APPENDIX H: TEMPORARY ROAD REQUIREMENTS FOR ALTERNATIVES 2 AND 4

APPENDIX H: TEMPORARY ROAD REQUIREMENTS FOR ALTERNATIVES 2 AND 4

INTRODUCTION

This appendix was developed to guide temporary road construction activities in Colorado Roadless Areas (CRAs) under either alternative 2 or 4 for activities related to road planning, location, design, construction, operation, maintenance, and decommissioning. The term "temporary road" addresses roads necessary for emergency operations or authorized by contract, permit, lease, or other written authorization. Also included in this appendix are criteria for temporary road bridges; these criteria are required due to the unique nature of temporary bridges.

Although a temporary road is decommissioned at the end of its authorized use, temporary roads can be in operation for a few years to a decade or more. Temporary roads are not open to public travel. However, they shall be developed, managed, and obliterated according to related Forest Service Manual and Handbook directives to ensure safe operation and minimal affect on the environment. These directives shall provide the basis for planning, location, design, construction, operation, maintenance, and decommissioning of temporary roads.

Approvals and Administration

The proposed locations for temporary roads and their Road Management Objectives (RMOs) shall be reviewed by the Forest Engineer and approved by the District Ranger; the road survey, design and safety plans shall be reviewed by a qualified engineer. Construction administration shall be conducted by qualified inspectors and the decommissioning plan shall be reviewed by the Forest Engineer and approved by the Forest Supervisor.

Planning

The planning for temporary roads results in a travel analysis report that provides the basis for developing proposed actions to implement the minimum road system and/or to change existing travel management decisions.

Forest Plan management area direction describes what is intended to happen within the management area and leads to the development of Road Management Objectives. RMOs shall be developed for the temporary roads, in accordance with FSM 7714 and FSH 7709.59.11, to identify and document a management objective for each road; the RMO results in design criteria and operation and maintenance criteria, as well as criteria concerning safety for the intended use.

Further planning requirements for temporary roads include:

1. Develop Travel Analysis (FSM 7712 and FSH 7709.55.20) at the appropriate scale.

2.Select design elements and standards for the temporary roads as governed by FSH 7709.56, chapter 4.

3.Implement traffic management measures required to control and regulate use, using current Forest Service policy for all signs and traffic control devices on temporary roads.

Location

Use of proper road location techniques is the single most important step in transportation system development for low volume and single purpose roads. This is especially true for the temporary roads, as the eventual decommissioning process must be considered and provided for during the location phase. Optimal road location is critical in facilitation of subsequent operation, maintenance, and decommissioning. No amount of extra effort during design, construction, or maintenance will effectively compensate for a substandard road corridor.

In deciding temporary road location, the Forest Service performs route selection, location, geotechnical investigation, survey, and design to a technical level sufficient for the intended use of the facility, the investment to be incurred, and the affected resource values. The location, design and facilities for temporary roads are designed to provide the stability and durability appropriate for their intended service life and uses. Preconstruction engineering is conducted under the direct supervision of individuals qualified by experience and training.

To the extent practicable, the following location principles for temporary roads are provided to minimize alterations to natural hydrology, protect environmental values, and facilitate the decommissioning process:

- A well thought-out road location allows a road to "lay lightly" on the land, minimizes cuts and fills and other disturbed areas, and can reduce the total area impacted, in addition to minimizing alteration of natural hydrology. Roads should be located on as gentle a side slope as possible, although some side slope facilitates drainage of surface water.
- Road surface drainage is most easily provided for on flatter vertical alignments, thus reducing water concentration and erosion potential. Roads should be located with rolling rather than straight or uniform grades. A roll in the grade constitutes a dip that encourages the shedding of water, breaking up water concentrations.
- A road located on the southern or western exposure tends to dry out more quickly; similarly, choosing natural openings (or performing the extra clearing of vegetation required to open up the road corridor to sunlight) encourages drying. Balance the potential tree cutting to mitigate wet road sections, with the long-term effect on roadless area characteristics. Locate on the side of the canyon with the least number of tributaries to the main drainage for smoother alignments, less embankment haul and construction, and fewer drainage structures.
- Locating a temporary road close to a stream increases the risk of having road-related sediment enter the stream. When locating a temporary road within a native cutthroat trout catchment or identified recovery watershed, road construction or reconstruction must maintain or improve conditions in the water influence zone and in the native cutthroat habitat. Avoid placing fills in flood plains or channels, as the encroachment

causes drainage paths to shorten, steepen, straighten, and speed up. Minimize drainage bottom temporary road embankments to reduce encroachment and the resulting modifications to waterway hydraulics.

