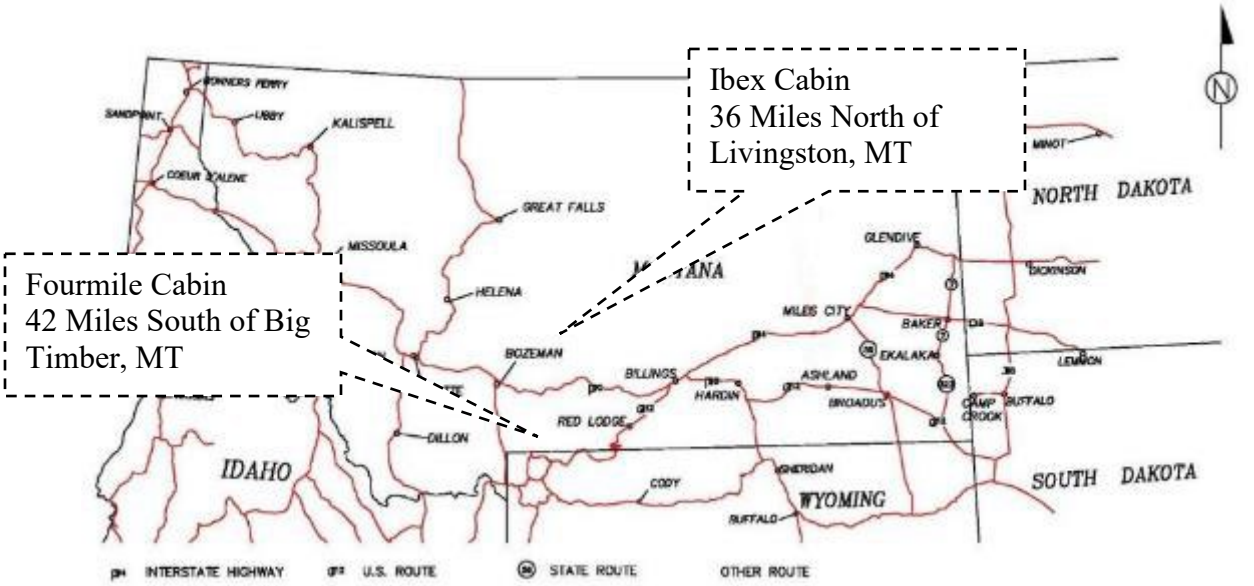
United States Department of Agriculture
Forest Service-Region One
Custer Gallatin National Forest
Yellowstone Ranger District

FY25 GAOA Cabins 1BF Foundation Repairs: Fourmile and Ibex Cabins



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Recommended by: Yellowstone District Ranger / Date

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Approved by: Forest Engineer Date

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Approved by: Forest Supervisor Date

