INSPECTION DATE:

REFERENCE PHOTOS OF STUCCO:

INSPECTOR:

WEATHER CONDITIONS:

STUCCO CONDITION:

Free of cracks measuring over 1/16”

Free of losses or blistered or bulged areas that appear to be ready to detach

INSERT PHOTO

INSERT PHOTO

Free of signs of moisture infiltration

Free of incompatible patching materials that do not match in color, material, strength, or texture

Lath made visible due to deteriorated or lost areas is free of corrosion

PAINT CONDITION:

Intact and free of cracking, flaking, blistering, worn areas, and peeling

Paint is not chalky

Patches are painted “corner to corner” of an element

SEALANT CONDITION:

Caulking and sealants used in joints are intact, flexible, and not cracked or powdering

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

MAINTENANCE OR REPAIRS COMPLETED BY:

MAINTENANCE INTERVAL: EVERY 5 YEARS

Why Maintain?

Historic wood windows are present at many historic Texas courthouses. These windows are almost always a character-defining feature of the building and contribute to its weather tightness, daylighting, and environmental comfort. Maintenance of windows—including the paint, wood, glass, and seals such as wood stops and putty—keeps them in good condition for many years. Wood windows made from old-growth wood like cypress has the potential to last hundreds of years with proper maintenance. Wood of equal quality to old-growth wood is no longer available, so historic wood should always be retained when possible. Windows that are well-maintained will also save money by reducing energy consumption and the need for wholesale replacement of window units.

Assessing Conditions

Wood windows should be assessed every five years, at which time repainting is typically required. More frequent periodic walk-throughs of the building may identify repairs that require immediate attention, such as broken glass or water infiltration. Assessing wood windows involves checking the interior and exterior of the windows to make sure they are operating properly and that each element is in good repair. Especially vulnerable parts of windows include the putty and the underside of the bottom rail of the bottom sash, where water can collect between the sill and the rail, and the bottom of the exterior frames and moldings. Each window should be assessed individually and will involve close inspection of each window frame and sill, inside and out. Often a lift or ladder will be needed. Things to check during the assessment include:

OPERABILITY

- windows should operate smoothly without forcing them up or down, and they should stay open without propping
- sash cords should not be broken or frayed
- there should be no gaps between the windows and jambs or headers, and windows should be level and square

HARDWARE

- hardware should be in working condition and free of corrosion

GLASS CONDITION

- glass (glazing) should not be cracked or loose in the muntin

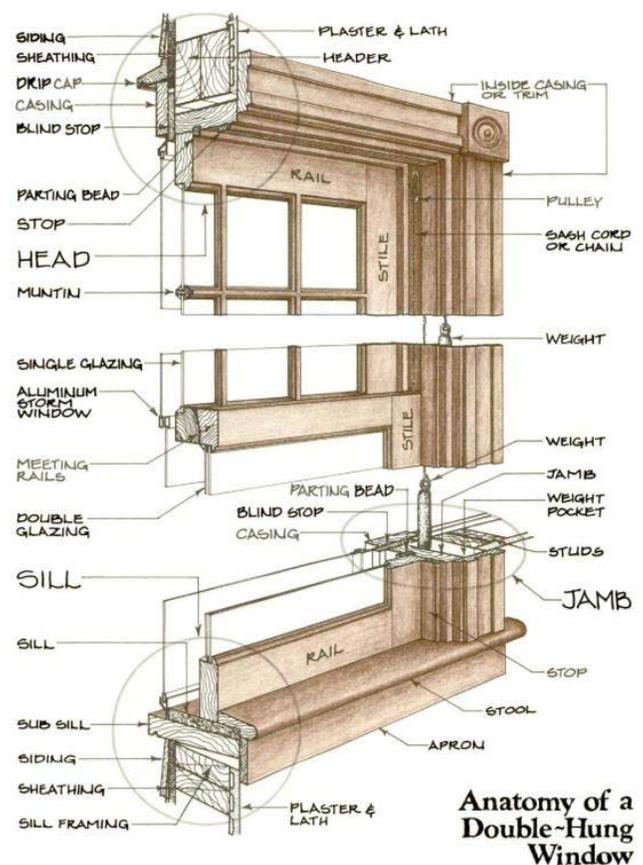


Diagram of the parts of a historic double hung wood window. Image courtesy of *Old House Journal*. Used with permission.

WOOD CONDITION

- casing and trim should be firmly attached and checked for signs of deterioration
- paint should be intact and free of flaking, blistering, or “alligatoring,” where the paint cracks and splits from the wood substrate; note that failed paint does



Deteriorated bottom rail and putty

not always mean the wood beneath has deteriorated and should be checked separately from the paint

- wood elements—including sills, stops, mullions, muntins, stiles, and rails, as well as wood casing and trim—should be intact, tightly attached and joined, and not be split, spongy, or soft; checking for soft wood can be done with a sharp awl or icepick; be sure to check the underside of the bottom rail
- check for water infiltration and proper drainage, biological growth (mold, mildew, etc.), and insect infestation

SEALS AND PUTTY

- glazing putty applied to seal the glass to the frame or muntin should be intact and painted, with no cracks or missing areas
- caulking where the window openings and frames join should be intact, flexible, and not cracked or powdering
- weatherstripping should be intact, securely attached, and have no bends or tears

Maintenance

Historic windows were designed with joined elements that could be maintained rather than replaced, and this maintenance is key to a properly performing window. Replacing an entire window is usually not necessary, and most components can be repaired or selective portions replaced. Regular maintenance of windows includes:

- adjust sashes that do not operate smoothly, and lubricate wooden sash runs and tracks using solid sash wax made from paraffin or beeswax

- repair or replace components that are deteriorated with in-kind materials and products such as wood consolidants
- replace detached or deteriorated weatherstripping
- replace deteriorated caulking where window openings and frames join
- replace broken glass with matching material; note that hairline cracks, especially in historic glass, may not require replacement and may be able to be repaired with specialty glues
- re-caulk joints, taking care to make sure sashes remain operational
- replace and paint cracked or loose glazing putty, taking care to protect glass
- regularly repaint windows, taking care to remove excess paint build-up, particularly at jambs, to help windows operate more smoothly; when painting, protect edges of stiles or sashes at jambs, sash cords, pulleys, or weights, or any moving part of the window from overpaint or splashes, and never paint these elements; paint type should match the existing paint in color, type (i.e., acrylic, oil, etc.), and sheen; refer to completion reports for the correct paint type and keep paint can lids and swatches for matching in the future



Paint and wood deterioration at the sill and stool of a historic window

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of historic wood windows. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

General Services Administration, *Technical Documents for Windows*:

<https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents#Doors%20and%20Windows>

National Park Service, *Preservation Brief #9: The Repair of Historic Wooden Windows*:

<https://www.nps.gov/tps/how-to-preserve/briefs/9-wooden-windows.htm>

National Park Service, *Preservation Brief #10: Exterior Paint Problems on Historic Woodwork*:

<https://www.nps.gov/tps/how-to-preserve/briefs/10-paint-problems.htm>

Experienced Window Repair Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:



Biological growth, paint deterioration, and wood rot at an interior jamb and casing checked with an awl

CALL AN EXPERT

- When extensive moisture damage indicates a problem beyond the windows themselves
- When staff is inexperienced with window repair
- When paint or putty removal requires disturbing hazardous materials such as lead paint or asbestos
- When a repair requires a window to be removed
- Possible experts may include: a window contractor, who can help with repairs that staff cannot undertake themselves; a preservation architect when problems indicate a more serious issue; or the THC when changes to the windows are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When replacing one or more windows is proposed for State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance

THIS PAGE INTENTIONALLY LEFT BLANK

Wood Window Checklist

This checklist is used to individually assess the windows. It should be duplicated and completed for each window and retained for future reference. Use a new checklist for each window at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection and each window.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. A Window Identification Number should be assigned to each individual window and remain the same for each inspection. Elevation drawings of the building can be used to identify each Window ID. Typically, the floor number is followed by the window number (e.g. 1–105). See your architectural plans or elevations for this information.

WINDOW ID:

REFERENCE PHOTOS OF WINDOW:

INSPECTION DATE:

INSPECTOR:

WEATHER CONDITIONS:

OPERABILITY:

- Windows open and close
- Windows stay open
- Windows lock
- Windows are square and have no gap between them and the jamb
- Sash cords or springs are intact and in good condition

INSERT INTERIOR PHOTO

INSERT EXTERIOR PHOTO

WOOD CONDITION:

- Paint is intact and without blisters, flaking, or cracks
- Wood has no checks, soft spots, or missing parts
- Water drains away from window
- No evidence of mold, mildew, or other biological growth
- No evidence of insect infestation
- Joints are tight

HARDWARE:

- All hardware is present
- All hardware is operable
- Hardware is free of corrosion

SEALS AND PUTTY:

- Sealants are intact and flexible
- Weatherstripping is intact
- Putty is intact and painted
- Wood stops are intact

GLASS CONDITION:

- No breaks or cracks
- Glass is secure in the frame

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

WINDOW ID:

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

MAINTENANCE OR REPAIRS COMPLETED BY:

MAINTENANCE INTERVAL: EVERY 5 YEARS

Why Maintain?

Metal windows gained popularity beginning in the 1890s, with the desire for “fireproof” construction and the wide availability of rolled steel. Steel and other metal windows are character-defining features of several architectural styles such as Art Deco, and many historic Texas courthouses feature these distinctive windows. Maintenance of metal windows—including the paint, steel sections and hardware, glass, and seals—keeps them in good condition for many years. Windows that are well-maintained will save money by reducing energy consumption and by reducing the need for wholesale replacement of window units.

Assessing Conditions

Metal windows should be assessed every five years, at which time some adjustments, repainting, and corrosion removal may be required. Casual walk-throughs of the building may identify repairs that require immediate attention, such as broken glass or water infiltration. Assessing metal windows involves checking the interior and exterior of the windows to make sure they are operating properly and that each element is in good repair. Especially vulnerable parts of windows include the putty and the bottom of the frame, and the underside of the bottom rail where water can collect. Steel window frames may be set into masonry walls, and any joints between the frame and walls is also a vulnerable location where water infiltration can cause deterioration of both elements. Each window should be assessed individually and will involve close inspection of each window frame and sill, inside and out. Often a lift or ladder will be needed. Things to check during the assessment include:

OPERABILITY

- windows should operate smoothly without forcing them open or closed, and they should stay open without propping
- there should be no gaps between the windows and jambs or headers, and windows should be level and square
- hinges and stays should be clean and well-lubricated

HARDWARE

- all hardware, bolts, screws, and hinges should be present, in working condition, and free of corrosion

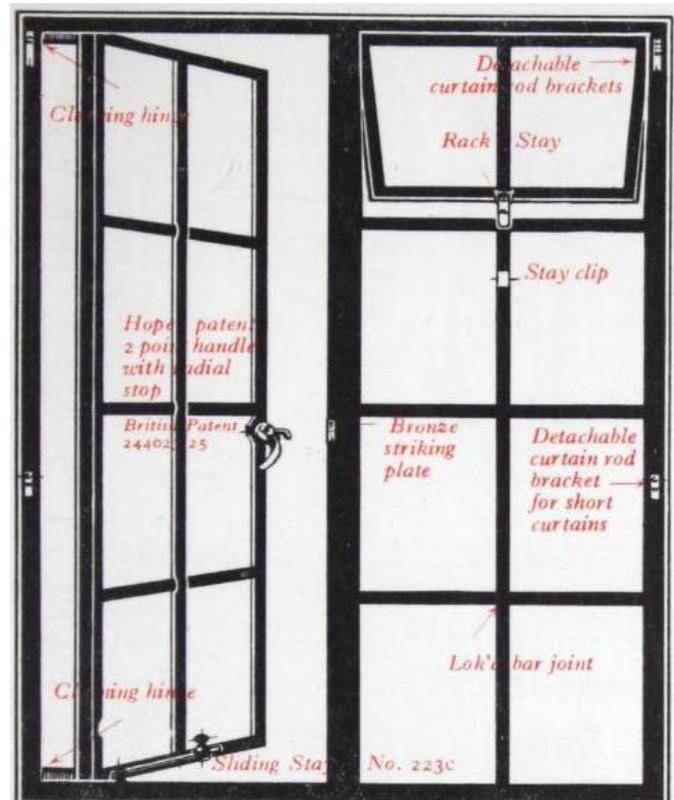


Diagram of a steel window, 1926. Image courtesy of Henry Hope & Sons and Association for Preservation Technology Building Technology Heritage Library.