- Consider using maximum grades and minimum curve radii to minimize road length in undesirable areas, if safe driving conditions can be maintained. Investigate the available road building materials on alternative sections. Often adjustment in horizontal or vertical alignment allows more favorable conditions on an adjacent section - such as less excavation or superior road building materials.
- Wetlands, bogs, and areas experiencing infiltration of groundwater should be avoided during road location. These areas require mitigation and result in increased potential for environmental damage.
- Minimize alteration to existing drainage patterns. Almost any modification to the natural drainage process results in altered natural hydrology, water concentration, and increased erosion potential.
- Ridge top roads require less provision for drainage than side hill or canyon bottom roads.
- Care must be taken to ensure proper drainage structure location and design, and that sufficient drains are provided to minimize water concentration and other alterations to the hydrology of an area.
- Pipe outlets and armoring should be designed to prevent damage to fills, erosive soils, meadows, and streams, and to encourage the spreading of outflow.
- Provision for surface drainage should be planned through the use of ditches, outslope, inslope, crown sections, and berms to control the flow of water off the road.
- Full bench construction alleviates the problems associated with saturated fills, but still modifies natural slope and hydrology characteristics, and can actually intensify the interception of groundwater. The "toe of the cut" is made further into the hill, as all required road width is provided by the cut and none by embankment construction.

Design and Construction

Definitions

Design Criteria:	The requirements derived from management area direction such as safety requirements and traffic characteristics that govern the selection of elements and standards for a road or section of a road.
Design Elements:	The physical characteristics of a road, such as traveled-way width, shoulders, slopes, curve widening, and pavement structures, that, when combined, comprise the planned facility.
Design Standards:	The definitive lengths, widths, and depths of individual elements, such as a 12-foot (3.6 m) traveled way, 2-foot (0.6 m) shoulders, 3/4:1 cut slopes, 3-foot (0.9 m) curve widening, and 6 inches (150 mm) of crushed aggregate, that define a road template.

Qualified Engineer: A qualified engineer is one who by experience, certification, education, or license is technically trained and experienced to perform the tasks specified.

Design

Design of temporary roads shall be performed in accordance with the Road Preconstruction Handbook FSH 7709.56 – 4 – Design. When standards more stringent than those established in FSH 7709.56 are necessary, use standards developed by other recognized transportation organizations, such as the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), or the state, to the extent that they comply with laws applicable to the National Forest System and that they are compatible with management direction.

Attest in writing that the project design has received a peer review for technical adequacy by a designer other than the primary designer and that the peer review included a timely field review. Ensure that a qualified engineer reviews all project design drawings, specifications, and cost estimates and signs the project design drawings, officially attesting to their technical adequacy.

Construction of temporary roads shall be administered by qualified inspectors. Ensure that construction engineering is performed by or under the supervision of an individual qualified in the applicable construction categories.

Provide the construction inspection, testing, and monitoring required to ensure that facilities are constructed in accordance with drawings and specifications, and that changes resulting from unanticipated field conditions are properly accomplished and documented.

Operation and Maintenance

Operate and maintain temporary roads in a manner that meets road management objectives (RMOs) and provides for safe and efficient travel, access for the administration, utilization, and protection of resources, and protection of the environment, roadless area characteristics, and infrastructure investment. Use must comply with the Colorado Roadless Rule 36 CFR 294.33(c)(4) that prohibits public motorized vehicles, including off-highway vehicles. Exceptions to the prohibition include administrative Forest Service use; motor vehicle use specifically authorized under Federal law or regulation; or motor vehicle use by any fire, emergency, or law enforcement personnel.

