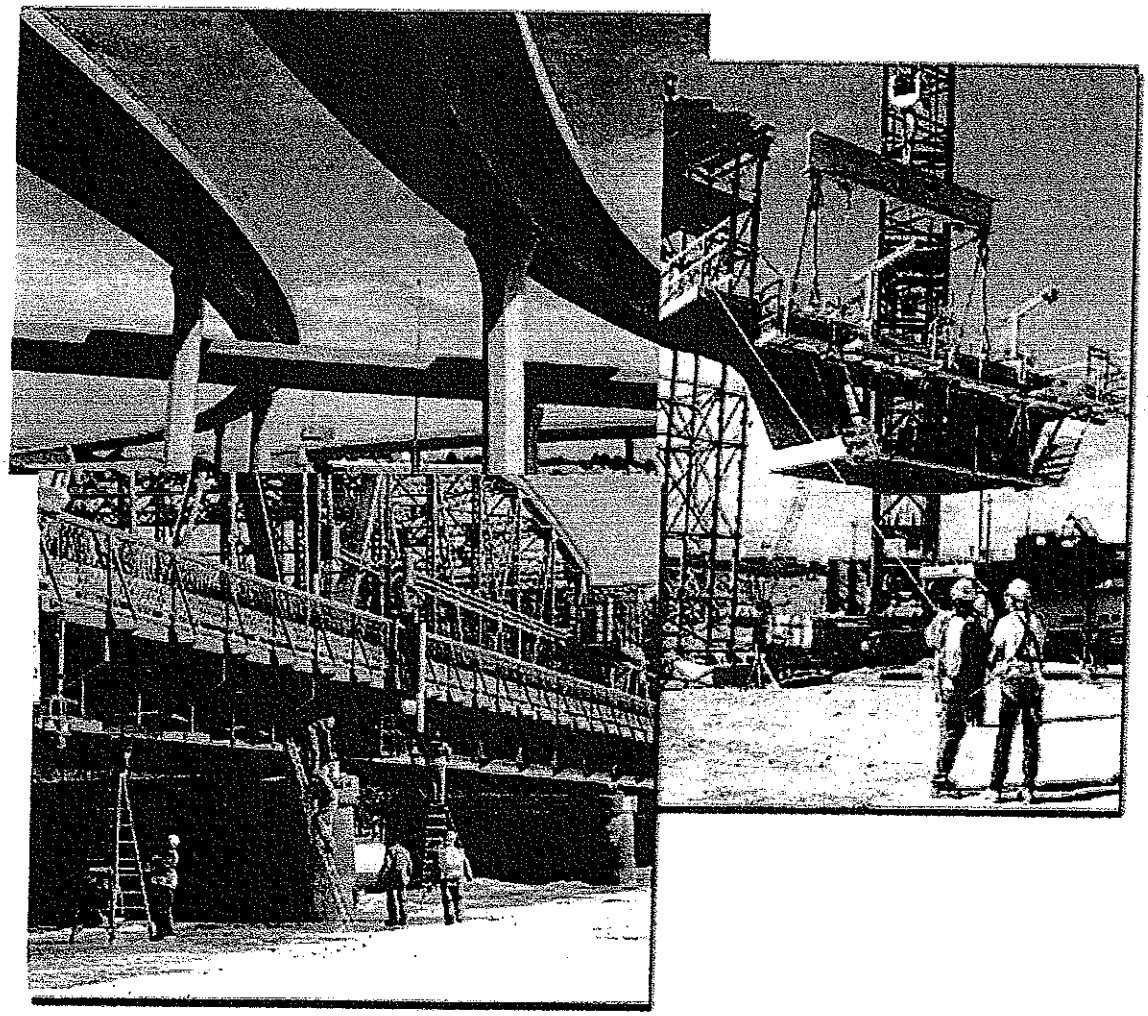
ATTACHMENT 45 – FHWA BRIDGE PROGRAM MANUAL DATED AUGUST 2004

(19 pages)

FHWA Bridge Program Manual



Developed by:

The Bridge Leadership Council

MEMORANDUM

U.S. Department of
Transportation
**Federal Highway
Administration**

Sent via e-mail

Subject: Final Version of Bridge Program Manual Available on FHWA Intranet

Date: August 17, 2004

From: (Original signed by)
Myint Lwin
Director, Office of Bridge Technology

Refer To: HIBT

To: Directors of Field Services
Resource Center Managers
Division Administrators
Federal Lands Highway Division Engineers

The Bridge Leadership Council has completed the first edition of the FHWA Bridge Program Manual (BPM). It is available for use at the following FHWA Intranet site, http://intra.fhwa.dot.gov/bridge/blc/bpm.htm. Please do not distribute the manual outside FHWA, until we go through a one-year shakedown period.

