

**Forest Service Manual
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Washington, DC**

Forest Service Manual 7700 – Travel Management

Chapter 7720 - Transportation System Development

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Digest: Following is an explanation of the changes throughout the directive by section.

7720: Revises dollar value threshold for requiring a Value Analysis. Removes references to specific dollar values and adds reference to values identified in OMB Circular A-131. Removes reference to specific dollar threshold for requiring value engineering clauses in contracts and replaces with reference to current simplified acquisition threshold.

7721.13a: Replaces \$1 million with reference to dollar limits set in OMB Circular A-131.

7721.14b: Replaces \$250,000 with reference to simplified acquisition threshold.

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7720.1 - Authority

See FSM 7701 for authorities.

7720.2 - Objective

1. Locate, survey, design, and construct transportation facilities in accordance with FSM 7702.
2. Protect and restore the physical, biological, and chemical integrity of the waters of the United States in accordance with Section 101 of the Clean Water Act of 1977. This includes:
 - a. Preventing the delivery of sediment to the waters of the United States;
 - b. Reducing the risk of mass wasting; and
 - c. Reducing the potential for flood damage to road structures, ditch lines, and surfacing.

7720.3 - Policy

Locate, design, and construct roads to best meet their intended purpose and resource constraints, as documented in applicable road management objectives (RMOs) (FSM 7714), within the limits of current and anticipated funding levels. Provide standards appropriate for the roads' intended uses, considering safety, cost of transportation, and impacts on lands and resources.

Refer to the best management practices found in USDA-Forest Service Publication FS-990-a, April 2012, entitled "National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1: National Core BMP Technical Guide."

7720.31 - Preconstruction Engineering

Perform route or site 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.

Ensure that road preconstruction activities receive peer reviews, and that the adequacy of road designs and cost estimates is attested to in writing by qualified engineers.

7720.32 - Construction Engineering

Ensure that construction engineering is performed by or under the supervision of an individual certified in the applicable construction categories (FSH 7109.17).

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

7720.5 - Definitions

Administrative National Forest System (NFS) Road. Any NFS road that is not a public road.

Bridge. A structure, including supports, erected over a depression or an obstruction such as water along a road, a trail, or a railway and having a deck for carrying traffic or other loads.

Bridge Approach Guardrail. A roadside guardrail system preceding a bridge and attached to its traffic barrier system that is intended to prevent a vehicle from impacting the end of the bridge railing or other roadside hazards.

Bridge Design Engineer. A registered professional engineer who meets the requirements of FSM 7722.2.

Crashworthy. Successfully crash-tested to a currently acceptable test level or geometrically and structurally evaluated as equivalent to a crash-tested system by a certified bridge design engineer.

Critical Vehicle. A vehicle type, typically the largest on a road by weight, size, or unique configuration, whose limited use on a road is necessary to fulfill its RMOs.

Culvert. Any structure with a bottom, regardless of fill depth, depth of invert burial, or presence of horizontal driving surface, or any bottomless (natural channel) structure with footings that will not have wheel loads in direct contact with the top of the structure (FSH 7709.56, sec. 44.4, ex. 01).

Design Criterion. A requirement derived from management direction, such as a safety requirement, level of service, traffic type or volume, an environmental consideration, or an economic constraint, that governs selection of design elements and standards.

Design Element. A physical characteristic of a road (such as traveled way width, shoulder, slope, curve widening, or pavement structure) that is considered in its design.

Design Exception. A proposed variation in design that would employ a less restrictive standard than AASHTO's Guidelines and Policy.

Design Parameters. Technical guidelines for the survey, design, construction, maintenance, and assessment of a trail, based on its Designed Use and Trail Class (FSH 2309.18, 05)

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Design Speed. The maximum speed that a design vehicle can safely maintain along a road or road segment when the design features of the road, rather than the operational limitations of the design vehicle, are taken into account and that is used to determine the design elements and standards of a road.

Design Standard. The definitive length, width, depth, slope, or grade of a design element.

Design Vehicle. A vehicle type that frequently travels a road, that is not subject to restrictions on use of that road, that travels at the road's design speed, and that determines the design standards for a particular design element for the road.

Forest Road. A road wholly or partly within or adjacent to and serving the NFS that the Forest Service determines is necessary for the protection, administration, and utilization of the NFS and the use and development of its resources (36 CFR 212.1).

Highway-Legal Vehicle. Any motor vehicle that is licensed or certified under State law for general operation on all public roads in the State and that must be operated consistent with State traffic law, including requirements for operator licensing.

Level of Service. A road's significant traffic characteristics and operating conditions.

National Quality Standard for NFS Trails. A national criterion that establishes the level of quality in terms of health and cleanliness, resource setting, safety and security, responsiveness, and condition of facilities for NFS trails managed at a full-service level.

NFS Road. A forest road other than a road which has been authorized by a legally documented right-of-way held by a state, county, or local public road authority (36 CFR 212.1).