RMOs for temporary roads shall include operation and maintenance criteria, documented in accordance with FSM 7714. These criteria must describe how to operate and maintain temporary roads to meet management needs as determined through land management planning, travel analysis, and route and area designation (36 CFR part 212, Subpart B). At a minimum, the criteria must:

- Identify vehicle classes and types of use for which the road is intended.
- Identify seasonal or yearlong designations necessary for meeting RMOs.
- Identify measures needed to protect the investment in the road.

Use the standards and guidance contained in the Manual on Uniform Traffic Control Devices (MUTCD) (FSM 7108.21) for all signs and traffic control devices on temporary roads, unless

superseded by the Federal Highway Administration (FHWA)-approved State supplement to the MUTCD. In that situation, follow the State supplement to avoid confusing road users.

Use the MUTCD standards and guidance for signs and markings on all traffic control devices, such as gates and barricades. Neither use nor allow others to use chain, cable, rope, or wire as a traffic control device. See Engineering Manual (EM) 7100-15 (FSM 7160.31) for additional direction on road signing.

Develop annual maintenance plans for temporary roads to meet road maintenance objectives; maintenance of temporary roads shall accommodate their intended use safely and in accordance with maintenance criteria documented in their RMOs (FSM 7714). The road maintenance plans should be revised as necessary to respond to emergencies and meet changing resource and traffic needs. Maintenance criteria shall include consideration of transportation system investment and environmental and resource values.

As stated above, temporary roads constructed in CRAs are restricted in use and they are decommissioned when no longer needed (see below). In the rare case there are multiple authorized users, each will be required to perform maintenance of temporary roads in accordance with their commensurate share. Schedule and coordinate road maintenance conducted by multiple users to accomplish work in the most efficient and cost-effective manner. Use the interagency road maintenance agreement to conduct maintenance with other Federal agencies (FSM 1531.07g).

Decommissioning

Temporary roads are decommissioned when no longer needed for the established purpose or upon termination or expiration of a contract, authorization, or permit, whichever is sooner. A road is decommissioned by reestablishing vegetation and, if necessary, initiating restoration of ecological processes interrupted or adversely impacted by the temporary road. Decommissioning a temporary road must achieve complete stabilization and restoration to a condition generally consistent with the pre-existing roadless area characteristics. Restoration is designed considering safety, costs, and impacts on land and resources. This could include total obliteration including denial of use, elimination of travelway functionality, and removal of the road prism, that is, restoration of the road corridor to original contour and hydrologic function. Decommissioning includes applying various treatments as needed, including one or more of the following:

- Blocking the entrance to a road and ripping and seeding the roadbed;
- Reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation;
- Removing culverts and other drainage structures, reestablishing drainage ways, removing fills, pulling back berms, and ripping and scattering slash on the roadbed;
- Other methods designed to meet the specific conditions associated with the unneeded road.

These treatments must be designed and implemented to completely eliminate the road by restoring natural contours, hydrology, and vegetation through mechanical and/or natural means within a reasonable time period.

ENGINEERING CRITERIA FOR TEMPORARY ROAD BRIDGES

The criteria stated below are minimum standards for the design, construction/reconstruction, inspection, posting, and maintenance of bridges and other drainage structures. For those counties with road and bridge standards, the more restrictive standard shall be used. A bridge is defined as a road structure including supports erected over a depression or an obstruction, such as water, having a deck or surface for carrying traffic or other loads.