GLASS CONDITION

- glass (glazing) should not be cracked or loose in the muntin

METAL CONDITION

- casing and trim should be firmly attached and checked for signs of deterioration



Flaking paint and failing sealant at metal window, San Augustine Courthouse

- paint should be intact and free of flaking and blistering; blistered paint can be a sign of corroded metal beneath
- metal elements—including sills, mullions, muntins, stiles, and rails as well as the sub-frame and trim—should be intact, tightly attached and joined, and have no signs of corrosion or soft areas of metal; checking for soft areas can be done with a sharp awl or icepick; be sure to check the underside of the bottom rail
- check for water infiltration and proper drainage
- metal sections should not be bowed or misaligned

SEALS AND PUTTY

- glazing putty applied to seal the glass to the frame or muntin should be intact and painted with no cracks or missing areas
- caulking or sealant around frame should be intact, flexible, and not cracked or powdering

- weather stripping, if present, should be intact and performing

Maintenance

Historic windows were designed to be maintained, and this maintenance is key to a properly performing window. Replacing an entire window is usually not necessary, and most components can be repaired or selective portions replaced. Regular maintenance of metal windows includes:

- adjust sashes that do not operate smoothly, and clean and lubricate hinges and stays with anti-corrosive lubricant appropriate for metal
- replace any missing hardware, bolts, screws, and hinges with matching element
- replace broken glass with matching material; note that hairline cracks, especially in historic glass, may not require replacement and may be able to be repaired with specialty glues



Surveying windows with an aerial lift



Flaking paint and corroded steel windows, Rusk County Courthouse

- regularly repaint windows, taking care to reduce excess paint build-up, particularly at jambs if interfering with window operability; when painting, protect any moving part that is not intended to be painted, as well as surrounding masonry from overpaint or splashes, and never paint these elements; anti-corrosive, direct-to-metal primer and paint, such as alkyd paint, should be used for repainting; all paints should be appropriate for metal and compatible with any existing paint coatings in color, type (i.e., alkyd, epoxy, etc.), and sheen; refer to completion reports for the correct paint type, and keep paint can lids and swatches for matching in the future
- re-caulk masonry surrounds with sealant appropriate to both the metal frame and the masonry
- replace and paint cracked or loose glazing putty with putty formulated for steel, taking care to protect glass and taking care to retain and reuse clips, glazing beads, and other fasteners
- replace deteriorated weather stripping and/or caulking to reduce air infiltration
- if minor corrosion is present, remove rust and any loose paint down to bare metal by using manual abrasion of the surface or appropriate rust-converting chemicals according to the manufacturer's instructions, taking care to protect surrounding masonry or other building elements; fill any small holes or uneven areas resulting from removed corrosion with metal-based epoxy patching material according to manufacturer's instructions; bare metal should be cleaned and immediately primed and painted as noted below

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of historic metal windows. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

General Services Administration, *Technical Documents for Windows*:

<https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents#Doors%20and%20Windows>

National Park Service, *Preservation Brief #13: The Repair and Thermal Upgrading of Historic Steel Windows*:

<https://www.nps.gov/tps/how-to-preserve/briefs/13-steel-windows.htm>

Experienced Window Repair Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

CALL AN EXPERT

- When extensive moisture damage indicates a problem beyond the windows themselves
- When staff is inexperienced with metal window repair
- When paint or putty removal requires disturbing hazardous materials such as lead paint or asbestos
- When a repair requires a window to be removed
- When corrosion is excessive, requiring replacement of a section of the metal or replacement of an entire window unit
- When there is deterioration of the subframe requiring the masonry surround to be disturbed
- When the window is bowed or bent
- When paint removal required is too extensive for manual means or spot chemical treatment, and requires sandblasting chemical dipping, or other methods
- Possible experts may include: a window contractor, who can help with repairs that staff cannot undertake themselves; a preservation architect when problems indicate a more serious issue; or the THC when changes to the windows are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When replacing one or more windows is proposed for State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance

Metal Window Checklist

This checklist is used to individually assess metal windows. It should be duplicated and completed for each window and retained for future reference. Use a new checklist for each window at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection and each window.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. A Window Identification Number should be assigned to each individual window and remain the same for each inspection. Elevation drawings of the building can be used to identify each Window ID. Typically the floor number is followed by the window number (e.g. 1–105). See your architectural plans or elevations for this information.

WINDOW ID:

REFERENCE PHOTOS OF STEEL WINDOW:

INSPECTION DATE:

INSPECTOR:

WEATHER CONDITIONS:

OPERABILITY:

Windows open and close

Windows stay open

Windows lock

Windows are square and have no gap between them and the jamb

Hinges and stays are clean and well-lubricated

HARDWARE:

All hardware is present

All hardware is operable

Hardware is free of corrosion

GLASS CONDITION:

No breaks or cracks

Glass is secure in the muntin

INSERT INTERIOR PHOTO

INSERT EXTERIOR PHOTO

METAL CONDITION:

Casing and trim are firmly attached

Casing and trim are free of signs of deterioration

Paint is intact and free of flaking and blistering

All metal elements are intact, tightly joined

Free of signs of corrosion or soft areas of metal

Free of signs of water infiltration

Metal sections are not bowed or misaligned

SEALS AND PUTTY:

Putty is intact and painted, with no cracks

Caulking or sealant around frame is intact, flexible, and not cracked or powdering

Weather stripping, if present, is intact and performing

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

WINDOW ID:

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

MAINTENANCE OR REPAIRS COMPLETED BY:

16 LEADED AND STAINED GLASS

MAINTENANCE INTERVAL: EVERY 5 YEARS

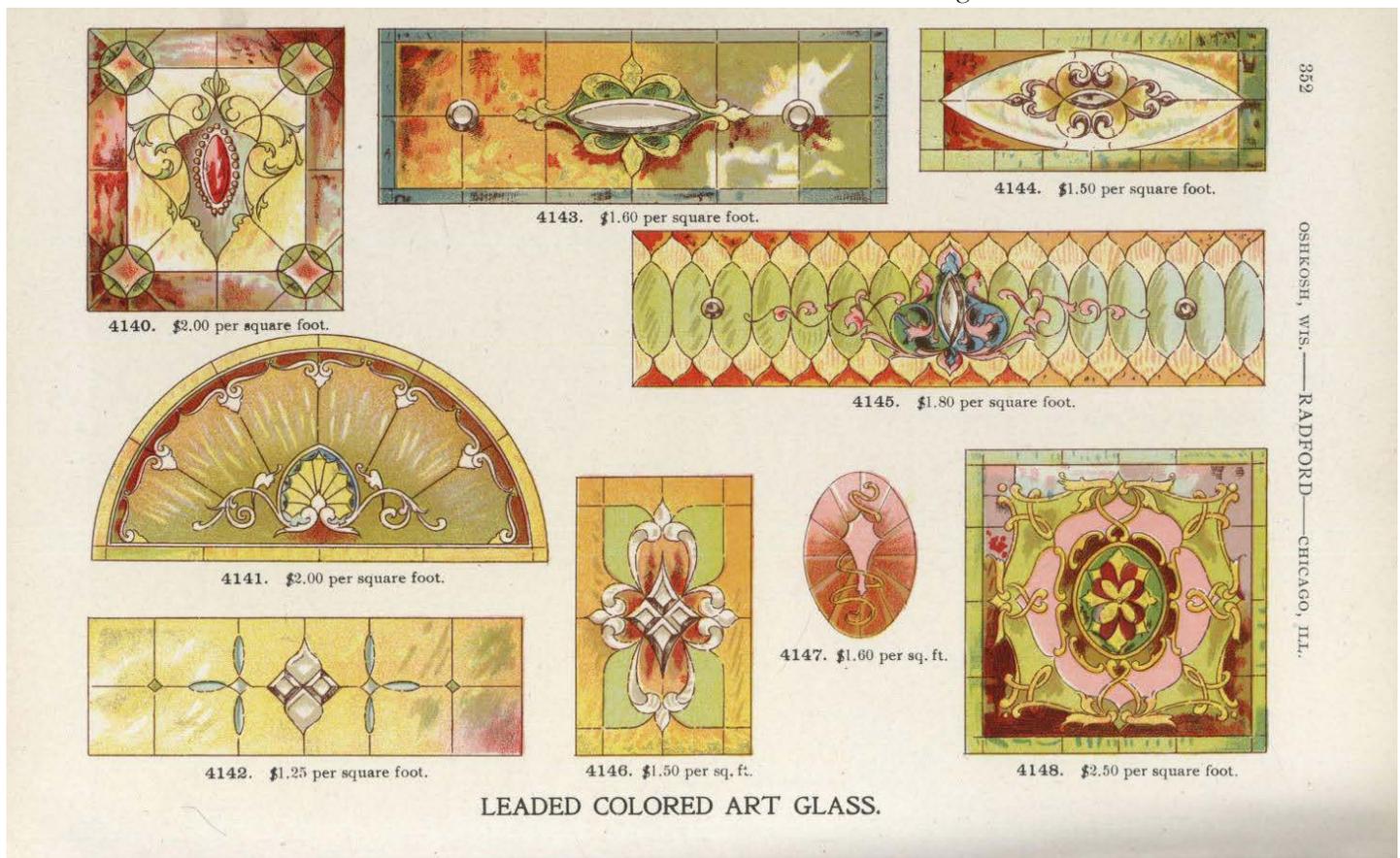
Why Maintain?

Leaded and stained glass became popular in the U.S. beginning in the 1850s, with its peak of use occurring from 1870 to 1930. Victorian period, Art Nouveau, and Neoclassical styles, among others, made use of the technique of using small pieces of clear, colored and fired, or painted glass held in intricate patterns by lead, zinc, brass, or copper strips called comes and reinforced with metal bars. Leaded and stained glass are present at many historic Texas courthouses, and some feature stained or leaded glass domes. These windows are always a character-defining feature of the building. While their repair requires the expertise of specialists, regular inspection and maintenance of frames and surrounding materials can help keep them in good condition.

Assessing Conditions

Stained and leaded glass windows and domes should be assessed every five years to monitor any changes in their condition. Often maintenance, such as repainting the frames containing the windows, may be required. Casual walk-throughs of the building may identify conditions that

require immediate attention, such as broken glass, sudden bowing of the glass, or cracked solder joints. Assessing stained and leaded glass windows involves checking the interior and exterior of the windows to make sure they are operating properly (if they are operable) and that each element is in good repair. Especially vulnerable parts of stained and leaded glass windows and domes include the



Leaded glass available through catalogs, 1904. Image courtesy of Radford and Association for Preservation Technology Building Technology Heritage Library.

glass, the comes (also called leading), reinforcing bars, and the interior and exterior of frames and moldings. Windows covered with protective panels of glass or Plexiglas are also vulnerable to condensation from trapped moisture. Each window should be assessed individually and will involve close inspection of each window, inside and out. Often a lift or ladder will be needed. Stained and leaded glass windows that are mounted within wood or steel frames or within cast stone or terra cotta frames may also be assessed using the assessment procedures for those materials (see Wood Windows, Steel Windows, Stone and Cast Stone, or Terra Cotta section), but the glass and comes should be assessed as follows. Things to check during the assessment include:

GLASS CONDITION

- glass (glazing) should not be cracked
- all glass pieces should be present
- if glass is painted, paint should be intact and not flaking or bubbled
- glass should not be scratched or etched
- glass panel should not be loose in the frame or rattle in the wind
- glass panel should not bow or sag
- glass protected with glass or Plexiglas panels should be well vented and be free of condensation
- glass should not have excessive dirt that obscures the light coming through the window
- water should not leak between the glass panel and the frame



Stained glass dome, Harris County Courthouse; image courtesy of N. Baker

LEADING/REINFORCEMENT CONDITION

- lead comes should not be bent, deformed, or cracked
- reinforcing bars and tie wires should be free of cracks and corrosion
- soldered joints should be intact and free of cracks



Back of stained glass panels and dome structure, Harrison County Courthouse

Maintenance

Like other parts of the building and site, stained and leaded glass windows and domes should be part of the regular inspection and maintenance routine. Regular maintenance of these elements includes:

- protective glazing and screens should be cleaned and ventilation ports kept free of dirt and debris
- clear and unpainted leaded or stained glass pieces can be lightly cleaned with damp (not wet) cotton swabs and deionized water; abrasives and chemical cleaners such as ammonia should never be used, and all cleaning should be done at close range without extension poles or other tools that could accidentally bump or tap the glass panel
- leaded and stained glass should be protected from damage during work on other building components, including exterior cleaning and repainting
- discourage people from creating “rubblings” of stained and leaded glass unless it is part of a repair effort by professional conservators, as this could damage the glass panel or cause glass to crack
- maintain paint coatings of frames; prior to priming and painting with an appropriate paint coating

system, the frames should be scraped of flaking paint and treated for any deterioration (see applicable section of this handbook for the frame material)

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of historic stained and leaded glass. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

National Park Service, *Preservation Brief #28: Painting Historic Interiors:*

<https://www.nps.gov/tps/how-to-preserve/briefs/28-painting-interiors.htm>

National Park Service, *Preservation Brief #33: The Preservation and Repair of Historic Stained and Leaded Glass:*

<https://www.nps.gov/tps/how-to-preserve/briefs/33-stained-leaded-glass.htm>

Experienced Stained Glass Conservator familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

CALL AN EXPERT

- When stained and leaded glass require work beyond simple swabbing with water on cotton swabs
- When staff is inexperienced with maintenance of stained or leaded glass
- When paint removal on frames requires disturbing lead paint
- When the installation of protective panels is proposed
- Possible experts may include: a stained glass conservator who can help with cleaning and repairs that staff cannot undertake themselves; a preservation architect when problems indicate a more serious issue; or the THC when changes are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When removal of stained or leaded glass windows for repair is proposed for State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance
- For proposed installation of protective panels



Stained glass dome, Cameron County Courthouse

THIS PAGE INTENTIONALLY LEFT BLANK

Leaded and Stained Glass Checklist

This checklist is used to individually assess leaded and stained glass. It should be duplicated and completed for each glass panel and retained for future reference. Use a new checklist for each window at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection and each glass panel.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. A Window Identification Number should be assigned to each individual window and remain the same for each inspection. Elevation drawings of the building can be used to identify each Window ID. Typically the floor number is followed by the window number (e.g. 1–105). See your architectural plans or elevations for this information.

WINDOW ID:

LEADING/REINFORCEMENT CONDITION
(CONTINUED):

INSPECTION DATE:

Reinforcing bars and tie wires are free of cracks and corrosion

INSPECTOR:

Soldered joints are intact and free of cracks

WEATHER CONDITIONS:

REFERENCE PHOTOS OF LEADED GLASS:

GLASS CONDITION:

Glass (glazing) is not cracked

All glass pieces are present

If glass is painted, paint is intact and not flaking or bubbled

Is not scratched or etched

Panel is not loose in the frame and does not rattle in the wind

INSERT PHOTO

INSERT PHOTO

Panel does not bow or sag

Glass protected with glass or Plexiglas panels are well-vented and free of condensation

Free of excessive dirt that obscures the light coming through the window

Water does not leak between the glass panel and the frame

LEADING/REINFORCEMENT CONDITION:

Is not bent or cracked

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

WINDOW ID:

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

MAINTENANCE OR REPAIRS COMPLETED BY:

17 EXTERIOR DOORS, GRILLES, AND SCREENS

MAINTENANCE INTERVAL: EVERY 5 YEARS

Why Maintain?

Historic exterior doors, grilles, and screens are present at many historic Texas courthouses. These doors, grilles, and screens may be character-defining features if they are at one of the primary entrances of the building and contribute to its appearance, as well as weather tightness and environmental comfort. Maintenance of doors, grilles, and screens—including the paint or other finish, wood or metal, glass, operable parts, and seals such as astragals and sweeps—keeps them in good condition for many years in spite of heavy use. Doors that are well-maintained will save money by reducing energy consumption and by reducing the need for replacement of historic doors with modern units.