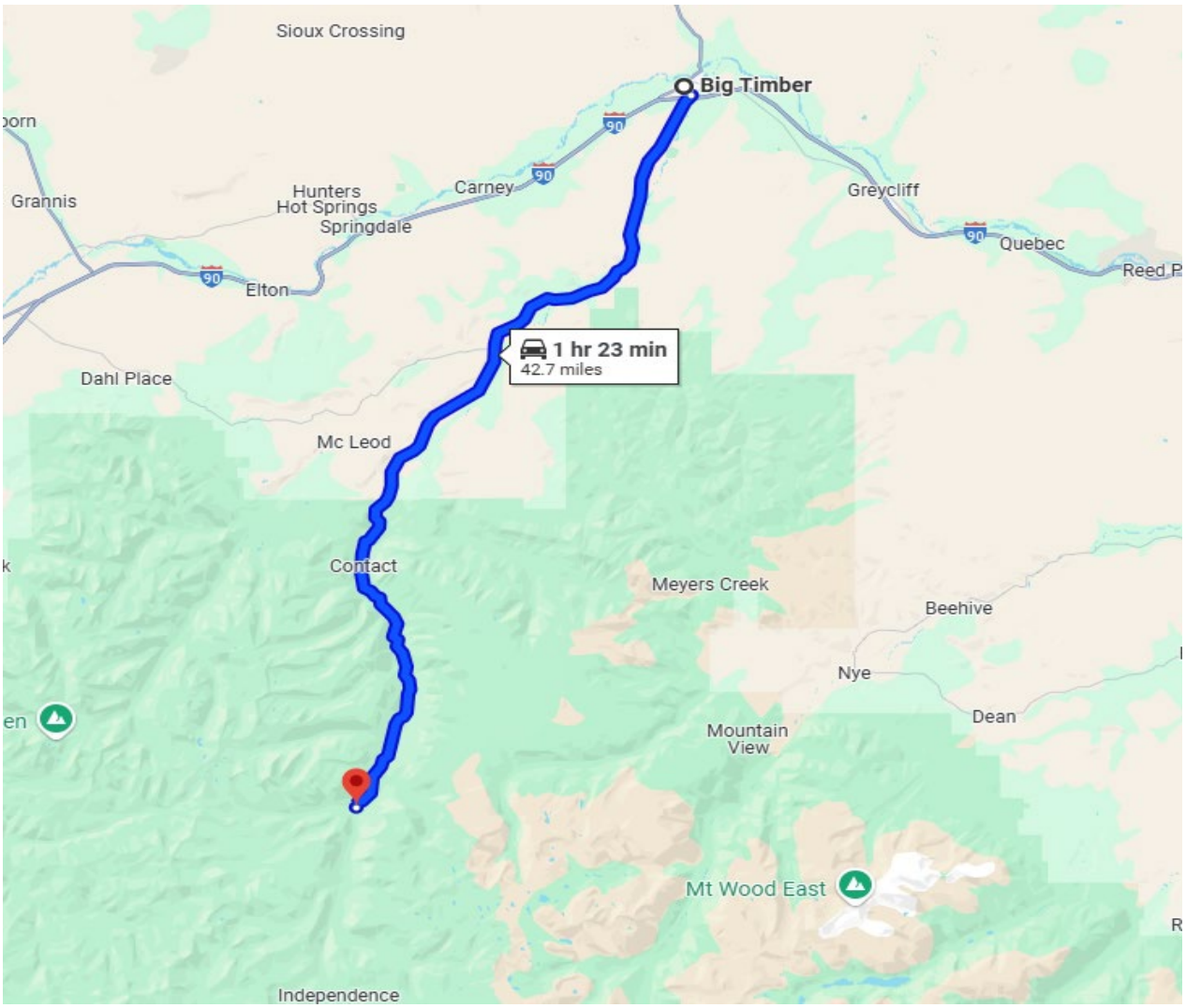


FIGURE 1: Fourmile Cabin: Location Map

FIGURE 2: Fourmile Cabin: Vicinity Map

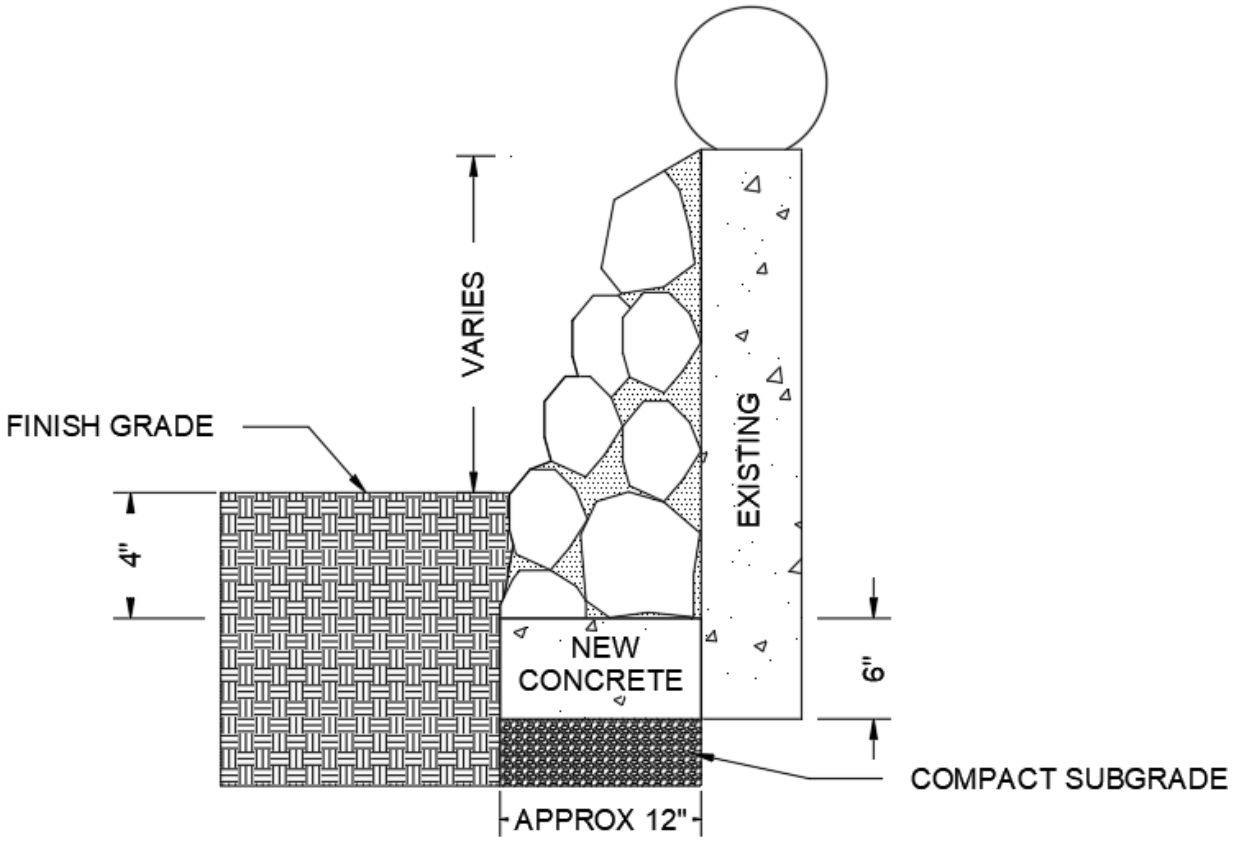
FIGURE 3: Fourmile Cabin: Profile View

FIGURE 4: Fourmile Cabin: Façade Failure, No Façade Support

FIGURE 5: Fourmile Cabin: North Wall and Porch Interface Failure

FIGURE 6: Fourmile Cabin: South Wall and Porch Interface Failure.

FIGURE 7: Fourmile Cabin: Front Porch Step



DETAIL: NEW 6" FOOTING TO EXTEND FROM THE EXISTING FOUNDATION OUT AS NEEDED TO SUPPORT THE FACADE. FOOTING SHALL BE FIBER REINFORCED CONCRETE.

COMPACT FOOTING AREA AND ADD GRAVEL AS NEEDED.

NOTE:
MAINTAIN THE EXISTING HISTORIC GRADE AFTER ALL STONEWORK HAS BEEN COMPLETED.

REPAIR MASONRY IN FASHION MATCHING ORIGINAL INSTALLATION, REUSING EXISTING STONES WHERE POSSIBLE.