1. **Design Vehicle**: AASHTO HS20-44 (FSM 7722 and FSH 7709.56, Section 7.32) for road bridges, unless Special Vehicle(s) exceeding the HS-20 loading will travel over the structure. AASHTO HL-93 vehicle and tandem loading shall be used for all structures designed to the LRFD Design Standard, unless a permit vehicle would control.
2. **Wind Loads**: Bridges shall be designed to resist all types of wind loads including uplift according to AASHTO Standards for both winter and summer conditions.
3. **Live Loads**: Bridges shall be designed to resist the applicable live loads according to AASHTO Standards.
4. **Other Loads**: All other loadings shall be in accordance with AASHTO Standards or Specifications and applied as applicable.
5. **Design Load Cases:** When the ASD or LFD methods are used, the following load grouping shall be evaluated Group I and III, as a minimum. When the LRFD method is used, the following load cases shall be evaluated Strength I, Strength II (for Special or Permit Vehicles), Strength III, Strength V, Service I, Service II (for Steel, only), Service III (for P/S concrete, only), and Fatigue I (Steel, only), as a minimum.
6. **Design Specifications**: The most current edition of the AASHTO, "Standard Specifications for Highway Bridges", Division I, including all current interims, as amended (FSM 7722 and FSH 7709.56, Section 7.1). The most current edition of the AASHTO, “LRFD Bridge Design Specifications, Customary U.S. Units” shall be used including all current interims, as amended upon agency adoption or Permit Holder’s Engineer preference
7. **Bridge Railings**: AASHTO Specifications, Section 2.7.1, modified as follows (FSH 7709.56, Section 7.34):
    a) Double Lane Bridges: No allowable modification. Use full AASHTO rail load.
    b) Single Lane Bridges: Use one-half of the AASHTO rail load specified.
    c) Crash-Tested Rails: A TL-2 Rated Rail System can be used instead of a rail system design based on the AASHTO rail load.
    d) State, County, or City DOT Bridge Rail Standards shall be used where applicable.
    e) Non-motorized Railings: 50 PLF per AASHTO Standards.
    f) Curbs: 500 PLF per AASHTO Standards.

Bridge deck edges shall be delineated by either a curb or railing or both. Road bridge rail heights above the travel way shall correspond to AASHTO Standards. Road bridges may have a barrier curb vs. a railing, if the bridge is located on a Forest Service Maintenance Level 2 Road, the bridge corners are delineated by Type 3 Object Markers, and appropriate for use based on a curb warrant/hazard analysis. Minimum barrier curb height shall be 12 inches above the travel way and provide a means to drain the deck, i.e., longitudinal bridge grade, scuppers, etc. A hazard analysis should consider, but not be limited to the following: the bridge/road geometrics, sight distance, possible hazards (travel surface, bridge height above obstruction, depth of water, etc.), accident history (if available), ADT/design speed (if appropriate), and engineering judgement. The hazard analysis documentation could consist of, but is not limited to, a written evaluation, applicable photographs, applicable sketches, and other relative documentation (i.e., traffic counts, accident reports, etc.). The hazard analysis should be prepared by, sealed, signed, and dated by the Professional Engineer registered in the State where the bridge is located.

8. **Width**: The usable width of a bridge is the distance, measured perpendicular to the longitudinal centerline, between traffic faces of curbs; or, between traffic faces of bridge rails, which ever is the lesser distance.

   In accordance with FSH 7709.56, Section 7.31, bridge widths should not be less than the following:

   a) Double Lane Road Bridges: 24 feet minimum. 28 feet is preferred for low volume road bridges.

   b) Single Lane Road Bridges: 14 feet minimum. 12 feet minimum if approved by the Forest Engineer.

   Greater widths may be necessary to accommodate curve widening, shoulders, vehicle widths, traffic capacity or design speed.

9. **Approach Railing**: Required for Forest Service Maintenance Level 3-5 Roads or warranted by the hazard for Forest Service Maintenance Level 2 Roads. Use of CDOT Standard Plans M-606-01B Sheets 1-3, 5, 8, 11-12, dated November 1992, is recommended for the approach rail requirements. The flared ends of the approach rails shall be 4 feet and conform to a CDOT Type 3K Breakaway System or equal. The transition section from the approach rail to the bridge rail shall conform to CDOT Type 3L End Treatment, as a minimum. Road Bridge Approach Rail Posts shall be 7 feet in length, except for breakaway flared end treatment posts. The length of approach rail shall be determined based on a risk assessment of the site, road geometrics, design speed (if applicable) and engineering judgement. State, County, City, or DOT approach rail standards shall control if they are more restrictive or are required in writing by the agency administrating the connecting roadway. Bridge approach railings shall be the same height above the travel way as the bridge railings. Approach railings are not required for bridges with barrier curbs.

10. **Road Bridge Signage**: The corners of the bridge shall be delineated with Type 3 Object Markers installed in accordance with MUTCD and Forest Service Standards/Guidelines. For existing bridges that require load limit restrictions, they shall be posted in accordance with MUTCD and Forest Service Standards/Guidelines.