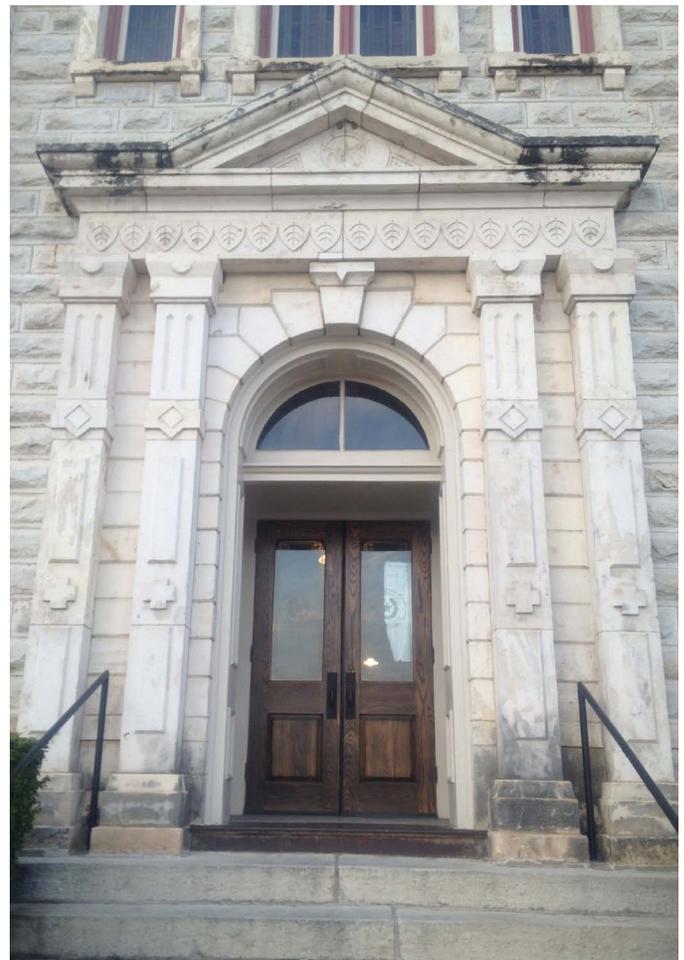
Assessing Conditions

Exterior doors, grilles, and screens should be assessed every five years, at which time some repairs are typically required. Casual walk-throughs of the building may identify problems that require immediate attention, such as loose or broken hardware, sticking or dragging doors, or water infiltration at the threshold.

Assessment involves checking the interior and exterior sides of the doors to make sure they are operating properly and that each element is in good repair. Each type of material (wood, bronze, aluminum, steel, etc.) will have its own needs, but especially vulnerable parts include the operable elements like hinges and pulls, and where water can enter at the threshold of a door. Sidelights should be assessed at the same time. Each exterior door, grille, or screen should be assessed individually and will involve close inspection of each frame, panel, and all hardware, inside and out. A ladder or lift may be needed. For that reason, grilles and screens above the ground floor may need to be assessed at the same time as windows. Things to check during the assessment include:

OPERABILITY

- doors and operable grilles or screens should operate smoothly without forcing them open or closed, and they should stay closed if door closers are present
- door closer is in good repair, if applicable
- doors, grilles, or screens should be level and not bind or drag
- there should be no gaps between the frame and surround



Wood doors at the Weatherford County Courthouse

HARDWARE

- hardware should be present, in working condition, and free of corrosion



Corrosion of steel door frame and door closer attachment

GLASS CONDITION

- glass (glazing) should not be cracked or loose in the muntin

DOOR, GRILLE, OR SCREEN CONDITION

- door, grille, or screen should not be warped or bowed
- casing and trim should be firmly attached and checked for signs of deterioration
- finish should be intact and free of flaking, blistering, or “alligating,” where the finish cracks and splits from the substrate; note that failed paint does not always mean the substrate beneath has deteriorated and should be checked separately
- metal patinas should be intact; note that some patinas intentionally have a dull or “weathered” appearance that can be damaged through attempts to shine or otherwise alter them
- all elements including sills, stops, astragal, casing, and trim should be intact, tightly attached and joined, and have no signs of deterioration such as rot (for wood) or corrosion (for metal); soft areas and rot can be checked with a sharp awl or icepick; be sure to check the underside of the door or screen where it meets the threshold or sill by opening the door (a small mirror may be required)
- check for water infiltration and proper drainage so that water cannot collect at the base
- kick plates of doors and screen or grill panels are free of corrosion and are attached, without significant dents, scratches, cracks, or other deterioration

SEALS AND PUTTY

- if applicable, glazing putty applied to seal the glass to the frame or muntin should be intact and painted, with no cracks or missing areas
- caulking around frame should be intact, flexible, and not cracked or powdering
- sweeps of doors are intact and well-attached
- weatherstripping of doors is intact and functioning

Maintenance

Historic doors were designed to be maintained, and this maintenance is key to a properly performing door. Replacing an entire door is usually not necessary, and most components can be repaired or selective portions replaced. Regular maintenance of doors includes:

- adjust doors that do not operate smoothly or that drag or bind, taking care to keep doors level; tighten and lubricate hinges and other operable parts as required; never trim or plane wood doors when adjustments can be made
- repair or replace components that are deteriorated with in-kind materials; for deteriorated wood,



Bronze door and door surround, San Augustine County Courthouse

products such as wood consolidants may be appropriate

- replace deteriorated weather stripping and/or caulking to reduce air infiltration
- replace broken glass with matching material; note that hairline cracks, especially in historic glass, may not require replacement and may be able to be repaired with specialty glues
- repair bows or warps in door by securing loose jamb to frame, or by freeing the door from the casing and realigning it
- tighten any loose elements and replace missing or damaged screws, clips, etc. as needed with in-kind material
- replace sealant around frames at masonry openings
- replace and paint cracked or loose glazing putty, taking care to protect glass
- regularly refinish painted or varnished elements with matching finish appropriate for the substrate, taking care to remove old coating build-up, particularly at jambs; when painting or refinishing, protect edges of any moving part of the door and adjacent materials from overpaint or splashes and never coat these elements; if doors are metal, remove any corrosion prior to painting or coating; if doors are wood, treat any moisture damage or rot with consolidant or dutchman repairs prior to painting or refinishing; finish type should match the existing in color, transparency, type (i.e., oil-based, water-based, etc.), and sheen; refer to completion reports for the correct finish type, and keep can lids and swatches for matching in the future



Deteriorated sweep, failed sealant, and corroded metal at the bottom of a bronze door



Deterioration of sealant at door frame; also note inappropriate fastener attached to frame and wall opening

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of historic doors. Refer to these resources if conditions observed do not appear in these assessment and maintenance recommendations.

National Park Service, *Preservation Brief #28: Painting Historic Interiors*:

<https://www.nps.gov/tps/how-to-preserve/briefs/28-painting-interiors.htm>

General Services Administration, *Technical Documents for Doors*:

<https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents#Doors%20and%20Windows>

Experienced Door Repair Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

CALL AN EXPERT

- When extensive moisture damage indicates a problem beyond the doors themselves
- When staff is inexperienced with door repair
- When paint or sealant removal requires disturbing hazardous materials such as lead paint or asbestos
- When a repair requires a door frame to be removed
- When door hardware must be replaced, which could effect accessibility, building code, and life safety code compliance
- Possible experts may include: a door contractor, who can help with repairs that staff cannot undertake themselves; a finishes expert or conservator; a preservation architect when problems indicate a more serious issue; or the THC when changes to the doors, grilles, or screens are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When replacing one or more doors is proposed for State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance

17 EXTERIOR DOORS, GRILLES, AND SCREENS

Exterior Doors Checklist

This checklist is used to individually assess the doors, grilles, and screens. It should be duplicated and completed for each door, grille, and screen and retained for future reference. Use a new checklist for each door, grille, or screen at every annual inspection. (If completing by hand, make a copy of the front and back of this form prior to using it and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection and each door, grille, or screen.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. A Door Identification Number should be assigned to each individual door, grille, or screen and remain the same for each inspection. Elevation drawings of the building can be used to identify each Door ID. See your architectural plans or elevations for this information.

DOOR ID:

INSPECTION DATE:

INSPECTOR:

WEATHER CONDITIONS:

OPERABILITY:

Operates smoothly without forcing and stays closed

Door closer is in good repair

Level and does not bind or drag

No gaps between the frame and surround

HARDWARE:

All hardware is present

All hardware is operable

Hardware is free of corrosion

GLASS CONDITION:

No breaks or cracks

Glass is secure in the frame

DOOR CONDITION:

Free of warping or bowing

Casing and trim is firmly attached

Casing and trim free of deterioration

Finish is intact and free of flaking, blistering, or “alligatoring,” where the finish cracks and splits from the substrate

Patinas are intact and unaltered

Sills, stops, astragal, casing, and trim are intact and tightly attached and joined

Sills, stops, astragal, casing, and trim have no signs of deterioration such as rot (for wood) or corrosion (for metal)

Water does not collect at the base

Kick plates and panels are free of corrosion

Kick plates and panels are firmly attached

Kick plates and panels are free of dents, scratches, cracks, or other deterioration

SEALS AND PUTTY:

Sealants are intact and flexible

Putty is intact and painted

Wood stops are intact

Sweeps of doors are intact and well-attached

Weatherstripping of doors is intact and functioning

(form continues on next page)

(form continued from previous page)

REFERENCE PHOTOS OF DOOR:

INSERT INTERIOR PHOTO

INSERT EXTERIOR PHOTO

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

DOOR ID:

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

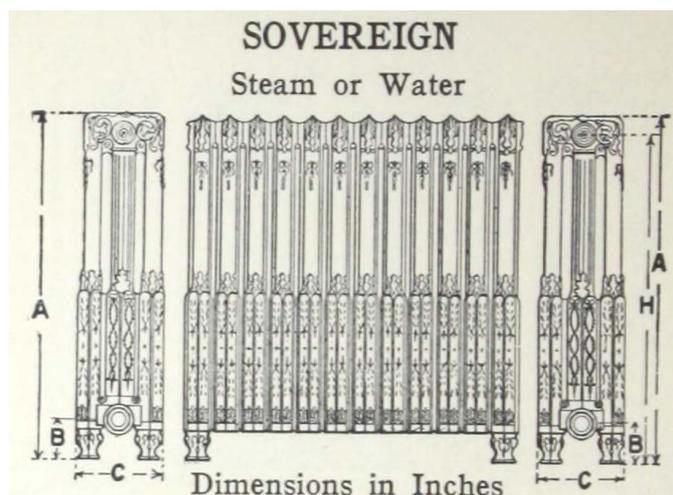
MAINTENANCE OR REPAIRS COMPLETED BY:

THIS PAGE INTENTIONALLY LEFT BLANK

Why Maintain?

Operations and maintenance of building systems in historic courthouses can be a challenge. This is due to the many unique obstacles faced in each county, such as a low local tax base, building systems that can not be serviced or repaired by local contractors or resources, older building systems that no longer perform as designed, limited staff, and many other factors.

Operations generally consists of the daily operation of equipment and systems, identification of system deficiencies either by occupants or by operations staff, scheduling the repair or replacement of components, scheduling of down time for systems required for repair or replacement, and other activities.



Radiator, 1907. Image courtesy of H.B. Smith Co. and Association for Preservation Technology Building Technology Heritage Library.

OPERATIONS AND MAINTENANCE MANUALS

Maintenance is an extension of operations, and includes recurring maintenance of equipment and systems recommended by the manufacturer. Periodic maintenance task lists exist for nearly all manufactured equipment, with recommended scheduled intervals. These are generally made available by manufacturers in Installation or Operation and Maintenance (O&M) Manuals. These manuals should be obtained at project close out after capital projects or significant replacement or upgrade work is performed. For existing facilities, these documents can be obtained through the respective manufacturers, and are often on their websites in digital format that can be printed. They can also be used digitally for those who have computer access or have mobile devices such as smart phones or tablet computers.

SYSTEMS AND EQUIPMENT DOCUMENTATION

Based on the information in the Installation or O&M Manuals, courthouse facilities staff should create a detailed list of the major systems and equipment in the courthouse, as well as a list of spare parts to keep on hand. The systems and equipment list should include the name, nomenclature or designation (tag), manufacturer, model number, serial number, year installed or manufactured, description of general condition, and any other descriptive information beneficial to you and your personnel. The O&M manuals should also include a spare parts list specific to the equipment. This spare parts list is necessary for developing an inventory sheet for items that should be kept on hand, and should include manufacturer, model number, and supplier information. These systems and equipment lists and spare parts lists are critical to a successful operations and maintenance program. This documentation can be developed in any format which works best for the user. If paper copies are the desired format, then create this documentation and place it in labeled three-ring binders with dividers that have tabs to subdivide the information in a manner that works for you and your staff. The systems and equipment lists and spare parts lists created by courthouse maintenance staff could also be created in a computer program such as Microsoft Excel or Word. Customizable lists are also available on the internet. The advantage of using an electronic format is the ability to download these materials to mobile devices so they are readily available to all individuals who need them rather than having to go to a centralized location to pull this information when time is short. It can become a time saver once developed sufficiently. The Cyclical Maintenance Chart included in this handbook in Excel format can be adapted to include the systems and equipment lists and spare parts lists specific to your building.



Vertical fan coil unit

PREVENTIVE MAINTENANCE SOFTWARE

Many counties within metropolitan areas, or those with more significant tax bases, have purchased maintenance software packages that have a multitude of customizable features. These software packages can be somewhat expensive and complex. Many counties who purchase these typically only use the portion of the software that genuinely helps them in this effort. However, there are some less expensive and more basic maintenance software packages that are more affordable, even for smaller, more remote counties, or for those with smaller budgets. Although some free online resources have limited features or functions, they may be valuable for basic maintenance and to get started on proactive maintenance scheduling and planning. The point is that a county should not discount these software packages due to a belief that they are not affordable.

HVAC MAINTENANCE PROGRAM IMPLEMENTATION

Once the system and equipment lists and spare parts lists are made, the second important step is to obtain or develop periodic maintenance task lists and a schedule for each size and type of system. Manufacturers provide generic maintenance task lists that include a brief task description and suggested frequency of when such tasks are recommended to be performed for each separate piece of equipment. Some judgment needs to be exercised in frequency based on availability of staff, age of equipment, and general condition of equipment/systems. When

periodic maintenance task lists and schedules are made, they should include any notes for each piece of equipment to document typical parts, materials, tools needed when performing that maintenance, and how often the maintenance should occur. For example, larger air handling equipment has sheaves and belts that sometimes need to be replaced. In this case it is important to note the size, type, and number of belts required so time is saved when they need to be replaced. Also note any special conditions such as how to get to equipment that is difficult to access. This information becomes institutional memory, so it is necessary to leave a record of these situations for when personnel turnover occurs. Most maintenance software packages include places to add notes that become available to a technician in the field using a mobile device. The Cyclical Maintenance Chart included in this handbook in Excel format provides a basic maintenance task list and schedule that can be adapted to include systems and equipment specific to your building.