Other Road Structure. A culvert, retaining wall, cattle guard, or other structure within a road right-of-way.

Qualified Engineer. A qualified engineer is one who by experience, certification, education, or license is technically trained and experienced to perform the engineering tasks specified and is designated by the Regional Director of Engineering.

Public Road. A road that is:

1. Available, except during scheduled periods, extreme weather, or emergency conditions;
2. Passable by four-wheel standard passenger cars; and
3. Open to the general public for use without restrictive gates, prohibitive signs, or regulation other than restrictions based on size, weight, or class of registration (23 U.S.C. 101(a)(27); 23 CFR 460.2(c) and 660.103).

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Road Cost Estimate.

1. Public Works Contract. The estimated total cost of road construction, including all expenditures for equipment, labor, depreciation, overhead, profit, and risk, projected to the time when actual construction can most feasibly occur. See FSH 7709.56, chapter 70, for guidance on development of costs.
2. Small Business Set-Aside. The estimated total cost of road construction, including all expenditures for equipment, labor, depreciation, overhead, profit, and risk, excluding the cost of preconstruction engineering performed by the timber purchaser and the cost of federally furnished materials, projected to the time when actual construction can most feasibly occur. This estimate is the “estimate of cost the Secretary would incur to construct the roads” required by 16 USC 535a(c).
3. Timber Sale Contract. The estimated total cost of road construction, including all expenditures for equipment, labor, depreciation, overhead, profit, and risk, less the difference between the public works labor rates and local logging industry labor rates, projected to the time when actual construction can most feasibly occur. See FSH 7709.56, chapter 70, for more guidance on this topic.

Traffic Barrier. A curb, rail, or parapet that is mounted on a road bridge and that is designed to separate vehicular traffic from pedestrian or bicycle traffic or to protect and redirect vehicular traffic from obstacles or hazards.

Value Analysis. Analysis of the functions of a project component or system for the purpose of achieving the required function at minimum total cost, consistent with the requirements for performance, reliability, quality, and maintainability (FSM 1348.2).

Value Engineering. A mechanism included in a construction contract through which contractors may propose methods consistent with contract requirements for obtaining the end product more economically without impairing its essential functions or characteristics and share in any resulting savings to the Federal Government (Federal Acquisition Regulations (FAR), Parts 48 and 52 (FSM 7701.2; FSH 6309.32).

7721 - Roads

7721.01 - Authority

See FSM 7701 for authorities.

7721.02 - Objective

See FSM 7702 for objective statements.

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7721.03 - Policy

Follow requirements for design of National Forest System (NFS) roads in FSH 7709.56, chapter 40.

Geometric design of NFS roads managed as public roads should be consistent with American Association of State Highway and Transportation Officials' (AASHTO) "Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT<400)" and "A Policy on Geometric Design of Highways and Streets" (hereinafter "AASHTO Guidelines and Policy"), or FSH 7709.56, chapter 40.

In lieu of these sources, procedures for design and construction of roads developed by other recognized transportation organizations, such as the Federal Highway Administration (FHWA) or State Departments of Transportation, may be used when engineering judgment indicates that RMOs are better met by applying these procedures, they comply with laws applicable to the NFS, and are compatible with current management direction.

7721.04 - Responsibilities

7721.04a - Washington Office, Director of Engineering

The Washington Office, Director of Engineering is responsible for:

1. Adopting, supplementing, and updating national construction specifications (FSM 7721.14) for transportation facilities and direction on their use.
2. Approving Regional special project specifications that routinely replace sections of the national construction specifications (FSM 7721.14a).

7721.04b - Regional Foresters

Regional Foresters are responsible for ensuring that:

1. Construction cost estimating guides are developed and updated in a timely manner.
2. Regional standard drawings are prepared and updated.
3. Supplemental specifications are prepared for use with the national construction specifications to meet regional situations.
4. Procedures are in place for regional approval and distribution of supplemental specifications (FSM 7721.14a).

7721.04c - Regional Office, Director of Engineering

The Regional Office, Director of Engineering is responsible for:

1. Designating qualified engineers who are responsible for review and written approval of the adequacy of road designs and cost estimates.
2. Reviewing and making recommendations regarding requests for value engineering exemptions submitted by administrative units.
3. Reviewing and acting upon requests from Administrative Units for exemption from design elements and standards required when AASHTO's Guidelines and Policy apply to proposed projects (FSH 7709.56, sec. 42).
4. Reviewing and acting upon requests from administrative units for exemption from minimum widths required in FSH 7709.56, section 42.4, exhibit 02.

7721.04d - Forest Supervisors

Forest Supervisors are responsible for:

1. Ensuring that current approved RMOs are available and that design criteria in RMOs are adhered to in design efforts in the Administrative Unit.
2. Confirming prior to approving construction or reconstruction of roads and bridges that funding necessary to complete the project is available.
3. Providing that the Forest Staff Officer for engineering activities:
 - a. Attests in writing that project designs for the Administrative Unit have been peer reviewed for technical adequacy by a designer other than the primary designer and that the peer review included a timely field review.
 - b. Ensures that preconstruction and construction engineering activities in the Administrative Unit are performed by personnel meeting experience, education, training, and certification requirements.
4. Ensuring that a qualified engineer reviews all project design drawings, specifications, and cost estimates for the administrative unit and signs the project design drawings to attest to their technical adequacy.