11. **Approach Alignment**: Tangent is recommended.
12. **Bridge Substructure Alignment**: Longitudinal centerline of bridge at 90 degrees to the stream flowline is recommended.
13. **Bridge Grade**: 6 percent maximum recommended. Bridge grades one percent or more shall require beveled bearing plates to account for the grade and provide uniform bearing.
14. **Hydrology:** Design flows shall be determined from appropriate regression equations and/or stream gage data. Regression equation results should be compared to actual stream flow data to the greatest extent possible. This may include comparing results of a stream gage in a similar and adjacent basin. The larger flows should also control the hydraulic design.
15. **Hydraulics**: Design the bridge to pass the 100 year flood flow with appropriate freeboard. The practices of stream simulation and aquatic organism passage should be applied to the greatest extent possible. Forest Hydrologist and Fish Biologists should be consulted on AOP aspects of the design. If the stream flow is regulated, design to the normal high water with appropriate freeboard; and, check passage of maximum high water. The bridge structure should not unnecessarily restrict the channel. The Design Engineer of Record shall ensure that the backwater relating to the drainage structure does not adversely impact the adjacent lands or facilities. The Design Engineer of Record shall also verify the scour susceptibility of the drainage structure(s) and design appropriate countermeasures or place the foundations sufficiently below the anticipated scour depth (FSH 7709.56, Section 6.46). The hydraulic design should maintain the channel so there is no restriction under bankfull conditions. The hydraulic analysis may be completed using one dimensional, steady flow, water surface profile analysis. An acceptable computer programs is a version of HEC-RAS, unless otherwise noted. The hydraulic analysis should account for any anticipated debris blockages (light to moderate anticipated debris can assume a 30 percent blockage and moderate to heavy anticipated debris can assume a 50 percent blockage). The blockages can be modeled in HEC-RAS through infective flow areas. The mannings roughness value (n) can be reduced 20 percent for the 100 year flow vs. the 2 year flow/seasonal high water/ordinary high water. The Q_2 flow should be used with the bankfull depth and width to refine Manning Roughness factors for the channel. Pebble counts of the channel material may also be considered in determining the channel roughness used for the hydraulic model. The bridge expansion and contraction coefficients in a HEC-RAS model should be 0.5 and 0.3, while normal channel expansions and contraction coefficients may be 0.3 and 0.1, as a minimum. Expansion and contraction coefficents will vary depending on channel and overbank conditions and should be different if warranted to represent the actual flood plain.
16. **Freeboard**: Freeboard is the vertical clear distance between the design water surface (usually the 100 year flood) and the bottom of the superstructure's slab or girder. The amount of freeboard is a matter of professional judgement dependent upon the amount and type of floating debris anticipated. The need for navigational clearance should be relative to the water level expected during the navigational season.
    a) The recommended freeboard to pass floating debris is usually 2-3 feet at the design water level (usually the 100 year flood flow).

b) Freeboard can also be based on the maximum stream velocity during the peak project design flow.

c) Navigational clearance depends upon local requirements, maximum water level during the navigational season and the type of water use expected. The recommended minimum navigational clearance is usually 5 feet at the maximum water level during the navigational season.

17. **Abutments**: The abutment and wing wall design shall minimize channel/overbank scour and approach roadway erosion. The abutment design shall minimize encroachment upon the stream channel. An abutment and wing wall minimum factor of safety of 2 is recommended against sliding/rotation stability resisting at-rest lateral earth pressure. An abutment and wing wall minimum factor of safety of 3 is recommended for applied (dead load and maximum live load) soil or rock pressure. Abutments should be aligned parallel with the direction of the design flow. The use of spill through abutments are recommended versus a vertical wall abutment to minimize scour impacts.

18. **Scour**: The depth of anticipated scour is again a matter of engineering judgement depending upon the channel and soil characteristics, water depth and velocity, bridge/channel alignment and substructure geometry. Pier scour depth should be determined by the most recent edition of the Hydraulic Engineering Circular (HEC) No. 18, “Evaluating Scour at Bridges”. The bottom of abutment footings is usually placed a minimum of 6 feet below the lowest point in the channel. The lowest point in the channel is determined from the channel profile taken along the bridge longitudinal centerline.