Even with scheduled periodic maintenance, things can break down or fail without warning. In some cases breakdowns are obvious and maintenance personnel know immediately. However, when not so obvious, it is beneficial to have a process in place to quickly identify system deficiencies and a plan for how to correct them. This could be as simple as having an Email address or telephone number for building occupants to call when such items are discovered. Often the list of work needing to be performed is more than what staff can immediately respond to. As such, it is essential that some type of work order log system be in place that documents the work requirements and sets priorities. Maintenance lists and schedules, as well as work orders and their priorities are important tools when setting annual budgets.

Properly operated and maintained building systems last longer than the average service life and operate more efficiently. Longer service life results in delayed capital expenditures, and more efficient operation saves annual operating expenses. Longer equipment life and efficiency can help offset the cost and time needed to implement a maintenance program.

Implementing a maintenance program is not quick and easy, so be patient. Do a little here and there until you complete the overall task. Focus on the main systems, more expensive systems, or the ones that require the most frequent attention first. Once these are addressed, move

on to other necessary tasks until all are included in the maintenance schedule. Starting is the most important step.

COMMON HVAC SYSTEMS

Many larger courthouses in Texas have chilled water systems that provide building cooling. Usually, these chilled water systems consist of one or two packaged air-cooled chillers. On many sites, water-cooled chillers are used, which then involve a remote cooling tower system that uses water to reject system heat. When chilled water is used for cooling, gas-fired boilers are routinely used to provide building heating.

For water cooling and heating systems, pumps are used to circulate chilled and heating water to air-handling equipment (generally air handling units and fan coil units). For water-cooled chillers, pumps are used to circulate condenser water from the chiller to the cooling tower. A cooling tower includes one or more fans to help reject the system heat from the water.

Since water is involved with chilled, heating, and condenser water systems, chemical treatment of the water in each independent loop is required. Closed-water loops, chilled, and heating water systems generally require little attention once properly cleaned, flushed, and treated with suitable chemicals at start-up. However, condenser water systems that are open to the atmosphere require a more aggressive schedule to maintain.

Many courthouses also utilize split direct expansion (DX) air conditioning (A/C) units, which involve electric cooling and generally electric heat. These may serve the entire courthouse or may be part of a supplemental cooling system added over time to address use changes or inadequate cooling capacity, which require added cooling or additional cooling zones.

Some courthouses with flat roof areas use packaged rooftop A/C units that may incorporate gas or electric heating. Since these are not used as much in historic courthouses, no further specific discussion on them is included in this handbook.

Fans are used in all courthouses to either supply make-up air to, or exhaust air from, portions of the building. Typically, exhaust fans are used to exhaust toilet rooms and other areas where high heat or odors are generated.

All of these mechanical systems are generally controlled by some type of control system, which can vary from basic thermostats and switches, programmable thermostats, and basic building automation and energy management systems to more advanced automation/control systems. These control systems are generally electric, although some older systems utilize compressed air supply systems that operate thermostats and control actuators on control dampers and valves.

Building heating, ventilating, and air conditioning (HVAC) systems are somewhat unique and different in each courthouse and can be complex. This complexity generally dictates that the maintenance program at each courthouse be tailored to the specific systems and installation that occur at that site and will often require the use of outside maintenance contractors to assist with maintenance.

Maintenance of the HVAC equipment and systems is extremely important, as this impacts the service life, overall system annual energy use, and the ability to properly cool and dehumidify the spaces served. Proper and continuous maintenance helps achieve the longest service life possible and minimize annual energy use, all of which saves money each year and over time.

It is imperative that recurring maintenance be performed on the various elements of each these systems and sub-components. In the long-term, this reduces the capital cost associated with premature replacement of equipment, reduces overall energy consumption over time—which



Split DX A/C unit above ceiling



Rooftop air cooled chiller and A/C condensing units

saves money that can be used for maintenance—and reduces premature and sudden failures of equipment.

WARRANTY DOCUMENTATION

For newer equipment, it is also important to have warranty documentation on hand. The warranty documentation should reflect specific equipment or systems under warranty, the start date of warranty, length of warranty, and what the warranty actually covers such as labor, materials, or both. The warranty normally includes some type of terms and conditions that limit the warranty should proper operation and maintenance not occur. Many warranties also include overlapping warranties. For example, many warranties include full repair or replacement during the first full year, to include all parts and labor. Extended warranties can be obtained for certain types of equipment or for certain components in the equipment. Compressors on air conditioning equipment often include an extended warranty of five years, but generally include parts only after the first year. Similarly, boilers and furnaces have extended warranties of different lengths, though a common term may be 10 years total, but also generally include parts only after the first year. At minimum, the maintenance necessary to maintain the warranty should take place.

THE ROLE OF RELATIVE HUMIDITY

Historic courthouses are precious resources for Texas, and it is important to preserve these structures for the benefit of future generations. Proper operation and

maintenance of the mechanical systems that control the indoor environmental conditions within these structure is paramount to the preservation of these facilities. Indoor environmental parameters that are impacted by these systems include temperature, relative humidity, air filtration, outdoor air ventilation, air circulation, and exhaust of odors and contaminants.

The most critical indoor elements that impact preservation are outdoor air ventilation and indoor relative humidity. In arid climates, indoor relative humidity is less of an issue. However, in significant portions of the state it is an ongoing chore to control relative humidity within an acceptable range, which is generally a maximum of 60 percent relative humidity.

The introduction of relatively humid outside air for ventilation purposes can compound the problem. In mild spring and fall weather, and during humid summer days, this can contribute to increased indoor relative humidity. Air conditioning systems have to operate at a high-enough capacity for a long-enough period to properly dehumidify the air inside the building.

Reducing and minimizing the amount of outside air introduced into the building, attempting to maintain a positive pressure within the building, and adequate cooling concurrent with higher indoor humidity conditions all contribute to minimizing indoor relative humidity. This also helps to eliminate any negative impacts humidity has on building materials, which can swell, buckle, and eventually develop mold or mildew.

In extremely humid areas, it may be necessary to implement a specific direct dehumidification sequence of control on air conditioning equipment, or space dehumidification systems may need to be employed. Relative humidity should be monitored regularly. Relatively inexpensive remote data collection devices have been developed that monitor relative humidity, temperature, and dewpoint and send the data to mobile devices. It can also be measured manually and recorded by hand.

Assessing Conditions

Note that this HVAC section of the handbook does not include a checklist. For building systems there are numerous manufacturers, system types, and components



Boiler located in basement

that could be present in courthouses, and the sheer combination of these factors cannot be easily summarized in a checklist. Instead, general guidelines for assessment and maintenance are provided. Chillers, cooling towers, boilers, pumps, air handling units, DX air conditioning units, and fans all have their own unique schedules for periodic inspection and maintenance. Control systems have little to no recurring periodic maintenance requirements, except for pneumatic control systems. Each of the listed pieces of equipment generally require at least some form of visual inspection and maintenance performed every six months at a minimum.

Before assessing the condition of HVAC system components, the O&M manuals, warranty information, and the latest construction drawings of the building should be obtained and referenced. In addition, the systems and equipment lists, spare parts lists, periodic maintenance task lists, and schedules created by the courthouse maintenance staff or included in the Cyclical Maintenance Chart in this handbook should be referenced and used during the assessment. If preventive maintenance software has been purchased, it should be used during the assessment.

The results of each assessment should be recorded in an assessment log, both when there are items that require repair and when components are found in good condition. It is important to also log operating parameters of major equipment such as chillers and boilers over time to develop a baseline that can be compared to periodically identify significant changes in operation parameters. Changes may indicate potential failure or the need to

perform unscheduled inspections and maintenance. Changes in performance or operating parameters over time can signal impending failure or that maintenance is required to reverse such trends and to maintain desired energy efficiency levels.

The Cyclical Maintenance Chart included in this handbook can be used to record conditions found during the assessment. The chart can be adapted to include systems and equipment specific to your building.

In order to assess and maintain HVAC systems adequately, courthouse maintenance staff should:

- locate installation manuals and O&M manuals
- locate warranty documentation
- locate the latest construction documents for the courthouse
- adapt the Cyclical Maintenance Chart included in this handbook to the systems and equipment in the courthouses or create a paper or digital documentation system that includes: systems and equipment lists, spare parts lists, periodic maintenance task lists, periodic maintenance schedule, work order logs, and assessment log; alternatively, preventive maintenance software can be purchased

CHILLERS

Chillers are larger, complex pieces of equipment that generally require specially trained technicians to perform most, but not all, required maintenance work. It is strongly recommended that an annual service contract be secured for equipment of this type to ensure all proper maintenance is performed.

COOLING TOWERS

Cooling towers are not complex components but are maintenance intensive. Due to evaporation of water causing the cooling effect, these devices require significant make up water, which can lead to fouling of “fill” used inside them and the condensers located in the chillers. This requires monthly inspection and yearly cleaning of the tower cold-water basin at the bottom section, hot-water basin at the top of the tower and polyvinyl chloride (PVC) fill inside the tower. Some cooling towers are winterized, which involves an electric basin heater and a bypass control valve, with actuator and associated

controls. These also require inspection and verification of proper operation. Cooling towers also require an automatic chemical treatment system, which is important for maintaining suitable water chemistry. This is the most intensive item related to maintenance of cooling tower systems. The chemical treatment system should be contracted with a professional chemical treatment firm.

BOILERS

Basic boiler maintenance is generally able to be performed by courthouse maintenance personnel. However, it is recommended to have an annual maintenance check performed by a professional service firm. Suitable gas pressure (either natural or propane), open combustion air pathway, burner function, and flue vent draft all need to be inspected and verified at least annually.

PUMPS

Pumps have the fewest maintenance requirements of the items of equipment encountered, and are generally checked quarterly. Visual inspection of the pump, motor, and seals is required to check for leaks, excessive bearing or motor noise, vibration, and motors operating with excessive heat buildup. These are all signs of impending issues.

AIR HANDLING UNITS

Air handling units are basic insulated cabinets that include one or more fans that are either direct-drive or belt-driven that also house condensate pans and filter sections. This includes any air moving component to include fan coil units and DX air conditioning units. External to chilled and heating water units, there are control valves with electric or pneumatic actuators and control dampers with similar actuators. Control dampers may be used for outside air, return air, relief air, and zone-control dampers where utilized, such as in older multi-zone systems. Each of these components require periodic inspection with emphasis on filters, coils (especially the cooling coil), and the condensate pan, which generally require the most attention.

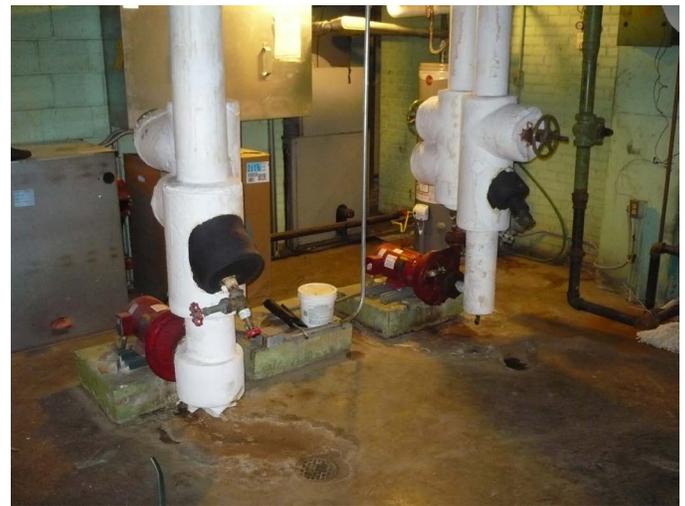
SPLIT DIRECT EXPANSION A/C UNITS

Split direct expansion A/C units involve refrigerant piping and remotely mounted outdoor condensing units

that contain the compressor, condenser coil, fan, and related controls. Both the indoor fan/blower assembly and outdoor condensing unit require at least an annual inspection. Evaporator and condenser coils, condensate pans, and filters are the major items of importance that require the most attention.

FANS

Fans, whether in air handling units, fan coil units, or supply/exhaust fans, all require periodic maintenance, especially where belts are involved.



Chilled heating water distribution pumps

Maintenance

Chillers, cooling towers, boilers, pumps, air handling units, DX air conditioning units, and fans all have their own unique inspection intervals and methods of maintenance, which are generally outlined in manufacturer Installation and start-up manuals or O&M manuals. Many of these manuals are generic for a full product line, so maintenance personnel will have to customize their maintenance plan to be specific to the exact equipment and accessories provided, as described in the “Why Maintain?” section. Otherwise unnecessary work can be performed without any benefit.

CHILLERS

Chiller performance such as recording entering and leaving chilled-water temperatures, coincidental ambient outside air temperature, pressure drop through evaporators, water

shells, and possibly electrical power (volts/amps per phase) are desired operating parameters to be recorded on a daily basis for air-cooled chillers. It is recommended that operating parameters be recorded on a daily basis in the afternoon, the hottest part of the day. Ideally, the parameters are recorded on an hourly basis. However, this is seldom done due to man hour limitations. For water-cooled chillers, also record the entering and leaving condenser water temperatures, condenser pressure drop (entering and leaving pressures), and ambient wet bulb temperature or outdoor relative humidity. If not performed daily, then this should be done at least every few days, but no less than weekly, primarily during the main cooling season between May and October. Once the weather cools off this can be suspended.

For air-cooled chillers, the biggest area of concern is the protection of the condenser coils from physical damage due to hail and the accumulation of lint, dirt, dust, or cottonwood tree filaments. Hail guards are highly recommended. If the condenser fins have been damaged, they need to be raked and straightened, as flattened fins impede condenser air flow, causing the refrigerant temperatures and pressures to rise. This increases energy consumption.

For water cooled chillers, condenser tube bundles should be physically inspected and cleaned on an annual basis or as often as can be performed. Evaporator tube bundles should only be cleaned when the performance of the chiller appears to have degraded over time based on the recorded performance data or when a significant water loss occurs in the system. This results in a significant amount of fresh make-up water being added to the system.

Check operating control panels on chillers monthly for displayed or recorded historical faults, and record any faults. Many control panels have limited memory to retain the history of faults, so it is important to also record the faults in the documentation kept by maintenance staff.