7721.1 - Design

Select design elements and standards to meet the applicable design criteria in accordance with the procedures and considerations in FSH 7709.56, chapter 40. Use the requirements in FSM 2432.34a for those roads included in a timber sale contract as specified roads.

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Design road segments to the selected standards for the intended use, giving consideration to the following:

1. Safety;
2. Cost of transportation;
3. Impacts on NFS lands and resources; and
4. Cost of long-term monitoring and maintenance and the expected capability to perform them over the life of the road (36 CFR 212.5(b)(2), 212.55, 212.57).

When a broad-scale travel analysis (FSM 7712.1) or ongoing monitoring indicates long-term annual road maintenance appropriations have been significantly less than what is necessary to meet the cumulative annual road maintenance needs of all roads in an Administrative Unit and that broad-scale resource damage is resulting from failure to perform annual maintenance across the unit, consider selection of design elements and standards that address road user safety and protection of resources that do not require annual road maintenance expenditures at costs per mile greater than what has been historically available to maintain similar roads in the Unit.

7721.11 - Safety

Provide for safety considerations appropriate for the intended uses of the road as shown in its RMOs. Do not compromise safety-related design criteria, design elements, and design standards determined to be necessary for the intended use of the road.

Evaluate additional safety measures in terms of management direction; economics; volume and composition of traffic; and probability, frequency, and severity of accident occurrence.

Direction on the Forest Service's Highway Safety Program is found in FSM 7733 and FSH 7709.59, chapter 40.

7721.12 - Environmental Considerations

Identify the environmental protection requirements associated with road construction on both National Forest and private lands. Consider the protection and enhancement of watersheds, fish-producing streams, wildlife habitat, and scenic resources and the control and reduction of soil erosion at all stages of location and design.

When the selection of road design elements and standards to meet the approved design criteria require compromises between elements of the design criteria, such as environmental and resource consideration, safety, and economics (FSH 7709.56, sec. 41), develop alternative sets of design elements and standards, including their costs and expected effects, for management selection and approval.

7721.13 - Economics and Design Life

Consistent with the applicable design criteria, design roads to meet the needs of projected traffic at the lowest total transportation cost, including construction and maintenance costs and costs incurred by traffic using the roads. Consider availability of appropriated funding for long-term maintenance and monitoring in accordance with FSM 7721.1.

Per the National Forest Roads and Trails Act, NFS roads generally have a permanent design life (16 U.S.C. 532). A finite design life for some road design elements, such as a 20-year design life for pavements, may be utilized when consistent with standard highway engineering practice.

7721.13a - Value Analysis

1. Each road and road bridge project with a cost estimate that exceeds the dollar limits identified in the current publication of OMB Circular A-131 must have a documented value analysis showing that the selected design is the least costly alternative that meets the applicable RMOs.
2. Regional Foresters may develop value analysis requirements for road and road bridge projects costing less than the dollar limits identified in the current publication of OMB Circular A-131.

7721.14 - National Construction Specifications

The Washington Office, Director of Engineering adopts national specifications for construction of NFS roads and road bridges. These specifications may be developed by the Forest Service or other agencies, such as FHWA (see “Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects”). See FSH 7709.56, chapter 40, for direction on selection and use of these specifications and FSH 7709.56, chapter 70, for direction on development of supplemental specifications.

Consistent with applicable design standards, select or prepare specifications that encourage economical construction practices, facilitate contract preparation commensurate with the expected quality of work, and enable prompt response to a timber sale purchaser’s election for the Forest Service to build specified timber sale roads (16 U.S.C. 472a(i)).

Review specifications periodically to clarify intent, correct errors and omissions, ensure specifications remain current with management direction, and ensure specifications reflect current road construction methods and technology.

Use contractor quality control requirements for all public works road and bridge contracts (FAR, sections 46.312 and 52.246-12; FSH 6309.32).

The use of contractor quality control provisions is optional for public works contracts resulting from a timber sale purchaser’s election for the Forest Service to build timber sale roads and for road construction under timber sale contracts.

7721.14a - Application of Supplemental Specifications

Incorporate changes or additions to national construction specifications that are unique to a particular project, such as requirements not covered by the FAR and other contract provisions, into the construction contract for that project. Numbering of supplemental specifications must correspond to the numbering for the national construction specifications.

The approval of supplemental specifications may be delegated to Forest Supervisors. Each Regional Forester shall establish policy for approval and distribution of supplemental specifications (FSM 7721.04b). Secure approval from the Washington Office, Director of Engineering before using supplemental specifications routinely (FSM 7721.04a).