    The abutment and pier footings may be set at a shallower depth than stated above if adequate countermeasures are taken to minimize the probability of scour under the abutment or pier footings or footings are keyed into competent bedrock. Scour/ countermeasure design velocities should determined from the hydraulic model with the anticipated blockage during the 100 year flood event. If riprap is used as a countermeasure it should conform to HEC 18. Spill through abutments as defined by the Corps of Engineers are recommended versus vertical wall abutment with or without wingwalls to reduce scour impacts.

19. **Materials and final treatment**: Usually a matter of permittee's preference; however, selection may be subject to District's visual/resourse management requirements. If treated timber is utilized the treatment method shall include the "Best Management Practices for the Use of Treated Wood in Aquatic Environments" latest edition, published by the Western Wood Preservers Institute (800-279-WOOD).

20. **Drainage**: The bridge deck/road surface should be free draining. Drainage off the deck directly into the stream is not recommended if dust pallative or de-icing salts will be used. If deck drainage is toward one of the abutments, the appropriate abutment/wingwalls must be designed to minimize the subsequent errosion. Minimum longitudinal road bridge grade is one percent.

21. **Bridge Approaches**: The bridge and the bridge’s approach roadways should be designed for the most restrictive anticipated design vehicle to determine vertical and horizontal alignments, curve widening (if necessary), maximize site distances, and another road design features. The design vehicles should also include any attached trailer(s) too.

22. **Soils**: Soil(s)/rock must be investigated for bearing capacity, general stability under the loading proposed and scour/erosion potential for the water velocities involved. A geotechnical investigation report should be prepared, sealed, signed and dated by a Registered Professional Engineer licensed in the state where the structure is being built. The report shall contain the method of investigation, foundation recommendations, and design criteria for the applicable foundation (spread footing or pile). Design criteria shall, include but not be limited to, bearing capacity for spread footing (if applicable), equivalent lateral fluid pressure, unit weight of soil(s), pile capacities per foot for each size and type of pile proposed (if applicable), pavement design (if applicable), coefficient of friction for concrete on soil/rock (if applicable), pile lateral analysis (if applicable), construction recommendations, anticipated scour depth, frost depth, and recommended scour/erosion countermeasures. A copy of the geotechnical investigation report shall be submitted with bridge design for review.
23. **Piers**: Piers or other structures within the channel are not recommended. If piers are required they must be aligned in the direction of design flow and constructed below the anticipated scour depth. If piles are used for a pier, the Design Engineer of Record must provide written proof that the structure is stable after maximum anticipate scour has occurred.
24. **Span**: Place the bridge at the narrowest point of a straight reach of stream channel, if possible. At a minimum, abutments shall be located outside the bank full stream channel and with adequate measures or mitigations to protect against resource damage. The height of the side slopes would be determined from the bottom of slab or girder less the sill or foundation height above the adjacent soil. The bottom of slab or girder would equal the bank full flow depth plus 2 feet freeboard plus any additional height to pass debris flows (1/2 diameter of a log or root wad).
25. **Camber**: Camber should not be less than the following limits:
    a) Solid Timber: Install with crown up.
    b) Glu-Laminated Timber: 2 x dead load def + 1/2 live load def (Timber Construction Manual, 1985).
    c) Steel & Concrete: Dead load deflection plus vertical road alignment curvature. (AASHTO 10.14).
    d) Prestressed Concrete: Dead load deflection plus Prestressing plus vertical road alignment curvature.
26. **Deflection**: Deflection due to distributed live load plus impact should not exceed the following limits:
    a) Timber: L/500 (AASHTO 13.4.3).
    b) Steel, Concrete, & Prestressed Concrete: L/800 (AASHTO 8.9.3.1, 9.11.3.1 and 10.6.2).
    c) Steel, Concrete, & Prestressed Concrete: Cantilever Spans L/375 (AASHTO 8.9.3.2, 9.11.3.2 and 10.6.3).

27. **As-Built Drawings and Construction Documentation:** All as-builts drawings, inspection reports, and material testing records shall be sealed, signed and dated by a Professional Engineer registered in the State where the bridge is located.