Most other maintenance on chillers should be performed by trained professional service technicians. Courthouse maintenance staff or a service technician should:

- routinely record chiller operating parameters during warm weather seasons to determine a base line and to monitor decreased performance of equipment. When significant-enough deviations occur in performance

parameters, conduct a detailed inspection to determine necessary repairs and correct any problems

- inspect condenser coils on air-cooled chillers semi-annually; clean fins as necessary and straighten any damaged fins
- if no hail guards exist on air-cooled chillers, install whenever possible
- review condenser tube pressure drop recordings on water-cooled chillers, and determine the need to clean the condenser tube; this should be performed once a year in winter or spring
- review chiller control panel faults, and determine whether these indicate a trend that might suggest a long-term problem that needs to be corrected; perform repairs as needed
- operate isolation valves at least once a year
- for air-cooled chillers, have closed chilled water system chemistry tested and recorded; have appropriate chemicals added as required to achieve recommended treatment levels; for water-cooled chillers, the condenser water system chemistry requires monthly testing and adjustment, as well as an automatic chemical feeder system; this treatment program requires an outside professional chemical treatment company to perform this service, but should be monitored by the maintenance staff to ensure this program is successfully administered
- have a professional unit manufacturer's trained and authorized representative, or trained and authorized contractor, perform the manufacturer's recommended annual maintenance, if not already performed by current maintenance staff; a maintenance contract should be pursued to accomplish this; contracts should be competitively bid with a detailed list of what is to be included in the contract

COOLING TOWERS

The cooling tower make-up water control valve should be inspected monthly to ensure it is operating properly and not open continuously. Manually test and verify that mechanical or electronic float controls operate correctly.

Many cooling towers have electric heaters located in the cold-water basin for operation in the winter with a basin thermostat. Each fall before the beginning of winter, test the basin heat system to ensure it is operational, turning on and off per the set point on the system. Typically, the



Climatec-Alerton control panel

system turns on when the basin temperature drops to 35 degrees F and turns off as the basin temperature rises to 40 degrees F.

The PVC fill and cold-water basin should be inspected monthly to ensure no scale, or algae and bacteria growth is occurring. If it is occurring, the water treatment program, testing, and adjustments should be scrutinized. This is typically the reason for these issues inside the cooling tower.

The cooling tower cold-water basin at the bottom section and hot-water basin should be inspected monthly and cleaned as needed. Once a year, the cold- and hot-water basins should both be fully drained and thoroughly cleaned of all dirt and debris.

The automatic chemical monitoring and control system should be observed monthly to confirm that the auto feed set points are set properly. To minimize cleaning the cooling tower, a monthly water chemistry test is required, and water treatment adjusted as needed to control this chemistry to within specific ranges. This will minimize corrosion and buildup of scale, bacteria, and algae. While automatic chemical monitoring and control systems are required, this alone does not negate the need for the monthly testing and treatment level adjustments. An annual contract for water treatment services is mandatory to ensure this effort is successful. Monthly water treatment tests, adjustments for chemical type and the quantity added, or automatic feed rates need to be recorded and kept on file for a minimum of two to four

years. Courthouse maintenance staff or a service technician should:

- annually test and verify control valve operation
- annually test make-up water float or electronic control valve and verify correct water level is maintained
- test cold-water basin heater operation as applicable
- inspect cold- and hot-water basins and fill material monthly and have them cleaned as necessary or annually, in the winter or spring
- operate isolation valves at least once a year
- condenser water system chemistry requires monthly testing and adjustment, as well as an automatic chemical feeder system, which controls chemical injection on a daily basis; contract with an outside professional chemical treatment company to perform this service; maintenance staff should monitor the program to ensure it is successfully administered

BOILERS

Natural or propane gas-fired boilers should be inspected and serviced just prior to the heating season, which generally starts in mid-October. The water circulating pumps should be exercised to ensure it is operating properly. This includes a visual inspection of the piping system to verify there are no leaks that need repaired. Leaks generally occur at valves, pumps, and other piping specialties. The flow switch, make-up water valve, pressure and temperature relief valve, and burner controls should all be inspected and tested to verify they are operational. The manufacturer's recommended minimum gas pressure should be verified. This impacts burner operation and boiler efficiency. The combustion air pathway should be inspected to verify that they are open to the outdoors and not closed, which often happens. The boiler should also be test fired to verify that it has a proper draft of flue gases that exit the boiler stack at roof level. The boiler flue vent pipe to the roof and the roof vent cap should also be inspected to confirm these are all open to allow full flow of flue vent gases. A more-detailed list of tasks and frequency should be obtained from the boiler manufacturer. It is recommended that a professional boiler service technician be hired to perform annual service work. This could coincide with the required annual State Boiler Inspector visit. Courthouse maintenance staff or a service technician should:

- inspect boiler, boiler controls/panel, and accessories annually; repair or replace items if found to be broken or not operating properly
- annually verify that the gas pressure remains adequate for proper firing of the boiler; refer to manufacturer start-up and O&M manual
- operate isolation valves at least once a year
- test fire boiler annually in the fall to verify all components are operating properly in preparation for the heating season; make corrections and repairs as required.
- it is recommended that annual maintenance be contracted to a professional trained specifically on the boiler type used; the contract should be specific as to what is to be performed

PUMPS

Pumps themselves require little maintenance, but accessories surrounding the pump need attention. Specifically, the inlet pump strainers need periodic blow-down. Open and close the blow-down valves located at the wye strainer discharge for 10–20 seconds every six months. If only clear water is discharged, this can be extended to once every 12 months.

If the water chemistry in a system has been compromised, or a large water leak has occurred, the strainer screen may need to be removed and physically cleaned. Large pressure drops through the strainers may also indicate a significant build-up of silt, rust when treatment levels are not correct, and debris in the strainer. Build-up should be cleaned from the strainer screen.

The pumps should generally be test-operated just prior to the normal intended use. Chilled water pumps and condenser water, as applicable, should be tested in the spring. Heating water pumps should be tested in the fall. Repair any problems prior to use. It is also beneficial to inspect each piping system for leaks at the same time and have them repaired.

Utilize manufacturer-provided maintenance check lists for a more-detailed task list associated with pumps. Courthouse maintenance staff or a service technician should:

- inspect all pumps semi-annually to observe any unusual conditions that require repair or replacement of components

- if leaks are observed, have them repaired
- open and close wye strainer blow-off/down valves for several seconds and identify whether they are clear or dirty when initially opened; if dirty, consider removing the internal strainer and physically clean
- operate isolation valves at least once a year
- identify any unusual noises or vibration, which may be an indication of misalignment, water hammer, cavitation, or other issue; identify the source of noise or vibration, and have the issue corrected to prevent premature failure of couplings, pump, or motor

VALVES

Isolation valves need to be operated annually to avoid the build-up of sediment inside valves and valve seats. Build-up may render a valve inoperable. This can be performed simultaneously with other system reviews, such as pump maintenance. Courthouse maintenance staff or a service technician should:

- fully open and close all isolation valves at least once annually; if a valve cannot be fully opened or closed, repair or replace the valve

AIR HANDLING UNITS

Air handling units require routine inspections and maintenance. Courthouse maintenance staff or a service technician should:

- inspect cabinets for dirt; dirt is a symptom of poor housekeeping, but is also a signal there is an air leak; if an air leak is found, attempt to seal
- check for excessive vibration or noise; if vibration is an issue, investigate the source and repair
- inspect interior of unit for dust, dirt, and debris inside the cabinet, on fan wheel, on internal or external motor, on drive components including belts and sheaves, and in condensate pan; dirty fan wheels and drive components can degrade unit performance and move less air, which makes the unit operate less efficiently; clean all areas as required
- clean condensate pan including condensate P-trap and drain line, as required, or at least once a year
- replace air filters; frequency can be based on either a fixed time period (every three months is recommended, but this can be adjusted based on experience), accumulation of dust, dirt, and debris on filters as each air unit, or on the maximum

air pressure drop through the filter type used as recommended by the filter manufacturer; MERV 11 filters or higher are recommended

- operate any damper or valve actuators over the full rotation of the controlled device, and confirm the valve stem or damper shaft moves the entire stroke when actuated; replace or repair actuators, valves, or dampers as required
- annually inspect any vibration isolation springs or pads to ensure they are in the proper place and are not fully compressed; compressed springs and pads are useless; adjust or replace as required
- for water systems, operate the isolation valves once a year to help keep seats clean
- for water systems, inspect for pipe or pipe accessory leaks; repair leaks to include insulation; this is more critical on chilled-water systems
- if leaks occur over a long period of time or are excessive over a short period of time, have the water tested and add chemicals, or flush, clean, and treat as required; a chemical treatment firm should make a recommendation for remediation
- annually inspect ductwork in the area around the air handling equipment and look, or listen, for leaks; repair by sealing as required
- annually clean cooling coils; use appropriate coil cleaning solution in the manner recommended by the unit manufacturer

SPLIT DIRECT EXPANSION A/C UNITS

Maintenance on these units is similar to air-cooled chillers for outdoor air-cooled condensing units, and air handling units for the indoor blower unit. Courthouse maintenance staff or a service technician should:

- inspect condenser coils on remote air-cooled condensing units semi-annually; clean fins and straighten any damaged fins
- if no hail guards exist on condensing units, install whenever it becomes possible
- inspect outdoor condensing units to ensure fan is properly rejecting heat of compression for unit and to verify that condenser fans operate when the compressor operates and does not short cycle; this could indicate possible fan capacitor failure; if excessive vibration or noise is observed, the fan may be in the early stages of failure and may not be moving enough air to properly reject the full heat being rejected

- inspect condensing unit for any insects or other foreign objects; ground-mounted units attract ants, wasps, and other insects whose nests can cause electrical failures
- inspect indoor blower unit cabinets for dirt; dirt is a symptom of poor housekeeping, but is also a signal there is an air leak; if an air leak is found, attempt to seal
- check for excessive vibration; if vibration is an issue, investigate the source and repair
- inspect interior of unit for dust, dirt, and debris inside the cabinet, on fan wheel, on internal or external motor, on drive components including belts and sheaves, and in condensate pan; dirty fan wheels and drive components can degrade unit performance and move less air, which makes the unit operate less efficiently; clean all areas as required
- clean condensate pan including condensate P-trap and drain line, as required, or at least once a year
- replace air filters; frequency can be based on either a fixed time period (every three months is recommended, but this can be adjusted based on experience), accumulation of dust, dirt, and debris on filters as each air unit, or on the maximum air pressure drop through the filter type used as recommended by the filter manufacturer; MERV 11 filters or higher are recommended
- operate any damper actuators over the full rotation of the controlled device and confirm the damper shaft moves the entire stroke when actuated; replace or repair actuators or dampers as required
- annually inspect any vibration isolation springs or pads to ensure they are in the proper place and are not fully compressed; compressed springs and pads are useless; adjust or replace as required
- inspect refrigerant piping or accessories for leaks; repair leaks to include insulation on the cold suction line from the condenser to the evaporator (cooling coil); a trained refrigeration air conditioning contractor should perform all work related to repairing system leaks and charging of this system since special training and certifications are required
- annually inspect ductwork in the area around the air handling equipment and look, or listen, for leaks; repair by sealing as required
- annually clean cooling coils; use appropriate coil cleaning solution in the manner recommended by the unit manufacturer

- have a professional unit manufacturer’s trained and authorized representative, or a trained and authorized contractor, perform the manufacturer’s recommended annual maintenance if courthouse maintenance staff is not trained to do so; a maintenance contract for this work should be competitively bid, with a detailed list of what is to be included in the contract

FANS

Most direct-drive fans require little to no maintenance and are generally repaired or replaced only when performance becomes noticeable or failure occurs. Belt-drive fans are the ones that normally require routine maintenance. Courthouse maintenance staff or a service technician should:

- annually inspect belt-drive fans for air handling units, exhaust fans, and other ventilation fans; tighten or replace belts as required; automatic belt-tensioning kits can be retrofitted on these types of fans; this eliminates having to adjust and tighten belts
- clean sheaves and pulleys as needed if significantly worn or dirty
- annually clean fan wheels, housings, and motors where dust, debris, or oil accumulates
- clean bird screen on outdoor fan housings as needed
- annually inspect fans for leakage at fan housing or roof curbs, and seal or repair as required
- annually test disconnects or related operating controls, as applicable
- annually verify that any related control dampers or automatic backdraft dampers fully open and close; if these bind, they should be repaired

Resources

The following resources provide additional detailed information and specific procedures for the maintenance of HVAC-related equipment utilized in courthouses. Refer to these resources if the information above is not sufficient, or as needed to customize your maintenance program and equipment. Most equipment manufacturers have generic and specific information on their equipment, which is included in their Start-up, Installation, and O&M manuals. These manuals are great resources for training maintenance personnel, and also provide maintenance task lists and frequency of when tasks should be performed.

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) includes maintenance guidelines in the following documents:

- ASHRAE, *Guideline 4-2008 (RA 2013) - Preparation of Operating and Maintenance Documentation for Building Systems*
- ASHRAE, *Guideline 32-2012 - Sustainable, High Performance Operations & Maintenance*
- ASHRAE, *GPC 34P - Proposed Guideline - Energy Efficiency Guideline for Historic Buildings*
- ANSI/ASHRAE/IES, *Standard 100-2018 - Energy Efficiency in Existing Buildings*
- ANSI/ASHRAE/ACCA, *Standard 180-2012 - Standard Practice for Inspection and Maintenance of Commercial-Building HVAC Systems*

To assist in a more formalized recurring maintenance program or work order system, several software programs exist that can greatly enhance periodic maintenance efforts. These can become the backbone of better documentation of existing systems, equipment, components, spare parts, cost data, etc. Available programs include, but are not limited to:

Facility Dude:

<http://info.dudesolutions.com>

Maintenance Connection:

<https://www.maintenanceconnection.com/website/industries/building-management/>

Manager Plus:

<http://www.managerplus.com>

Capterra comparison of available software programs:

<https://www.capterra.com/building-maintenance-software/>

Other general building maintenance website links that provide additional related material include:

Whole Building Design Guide: *Operations and Maintenance for Historic Structures*:

<http://wbdb.org/resources/operations-and-maintenance-historic-structures>

National Park Service, *Preservation Brief #24: Heating, Ventilating, and Cooling Historic Buildings - Problems and Recommended Approaches*:

<https://www.nps.gov/tps/how-to-preserve/briefs/24-heat-vent-cool.htm>

General Services Administration Technical Preservation Guidelines, *HVAC Upgrades in Historic Buildings*:

<http://www.gsa.gov/cdnstatic/HVAC.pdf>

It is desirable to document specific professional resources applicable to major systems or items of equipment for HVAC systems:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

Systems Specialty:

CALL THE TEXAS HISTORICAL COMMISSION

- When performing any work on HVAC systems that may impact the exterior building elevations or visibility of HVAC components, or if interior finishes could be impacted

CALL AN EXPERT

- When current staff is not trained or experienced in properly servicing specific equipment or systems
- Where chemical-treatment services are required
- Maintenance of equipment or systems involving refrigeration leak detection, leak repair, and charging of refrigerant in systems
- Troubleshooting of electronic control system components for chiller and boiler-control panels as well as energy management system controllers
- Repair or replacement of components requiring specialized equipment that is not economical to purchase and maintain locally at the courthouse
- Possible experts include: HVAC contractors licensed to perform such services which may not always be locally available (such as rural courthouses utilizing chiller and boiler systems), control system vendors, and professional engineers who can observe and diagnose extensive building system issues such as indoor moisture control

Why Maintain?