When a timber sale purchaser elects Forest Service timber sale road construction, transfer requirements contained in section C of the timber sale contract to the supplemental specifications of the subsequent public works contract to ensure that the road and bridge construction meets the standards specified in the notice of sale.

7721.14b - Value Engineering

1. **Contract Preparation.** Include value engineering clauses in all procurement contracts for services, supplies, and construction when the contract amount is expected to be equal to or exceed the current simplified acquisition threshold (FAR, Part 48; 48 CFR Part 48; FSH 6309.32). Include value engineering clauses in contracts of lesser value when there is a potential for significant savings.

Submit requests for value engineering exemptions to the Regional Forester for review by the Regional Director of Engineering (FSM 7721.04b). Requests for value engineering exemptions must be supported with written justification statements prepared by the designer or by the Forest Supervisor where any of the following apply:

- a. A permit or other written authorization from another governmental entity is required for construction.
- b. The project is funded under a cooperative agreement.
- c. Non-standard mitigation measures, such as colored concrete or planting of trees and shrubs, have been required in the design.
- d. A documented value analysis (FSM 7721.13a) has shown little potential for significant savings through value engineering.

Ensure that value engineering proposals are checked for consistency with applicable design criteria, elements, and standards.

2. **Contract Administration.** Process value engineering contract proposals according to FSH 6309.11 and the FAR, Parts 48.102 and 48.103, as supplemented. Unless otherwise justified, value engineering proposals should follow the standard value engineering

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process used by the Society of American Value Engineers for technical review. Ensure that value engineering proposals are checked for consistency with applicable design criteria, elements, and standards. Check design modifications for technical adequacy and compatibility with applicable management direction.

7721.15 - Road Cost Estimates

Develop road cost estimates in accordance with FSH 7709.56, chapter 70.

Retain the documents containing cost data and assumptions used by the estimator in preparing the cost estimate (FSH 6209.11, ch. 20).

7721.16 - Roads and Bridges on or Intended for Public Road Systems

Roads and bridges identified in the applicable RMOs as on or intended to become a part of a public road system under the jurisdiction of a State or local public road authority may have design elements and standards higher than those needed for Forest Service resource-related traffic. Provide for access, construction, and funding through a forest road agreement (FSM 7703.4; FSH 1509.11, sec. 31.2).

7721.2 - Rights-of-Way and Agreements

See FSM 5460 for acquisition of rights-of-way for roads over private or other lands not administered by the Forest Service. Develop a right-of-way acquisition plan and obtain written permission to access these needed rights-of-way before surveying them.

Do not issue a prospectus or begin any construction work until all necessary rights-of-way and approvals have been secured and needed agreements have been approved and executed (36 CFR 212.4(c)).

Prior to considering acquisition of a parcel for a transportation project, determine the status of any hazardous material that may be present on or beneath the surface.

7721.3 - Road and Bridge Construction

7721.31 - Construction Engineering, Supervision, and Inspection

Construction engineering consists of all staking, controlling, and inspecting necessary to complete a project according to the applicable plans and specifications, and other contract requirements.

7721.32 - Construction by Timber Sale Contract

1. Authority and Procedures. Follow the lines of authority and general responsibilities in FSM 7115 and FSH 2409.15. The Engineering Representative and Construction Inspectors shall meet the certification requirements prescribed in FSH 7109.17.

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2. Responsibilities. See FSH 2409.15, sections 04.6 and 50.44, for Engineering Representative responsibilities, and section 04.7 for Construction Inspector responsibilities.
3. Reviews and Inspections. Conduct reviews and inspections in accordance with FSM 7721.33, paragraph 3.

Submit to the Forest Service Timber Sale Representative a final inspection report signed by the Engineering Representative certifying the extent of conformity of the construction to the contract plans, specifications, and other requirements, with a recommendation for or against acceptance. If the construction work is not acceptable, include a list, supported with appropriate contract references, detailing items to be completed before acceptance.

7721.33 - Construction by Public Works Contract

1. Authority and Procedures. Follow contracting authority and procedures in the FAR (FSH 6309.32) and the Contract Administration Handbook (FSH 6309.11). Contracting Officer's Representatives and Inspectors shall meet the certification requirements in FSH 7109.17.
2. Responsibilities. See FSH 7709.57, section 02, for Contracting Officer's Representatives responsibilities.
3. Reviews and Inspections. Make interim reviews and final acceptance inspections to ensure proper control of construction projects. Review each project at an early stage and at other stages before final inspection.

Document final inspections for all projects on form FS-6300-15, Certificate of Final Inspection.

7721.34 - Construction by Force Account

1. Limitation of \$50,000. In accordance with 23 U.S.C. 205(c), do not construct projects less than one mile in length that are estimated to cost \$50,000 or more or projects more than one mile in length that are estimated to cost \$50,000 or more per mile by force account. Do not divide a project into stages to avoid the \$50,000 limitation.
2. Inspections and Reviews. Follow the authorities, construction procedures, and quality control requirements for construction under a public works contract, in accordance with FSH 7709.57.

