

8.0 EXTERIOR FEATURES

ARTICLES

NOTES

8.1.0 INTRODUCTION

Historic columns at Fort Lewis appear to be hollow wood staved, and are in relatively good condition. There are at least six types of stave joints used historically; butt, spline, lock, alignment, etc. Joint types on this site are undetermined.

Most column bases are wood and some are showing moisture damage.

8.1.1 TYPICAL REPAIRS

8.1.1.1 Checks in wood.

REPAIR

Clean soft wood, paint and debris out of checks.

Caulk and repaint checks 1/8" or less.

Tap a soft pine slat into larger checks, applying glue on one side and caulk on the other.

Trim and sand surface after glue has set. Repaint.

8.1.1.2 Loose staving; column is capable of movement and lines of joints are apparent.

REPAIR

Column must be removed. Provide temporary shoring, transferring all loads to the ground. Remove base of column, drop and remove shaft.

Make radiused cradles secured to saw horses to hold column.

Remove glue, caulk and paint, scraping to bare wood.

Use weatherproof glue and band clamps every 12 inches.

Apply clamp pressure gradually working up and down column using two people to complete clamping before glue dries.

Glue one joint at a time until two are remaining.

Glue these at the same time.

Remove clamps slowly.

Repaint.

8.1.1.3 Base is soft, split, or rotted.

REPAIR

Base must be replaced or decay will spread.

Replace with new wood base, fabricated to reduce exposed endgrain, and matching original profile, or;

Replace with cast aluminum or fiberglass base. These are readily available, vented, and durable. See "Sources".

8.1.1.4 Sprung stave.

REPAIR

Column should be removed and sprung stave should be screwed into anchor blocks inserted inside of columns.

Cut several anchor blocks matching exactly the inside joint profile of the column joint junction.

Make an insertion stick by cutting off the head of a wood screw and twisting the end of it into a broomstick with pliers. The projecting end can be used to hold the anchor blocks in place.

Predrill a hole at the end of each block, attach to end of insertion stick and insert into column between sprung stave and neighboring stave. Hold against the neighboring stave. Predrill through stave into block, and screw through. Proceed every 8".

Clamp or wedge sprung stave into place, applying caulk at both edges.

Predrill and screw sprung stave into other side of anchor block.

Use only hot dipped galvanized or brass screws, countersunk and filled. Paint.

8.1.2 MAINTENANCE RECOMMENDATIONS

- A. Wood columns need to be protected from water and moisture vapor.
- B. No water should be allowed to run down columns. This can be prevented by adequate porch gutters or copper cap flashing.
- C. Columns need to be vented both top and bottom. If ventilation isn't apparent, drill two 1" holes top and bottom away from the weather side. Plug with screen vents.
- D. All cracks should be immediately caulked.
- E. Paint film needs to be continuous, but vapor permeable. If paint is thicker than .015" (four sheets of paper) it should be removed because it may be trapping moisture within the wood members.
- F. Repainting shall consist of one coat of clear wood preservative, one coat of alkyd primer, and two coats of exterior latex.

8.2.0 INTRODUCTION

Cast iron is a hard, ferrous metal, more brittle than wrought iron. It is strong in compression but weak in tension.

Historic cast iron was not as malleable as iron produced today.

Cast iron junctions were typically joined by decorative unions rather than by bending.

Most iron deterioration is caused by water. All repairs should prevent water from entering or sitting on metal surfaces.

All repairs must be primed with a rust inhibiting primer immediately.

8.2.1 TYPICAL REPAIRS

8.2.1.1 Railing is pitted, cut, rusted through or cracked.

CAUSE

Moisture, impact, stress.

REPAIR

Remove all rust and adjacent paint from surface.
Fill small cracks or voids with auto body putty. Sand smooth.
Paint immediately.
Employ an experienced welder for larger repairs.
All repairs shall match existing forms, gauges and profiles.

8.2.1.2 Railing connection flange is loose at column or wood deck.

CAUSE

Screws are missing.
Wood is soft.