28. **Construction:** Any construction documentation shall include provisions for Forest Service required resource protection (i.e., noxious weed controls, sediment and erosion control measures, and fire preventive measures). The permit holder should have a full time project manager during any construction. Any construction shall have quality assurance and quality control (QA/QC) provisions specified by the design engineer. The QA/QC documentation shall be available for Forest Service review upon request.

29. **Bridge Inspections:** Bridges should be inspected as a minimum every two years by a Bridge Inspector meeting the requirements of 23 CFR 650.309. The bridge inspection report shall be sealed, signed and dated by a Professional Engineer licensed in the State where the bridge is located. Bridge inspection reports shall include, but not be limited to: a FHWA Structure, Inventory and Apprasal Sheet; a list of bridge maintenance items (description of required maintenance; estimated quantities material or hours of equipment/labor; time to correct maintenance; amount of engineer support, required; indication if maintenance work is new, incomplete, or reoccurring; and, if past maintenance was satisfactorily corrected); photographs (bridge elevation, bridge approaches, up and downstream channels, existing/corrected bridge deficiencies, etc); and bridge sketches (typical section perpendicular to the road/bridge center line, bridge elevation view, bridge plan view, existing bridge deficiencies (if appropriate), etc.). A copy of any bridge inspection report shall be available to the Forest Service upon request.

30. **Bridge Load Rating and Posting:** The bridge shall be load rated after any initial inspection or if the structural condition changes from the last inspection. If the bridge does not conform to state legal loads, it should posted in accordance with Forest Service requirements. The bridge load rating analysis shall be sealed, signed and dated by a Professional Engineer licensed in the State where the bridge is located. The permit holder shall maintain records of all vehicles that exceed the inventory load rating of the road bridge. The permit holder shall maintain a copy of the most recent load rating analysis documents, which shall be available to the Forest Service upon request.

31. **Bridge Maintenance:** Bridge maintenance determined during the inspection shall be documented and completed within the timeframe stated on the inspection report. As a minimum, bridge maintenance shall be completed prior to the next biannual inspection unless the inspector would require a shorter completion time. If the inspector designates specific maintenance work requires engineering, the permit holder shall submit the design documents for review by Forest and/or Regional Engineering and acceptance by the Authorized Officer prior to commenceing work. The bridge maintenance design shall be sealed, signed and dated by a Professional Engineer licensed in the State where the bridge is located. The permit holder shall maintain a copy of all bridge maintenance design documents, which shall be available to the Forest Service upon request.

32. **Submittals**: The following submittals should be required:

    a) **Drawings:** Construction drawings shall consist of, but not be limited to: plans and profiles of proposed and existing bridge and road alignments; plan views; elevation views; typical road and bridge sections; erosion control

plans; traffic control plans; and, structural plans, elevations, sections, and details, as deemed necessary to accurately assess the work and materials involved.

- Location of borrow pits and disposal areas should also be shown. District staff may require such locations be off lands administered by the Forest Service.
- FSH 7709.56b, Chapter 3 should be consulted for more detail.

Engineered maintenance drawings shall consist of, but not be limited to, all plans, elevations, sections, and details, as deemed necessary to accurately assess the work and materials involved.

Specifications: Sufficient specifications to define the materials, quality control and construction methods proposed.

b) **Design Calculations:** Engineering calculations shall be prepared by or under the direction of a Professional Engineer licensed in the state where the bridge will be constructed. Calculations may include computer printouts of input and output and/or hand calculations. Calculations shall be prepared for all hydraulic, geotechnical, road/bridge geometrics, and structural aspects of the design.

c) **Design Certification:** Design complies with appropriate sections of the most current edition of the AASHTO, "Standard Specification for Highway Bridges", Division I, including all interims; and, the drawings, specifications, and design calculations, when submitted by a permittee, shall be letter sealed, signed and dated by a Registered Professional Engineer (this is generally a condition of the Special Use Permit) licensed in the state where the bridge will be built and in accordance with State Law.