Though courthouses across Texas vary in size and shape, all have one extremely important operational system in common. All rely on electricity to maintain their operating conditions. Lighting, security, information technology, air conditioning, and other systems rely on electricity to function. Without a reliable electrical system, a courthouse cannot maintain its vital daily operations for the community it serves.

A typical courthouse will have a single electrical utility feed from the local electrical utility company. Power is typically stepped down from a higher utility voltage to a lower operating voltage by a utility company transformer. However, large courthouses with multiple electrical utility services, with each service being several thousand amps in size, is not uncommon. Courthouses can range in ampacity from a few hundred amps to several thousand amps. Electrical utility feeds can be from underground utility vaults or can be from overhead utility lines. Electrical utility transformers can be pad-mounted transformers found on the ground or pole-mounted transformers mounted on electrical utility poles.

Voltages can vary depending on the location of the courthouse. Smaller courthouses in residential areas are often provided with 120/240 volt residential electrical services, while large courthouses in metropolitan areas are often provided with 15,000 volt electrical services. Common voltages for courthouses include 120/240V single phase, 240V three phase, 208Y/120V three phase, 480Y/277V three phase, 4,160V three phase, 12,470V three phase, and 13,200V three phase. Other, lesser common voltages may also be found. Many courthouses are provided with standby generators and automatic transfer switches. When electrical utility power is lost, the generator will start and the automatic transfer switch will transfer from the de-energized utility source to the energized generator source. Once utility power is restored, the automatic transfer switch will return to the normal utility power source and the generator will shut down. These generator can be fueled by diesel, natural gas, propane, or a combination of these fuel sources.

Typical electrical equipment found at courthouses includes switchboards, distribution panelboards, lighting and appliance panelboards, transformers, disconnect switches, motor control centers, variable frequency drives, automatic transfer switches, and generators. Typical electrical devices include lighting fixtures, occupancy sensors, time clocks, switches, and outlets. Each of these pieces of electrical equipment and individual electrical devices require ongoing maintenance to ensure they remain in good working order.

Courthouses are typically provided with fire alarm and/or voice evacuation systems. These systems alert the

23 - 16
Westinghouse
DIAGRAM SHOWING WESTINGHOUSE EQUIPMENT FOR THE DISTRIBUTION, CONTROL AND UTILIZATION OF ELECTRICAL ENERGY

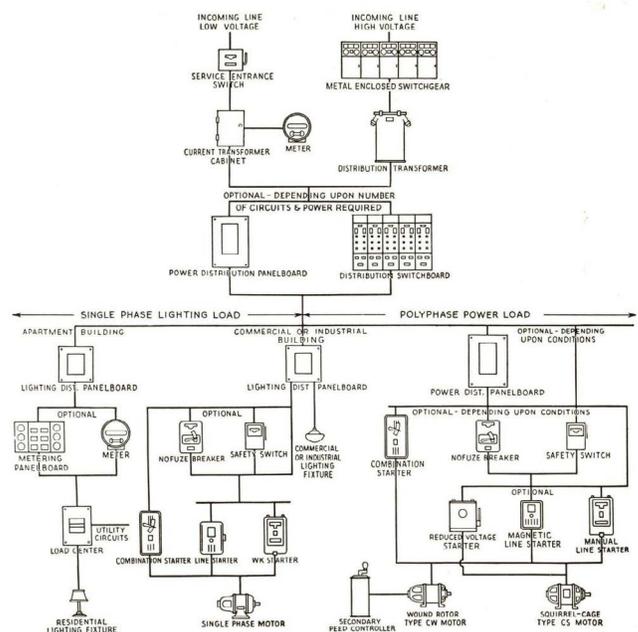


Diagram of electrical distribution equipment, 1939. Image courtesy of Westinghouse Electrical and Manufacturing Co. and Association for Preservation Technology Building Technology Heritage Library.

building's occupants and local first responders when there is a potential fire.

Maintenance of the electrical equipment and systems is extremely important, as this impacts the service life and overall reliability of the facility. Proper and continuous

maintenance helps achieve the longest service life possible of this equipment and helps guard against unexpected equipment failures and associated power outages. It is imperative that recurring maintenance be performed on the various elements of each these systems and sub-components. In the long-term this reduces the capital cost associated with premature replacement of equipment, reduces overall energy consumption over time, which can be used for maintenance, and reduces premature and sudden failures of equipment.

Assessing Conditions

Each piece of electrical equipment has its own unique schedules for periodic maintenance. Typical equipment assessments are described for each piece of equipment below. Electrical equipment covers and housing should never be opened or removed by untrained staff and should never be opened or removed while energized unless the appropriate personal protection measures are taken. Modifications and maintenance procedures should never be performed while a switchboard is energized. Only infrared scanning should be performed, while energized and covers should only be removed if infrared scanning windows are not available. Electrical devices should never be uncovered, removed, or changed while electrical circuits are energized.

Note that this Electrical section of the handbook does not have a checklist. For electrical systems, there are numerous manufacturers and components that could be present in courthouses, and the various combination of these factors cannot be easily summarized in a single checklist. Instead, general guidelines for assessment and maintenance are provided, with any work requiring special expertise identified.

UTILITY FEEDERS AND TRANSFORMERS

Electrical utility feeders and transformers are to be maintained by the electrical utility company. These systems can serve a courthouse for decades with minimal maintenance. It is generally not possible to look at electrical utility feeders and transformers and access their condition. Assessment of this equipment should be left to the local electrical utility distribution provider. However, the local electrical distribution provider should be notified



Disconnect switch

immediately if feeders or transformers are found to be down or damaged.

SWITCHBOARDS AND MOTOR CONTROL CENTERS

Switchboards and motor control centers are large and often complex pieces of electrical equipment and will require licensed and trained electricians to perform maintenance procedures. It is strongly recommended that an annual service contract be secured for equipment of this type to ensure all proper maintenance is performed.

DISTRIBUTION PANELBOARDS, LIGHTING AND APPLIANCE PANELBOARDS, AND DISCONNECT SWITCHES

Though not as complex as switchboards and motor control centers, panelboards and disconnect switches will require licensed and trained electricians to perform

maintenance procedures. It is strongly recommended that a service contract be secured for panelboards and that they be serviced and assessed at least once every five years.

TRANSFORMERS

Transformers are fairly simple and have no moving or operational parts. However, they still require routine maintenance. It is strongly recommended that a service contract be secured for transformers and that they be serviced and assessed at least once every five years.

GENERATORS AND AUTOMATIC TRANSFER SWITCHES

Generators and automatic transfer switches are complex systems that require certified technicians to perform maintenance procedures. It is strongly recommended

that an annual service contract be secured with a service group that specializes in generator maintenance and repair to ensure all proper maintenance is performed. Generators should also be operated at least once a month. These generator operations are typically performed after operating hours automatically or by a maintenance technician.

VARIABLE FREQUENCY DRIVES

Variable frequency drives are pieces of electrical equipment that control the on/off/speed control of mechanical equipment. It is recommended that variable frequency drives be serviced at the same time and under the same contract as the mechanical equipment they serve.

LIGHTING FIXTURES AND LIGHTING CONTROL DEVICES

Lighting fixtures and lighting control devices should be assessed on a continual basis. Light bulbs should be replaced immediately when not working (see Housekeeping section). Lighting control devices such as time clocks and occupancy sensors should be immediately repaired or replaced when found to not be functioning properly. Though lighting fixtures and lighting control devices can be assessed by anyone, only a licensed electrician should repair or replace these devices and they should only be repaired or replaced while de-energized. Courthouses with large parking lots and many light poles may want to put their exterior lighting fixtures on a yearly service contract to ensure all exterior bulbs and lamps are replaced on a regular basis before they go out and at the same time that a boom truck or aerial lift is on site.

ELECTRICAL FEEDERS AND BRANCH CIRCUITS

Electrical feeders and branch circuits rarely, if ever, fail along their lengths. They do occasionally fail at their terminations and splices. Electrical wiring does not require routine assessment. Terminations will be assessed during thermal scanning of other equipment. However, conduit found to be broken or disjoined should be assessed by a licensed electrician immediately.



Voice evacuation system components added as retrofit

ELECTRICAL SWITCHES AND OUTLETS

Electrical switches and outlets do not need to be assessed on a regular basis. However, any of these devices found to be damaged or not working should be repaired or replaced immediately.

FIRE ALARM AND VOICE EVACUATION SYSTEMS

Fire alarm and voice evacuation systems are complicated and critical systems. It is strongly recommended that an annual service contract be secured for equipment of this type to ensure all proper maintenance is performed. Fire alarm systems should be tested by facility personnel at least quarterly.

Maintenance

Each piece of electrical equipment has its own unique set of maintenance requirements. Typical maintenance requirements are described for each piece of equipment below.

UTILITY FEEDERS AND TRANSFORMERS

Electrical utility feeders and transformers are to be maintained by the electrical utility company. The courthouse maintenance staff should not be expected or required to perform any maintenance on electrical utility-owned equipment.

- contact the local electrical distribution company immediately if an electrical utility feeder or utility transformer is damaged
- do not attempt to repair damaged electrical utility feeders or electrical utility transformers

SWITCHBOARDS AND MOTOR CONTROL CENTERS

Switchboards and motor control centers should be thermal scanned while energized. Thermal scanning results should be interpreted by trained technicians. All maintenance should be performed with the equipment is de-energized. “Hot spots” found during thermal scanning should be repaired immediately.



Motor control center dating to the mid-1950s

- visually inspect all switchboards and/or motor control centers at least once a year
- operate switches and circuit breakers while the switchboard and/or motor control center is de-energized once a year
- damaged circuit breakers should be replaced, and loose terminations should be repaired and re-terminated
- equipment should be cleaned and vacuumed inside and out
- damaged covers should be replaced
- damaged circuit breakers should be repaired or replaced
- thermal-scan switchboards and/or motor control centers while energized at least once every five years
- draw-out circuit breakers should be racked out, cleaned, and inspected while the switchboard and/or motor control center is de-energized at least once every five years

DISTRIBUTION PANELBOARDS, LIGHTING AND APPLIANCE PANELBOARDS, AND DISCONNECT SWITCHES

Panelboards and disconnect switches should be thermal scanned while energized. Thermal scanning results should be interpreted by trained technicians. All maintenance should be performed while the equipment is de-energized. “Hot spots” found during thermal scanning should be repaired immediately.

- visually inspect panelboards and disconnect switches at least once a year
- operate panelboard main circuit breakers while de-energized once a year
- operate disconnect switches while de-energized once a year
- damaged circuit breakers should be replaced, and loose terminations should be repaired and re-terminated
- equipment should be cleaned and vacuumed inside and out
- damaged covers should be replaced

- automatic transfer switches should be thermal scanned under load once a year
- automatic transfer switches should be serviced at the same time as the generator by the same contractor once a year.
- generators should be run with a roll up or fix-mounted load bank at least once a year

TRANSFORMERS

Transformers should be thermal-scanned while energized. Thermal scanning results should be interpreted by trained technicians. All maintenance should be performed while the equipment is de-energized. “Hot spots” found during thermal scanning should be repaired immediately.

- visually inspect transformers at least once a year
- damaged circuit breakers should be replaced, and loose terminations should be repaired and re-terminated
- equipment should be cleaned and vacuumed inside and out
- damaged covers should be replaced
- thermal scan transformers while energized at least once every five years

GENERATORS AND AUTOMATIC TRANSFER SWITCHES

Generators and automatic transfer switches should be maintained per the manufacturer’s operation and maintenance manual. Factory-trained maintenance technicians should provide ongoing maintenance as required. Technicians providing maintenance for other electrical equipment should thermal scan automatic transfer switches while energized and under load. “Hot spots” found during thermal scanning should be repaired immediately.

- generators should be started and run for at least 30 minutes without load once a week
- generators should be started and run for with a resistive load bank once a year
- generators should be serviced by a certified generator maintenance contractor once a year

VARIABLE FREQUENCY DRIVES

Variable frequency drives should be maintained per their operation and maintenance manual by the service group providing maintenance to the mechanical equipment it serves.

LIGHTING FIXTURES AND LIGHTING CONTROL DEVICES

Lighting fixtures should be cleaned at least once every five years. There is no reason to replace light bulbs or lamps unless they are burned out or not working. However, bulbs or lamps that are not working should be replaced immediately (see Housekeeping section). Lighting control devices such as occupancy sensors and time clocks do not require regular maintenance and should only be serviced or replaced by a licensed electrician when they are found to be not working.

- lighting fixtures should be cleaned once every five years
- light fixture lamps and bulbs should be changed immediately when found to be burned out
- lighting fixture emergency battery packs should be tested on a monthly basis

ELECTRICAL FEEDERS AND BRANCH CIRCUITS

Electrical feeders and branch circuits do not require routine maintenance. Electrical conduit found to be broken, damaged or disjoined should be repaired or replaced by a licensed electrician immediately. Work should only be performed while the feeder or branch circuit is de-energized.

ELECTRICAL SWITCHES AND OUTLETS

Electrical switches and outlets do not require regular maintenance. However, they should be repaired or replaced immediately if found damaged. These devices

should be repaired or replaced by a licensed electrician and only while their branch circuit is de-energized.

FIRE ALARM AND VOICE EVACUATION SYSTEMS

Fire alarm and voice evacuation systems should be maintained per the manufacturer's operation and maintenance manual. Factory-trained maintenance technicians should provide ongoing maintenance as required.

- contract with a fire alarm maintenance and testing agency for routine service

Resources

The following resources provide additional detailed information and specific procedures for the maintenance of electrical equipment utilized in courthouses. Refer to these resources if the information above is not sufficient, or as needed to customize your maintenance program to the specific conditions encountered in your facility. Most equipment manufacturers have generic and specific information on their equipment which is included in their Start-up, Installation, O&M manuals. These manuals are great resources for training maintenance personnel and also provide checklists for maintenance to include task lists and frequency of when tasks should be performed.