REPAIR

Remove flange. Remove all paint and rust. Wire brush smooth.
Paint immediately all sides.
Clean column surface. Remove all loose paint and soft wood.
Fill column voids with wood filler. Paint.
Predrill pilot holes for wood screws.
Secure flange to wood with flat head, non-corrosive, wood screws. Install all screws.
Diameter of screws may be increased to compensate for worn openings in flange.

8.2.1.3 Railing connection is loose at base.

CAUSE

Water has entered and caused rusting. Rust has expanded and forced connections loose, sometimes cracking lower tread.

REPAIR

Remove flange, bolts, loose concrete, rust, moss and previous repairs.
Fill voids in concrete tread with patching compound. (See Article on "Concrete".)

Repair flange if broken by casting new element to match existing or welding replacement piece to original.

Clean flange thoroughly, wire brush smooth. Paint immediately.

Drill new holes in concrete for 4" bolts. Drill wider at bottom.

Set bolts in hole to extend 1"

Pour melted lead all around bolt. When lead is cool, tamp tightly around bolt. Fill with more lead if voids or pockets appear.

Reinstall flange on bolts. Secure. Paint.

8.2.1.4 Railing components are rusted or paint is flaking off.

CAUSE

Impact.

Excessive layers of paint have expanded and contracted at a different rate than iron. Cracks have occurred in paint allowing moisture to enter.

REPAIR

Remove finish and rust.

Protect all building elements and landscaping if a commercial paint stripper is used.

Reuse thoroughly, dry, prime and paint immediately.

If ironwork is heavily painted and details are obscured, strip ironwork, especially if in a highly visible location.

8.2.2 MAINTENANCE RECOMMENDATIONS

- A. Avoid repairs which may trap moisture.
- B. Keep all ferrous metals painted.
- C. Keep all moss removed. It acts as a sponge.
- D. Never fill voids in hollow cast iron with concrete. As the concrete shrinks moisture will become trapped against the iron.
- E. Existing galvanized replacement rails would harmonize better if they were painted black.

8.3.0 INTRODUCTION

Wrought iron is very malleable and can be machine or anvil worked. Elements are usually thinner appearing than cast iron elements since they are produced from bar stock, tubular steel or heavy gauge sheet.

Connections are usually mechanical, such as riveting, collaring and mortise-and-tenon. Welding is seen where other connections are impractical and is a common connection method at Fort Lewis.

Most iron deterioration is caused by water. All repairs should prevent water from entering or sitting on metal surfaces, and should have as few horizontal surfaces as possible.

8.3.1 TYPICAL REPAIRS

8.3.1.1 Railing is pitted, cut, rusted through or cracked.

CAUSE

Moisture, impact, stress.

REPAIR

Remove all rust and adjacent paint from surface.

Fill small cracks or voids with auto body putty. Sand smooth.

Paint immediately.

Employ an experienced welder for larger repairs.

All repairs shall match existing forms, gauges and profiles.

8.3.1.2 Railing connection flange is loose at column or wood deck.

CAUSE

Screws are missing.

Wood is soft.

REPAIR

Remove flange. Remove all paint and rust. Wire brush smooth.

Paint immediately all sides.

Clean column surface. Remove all loose paint and soft wood.

Fill column voids with wood filler. Paint.

Predrill pilot holes for wood screws.

Secure flange to wood with flat head, non-corrosive, wood screws. Install all screws.

Diameter of screws may be increased to compensate for worn openings in flange.

8.3.1.3 Railing connection is loose at base.

CAUSE

Water has entered and caused rusting. Rust has expanded and forced connections loose, sometimes cracking lower tread or face of porch.

REPAIR

Remove post or cut and remove bottom of post.
Provide new posts or weld new post extensions to existing posts. Prime or galvanize.
Cut back damaged concrete a minimum diameter of 4" around base.
Clean concrete.
Insert temporary sleeve in void, sized slightly larger than post.
Fill void with cementitious patching compound, crowned to slope away from metal.
Remove temporary sleeve when firm.
Insert post, bracing plumb and level.
Pour melted lead all around post. Tamp down, add more lead to a height slightly higher than patching compound.
The lead will help cushion movement from different rates of thermal expansion, keeping moisture out.
Prime and paint with oil based semi-gloss exterior paint.