FIGURE 8: Fourmile Cabin: Foundation/Masonry Facade Repair Detail

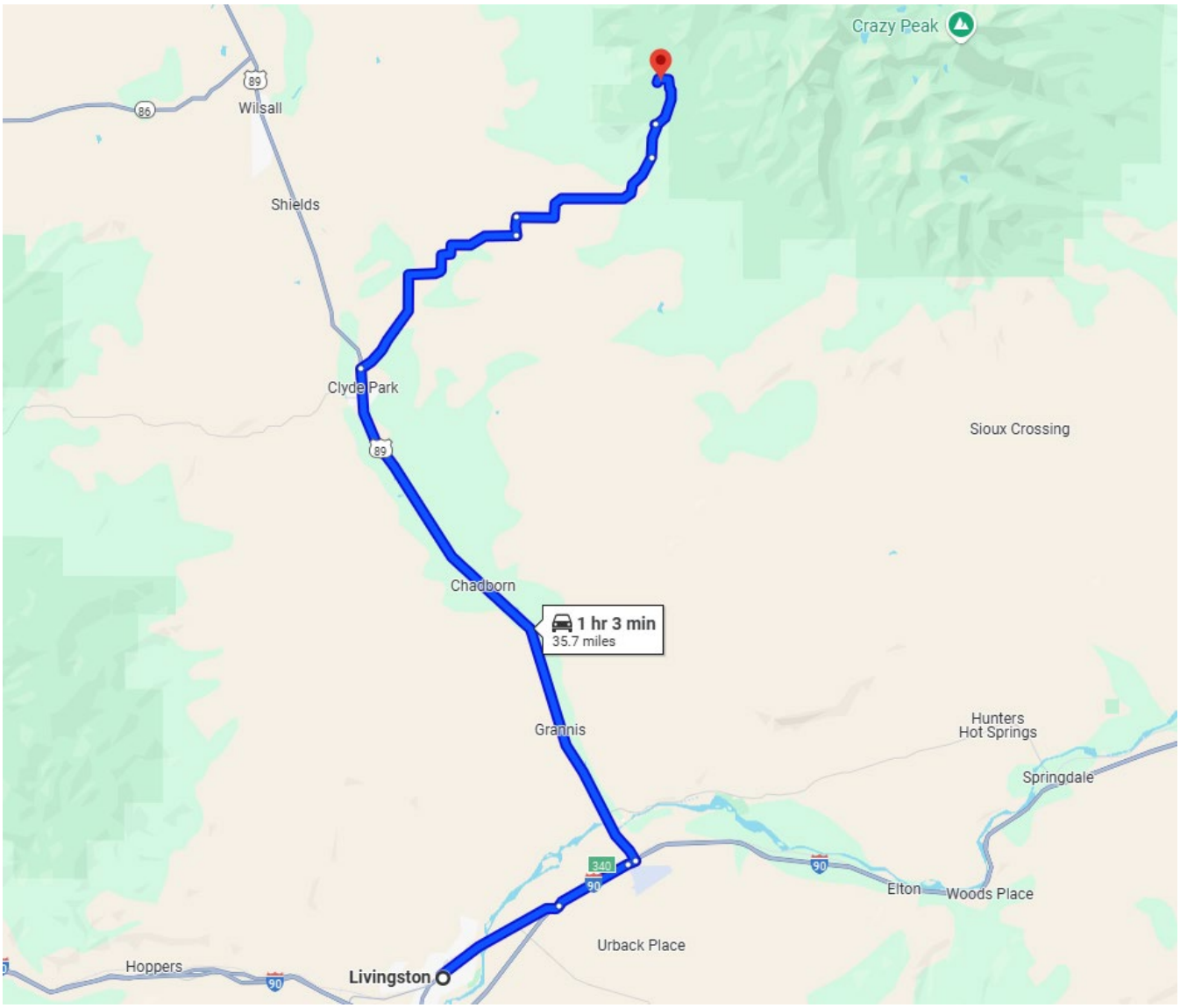


FIGURE 9: Ibex Cabin: Location Map

FIGURE 10: Ibex Cabin: Vicinity Map

FIGURE 11: Ibex Cabin: Profile View

FIGURE 12: Ibex Cabin: Front Steps, Existing Condition

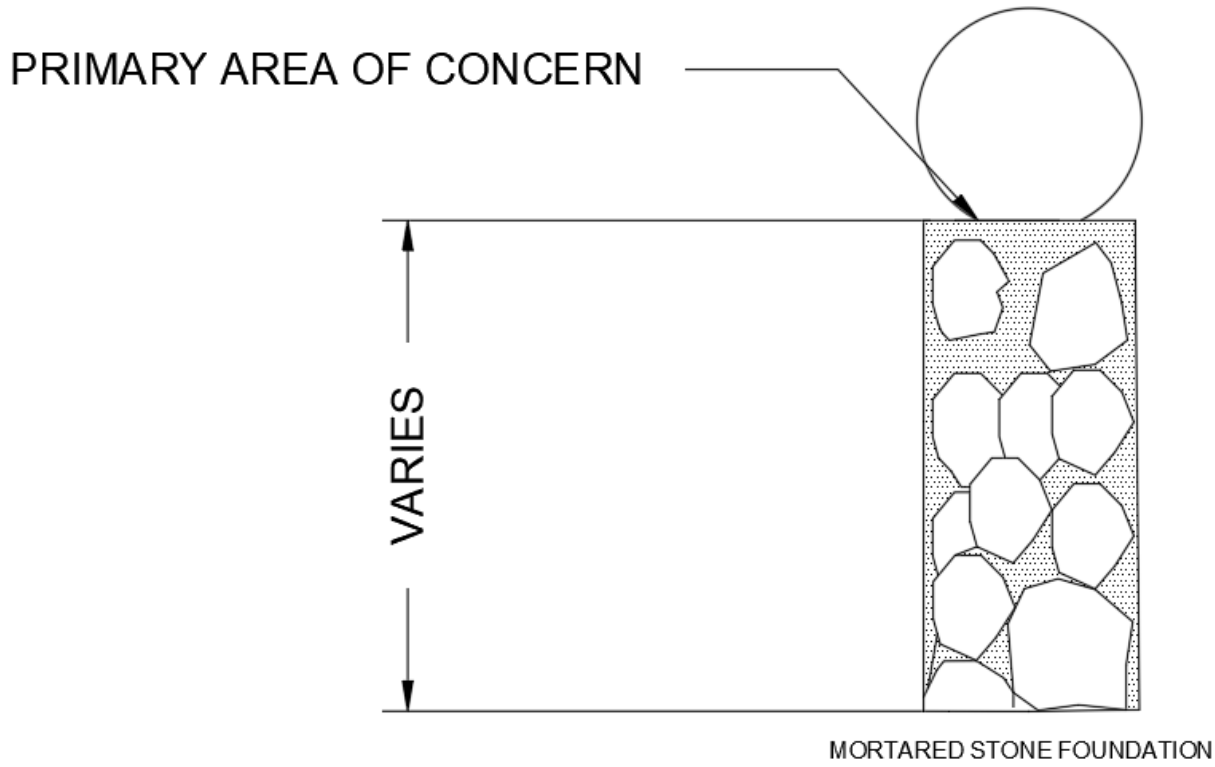
FIGURE 13: Ibex Cabin: Front Steps To Be Rebuilt

FIGURE 14: Ibex Cabin: Typical Coping Cracking

FIGURE 15: Ibex Cabin: Additional Coping Cracks

FIGURE 16: Ibex Cabin: Vertical Cracks in Foundation, Rebuild

FIGURE 17: Ibex Cabin: Additional Vertical Cracks in Foundation



DETAIL: FOCUS ON TOP JOINT ALONG LOG (COPING CRACKING)

THERE ARE AT LEAST FOUR AREAS WITH CONTINOUS VERTICAL CRACKS. IN THESE AREAS, A COMPLETE RESTORATION MAY BE NEEDED. REMOVE AND REPLACE ALL FAILING MORTAR AND STONE. PRIMARILY ON THE EASTERN ELEVATION OF BUILDING

IF PREVIOUS REPAIRS ARE FOUND THAT DO NOT MATCH EXISTING, THESE AREAS WILL ALSO NEED TO BE REMOVED AND REPLACED.

REPAIR ALL MASONRY IN FASHION MATCHING ORIGINAL INSTALLATION.