NETA – International Electrical Testing Association

<https://www.netaworld.org/standards/ansi-neta-ats>

Experienced Electrical Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:

CALL AN EXPERT

- When maintenance or repair is required for electric utility equipment, transformers, generators and automatic transfer switches, variable frequency drives, fire alarm, voice evacuation systems, or other systems that require special training or licensing, or require utility personnel to conduct work
- When staff is inexperienced with electrical repair or repair requires a licensed electrician and staff members are not licensed
- Possible experts may include: a licensed electrician or specialized service technicians, who can help with repairs that staff cannot undertake themselves; an electrical engineer when problems indicate a more serious problem; or the THC when changes to the system are proposed and requires disturbing interior finishes or exterior mounting of equipment

CALL THE TEXAS HISTORICAL COMMISSION

- When performing any work on electrical systems that may impact the exterior building elevations or visibility of electrical components, or if interior finishes could be impacted

Why Maintain?

Historic Texas courthouses have a wide range of plumbing systems, which include domestic hot water heating equipment and plumbing fixtures. All of these plumbing systems are essential to the daily operation of these facilities and need to be assessed and maintained in order to keep the building functional.

Assessing Conditions

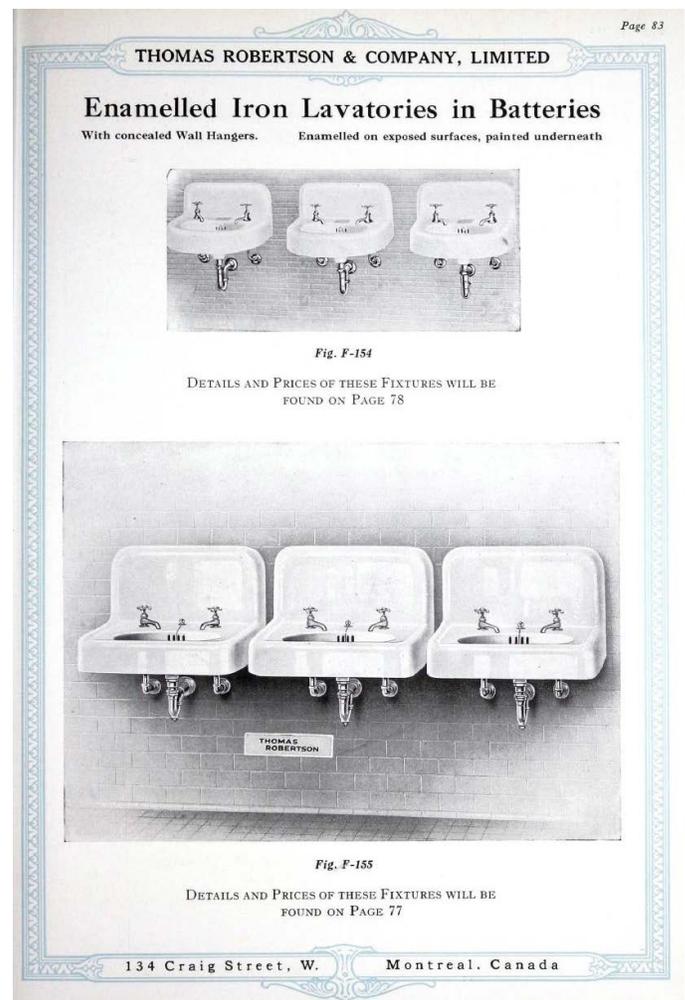
Typical plumbing equipment and systems assessments are described for each piece of equipment below. Each system should be assessed to ensure all components are working properly. Plumbing systems include domestic hot water heating equipment and plumbing fixtures (also see Drains, Gutters, and Downspouts section for storm roof drain systems). Modifications and maintenance procedures should be performed as recommended by the manufacturer.

DOMESTIC HOT WATER SYSTEMS

Electric and natural gas fired storage water heaters have a typical life expectancy of 10–12 years, depending on use and supply water hardness. Domestic hot water systems should be inspected once every two years and be maintained in accordance with the operation and maintenance manual for each specific piece of water heating equipment. The power should always be off when servicing the water heater. Assessment of domestic hot water systems includes:

- check that a visible sacrificial anode rod is within the electric water heater storage tank (these are typically screwed in from the top of the heater); this will extend the life of the tank and prevent rusting
- all tank-type water heaters require a safety relief valve; check to make sure the temperature and pressure (T&P) relief valve is operating by opening the relief valve and allowing some water to drain through the relief piping into a bucket; close the relief valve to see if it seals completely water tight
- to drain the water heater to remove dirt and debris, connect a hose to the tank drain valve at the bottom and allow 25 percent of the water to drain within the tank to allow sediment build-up to drain out until the water is clear

- check to make sure all domestic hot and cold water piping serving the water heater is insulated
- adjust the temperature thermostat of the water heater as needed



Batteries of enameled iron lavatories, 1927. Image courtesy of Thomas Robertson and Company and Association for Preservation Technology Building Technology Heritage Library.



Modern plumbing fixtures in a historic bathroom

- verify the circulation pump is in working order and is circulating the hot water within the domestic hot water loop
- verify if a remote timer is installed and working to allow to the circulation pump to be turned off when the facility is closed to save on energy

PLUMBING FIXTURES

Throughout the facility, there are several different plumbing fixtures that may operate differently and could have different assessment and maintenance requirements. The most common fixtures are discussed here. These fixtures should be assessed once per year. In addition to these recommendations, operations and maintenance manuals should also be referenced.

- check toilet flush valves to make sure they flush properly; if a flush valve is not flushing properly, the diaphragm should be inspected for clogs; debris

within the water being flushed can clog the orifice of the diaphragm

- toilet seats should be inspected to make sure all the screws are tight and the seat isn't loose and moving
- check urinal flush valves to make sure they are flushing properly; if a flush valve is not flushing properly, the diaphragm should be inspected for clogs
- check sinks to ensure any drain and supply piping is secured below the sink and there are no leaks
- open and close hot and cold water valves below sinks multiple times to make sure they are not stuck in the open position; if a shut-off valve is stuck in the open position, it is recommended the valve be replaced by shut off to allow it to be serviced
- remove the aerators from the faucet and clean any sediment that might have collected
- inspect faucets to make sure they are not leaking and tighten any screws that may have come loose
- inspect electric water coolers to ensure the bubbler and water streams are operating correctly by pushing inward on the push bars

Maintenance

Plumbing equipment and systems have their own unique schedules for periodic maintenance. Modifications and maintenance procedures should be performed as recommended by the manufacturer or the recommendation indicated below. The following maintenance items can help extend the life expectancy of these systems and fixtures. If maintenance personnel do not have plumbing experience, a plumbing contractor should be retained to perform maintenance.

DOMESTIC HOT WATER SYSTEMS MAINTENANCE

Domestic hot water systems should be inspected once every two years and be maintained in accordance with the operation and maintenance of that specific piece of equipment; refer to operations and maintenance manuals.

- if the anode is corroded, replace the anode; this will extend the life of the tank and prevent rusting
- insulate pipes as required
- perform all maintenance with power to the system off



Domestic hot water heater

PLUMBING FIXTURES MAINTENANCE

- replace toilet and urinal flush valve diaphragms as necessary
- tighten toilet seats
- repair leaks in sink supply piping and drains
- replace sink shut-off valves as required
- repair or replace leaking faucets
- tighten faucet screws
- adjust and/or replace electric water cooler push bars if they are not in good working condition

Resources

The following resources provide in-depth technical information and specific techniques for the maintenance of plumbing. Refer to these resources if conditions observed do not appear in the assessment and maintenance recommendations. It is also important to refer to the documents that are specific to the equipment installed in your building. Locate installation manuals and O&M

manuals. O&M manuals can also be accessed on the manufacturer's website when the make and model of the equipment is known. Locate any close-out documents that can also contain information on what equipment has been installed, as well as warranty information.

General Services Administration, *Selected Reading on Plumbing*:

https://www.gsa.gov/real-estate/historic-preservation/historic-preservation-policy-tools/preservation-tools-resources/technical-documents?Form_Load=88497

Experienced Plumbing Contractor familiar with our courthouse:

Company Name:

Contact Name:

Phone Number:

Email Address:

Website:



Historic drinking fountain

CALL AN EXPERT

- When complete replacement of water heaters is needed, as this requires a licensed plumber
- When staff is inexperienced with plumbing repair
- Possible experts may include: a plumbing contractor, who can help with repairs that staff cannot undertake themselves; a preservation architect or engineer when problems indicate a more serious problem; or the THC when changes that could effect historic interior finishes are proposed

CALL THE TEXAS HISTORICAL COMMISSION

- When work could effect the exterior appearance of the building a State Antiquities Landmarks, a THC permit is required
- For any work or alteration that is not cyclical maintenance

Plumbing Checklist

This checklist is used to assess plumbing system components. Use a new checklist for inspection. (If completing by hand, make a copy of the front and back of this form prior to using it, and use a new blank form for each inspection. If completing this form electronically, use Adobe Acrobat or Reader, create a copy, and “save as” a new document for each inspection.) On the first page, use the boxes to check off the items in good repair. On the second page, note any maintenance or repair work required for items that are not in good repair. Update this page when the repair work is completed. For specific guidance on repair techniques, reference the “Resources” section. Reference building plans as needed to identify component locations.

INSPECTION DATE:

PLUMBING FIXTURE CONDITION (CONTINUED):

INSPECTOR:

faucets are free of leaks, and screws are tight

DOMESTIC HOT WATER SYSTEM CONDITION:

electric water cooler bubbler and water streams operate correctly

sacrificial anode rod is within the electric water heater storage tank

REFERENCE PHOTOS OF PLUMBING:

temperature and pressure relief valves are operating

valve seals completely water tight

water heater is free of dirt and debris

domestic hot and cold water piping serving the water heater is insulated

thermostat of the water heater is set at the proper temperature

circulation pump is in working order

INSERT PHOTO

INSERT PHOTO

remote timer is installed and working

PLUMBING FIXTURE CONDITION:

toilet flush valves flush properly

toilet seats screws are tight

urinal flush valves flush properly

drain and supply piping is secured and free of leaks

hot and cold water valves below sinks are not stuck in the open position

faucet aerators are clean

(form continues on next page)

(form continued from previous page)

Complete this section based on the results of the assessment.

PROBLEMS FOUND (ITEMS NOT CHECKED OFF ON PREVIOUS PAGE):

ADDITIONAL PROBLEMS FOUND (ITEMS NOT LISTED ON PREVIOUS PAGE):

PHOTOS OF MAINTENANCE PROBLEMS, IF NECESSARY:

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

INSERT PHOTO

Complete this section after maintenance or repairs are complete. Cost data can be used for future budgeting.

MAINTENANCE OR REPAIR PROCEDURE:

COST OF MAINTENANCE OR REPAIRS:

DATE MAINTENANCE OR REPAIRS COMPLETED:

MAINTENANCE OR REPAIRS COMPLETED BY:

Why Maintain?

Deterioration of historic interior building materials is most often caused by water (including bulk water from leaks, water vapor migration, condensation, humidity, and even excessive water used for cleaning and mopping), dirt, and insects. Housekeeping is an important part of the maintenance and preservation of a historic building, critical to keeping these three deterioration causes at bay. The techniques and materials used in housekeeping can greatly aid in the longevity of historic materials. Alternatively, they can easily damage or destroy delicate finishes if used incorrectly. When courthouses were restored, only the most appropriate and high-quality materials were used, and thus they should be long-lasting and durable with proper care.

This guide is intended to provide basic guidelines in daily care of historic interior materials that housekeeping staff are likely to encounter. In addition, housekeeping staff are often the first to observe when historic materials require maintenance, and so they should be made aware of and become familiar with historic materials and special finishes, and be proactive to alert the facilities director when issues arise. While conducting their work, housekeeping staff should also be on the lookout for leaking pipes, moisture and leaks in walls and at windows and doors, cracks, mold, insect infestation, flaking paint, and blistering plaster, or any other condition that is out of the ordinary. When interior finishes do become damaged, historically compatible materials and repair methods should be used, and only those with expertise in that material should undertake the work. Completion reports should be referenced to identify materials requiring special care.

Housekeeping Materials and Methods

Using cleaning materials and methods appropriate to historic materials will help prevent their deterioration.

- modern solvent-based cleaners, detergents, and seemingly mild abrasive cleaning methods like “magic eraser”-type sponges can be damaging to historic finishes; they should only be used with full knowledge of their effects and according to manufacturer’s instructions
- all traditional and modern cleaners and cleaning methods should be tested in inconspicuous areas prior to use
- simple and gentle methods are almost always preferred, but some finishes can be damaged even by simple washing with water
- housekeeping staff should be trained to know which cleaning materials and methods are appropriate for each material, and which ones are not appropriate
- care should be taken by housekeeping staff to always store cleaning and other maintenance materials in a secure area away from the public and sensitive materials or spaces; off-gassing or accidental spills of cleaners, solvents, and other chemicals may damage historic and special finish materials; for some chemicals, special storage cabinets may be required



Non-original encaustic floor, Weatherford County Courthouse

- cleaning products should always be properly labeled and stored in their original containers

Floors

Floors and floor finishes are the subject of substantial wear and tear, and some floors like wood, stone, or historic carpets can be damaged by heavy foot traffic and from some cleaning methods. Refer to your building's completion report for information on the types of flooring present, and care for the various materials accordingly, as floor care is not the same for every flooring type. Floor housekeeping includes:

- regularly vacuum or shake out mats at entrances, desks, and queuing areas
- regularly vacuum or sweep carpeted floors, rugs, and runners; historic carpets may require cleaning by a specialty carpet-cleaning service with expertise in historic textiles, or a textile conservator
- hard floors such as wood, tile, linoleum, concrete, and stone should be regularly cleaned with a dry dust mop or microfiber pads; for rough floors, such as flagstone, vacuum cleaners may be used; a damp (not wet) mop can be used with plain water, or when dirt is excessive, a non-ionic detergent can be added to the water then rinsed with a damp mop and then immediately dried
- wet mopping should only be used on ceramic tile, terrazzo, or sealed concrete floors; it should never be used on wood, stone, historic linoleum, or oilcloth



Decorative painting, Weatherford County Courthouse

- masonry floors such as brick, flagstone, and marble should be cleaned with as little water as possible and dried immediately to avoid soaking the floors and possibly damaging the materials
- historic wood and linoleum floors should be waxed with non-skid paste wax; water emulsion and silicon waxes should not be used on historic materials
- tile, masonry, and concrete floors should not be sealed, waxed, or oiled unless it was historically sealed; sealing a floor that was not intended to be sealed can result in damage due to the inability of the material to breathe, causing moisture to be trapped beneath the surface, and can change the color and sheen of the floor
- floor polishers and scrubbers should be used only sparingly, and never on soft or deteriorated floors

Walls

Walls are generally subject to less wear and tear than floors, but can accumulate dust, as well as dirt and oils from contact with hands. Refer to your building's completion report for information on the types of wall materials present, and care for the various materials accordingly, as care is not the same for every type of wall surface.