8.3.1.4 Railing components are rusted or paint is flaking off.

CAUSE

Impact.
Excessive layers of paint have expanded and contracted at a different rate than iron. Cracks have occurred in paint allowing moisture to enter.

REPAIR

Remove finish and rust.
Protect all building elements and landscaping if a commercial paint stripper is used.
Reuse thoroughly, dry, prime and paint immediately.
If ironwork is heavily painted and details are obscured, strip ironwork, especially if in a highly visible location.

8.3.1.5 Railing collar bolts have come loose from concrete or masonry.

CAUSE

Impact.
Moisture and rust.

REPAIR

Remove connecting bolts or anchors. Clean lead, debris and rust from connection pocket.
Insert new lead expansion shield and galvanized bolt.
Clean collar; prime, paint and reinstall securely.

8.3.2 MAINTENANCE RECOMMENDATIONS

- A. Avoid repairs which may trap moisture.
- B. Keep all ferrous metals painted.
- C. Keep all moss and soil removed. It acts as a sponge.
- D. Remove rust promptly. Rust expands and spreads connections apart. It can corrode through thin wrought iron elements and weaken the entire assembly.
- E. Keep bolts tightened to eliminate movement stresses.

NOTES

8.4.0 INTRODUCTION

A number of buildings at Fort Lewis have concrete porch steps and porch structures. Although very simple, these elements have subtle decorative details that should be replicated.

Evident concrete damage is mostly related to spalling caused by the expansion of corroding metal (due to cracking and moisture infiltration) or mechanical damage.

Small patch work should be done following the general section on concrete.

Major concrete work requires the services of a structural engineer. Concrete that predates 1940 should be tested in-situ and under laboratory conditions for composition, density, porosity, and compressive strength before undertaking repair.

New or patching mixes should have the same ultimate compressive strength as the existing material and conform to ASTM or comparable specifications.

8.4.1 TYPICAL REPAIRS

8.4.1.1 Minor cracking evident on surfaces.

CAUSE

Cracks may be due to natural shrinkage of materials or foundation settlement.

They are not serious as long as they do not admit water to the building, corrode reinforcing materials, or cause spalling.

REPAIR

Minor cracks including seasonal or hairline cracks may be painted, filled with epoxy, or drypacked depending on the severity of the crack.

Cracks treated in this manner must be stable.

Epoxy treatment is appropriate only when cracks are large enough to let the epoxy flow into them.

Cracks must be clean and dry.

Cut a trough at the top edges to permit effective flow.

Inject epoxy to the full depth of the crack to ensure bonding.

Drypack methods require chipping all unsound material to a depth of one inch.

Widen cracks by cutting and scraping and provide undercut interior edges to create a mechanical lock for the patch.

Clean area with water or compressed air, allow full drying, and prime with an acrylic latex bonding agent.

Pack the area with cement mortar that has similar characteristics (compressive strength and thermal expansion properties) as the original materials.

8.4.1.2

Major cracks indicating building movement or structural failure. Cracks that run in the direction of reinforcing bars, show evidence of rust stains, or that are located at openings and accompanied by buckling are serious.

CAUSE

Major cracks are caused by building settlement or structural failure of reinforcing.

REPAIR

Identify specific cause. This requires consultation with and design by an architect and a structural engineer familiar with historic structures.

Causes must be corrected before any final patching occurs. This may include stabilizing foundations, providing additional structural support, or replacing the damaged section.

Remove concrete from around exposed or rusting reinforcing bars using hand held hammers and chisels.

If more than 1/2 the circumference of any bar is exposed, remove material from around entire circumference.

Clean steel and adjacent concrete by sandblasting or pressure wash to eliminate dirt, grease, and scale.

Dry thoroughly with hand-held blowers and paint steel immediately with a corrosion inhibiting primer.