FIGURE 18: Ibex Cabin: Mortared Stone Foundation Repair Detail

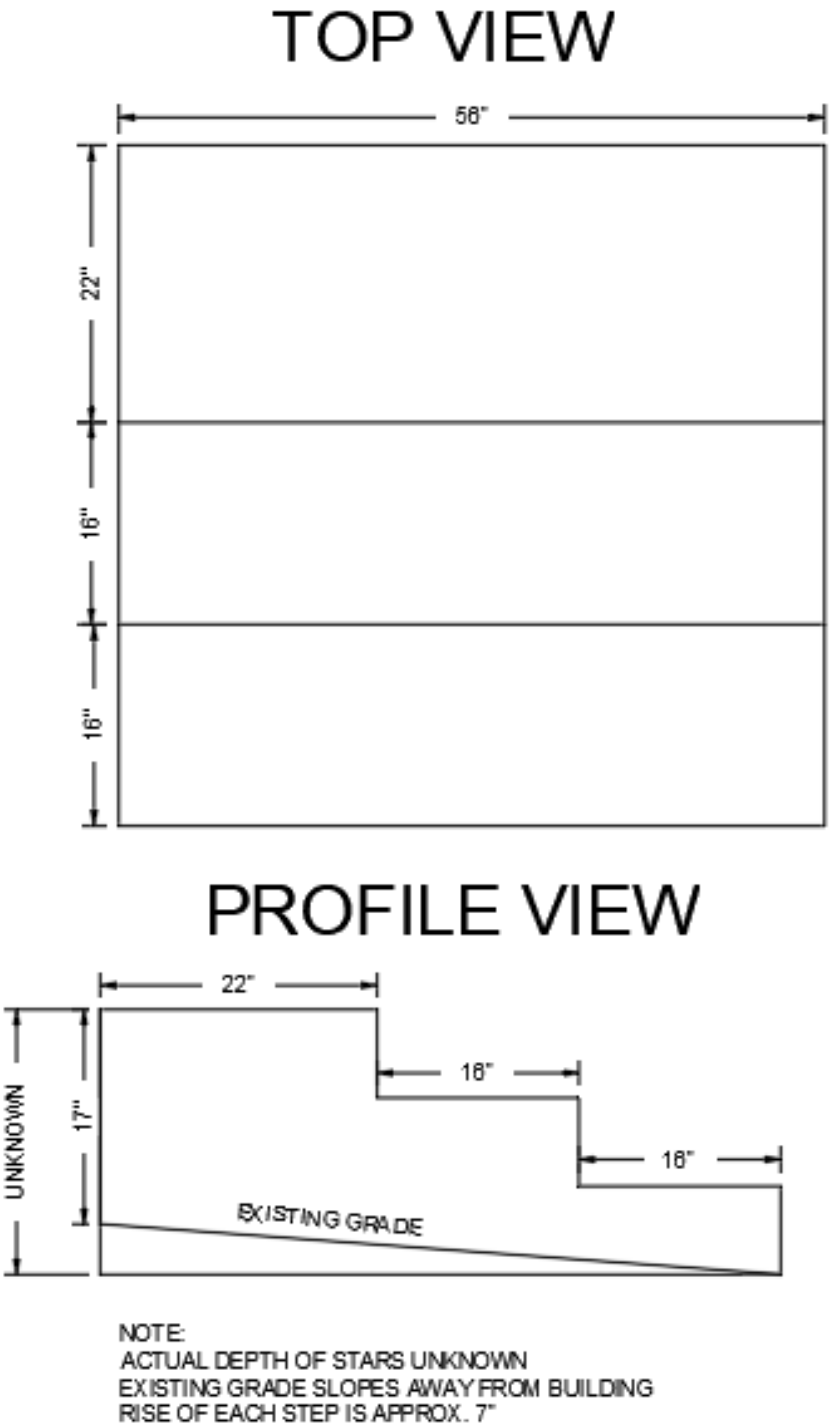


FIGURE 19: Ibex Cabin: Stair Example Detail

SECTION C - DESCRIPTION AND SPECIFICATIONS

C.1 PROJECT DESCRIPTION AND LOCATION

C.1.1 Intent of Contract – The intent of the contract is to provide for the completion of the work described below. The precise details of performing the work are not stipulated, except as considered essential for the successful completion of the work. Furnish all labor, material, equipment, tools, transportation, and supplies necessary to complete the work according to the contract.

Item 01001 – Mobilization – Work consists of preparatory work and operations, including those necessary to the movement of personnel, equipment, supplies, and incidentals to the project site, and for work on the various items on the project sites. A separate mobilization will not be paid when moving from one cabin to another.

Item 040151 – Fourmile Cabin Front Step Rebuild- Work consists of cleaning and restoring the front steps leading off the porch. Anticipated work includes removing all vegetation and debris from the steps, replacing any damage stones, and repointing all surfaces to match, as close as possible, the original structure.

Item 040152 – Fourmile Cabin Foundation and Masonry Repairs – Work consists of repairing the masonry façade on the concrete foundation at Fourmile Cabin. Most of the work will be along the North and South walls.

Item 040153 – Ibex Cabin Stair Rebuild **–** Work consists of all masonry work needed to replace and rebuild the stone steps at the front of the cabin. Steps should be rebuilt with larger stones then what are existing.

Item 040154 – Ibex Cabin Foundation Masonry Repairs **–** Work consists of repairing and repointing all mortared stone foundation failures at Ibex Cabin.

C1.2 Scope of Contract.

Project Summary: Perform foundation and masonry repairs consistent with national standards for repairs on historic properties.

Fourmile Cabin Description of Work: Existing stone façade has begun to fail and detached from the foundation in several locations. Primary focus of repairs shall be along the North and South walls which will require complete facade reconstruction and the installation of a footing to be installed to support the façade. Height of façade varies in respect to existing grade, but ranges from an estimated 6 to 24 inches. Existing grade surrounding the façade shall be maintained, therefore the new concrete footing depth will vary. A minimum depth of 4 inches for finished grade shall be maintained over the new footing. See Figure 8 for more details. Some additional work will be needed along the porch, primarily at the interface between the porch and crown ends to address cracks that have perpetuated to the porch. It is expected that less than 10% of the

porch façade area will need to be addressed. All work shall be done using historic masonry techniques. Stone should be replaced as close as possible to its original appearance.

The porch step work includes removing any vegetation and debris from the steps, replacing damaged stones, and repointing any other failing stonework.

Locate and protect any existing utilities prior to beginning excavation work. Damaged utilities shall be repaired at contractor's expense.

Ibex Cabin Description of Work: work shall consist of rebuilding the front steps and repairing any failing mortared stones along the foundation. The steps will need to be removed, recompact the subgrade, and rebuilt using larger stones. Stair tread shall consist of no more than three stones and shall slope gently away from the porch (0.25" - 0.5").