- routine cleaning of most walls includes dry dusting with a vacuum fitted with a dusting attachment, taking care to not scrape or gouge walls with plastic or metal parts; along with the walls, air grilles and electrical switches should also be cleaned
- a clean sponge slightly dampened with water or non-ionic detergent can be used to remove more tenacious dirt, and immediately dried with a clean cloth; note that only oil-based, latex, and acrylic paints can be safely cleaned with water
- water or detergents should never be used on porous surfaces like wood paneling, wallpaper, stone, brick, fabric, or walls painted with limewash or calcimine paint
- murals, paintings, and historic fabrics and wallpapers should be protected during cleaning and should never be cleaned by housekeeping or maintenance staff; seek the advice of an art conservator if cleaning is required
- wood paneling should be treated similarly to wood trim and cabinetry (see recommendations for wood trim and cabinetry in this section of the handbook)



Poorly repaired plaster ceiling after water damage

- if repainting must occur, paint type should match the existing paint in color, type (i.e., oil, acrylic, calcimine, etc.), and sheen; refer to your building's completion report for paint type, color, and other information prior to undertaking any repainting, as paints that are incompatible can cause serious failures of the paint coatings and possibly damage historic paint; keep paint can lids and swatches for matching in the future and be sure to keep these and any other records regarding repainting in a safe place with other maintenance records; repainting should not be performed by inexperienced personnel, and any special painting techniques, such as faux finishes or gilded painting, should never be treated by housekeeping or maintenance staff

Ceilings

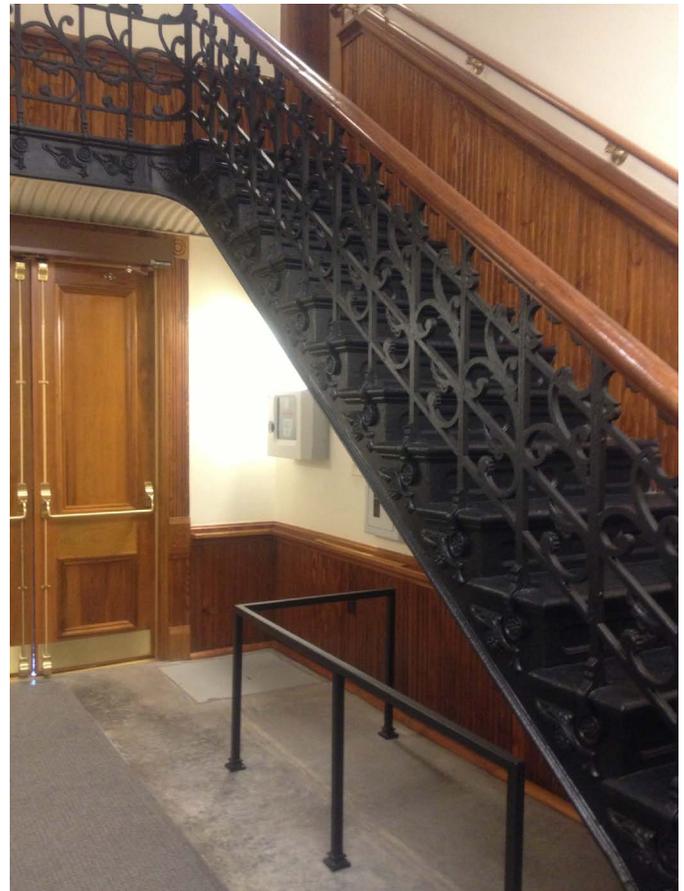
Ordinary ceiling surfaces are treated much the same way as walls (see recommendations for walls in this section of the handbook). Refer to your building's completion report for information on the types of ceiling materials present, and care for the various materials accordingly, as care is not the same for every type of material.

- decorative plaster and some painted ceilings such as painted pressed-metal ceilings may be gently dusted with vacuums held away from the surface, taking care to avoid direct contact with cleaning poles or any metal objects
- wet cleaning methods should not be used on plaster or decoratively painted ceilings; if decorative ceilings become excessively dirty or damaged, seek the advice of an art or plaster conservator

Trim and Cabinetry

Wood trim, such as baseboards, door and window trim, wainscot and paneling, chair rails, and built-in wood cabinetry may be finished with paint or varnish, or left unpainted. Care should be taken when cleaning wood trim and cabinetry. In some cases, special finishes such as faux graining, inlay, or metal leaf and original historic finishes could be present and damaged by inappropriate cleaning. Refer to your building's completion report for information on the types of materials used for trim and cabinetry.

- wood surfaces, including the horizontal surfaces of trim, should be lightly dusted with soft dry cloths or microfiber pads on a regular basis
- cleaning of heavy soiling should be done with a clean sponge slightly dampened with water or non-ionic detergent to remove more tenacious dirt, and immediately dried with a clean cloth



Wood and iron stair, Hood County Courthouse



Wood casework and doors, Hood County Courthouse

- unfinished and varnished wood can be treated occasionally with microcrystalline wax or paste wax; take care to avoid build-up of wax
- if repainting or refinishing of trim or cabinetry must occur, the finish type should match the existing finish in color, transparency, type (i.e., oil-based, water-based, etc.), and sheen; refer to your building's completion report for finish type, color, and other information prior to undertaking any refinishing, as finishes that are incompatible can cause serious failures of the coatings and possibly damage historic substrates; keep can lids and swatches for matching in the future, and be sure to keep these and any other records regarding refinishing in a safe place with other maintenance records; refinishing should not be performed by inexperienced personnel, and any special finishing techniques such as faux graining or marbling should never be treated by housekeeping or maintenance staff

Decorative Treatments

Decorative finishes and treatments can take many forms and be made up of one or more historic materials, each with its own housekeeping and maintenance requirements. It is important to understand the proper methods of cleaning each element to avoid damage.

- a different cleaning cloth should be used for each material, if the cleaning product used for one may damage another

- in some cases, dry dusting is the only acceptable means of cleaning
- some decorative treatments such as gilding, decorative painting, and faux graining requires the advice of a conservator for any cleaning or work other than dry dusting
- restored vault doors and vault surrounds should only be cleaned by dry dusting; for other deterioration or damage, consult a conservator
- if housekeeping staff is not familiar with the material, it is best to avoid cleaning these materials and instead seek the advice of a finishes conservator

Lighting

For restored courthouses, the lighting was designed to be appropriate to the period of the courthouse. The color temperature in degrees Kelvin (K) as well as the wattage were selected to provide light both for working and to complement its finishes. Care should be taken to maintain the lighting design. The color temperature is generally between 2700K to 3000K, but should be verified prior to purchasing lamps; information about the lighting used is available in your building's completion report.

- replace burnt out or flickering lamps as required with new bulbs of the same type, wattage, and color temperature



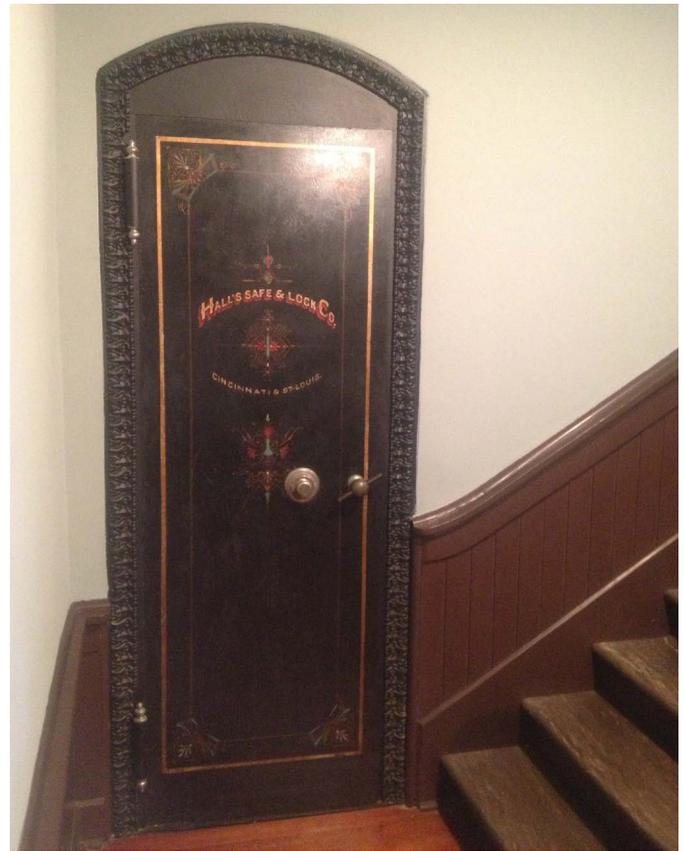
Corroded bronze hardware at interior of metal windows, San Augustine County Courthouse

- regularly dust fixtures for cleanliness and also to maintain light levels, which can appear lower if fixtures are dirty
- lamp types should be inventoried for color temperature and characteristics; only lamps of that type should be stocked to avoid inadvertently altering the lighting levels or apparent colors of interior finishes
- prior to undertaking projects where lighting is converted to LED, the color temperature of the proposed lighting should be evaluated to make sure the colors of interior finishes do not appear distorted

Doors and Interior Windows

Doors and windows are often subject to significant wear and tear. They must be cared for not only in a manner that takes their materials into account—including wood, metal hardware, glass, seals, etc.—but they should also be maintained in good working order.

- check that doors open and close easily without putting pressure on frames and handles
- window glass, frames, sills, and trim should be dusted regularly and the glass wiped with a clean untreated microfiber cloth
- plain, clear window glass can be washed with non-sudsing household ammonia in water and dried with a chamomis; be sure to protect surrounding materials, including wood and stone frames and sills, prior to cleaning glass
- stained and leaded glass can be cleaned using deionized water on a dampened cotton swab (see Leaded Glass section of this handbook for specific cleaning instructions); painted glass should never be cleaned by maintenance or housekeeping staff; if stained, leaded, or painted glass becomes excessively dirty or damaged, seek the advice of a conservator
- transoms are located above doors and/or windows, and were intended to provide additional light and ventilation of interior spaces, if operable; they are often glazed with leaded, textured, or stained glass; like doors, they should be able to be opened and closed without putting pressure on frames and handles; glass should be cleaned as appropriate for plain clear or leaded glass panels
- clean metal window and door hardware, including knobs, locks, and hinges by dusting regularly with a



Vault door, Weatherford County Courthouse

dry microfiber cloth to remove hand prints; tarnish remover and metal polish may be used sparingly to treat tarnish and light corrosion, and should be specific to the type of metal; microcrystalline wax can be used sparingly on brass and iron hardware; window glass cleaning solution, followed by water rinsing, can be used to clean glass and ceramic hardware

- clean window blinds with microfiber cloths or a vacuum with dust attachment set on low to avoid damage
- fabric window shades and curtains may be dusted with a soft dry dust brush or wrung-out damp sponge if they are not historic
- refer to the appropriate window section and exterior door section of this handbook for repairs to doors and windows, including repainting

Audio-Visual

- audio-visual equipment is generally modern; this equipment should be regularly dusted with clean dust brushes or microfiber cloths
- cleaning solutions appropriate for electronic equipment may be appropriate for removing tenacious dirt; follow the manufacturer's instructions for both the equipment and the cleaning solution

Clocks

- mechanical clocks can be dusted as appropriate
- movable parts, gears, and the like should be maintained by a specialist or conservator with experience in historic clockworks

Resources

The following resources are intended to provide facilities and housekeeping tools for recognizing historic materials, identifying problems when they occur, and helping to identify appropriate specialists to contact when problems arise. While many of the resources below provide advice on conservation and preservation techniques for special interior materials, as well as information on appropriate repair and replacement materials, this work should only be undertaken by those with expertise in the material.

Association for Preservation Technology International
Building Technology Heritage Library:

<https://archive.org/details/buildingtechnologyheritagelibrary>

National Park Service, *Preservation Brief #18: Rehabilitating Interiors in Historic Buildings: Identifying and Preserving Character-Defining Elements*

<https://www.nps.gov/tps/how-to-preserve/briefs/18-rehabilitating-interiors.htm>

National Park Service, *Preservation Brief #21: Repairing Historic Flat Plaster Walls and Ceilings:*

<https://www.nps.gov/tps/how-to-preserve/briefs/21-flat-plaster.htm>

National Park Service, *Preservation Brief #23: Preserving Historic Ornamental Plaster:*

<https://www.nps.gov/tps/how-to-preserve/briefs/23-ornamental-plaster.htm>

National Park Service, *Preservation Brief #28: Painting Historic Interiors:*

<https://www.nps.gov/tps/how-to-preserve/briefs/28-painting-interiors.htm>

National Park Service, *Preservation Brief #40: Preserving Historic Ceramic Tile Floors:*

<https://www.nps.gov/tps/how-to-preserve/briefs/40-ceramic-tile-floors.htm>

National Park Service, *Preservation Brief #49: Historic Decorative Metal Ceilings and Walls: Use, Repair, and Replacement:*

<https://www.nps.gov/tps/how-to-preserve/briefs/49-decorative-metal.htm>

ALERT THE FACILITIES MANAGER

- If floors are found to be sagging or springy
- If mortar joints in flagstone or brick floors are crumbling or deteriorated, which can trap dirt and water and cause deterioration of the masonry
- If cracks, bulges, mold, or water stains are observed on plaster walls or ceilings
- If condensation is evident on interior surfaces or windows
- If wood elements show evidence of cracks, moisture damage, insect damage, rot, or mold
- If deterioration or damage to any special decorative treatments, furniture, murals, or other special materials is observed
- When door hardware must be replaced, which could effect accessibility, building code, and life safety code compliance
- Possible experts that the facilities manager may contact if any of the above are observed include: an art conservator, a specialty finishes contractor, an engineer, a preservation architect, or the THC

CALL THE TEXAS HISTORICAL COMMISSION

- For any work or alteration that is not cyclical maintenance or housekeeping

THIS PAGE INTENTIONALLY LEFT BLANK