A qualified engineer or that engineer's designated certified representative (FSH 7109.17) shall provide direct technical oversight for all force account construction projects. Certified personnel shall inspect the work to ensure compliance with the applicable plans and specifications.

7721.35 - Traffic-Control Devices and Appurtenances

Ensure that appropriate temporary traffic control measures meeting the requirements of Part VI of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) are included in road construction, road maintenance, timber sale, and land service contracts; are used by Forest Service personnel doing force account road work; and are implemented in management activities impacting traffic on NFS roads.

Do not consider road construction and reconstruction projects complete and acceptable for use until all signs and traffic-control devices included in the design have been installed and all temporary signs and traffic control devices utilized by the contractor/purchaser have been removed.

7721.36 - Final Construction Report

A final construction report may be prepared for any road or bridge construction project. Reports should always be prepared when one or more of the following criteria are met:

1. The project construction cost exceeded \$1,000,000.
2. The project construction cost exceeded \$250,000 and at least one of the following applies:
 - a. For a public works contract, including a contract involving Forest Service road construction elected by a timber purchaser, the final cost varied more than 10 percent from the bid price.
 - b. For a timber sale contract, the final cost varied more than 10 percent from the estimated cost.
 - c. Design changes exceeded 10 percent of the original cost of the project.
 - d. The project was unusually difficult to administer.
 - e. The contractor or timber sale purchaser made a claim for additional costs exceeding 10 percent of the original contract cost prior to or at the close of the contract.
3. The design incorporated new concepts requiring performance data or new and unique construction methods were used.

Use the format in FSH 7709.57, chapter 7, for preparing the final construction report. Discuss in the report only the criteria listed in this section that apply to the project.

Include an evaluation of contractor performance for public works contracts in accordance with the FAR, Subpart 36.2 (FSH 6309.32).

7722 - Road Bridges and Other Road Structures

7722.01 - Authority

See FSM 7701.2, paragraph 2, for authorities.

7722.02 - Objective

The preparation, review, and approval of designs, plans, and specifications for construction of NFS road bridges, and other road structures which will result in constructed facilities meeting RMOs and applicable safety, geometric, and structural requirements.

7722.03 - Policy

1. Perform structural and foundation analyses for road bridges and other road structures, such as culverts, retaining walls, low-water crossings, fords, and cattle guards.
2. Perform hydrological and hydraulic analyses for road bridges, culverts, fords, and other waterway projects. Use hydrological methods described in FSH 7709.56b, chapter 50. Use hydraulic and aquatic organism passage methods described in FSH 7709.56b, chapter 60.
3. All road bridge designs, including those for temporary bridges, must be consistent with standards and guides established by law, regulation, and the AASHTO Load Resistance and Factor Design (LRFD) Bridge Design Specifications (23 CFR Part 625).

Exceptions must be approved by the Regional Director of Engineering (FSM 7722.04b) and must be documented in the structural design calculations and maintained in the permanent bridge file (FSM 7722.1.7). Limitations or special requirements must be specified in the project plans.

4. Ensure that traffic barrier systems for all NFS road bridges are designed and constructed appropriately for the anticipated vehicle traffic, in conformance with FSM 7722.12 and FSH 7709.56b, section 72.3.
5. Use of railroad flatcars as NFS road bridges is prohibited.
6. In designing and constructing NFS road bridges and other road structures, consider requirements imposed by RMOs and applicable road design criteria and agreements, such as memoranda of understanding with States and local governments.

7722.04 - Responsibility

The responsibilities in FSM 7722.04a are in addition to those cited in FSM 7721.04.

7722.04a - Washington Office, Director of Engineering

The Washington Office, Director of Engineering, is responsible for preparing, updating, and approving national plans and construction specifications for road bridges and policies for their use.

7722.04b - Regional Directors of Engineering

Regional Directors of Engineering are responsible for:

1. Reviewing and approving designs, plans, and specifications for the construction of all permanent and temporary road bridges, culverts with a clear span greater than 20 feet, retaining walls over 6 feet in height, and any other structures requiring structural engineering on NFS roads and NFS lands, including structures built by cost sharing cooperators, and stewardship contractors. Authority for this review and approval may be delegated by the Regional Director of Engineering to qualified Forest Service Engineers.
2. Determining and certifying that Forest Service Engineers are qualified (FSM 7722.2) to design road bridges and other road structures, such as culverts, retaining walls, low water crossings, fords, and cattle guards
3. Authorizing increased design loads for bridges in accordance with State design loads and other load requirements (FSH 7709.56b, sec. 72.2).
4. Approving design exceptions to the AASHTO LRFD Bridge Design Specifications.
5. Approving Regional designs and plans for road bridges and other road structures and establishing Regional guidance for use of those designs and plans (FSH 7709.56b, sec. 71.2).
6. Approving the use of previously used materials as structural elements in bridges on NFS roads and NFS lands (FSH 7709.56b, sec. 75).
7. Determining and documenting regional policy and guidance on road bridges and other road structures, such as cattle guards, culverts and retaining walls.