There are at least four vertical cracks that have propagated through the entire height of the foundation that will need to be repaired. Two of these cracks are within 2-3 feet of each other, and the section between these two cracks will need to be rebuilt entirely. The other continuous vertical cracks may need to be rebuilt as well but will need to be addressed using more than simple tuckpointing.

In several areas, coping cracks (between the stone foundation and log wall) are present and will need repaired. This item also includes any other repointing needed along foundation and porch surfaces. Contractor will supply all tools, equipment, materials and labor necessary for completion of the work at both locations.

Cabins are on the Rental Cabin Program. Contractor will need to schedule work in advance with Forest Service to avoid cabin renters. The Contractor shall ensure that daily business will not be interrupted. Pending approval, contractor may be able to use the cabin as housing while work is being performed. Work schedule timing may affect this, so please coordinate with the CO upon contract award.

The Contractor shall be responsible for verifying all measurements to determine necessary quantities and sizes of materials to be furnished.

C.1.3 Project Locations

– The work location for Fourmile Cabin is located about 43 miles South of Big Timber, MT just off Main Boulder Road (State HWY 298). The cabin is located on the Custer Gallatin National Forest. See included map images.
– The work location for Ibex Cabin is located about 36 miles North of Livingston, MT. The cabin is located at the end of Ibex Road in the Southwest portion of the Crazy Mountains, also located within the Custer Gallatin Nation Forest. Map images are included above.

Latitudes and Longitudes for project location:
Fourmile Cabin: 45.34242, -110.23321
Ibex Cabin: 46.003281, -110.442949

C.1.4 Government Cost Estimate, per FAR 36.204, is between $25,000 and $100,000.

C.1.5 Pre-bid Tour – No pre-bid tour is scheduled.

Prospective bidders wishing to obtain more information may do so by contacting Dustin Burns Custer Gallatin National Forest, Bozeman, Montana, telephone 406-548-7596, dustinburns@usda.gov.

C.1.6 Start Work - It is estimated that work will begin June 30th , 2025.
- Cabins has been blocked from the Rental Program for a specific timeframe during the 2025 season. In order to coordinate work between multiple projects, Contractor shall submit a work schedule at least 30 days in advance of work beginning. Contractor may block out multiple days or sets of days to conduct work but should not block out more days than needed for each hitch**.**

C.1.7 Period of Performance – Contract to be completed in 60 calendar days upon receipt of Notice to Proceed from CO.

C.1.8 Government Furnished Materials – None.

C.1.09 Submittals- The contractor shall submit a Work Schedule and all material to be used on the project as specified in the specifications

C**.1.10 Disturbances** –No deliveries shall be permitted on weekends or Federal Holidays. Schedule deliveries with District personnel.
- Julia Barton 406-222-1892

C.1.11 Staging Area - The Contractor shall coordinate with the CO on an unloading area location. The Contractor shall operate all equipment and store, transport, and handle materials in a manner that will not damage the existing roads, parking lots, and landscaping. Access must be maintained to the other facilities on the site.

C.1.13 Potable Water- There is no potable water on-site at either cabin location. Water may be collected at the Chippy Park Campground (17 miles North of Fourmile Cabin) when the campground is open (Memorial Day – Labor Day). If campground facilities are unavailable, potable water will need to be brought to the job site at contractor's expense.

C.1.14 Wastewater Facilities – There is no wastewater disposal facility in the cabin. The Contractor may use the vault toilet which is on site. The Contractor shall be responsible for cleaning and/or repairing the restroom if necessary, as a result of the Contractor's operations.

C.1.15 Electrical – Electrical power is available at Fourmile Cabin and available for contractors use. Ibex cabin does not have electrical power onsite, and the contractor will be responsible for providing electricity as needed.

C.2 – CLEANUP AND DISPOSAL

C.2.1 Cleanup and Disposal – The Contractor shall be responsible for solid waste disposal. The Contractor shall, at all times, keep the area in a clean, neat, and orderly condition. Construction related debris, including but not limited to used motor oil, oil cans, grease cartridges and refuse shall be removed promptly from the site and disposed of in a lawful manner off National Forest System lands. Fees for the use of landfills or transfer stations shall be paid for by the Contractor if there is a charge.

C.3 – SECURITY AND PROTECTION

C.3.1 Security and Protection – Security is the responsibility of the Contractor. The Contractor shall be responsible for protecting all equipment and supplies for use on the project and stored on the site. The Contractor shall be responsible for all costs required to provide such protection.

The Contractor shall complete sequences of construction activity in order to prevent damage to equipment, material, and articles incorporated into the work covered by this contract.

C-4 – OTHER RELATED DOCUMENTS AND DRAWINGS

C4.1 The following CSI formatted specifications are part of this solicitation and any resulting contract.

Section	Description
01000	Mobilization
01100	Demolition and Disposal
01025	Measurement and Payment
01400	Quality Control and Quantity Measurement
040140	STONE REPOINTING
040150	STONE REPAIR

C4.2 The following Figures are part of this solicitation and any resulting contract.

Figure	Description
1	Fourmile Cabin: Location Map
2	Fourmile Cabin: Vicinity Map
3	Fourmile Cabin: Profile View
4	Fourmile Cabin: Façade Failure, No Façade Support
5	Fourmile Cabin: North Wall and Porch Interface Failure
6	Fourmile Cabin: South Wall and Porch Interface Failure
7	Fourmile Cabin: Front Porch Step
8	Fourmile Cabin: Foundation/Masonry Façade Repair Detail
9	Ibex Cabin: Location Map
10	Ibex Cabin: Vicinity Map
11	Ibex Cabin: Profile View
12	Ibex Cabin: Front Steps, Existing Condition
13	Ibex Cabin: Front Steps To Be Rebuilt
14	Ibex Cabin: Typical Coping Cracking
15	Ibex Cabin: Additional Coping Cracks
16	Ibex Cabin: Vertical Cracks in Foundation, Rebuild
17	Ibex Cabin: Additional Vertical Cracks in Foundation
18	Ibex Cabin: Mortared Stone Foundation Repair Detail
19	Ibex Cabin: Stair Example Detail

SECTION 01001
MOBILIZATION

PART I: GENERAL

1.1 SUMMARY

A. Section Includes: Preparatory work and operations, including those necessary to the movement of personnel, equipment, supplies and incidentals to the project site; and for other work and operations which must be performed or costs incurred prior to beginning work on the various items on the project site. This specification does not include moves between project sites.

PART II: PRODUCTS

(There are no applicable requirements.)

PART III: EXECUTION

(There are no applicable requirements.)