Inspect condition of steel.

Severely rusted bars must be cut out and replaced.

New steel must overlap original reinforcing bar as specified by an engineer.

Repair remaining voids by priming surfaces with an acrylic latex bonding agent and either drypacking area with a concrete or mortar mix that has similar characteristics to the adjacent concrete or, in the case of larger holes, by using formwork.

Formwork should be carefully installed adjacent to visible surfaces to maintain, as best as possible, a flush finish surface.

8.4.1.3

Chips and spalls on concrete surfaces.

CAUSE

Spalls may be caused by incidental mechanical damage (e.g. trucks backing into corners), freeze/thaw moisture damage, severe efflorescence, or deteriorating reinforcing steel.

REPAIR

Minor spalls and mechanical damage less than 2 inches deep with no exposed reinforcing bars may be treated by either painting or light patching.

Remove all loose material with light hammers.

If the adjacent concrete is not painted, cut or chip edges perpendicular to surface of concrete to a minimum depth of 1 inch (providing slightly undercut edges for anchoring), clean surface with water or air, and allow to dry.

Prime area with acrylic latex bonding agent and dry pack area with cement mortar or concrete mix to match original finish and composition.

Major spalls include those with exposed reinforcing bar or a depth greater than 2 inches.

Repairs to major spalls should be supervised by an experienced architect and structural engineer.

Remove all loose materials with a small hammer.

Cut out deteriorated concrete so edges are sharp and perpendicular to the surface (providing undercut edges to anchor new patching material).

Expose and clean deteriorating reinforcing bars; expose the entire bar if more than 1/2 of the circumference is visible.

Treat reinforcing bars with corrosion inhibiting primer, prime concrete surfaces with acrylic latex bonding agent, and fill with a compatible concrete mix.

8.4.1.4 Edge spalling of stairways.

CAUSE

Rusting and expansion of iron stair railings or mechanical damage.

REPAIR

Refer to repair details under iron railings.

8.4.2 MAINTENANCE RECOMMENDATIONS

- A. Inspect concrete annually for deteriorating conditions including cracks, moisture penetration, spalling, and vegetation damage.
- B. Document existing cracks by measuring widths at specified points on an annual basis to identify movement. Cracks moving more than 1/8 inch in an annual cycle should be investigated to establish the cause.

NOTES

8.5.0 INTRODUCTION

Most of the fire escapes present at Fort Lewis are not historically significant and were added later to comply with code requirements and to increase life safety measures. They are all constructed of steel in a utilitarian design.

Most are located discretely, centered on the rear of buildings. The fire escapes at the Museum, however, are located on a primary facade.

Most fire escapes at Fort Lewis are fabricated using expanded metal treads, pipe rails and square steel supporting columns. They are painted black and are in good condition.

The application of fire escapes to primary facades is discouraged.

The best solution to the problem of fire exiting is, of course, the integration of new one-hour stair enclosures within the building. These should empty directly to the exterior.

8.5.1 TYPICAL REPAIRS

8.5.1.1 Elements are rusting.

CAUSE

Moisture penetration through paint layer.

REPAIR

Remove all rust completely and prime with rust inhibiting primer same day. Paint with two coats semi-gloss alkyd exterior paint.

8.5.1.2 Elements are loose.

CAUSE

Stress, movement, ordinary usage.

REPAIR

If due to settlement of a support, retain structural engineer to design new footing.

Loose connections can be repaired by welding or bolting.

The metal shop at Fort Lewis is qualified to make these repairs.

Prime immediately and paint all bolts, welds and new elements.

All connectors should be fabricated to avoid trapped or standing water or snow.

8.5.2 MAINTENANCE RECOMMENDATIONS

- A. Although used only in emergency situations, maintenance of fire escapes is just as important as in any pedestrian area.
- B. Wood members must be protected from moisture, moss and vegetation which may hasten decay.
- C. Metal members must also be protected from moisture and kept completely painted.
- D. Landing lights must be kept operable and lamped.

NOTES