7722.1 - Designs, Plans, Construction Specifications, and Cost Estimates

Designs, plans, construction specifications, and cost estimates for road bridges and other road structures must be completed in accordance with the AASHTO LRFD Bridge Design Specifications and must meet the following requirements:

1. Only Certified Bridge Design Engineers are authorized to design road bridges and other road structures (FSM 7722.04b), with the exception that other types of engineers, such as geotechnical engineers, may be certified to design structures such as retaining walls and culverts (FSM 7722.04b and 7722.2). Do not modify designs during

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construction without agreement from the responsible Design Engineer. Use Certified Bridge Construction Inspectors to inspect all phases of bridge construction.

2. Designs, plans, and specifications prepared by other parties, such as cost sharing cooperators, consultants, product manufacturers, volunteers, and other agencies, must be reviewed by a Certified Bridge Design Engineer or other Certified Engineer.
3. Designs for road bridges and other road structures must be based on sufficient and accurate preliminary data, including appropriate site surveys, hydrological and hydraulic analyses, and geotechnical investigations (FSH 7709.56b, ch. 10-60).
4. Design criteria for road bridges and other road structures should address safety, resource management and use, economics, and esthetics.
5. All bridge designs, including rehabilitation work or repairs, on road bridges and other road structures must be independently reviewed and checked by or under the close supervision of a Certified Bridge Design Engineer or other Certified Engineer.
6. Designs, plans, and specifications for all road bridges and other road structures must be accepted and signed by the Regional Director of Engineering or by a qualified Forest Service Engineer with delegated authority (FSM 7722.04b).
7. A permanent file must be developed for each road bridge. Bridge files are described in the AASHTO Manual for Bridge Evaluation. Include in the file a set of as-built plans and design calculations, including hydrological, hydraulic, and foundation investigation reports, when available. Maintain the file at a single location, typically at the Forest Supervisor's Office or as determined by Regional policy. The file must be readily available to the Bridge Program Manager and anyone issuing overload permits or completing load ratings.

7722.11 - Hydrological and Hydraulic Design

Stream crossing design requires training and experience in conducting aquatic organism passage, hydrological, hydraulic, scour, economic, and hazard analyses (FSH 7709.56b, chs. 50-70).

7722.12 - Traffic Barriers and Approach Guardrails

Design and selection of traffic barriers and bridge approach guardrails (FSH 7709.56b, sec. 72.3 and 7.24) should take into consideration the recommendations of the AASHTO Guidelines for Geometric Design of Very Low-Volume Local Roads ($ADT \leq 400$) and the AASHTO Roadside Design Guide (FSH 7709.56b, sec. 70.6).

Unless authorized in writing by the Regional Director of Engineering, all road bridges must be designed with a traffic barrier system that has either been successfully crash-tested to a currently acceptable test level (TL) per the 2009 AASHTO Manual for Assessing Safety Hardware (MASH) (FSH 7709.56b, sec. 70.6) or designed with a crashworthy traffic barrier system that is geometrically and structurally equivalent to a crash-tested system.

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The following is a listing of minimum requirements for bridge traffic barrier structures. See FSH 7709.56a, section 72.3, for a more detailed discussion of this topic.

Maintenance Level (ML)	Minimum Required Test Level (TL)
MLs 1 and 2	TL 1
ML 3 with a design speed \leq 30 miles per hour	TL 1
ML 3 with a design speed $>$ 30 miles per hour	TL 2
MLs 4 and 5	TL 3

When road geometry allows, bridge traffic barrier systems other than TL 1 curb only systems, must include a bridge approach guardrail transition system and appropriate terminal sections. When road geometry does not allow installation of these features, consult the AASHTO Roadside Design Guide for alternative bridge approach guardrail options.

If a bridge meets the minimum requirements listed above for a TL 1 curb only system, bridge approach guardrail is not required. In such cases install type III object markers at all four corners of the bridge in accordance with MUTCD requirements (FSM 7731.16 and FSH 7709.56b, sec. 70.6).

7722.2 - Qualifications for Bridge Design Engineers

At a minimum, all Forest Service personnel responsible for the design or design review, including preparation of design calculations, construction plans, cost estimates, and specifications, for road bridges and other road structures requiring structural engineering shall:

1. Be a registered professional civil or structural engineer.
2. Have at least 36 months of bridge engineering experience under the supervision of a bridge design engineer.

7722.3 - Privately Owned Road Bridges

Special-use authorizations for privately owned road bridges on NFS lands authorized by permit, term permit, lease or easement (special-use authorizations) should include clauses for design and construction requirements to adequately protect the public and National Forest System lands and resources. The design and construction requirements within FSM 7722 and FSH 7709.56b, section 79 are recommended for all road bridges designed and installed on NFS roads or NFS lands, regardless of bridge ownership or road jurisdiction.