PART IV: MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT:

A. Units: Progress payments will be made as follows:

1. When 5% of the original Contract amount is earned from other bid items, 50% of the amount bid for mobilization or 5% of the original Contract amount, whichever is lesser, will be paid.

2. When 10% of the original Contract amount is earned from other bid items, 100% of the amount bid for mobilization or 10% of the original Contract amount, whichever is lesser, will be paid.

3. Upon completion of work for the project, payment of the amount bid for mobilization in excess of 10% of the original Contract amount will be paid.

4. The total sum of all mobilization payments shall not exceed the original Contract amount bid for mobilization, regardless of the fact that the Contractor may have shut down the work on the project or moved equipment away from the project and then back again.

4.2 BASIS OF PAYMENT:

Payment: No direct payment for moves between project sites will be made. The Contractor shall include consideration for moves between project sites in the bid price for other items of the Contract. Prices and payment will be full compensation for the work described in this section. Payment will be made under:

Pay Item	Pay Unit
(01000) Mobilization.	Lump Sum

END OF SECTION

SECTION 01100
DEMOLITION AND DISPOSAL

PART 1 - GENERAL

DESCRIPTION

The work of this section consists of demolition and removal of failed or damaged elements as described in Section C and shown in previous figures, and other related items needed to complete this Contract.

QUALITY ASSURANCE

Comply with safety requirements for demolition, OSHA, and ANSI A10.6-90.

PROJECT CONDITIONS

Keep noise and dust to a minimum.

Ensure safety of persons in demolition area. Provide temporary barricades as required.

Explosives: Not Permitted.

CLOSEOUT SUBMITTALS

Provide documentation of legal disposal.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

PREPARATION

Protect buildings, walls, flooring, and ceiling to remain.

DISPOSAL

Dispose of unsuitable and excess material off of Government property and in accordance with all laws and regulations.

Any selected materials are to be removed and legally recycled or disposed of off government property in accordance with local, state, and federal regulations.

END OF SECTION

SECTION 01025
MEASUREMENT AND PAYMENT

PART I - GENERAL

1.1 Measurement and Payment - Measurement and payment for contract work will be made only for and under those pay items included in the SCHEDULE OF ITEMS. All other work and materials will be considered as included in the payment for items shown.

When more than one class, size, or thickness is specified in the SCHEDULE OF ITEMS for any pay item, suffixes will be added to the item number to differentiate between items to be bid.

1.2 Determination of Quantities - The following methods of measurement are used to determine contract quantities for payment.

For individual construction items, longitudinal and lateral measurements for area computations will be made horizontally or corrected to horizontal measurement unless otherwise specified. Measurements for seeding, mulching, geotextiles, netting, erosion control blankets, and sodding will be along slope lines.

Structures will be measured according to neat lines SHOWN ON THE DRAWINGS or as altered by the CO in writing to fit field conditions.

For standard manufactured items, such as fence, wire, plates, rolled shapes, pipe conduits, etc., identified by gauge, weight, section dimensions, etc., such identification shall be considered the nominal weights or dimensions. Unless controlled by tolerances in cited specifications, manufacturer's tolerances will be accepted.

1.3 Units of Measurement - Payment will be by units defined and determined according to U.S. Standard measure as follows:

A. Acre – Make longitudinal and transverse measurements for area computations horizontally.

B. Cubic Yard - A measurement computed by one of the following methods:

1. Excavation, Embankment, or Borrow - The measurement computed by the average end area method from measurements made longitudinally along a centerline or reference line.

2. Material in Place or Stockpile - The measurement computed with dimensions of the in-place material.

3. Material in the Delivery Vehicle - The measurement computed using measurements of material in the hauling vehicles at the point of delivery. Vehicles shall be loaded to at least their water level capacity. Leveling of the loads may be required when vehicles arrive at the delivery point.

C. Cubic Yard Mile - A combination of linear and volumetric measurement meaning the movement of a cubic yard of material 1 mile.

D. Each - One complete unit, which may consist of one or more parts.

E. Gallon – The quantity may be measured by any of the following methods:

1. Measured volume container.

2. Metered volume. Use an approved metering system

3. Commercially packaged volumes.

F. Hour – Measurement will be for the actual number of hours ordered and performed by the Contractor.

G. Linear Foot – Measure from end to end, parallel to the base or foundation being measured, or horizontal.

H. MFBM - One thousand board feet measure based on nominal widths, thickness, and extreme usable length of each piece of lumber or timber actually incorporated in the job.

I. Mile – Measure horizontal along the centerline of each roadway, approach road, or ramp.

J. Pound – If sacked or packaged material is furnished, the net weight as packed by the manufacturer may be used.

K. Square Foot - Measure on a plane parallel to the surface being measured or horizontal.

L. Square Yard – Measure on a plane parallel to the surface being measured or horizontal.

M. Station - One hundred linear feet measured horizontally.

N. Station Yard - A combination of linear and volumetric measurement meaning the movement of a cubic yard of material one station.

O. Thousand Gallons Mile - A combination of linear and volumetric measurement meaning the movement of 1,000 gallons of material 1 mile.

P. Ton - Short ton consisting of 2,000 pounds.

Q. Ton Mile - A combination of linear and weight measurement meaning the movement of 1 ton of material 1 mile.

1.4 Methods of Measurement - One of the following methods of measurement for determining final payment is DESIGNATED on the SCHEDULE OF ITEMS for each pay item:

A. Contract Quantities (CQ) AND Design Quantities (DQ) - These quantities denote the final number of units to be paid for under the terms of the contract. They are based upon the original design data available prior to advertising the project. Original design data include the preliminary survey information, design assumptions, calculations, drawings, and the presentation in the contract. Changes in the number of units SHOWN in the SCHEDULE OF ITEMS may be authorized under any of the following conditions:

1. As a result of changes in the work authorized by the Contracting Officer.

2. As a result of the Contracting Officer determining that errors exist in the original design data used to determine designed quantities that cause a pay item to change by more than 15 percent.

3. As a result of the Contractor submitting to the Contracting Officer a written request showing evidence of errors in the original design data used to determine design quantities that cause a pay item total to change by more than 15%. The evidence must be verifiable and consist of calculations, drawings, or other data that show how the designed quantity is believed to be in error.

B. Staked Quantities (SQ) - These quantities are determined from staked measurements prior to construction.

C. Actual Quantities (AQ) - These quantities are determined from measurements of completed work.

D. Vehicle Quantities (VQ) - These quantities are measured or weighed in hauling vehicles.

E. Lump Sum Quantities (LSQ) - These quantities denote one complete unit of work as required by or described in the contract, including necessary materials, equipment, and labor to complete the job. They will not be measured.