d) **Construction Certification:** Construction complies with the accepted plans and specifications and that any modifications to the original construction documents were approved by the Design Engineer of Record. The certification shall be a letter sealed, signed and dated by a Registered Professional Engineer (this is generally a condition of the Special Use Permit) licensed in the state where the bridge will be built and in accordance with State Law.

e) **Used and New Material Certifications:** The permit holder shall provide copies of all material certifications to the Forest Engineer, which shall include but not be limited to, timber treatment certifications, timber grading certifications, structural steel mil certification reports, rebar yield strength test reports, rebar shop drawings/concrete as-built drawings, cast-in-place concrete compressive strength reports, Structural Steel Charpy V-Notch Testing Reports, etc. Used materials shall be inspected and certified for their intended use by a registered Professional Engineer licensed in the State where the material is being reused. The inspection reports and related design shall reflect any structural rehabilitation and periodic maintenance and inspections to ensure a 50 year structural life. If used structural steel

members are to be utilized: the used steel members shall be free of detrimental plastic deformation along the structural member; have no significate loss of material cross-section due to delamination, corrosion or member failure; and, that new or existing holes or penetrations in the steel shall not adversely impact the member's structural life. If used timber members are to be utilized: the used timber members shall be free of decay or insect damage; free of flexural and shear cracks; free of crushed wood; and, that new or existing holes or penetrations in the timber shall not adversely impact the member's structural life. If used concrete members are to be utilized, the used concrete members shall be free of delaminations, freeze/thaw damage, significate loss of section due to spalling, exposed prestress strands or rebar, evidence of corroded rebar, flexural or shear cracks, and crushing. In addition, the Engineer of Record shall document within their inspection report, engineering calculations, and design drawings: the location(s), size(s), and length(s) of all shake(s), check(s), and split(s); structural steel defects; and, concrete defects. The reuse of railroad flatcar(s) shall be prohibited. Railroad flatcar bridges shall be prohibited from use.

f) **Other Related Requirements:** Water quality and fisheries shall be addressed in the design and construction processes. Where bridges would be located within a native cutthroat trout catchment or identified recovery watershed, as with construction of the temporary road, bridge construction must maintain or improve conditions in the water influence zone and in the native cutthroat trout habitat over the long term. It may be necessary to phase construction to mitigate fish migration. It may also be necessary to specify the installation of straw bales, silt fence, sediment ponds, etc. to mitigate stream sediment. The Corp of Engineers should be consulted for any 404 Permit requirements (excavation and embankments within the waterway exceed 100 CY), as well as, wetland/riparian mitigation. Forest Resource Specialists shall also be consulted for any NEPA documentation requirements and/or wetland/riparian mitigation.

g) **Corps of Engineer's:** A copy of the Nationwide or Individual Permit application including all figures and the Corps of Engineer's written approval including all provisions shall be submitted to the Forest Engineer, prior to construction commencing.

h) **DOT Access Permits**: A copy of the access permit application including all figures and the applicable agency written approval including all of their provisions shall be submitted to the Forest Engineer, if applicable, prior to construction commencing.

i) **Bridge Approval:** All road bridges shall be reviewed and acceptance recommended by the Regional Director of Engineering and Regional Bridge Engineer prior to construction commencing, unless authority is delegated to specific individuals on the Forest Engineering Staff. Final acceptance of a special use permit bridge project shall be in writing from the Forest Service Authorized Officer.

33. **Bridge Decommissioning:** During the decommissioning of the approach roads, any bridges, structural metal plate structures or culverts shall be removed, including all sign installations, railing systems, or other constructed features associated with the structure(s). Structural demolition shall consist of removal of the entire structure with the exception of piles. Bridge piles shall be removed to 12 inches below final finished grade. Channel banks shall be pulled back and recontoured to match existing natural banks near the structure. Cover or embankment materials shall be disposed of as directed by Forest Engineering or Resource Specialists. All recontoured channel side slopes shall be receive plantings and/or seeding and erosion control mats or mulch to establish a permanent erosion control. Seed, Mulch, Erosion Control Mats, and Planting specifications shall be obtained from the Forest Resource Specialist(s), where the work is being performed. All materials associated with structure(s) shall be removed and disposed of off National Forest System lands in accordance with all State, Federal and Local laws, rules and regulations.