7723 - Trail Bridges and Other Engineered Trail Structures

7723.01 - Authority

See FSM 2353.01 and 7701 for authorities.

7723.02 - Objective

Develop designs, plans, and construction specifications for trail bridges and other engineered trail structures to meet applicable geometric and structural design specifications, Design Parameters, and National Quality Standards for NFS trails, consistent with applicable Trail Management Objectives (TMOs).

7723.03 - Policy

1. Ensure that designs for trail bridges and other engineered trail structures are consistent with applicable TMOs (FSM 2353.12). TMOs specify the applicable Trail Class, Managed Uses, Designed Use (FSM 2353.13), Recreation Opportunity Spectrum (ROS) (FSM 2353.14), National Quality Standards for NFS trails (FSM 2353.15), and accessibility requirements (FSM 2353.17) for each NFS trail.
2. The Trails Handbook (FSH 2309.18) and the Transportation Structures Handbook (FSH 7709.56b) contain information and guidance pertaining to design requirements, standards, and methodologies for the design of trail bridges and other engineered trail structures.
3. Perform hydrological, hydraulic, scour, and foundation analyses for trail bridges and other engineered trail structures (FSH 7709.56b, chs. 30-60 and 80).
4. Each design for trail bridges and other engineered trail structures must be consistent with standards and guidelines established by law and the AASHTO LRFD Bridge Design Specifications and the AASHTO LRFD Guide Specification for the Design of Pedestrian (FSH 7709.56b, sec. 80.6). Exceptions to these standards and guidelines must be approved by the Regional Director of Engineering (FSM 7724.04b) and must be documented in the structural design calculations and maintained in the permanent bridge file. Design exceptions, use limitations and special requirements for designs must be enumerated in the project plan.
5. Design and construct all trail bridges with a user barrier system (FSH 7709.56a, sec. 82.4).

7723.04 - Responsibility

The responsibilities in FSM 7723.04a and 7723.04b supplement those enumerated in FSM 2353.04 and 7721.04.

7723.04a - Washington Office, Director of Engineering

The Washington Office, Director of Engineering is responsible for preparing, updating, and approving national standard trail bridge plans and construction specifications and policies for their use.

7723.04b - Regional Directors of Engineering

Regional Directors of Engineering are responsible for:

1. Reviewing and approving designs and plans for the construction of all minor, major and complex trail bridges and other engineered trail structures on NFS trails and NFS lands. Authority for this review and approval may be delegated by the Regional Director of Engineering to qualified Forest Service Engineers.
2. Determining and certifying that Forest Service Engineers are qualified (FSM 7723.2) to design trail bridges and other engineered trail structures by category, such as elevated viewing platforms and retaining walls over 6 feet in height.
3. Approving proposed exceptions to the AASHTO LRFD Bridge Design Specifications and AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges (FSM 7723.03).
4. Approving the use of previously used materials as structural elements in trail bridges or other engineered trail structures on NFS trails and NFS lands (FSH 7709.56b, sec. 85).
5. Approving Regional standard designs and plans for trail bridges and other engineered trail structures and establishing Regional guidance for use of those designs and plans.

7723.04c - Forest Engineers

Unless authority has been withheld by the Regional Director of Engineering, Forest Engineers are responsible for approving designs for trail bridges and other engineered trail structures which utilize standard plans and construction specifications approved for national use by the Washington Office, Director of Engineering or standard plans approved for Regional use by the Regional Director of Engineering.

7723.05 - Definitions

See FSM 2353.05, 7705, 7720.5 and 7737.05 for additional definitions relating to trail bridges and other engineered trail structures.

Design Parameters. Technical guidelines for the survey, design, construction, maintenance, and assessment of a trail, based on its Designed Use and Trail Class.

National Quality Standard for NFS Trails. A national criterion that establishes the level of quality in terms of health and cleanliness, resource setting, safety and security, responsiveness, and condition of facilities for NFS trails managed at a full-service level.

Other Engineered Trail Structure. A structure such as a fishing dock, elevated viewing platform, elevated boardwalk greater than 4 feet high, retaining wall greater than 6 feet high, or other engineered structure located on or adjacent to an NFS trail and that requires

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a certain level of technical expertise for design and inspection based on design complexity and potential user and inspector risk.

Trail Bridge. A trail structure, including supports, erected over a depression or obstruction such as a body of water, a road, a trail, or a railroad that provides a continuous pathway and that has a deck for carrying traffic or other loads.

1. Complex Trail Bridge. Any truss, suspension, or multi-span trail bridge; any trail bridge whose major load carrying elements are not constructed of wood, regardless of width, span or height; or any major trail bridge determined by the trail bridge inspection program manager to have increased design complexity, user or inspector risk, or decay or damage.