PART II - PRODUCTS (Not Applicable)

PART III - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01400
QUALITY CONTROL AND QUANTITY MEASUREMENT

PART I - GENERAL

1.1 Scope - This work shall consist of providing quality control in conformance with the Inspection of Construction provisions of this contract to ensure compliance with the drawings, specifications, and provisions of the contract, and measuring the quantities of completed work in conformance with the provisions of the applicable specifications. The Contractor shall provide all personnel, equipment, tests, and reports necessary to meet the requirements of this specification.

1.2 Measurement and Payment - No separate payment will be made for the work included under this section. Payment for this work is considered incidental to other items of work.

PART II - PRODUCTS (Not Applicable)

PART III – EXECUTION (Not Applicable)

END OF SECTION

SECTION 040140 - STONE REPOINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Repointing joints with mortar.

1.3 DEFINITIONS

A. Rift: The most pronounced direction of splitting or cleavage of a stone.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to repointing stonework including, but not limited to, the following:

    a. Verify stone repointing specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Materials, material application, sequencing, tolerances, and required clearances.
    c. Quality-control program.
    d. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

A. Order sand, lime, and gray portland cement for pointing mortar immediately after approval of Samples. Take delivery of and store at Project site enough quantity to complete Project.

B. Work Sequence: Perform stone repointing work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.

4. Clean stone.
5. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints.
6. Repair stonework, including replacing existing stone with new stone.
7. Rake out mortar from joints to be repointed.
8. Point mortar and sealant joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use.
3. Include test data substantiating that products comply with requirements.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For stone repointing specialist including field supervisors and workers (Section 1.8)

B. Quality-control program.

1.8 QUALITY ASSURANCE

A. Stone Repointing Specialist Qualifications: Engage an experienced stone repointing firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing standard unit masonry or new stone masonry is insufficient experience for stone repointing work.

1. Field Supervision: Stone repointing specialist firms shall maintain experienced full-time supervisors on Project site during times that stone repointing work is in progress.

2. Historic masonry on a National Register of Historic Places eligible building must be replaced in-kind according to the National Park Service's Secretary of the Interior's Standards for the Treatment of Historic Properties.

3. Stones and mortar must match type, material, and aggregate of existing historic façade.

B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging stonework. Include provisions for supervising performance and preventing damage.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits: Repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients and existing stone to produce temperatures between 40 and 120 deg F.
2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after pointing.

D. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Source Limitations: Obtain each type of material for stone repointing (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; white, or gray, or both where required for color matching of mortar.

   1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Masonry Cement: ASTM C91/C91M.

D. Mortar Cement: ASTM C1329/C1329M.

E. Mortar Sand: ASTM C144.

   1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
   2. Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

F. Water: Potable.

2.3 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

   1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again, adding only enough water to produce a damp, unworkable mix that retains its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

B. Do not use admixtures in mortar unless otherwise indicated.

PART 3 - EXECUTION

3.1 REPOINTING SPECIALIST

A. Stone Repointing Specialist Firms: Subject to compliance with requirements, stone repointing specialist must have experience with:

1. Historic masonry on a National Register of Historic Places eligible building that must be replaced in-kind according to the National Park Service's Secretary of the Interior's Standards for the Treatment of Historic Properties.
2. Stone and mortar must match type, material, and aggregate of existing historic façade.

3.2 PROTECTION

A. Prevent mortar from staining face of surrounding stone and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below pointing work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed stone and other surfaces.

B. Remove flashing, gutters, and downspouts and associated hardware adjacent to stone and store during stone repointing. Reinstall when repointing is complete.

1. Provide temporary rain drainage during work to direct water away from building.

3.3 STONE REPOINTING, GENERAL

A. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from 20 feet away by CO.

3.4 REPOINTING

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.
2. Joints at locations of the following defects:

a. Holes and missing mortar.
b. Cracks that can be penetrated 1/4 inch or more by a knife blade 0.027 inch thick.
c. Cracks 1/16 inch or more in width and of any depth.
d. Hollow-sounding joints when tapped by metal object.
e. Eroded surfaces 1/4 inch or more deep.
f. Deterioration to point that mortar can be easily removed by hand, without tools.
g. Joints filled with substances other than mortar.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:

1. Remove mortar from joints to depth of 2 times joint width and not less than that required to expose sound, unweathered mortar. Do not remove unsound mortar more than 6 inches deep; consult CO for direction.

2. Remove mortar from stone surfaces within raked-out joints to provide reveals with square backs and to expose stone for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of stone units or widen joints. Replace or patch damaged stone units as directed by CO.

D. Notify CO of unforeseen detrimental conditions including voids in mortar joints, cracks, loose stone, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 1 inch until a uniform depth is formed. Fully compact each layer and allow it to become thumbprint hard before applying next layer.
3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 1 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing stone has worn or rounded edges, slightly recess finished mortar surface below face of stone to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed stone surfaces or to featheredge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

F. Where repointing work precedes cleaning of existing stone, allow mortar to harden at least 30 days before beginning cleaning work.

3.5 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Clean adjacent nonstone surfaces. Use detergent and soft brushes or cloths.

C. Remove masking materials, leaving no residues that could trap dirt.

3.6 FIELD QUALITY CONTROL

A. CO's Project Representatives: CO will assign Project representatives to help carry out CO's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow CO's Project representatives access to the work site, as needed, to observe progress and quality of portion of the Work completed.

END OF SECTION 040140

SECTION 040150 - STONE REPAIR

PART 4 - GENERAL

4.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

4.2 SUMMARY

A. Section Includes:

1. Repairing stone masonry.

4.3 DEFINITIONS

A. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

B. Rift: The most pronounced direction of splitting or cleavage of a stone.

C. Stone Terminology: ASTM C119.

4.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to stone repair including, but not limited to, the following:

a. Verify stone repair specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, sequencing, tolerances, and required clearances.
c. Quality-control program.
d. Coordination with building occupants.
e. Ensure compliance with Montana State Historic Preservation Office compliance.

4.5 SEQUENCING AND SCHEDULING

A. Order sand, lime, and gray portland cement for mortar immediately after approval of submittals. Take delivery of and store at Project site enough quantity to complete Project.

B. Work Sequence: Perform stone repair work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean stone and ensure existing foundation concrete is clean and free of dirt.
5. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints. **Ensure joint between foundation wall and new footing is cleaned to ensure proper adhesion. Ensure this joint is properly sealed to mitigate moisture penetration.**
6. Repair stonework, including replacing existing stone with new stone.
7. Rake out mortar from joints to be repointed.
8. Point mortar and sealant joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

4.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use.
3. Include test data substantiating that products comply with requirements.