2. Major Trail Bridge. Any trail bridge whose major load carrying elements are constructed of wood, that has a clear span greater than 20 feet, and that is not a complex trail bridge; or any minor trail bridge determined by the trail bridge inspection program manager to have increased complexity, user or inspector risk, or decay or damage.

3. Minor Trail Bridge. Any trail bridge that is not a complex or major trail bridge.

Trail Bridge User Barrier. A railing system, curb, or combination of the two constructed along the edge of a trail bridge intended to delineate the edge and protect users from drop-offs.

Trail Fundamentals. The five concepts that are the cornerstones of Forest Service trail management, including Trail Type, Trail Class, Managed Use, Designed Use, and Design Parameters.

Trail Management Objectives (TMOs). Documentation of the intended purpose and management of an NFS trail based on management direction, including access objectives.

Trail Structure. A constructed feature on a trail, such as boardwalk, puncheon, or a retaining wall no more than 6 feet high.

7723.1 - Design, Plans, and Construction Specifications

The following requirements apply to designs, plans, and construction specifications for trail bridges and other engineered trail structures:

1. Only Certified Bridge Design Engineers are authorized to design trail bridges and other engineered trail structures (FSM 7722.04b), with the exception that other types of Engineers, such as Geotechnical Engineers, may be certified to design structures such as retaining walls and culverts (FSM 7722.04b and 7722.2). Do not modify designs during construction without agreement from the responsible Bridge Design Engineer. Use Certified Bridge Construction Inspectors to inspect all phases of bridge construction.

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2. Designs, plans, and specifications prepared by other parties, such as cost sharing cooperators, consultants, volunteers, and other agencies, must be reviewed by a Certified Bridge Design Engineer or other Certified Engineer.
3. Designs for trail bridges and other engineered trail structures must be based on sufficient and accurate preliminary data, including appropriate site surveys and geotechnical investigations (FSH 7709.56b, ch. 10-30).
4. Use the applicable TMOs, Trail Fundamentals, ROS, and National Quality Standards for NFS trails (FSM 2353.12 through 2353.15; FSH 2309.18) to determine trail bridge design requirements.
5. Design all trail bridges and other engineered trail structures using LRFD as specified in the AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges and the AASHTO LRFD Bridge Design Specifications.
6. All designs, including rehabilitation or repair work, for trail bridges and other engineered trail structures must be performed by or under close supervision of a Certified Bridge Design Engineer or other Certified Engineer.
7. Designs, plans, and construction specifications for all trail bridges and other engineered trail structures must be approved and signed by the Regional Director of Engineering (FSM 7723.04b) or by a qualified Forest Service Engineer with delegated authority.
8. Unless authority has been withheld by the Regional Director of Engineering, the Forest Engineer may approve designs utilizing standard plans and construction specifications approved for national use by the Washington Office, Director of Engineering or standard plans approved for regional use by the Regional Director of Engineering.
9. A permanent bridge file must be developed for each complex and major trail bridge or other engineered trail structure. Permanent bridge files are described in the AASHTO Manual for Bridge Evaluation. Include in the file a set of as-built plans and design calculations, including hydrological, hydraulic, and foundation investigation reports, when available. Maintain the file at a single location, typically at the Forest Supervisor's office or as determined by Regional policy. The file must be readily available to the Bridge Program Manager and anyone performing inspections and completing load ratings

7723.11 - Hydrological and Hydraulic Design

Stream crossing design requires training and experience in conducting aquatic organism passage, hydrological, hydraulic, scour, economic, and hazard analyses (FSH 7709.56b, chs. 50-60 and 80).

7723.12 - User Barriers

All trail bridges must have a user barrier system. Design user barriers consistent with applicable TMOs (FSM 2353.14; FSH 2309.18 and 7709.56b, ch. 80).

7723.13 - National Trail Bridge Standard Plans and Construction Specifications

The Washington Office, Director of Engineering has approved national standard designs, plans, and construction specifications for trail bridges. The Director has also approved national design aids for trail bridge substructures. Site-specific trail bridge projects utilizing these standard plans, designs, substructure design aids, and construction specifications are encouraged and can be approved and signed by the Forest Engineer, unless that authority has been withheld by the Regional Director of Engineering.

7723.2 - Qualifications for Trail Bridge Design Engineers

At a minimum, all Forest Service personnel responsible for the design or design review, including preparation of design calculations, construction plans, and specifications, of trail bridges and other engineered trail structures requiring structural engineering must:

1. Be a registered professional Civil or Structural Engineer; and
2. Have at least 36 months of engineering experience under the supervision of a qualified Bridge Design Engineer.

7723.3 - Privately Owned Trail Bridges

Special-use authorizations for privately owned trail bridges on NFS lands authorized by permit, term permit, lease or easement (special-use authorizations) should include clauses for design and construction requirements to adequately protect the public and National Forest System Lands and resources. The design and construction requirements within FSM 7723 and FSH 7709.56b, section 86 are recommended for all trail bridges designed and installed on NFS lands, regardless of trail bridge ownership or jurisdiction.