4.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For stone repair specialist including field supervisors and workers.

B. Quality-control program.

4.8 QUALITY ASSURANCE

A. Stone Repair Specialist Qualifications: Engage an experienced Historic Stone Repair Mason to perform work of this Section. Mason shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing standard unit masonry or new stone masonry is insufficient experience for stone repair work.

1. Field Supervision: Stone repair specialist firms shall maintain experienced full-time supervisors on Project site during times that stone repair work is in progress.
2. Stone Repair Worker Qualifications: Stone Repair Mason must have significant experience repairing and repointing Historic masonry on Section 106 Recorded buildings. Preservation work must be performed by a contractor familiar with Section 106

Compliance requirements and policy. Knowledge of Section 106 is required to meet the Federal laws regarding historic preservation.

3. Historic Stone Masonry repairs require a mason familiar with historic masonry mixes, application, and repairs.

B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging stonework. Include provisions for supervising performance, maintaining Historic Integrity, and preventing damage.

4.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver stone units to Project site strapped together in suitable packs or pallets or in heavy-duty crates and protected against impact and chipping.

B. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

F. Handle stone to prevent overstressing, chipping, defacement, and other damage.

G. Mark each piece of stone with code mark or setting number on unexposed face, corresponding to location in foundation, using nonstaining paint.

4.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit stone repair work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits, General: Repair stone units only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for stone repair unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients, repair materials, and existing stone to produce temperatures between 40 and 120 deg F.

2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after repair.

D. Hot-Weather Requirements: Protect stone repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and patching materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

PART 5 - PRODUCTS

5.1 PERFORMANCE REQUIREMENTS

A. Source Limitations: Obtain each type of material for repairing stone (stone, cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

5.2 STONE MATERIALS

A. Stone Matching Existing: Natural building stone of variety, color, texture, grain, veining, finish, size, and shape that match existing stone and with physical properties as listed below:

1. For existing stone that exhibits a range of colors, texture, grain, veining, finishes, sizes, or shapes, provide stone that proportionally matches that range rather than stone that matches an individual color, texture, grain, veining, finish, size, or shape within that range.

B. Cutting New Stone: Cut each new stone so that, when it is set in final position, the rift or natural bedding planes will match the rift orientation of existing stones.

5.3 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; white or gray, or both where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Masonry Cement: ASTM C91/C91M.

D. Mortar Cement: ASTM C1329/C1329M.

E. Mortar Sand: ASTM C144.

1. Exposed Mortar: Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.

5.4 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

B. Do not use admixtures in mortar unless otherwise indicated.

C. Mixes: Mix mortar materials in the following proportions:

1. Rebuilding (Setting) Mortar by Volume: 1 part portland cement, 1 part lime, and 6 parts sand.

2. Match existing mortar proportions and appearance.

PART 6 - EXECUTION

6.1 REPAIR SPECIALIST

A. Stone Repair Specialist Firms: Subject to compliance with requirements.

1. See 1.9 Quality Assurance.

6.2 PROTECTION

A. Prevent mortar from staining face of surrounding stone and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below rebuilding and repair work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed stone and other surfaces.

B. Remove flashing, gutters, and hardware adjacent to stone and store during stone repair. Reinstall when repairs are complete.

1. Provide temporary rain drainage during work to direct water away from building.

6.3 STONE REPAIR, GENERAL

A. Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 10 feet away by CO.

6.4 STONE REMOVAL AND REPLACEMENT

A. At locations indicated, remove stone that has deteriorated or is damaged beyond repair or is to be reused. Carefully remove entire units from joint to joint, without damaging surrounding stone, in a manner that permits replacement with full-size units.

B. Support and protect remaining stonework that surrounds removal area.

C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition. Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections.

D. Notify CO of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing stone or unit masonry backup, rotted wood, rusted metal, and other deteriorated items.

E. Remove in an undamaged condition as many whole stone units as possible.

1. Remove mortar, loose particles, and soil from stone by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to stone with utility knife and cleaning with solvents.
3. Store stone for reuse. Store off ground, on skids, and protected from weather.
4. Deliver cleaned stone not required for reuse to Owner unless otherwise indicated.

F. Clean stone surrounding removal areas by removing mortar, dust, and loose particles in preparation for stone replacement.

G. Replace removed damaged stone with other removed stone in good condition, where possible, or with new stone matching existing stone, including direction of rift or natural bedding planes. Do not use broken units unless they can be cut to usable size.

H. Install replacement stone into bonding and coursing pattern of existing stone. If cutting is required, use a motor-driven saw designed to cut stone with clean, sharp, unchipped edges. Finish edges to blend with appearance of edges of existing stone.

1. Maintain joint width for replacement stone to match existing joints.
2. Use setting buttons or shims to set stone accurately spaced with uniform joints.

I. Set replacement stone with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter vertical joints for full width before setting, and set units in full bed of mortar unless otherwise indicated.

1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing stonework.
2. Rake out mortar used for laying stone before mortar sets according to Section 040140.62 "Stone Repointing." Point at same time as repointing of surrounding area.
3. When mortar is hard enough to support units, remove shims and other devices interfering with pointing of joints.

J. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

6.5 PARTIAL STONE REPLACEMENT

A. Remove defective portion of existing stone unit (backing stone). Carefully remove defective portion of stone by making vertical and horizontal saw cuts at face of backing stone and removing defective material to depth required for fitting partial replacement (dutchman).

1. Make edges of backing stone at cuts smooth and square to each other and to finished surface; essentially rectangular. Make back of removal area flat and parallel to stone face.
2. Do not overcut at corners and intersections. Hand trim to produce clean sharp corners with no rounding and no damage to existing work to remain.
3. If backing stone becomes further damaged, remove damaged area and enlarge partial replacement as required.

B. Remove mortar from joints that abut area of stone removal to same depth as stone was removed. Remove loose mortar particles and other debris from surfaces to be bonded and surfaces of adjacent stone units that will receive mortar by cleaning with stiff-fiber brush.

6.6 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Clean adjacent nonstone surfaces. Use detergent and soft brushes or cloths.

C. Remove masking materials, leaving no residues that could trap dirt.

6.7 FIELD QUALITY CONTROL

A. CO's Project Representatives: CO will assign Project representatives to help carry out CO's responsibilities at the site, including observing progress and quality of portion of the Work completed.

6.8 STONE WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess stone materials are Contractor's property.

B. Stone Waste: Remove stone waste and legally dispose of off Owner's property.

END OF SECTION 040150