The BPM is intended to collect in one location all of the basic program information needed for bridge engineers to deliver the FHWA Bridge Program in an efficient and effective manner. The Manual does not establish any new policies, but contains existing guidance and sources for regulations and administrative rules.

The Manual was developed by a small group of FHWA Bridge Engineers under the direction of the Bridge Leadership Council. The Council will maintain the Manual and publish updates periodically. Any comments regarding proposed additions or corrections can be directed to anyone on the Manual Team or any member of the Bridge Leadership Council.

The Manual Team consisted of representatives from several different FHWA offices with responsibilities as listed below:

Organization and Format	Wil Dooley (NM Division)
Section 1, HBRRP	Larry O'Donnell (RC Olympia Fields)
Section 2, NBIS	Bruce Johnson (OR Division)
Section 3, Design Review	Dan Byer (NY Division)

Section 4, Construction Review	Helene Bowman (NJ Division)
Section 5, Technical Issues	Helene Bowman (NJ Division)
Section 6, Research Programs	Steve Chase (Turner Fairbank Research Center)
Section 7, Administration	Curtis Monk (IA Division)
Appendix, Headquarters Memos	Edgar Small (Office of Bridge Technology)

In addition to program guidance, the Manual contains examples of field practices in selected areas. We will continue to post additional best practices to illustrate successful implementation of FHWA Policies and Priorities, as they are submitted. They can be sent electronically or submitted in hard copy to Wil Dooley.

Hard copies of the Manual are currently being printed and will be provided to each Field Office, Headquarters and Federal Lands by September 30, 2004.

PREFACE

A working knowledge of FHWA Programs is a requirement for most FHWA engineers. In addition to this, bridge engineers are most effective when they have state-of-the-practice technical bridge engineering skills. FHWA has been very successful developing bridge engineers in both technical and program knowledge. This has been accomplished through informal mentoring of Assistant Division Bridge Engineers by more experienced Division Bridge Engineers as well as Resource Center, Washington Headquarters, and Federal Lands Engineers. Many technically competent bridge engineers from Federal Lands have successfully made the transition to Federal-aid by working with others familiar with the FHWA Programs. Occasionally, FHWA bridge specialists, especially those in Division Offices, are tasked to handle collateral duties including team leader, safety or technology transfer specialist, etc., or devote significant amount of attention to program delivery. In all of these situations, having a central source of current technical and program guidance, such as the Bridge Program Manual, helps facilitate the Division Bridge Engineer's job.

Increasingly, FHWA is emphasizing leadership in improving the transportation network by developing and deploying innovative engineering practices and technologies. FHWA Division Bridge Engineers are in a unique position to implement new technologies through appropriate project level activities because of their working relationship and influence with State Highway Departments and the project development process. They are the first line to identify potential applications of priority technologies and to call in help and expertise from the Resource Center or FHWA Headquarters.

FHWA Bridge Engineers collectively must self-manage so that they can readily adapt to changing expectations placed on them by internal and external partners and customers. They expect FHWA bridge engineers to be able to aid them in priority areas, such as:

1. Deploying emerging technologies and practices that help us reach our Program Goals,
2. Reducing construction time while increasing work zone and traffic safety, aiding State Highway Agencies to "get in, get out, and stay out", and
3. Producing low-to-zero maintenance, 100-year design life bridges with reduced life cycle costs that can be constructed in $1/10^{th}$ of the time that bridges currently take to construct.

FHWA Bridge Engineers must possess superior technical skills and have a comprehensive understanding of "best-practices" in bridge engineering to be able to accommodate our agency's strategic goals and support the "vital few". Bridge Engineers are increasingly challenged to do more than simply deliver the FHWA bridge program. FHWA Bridge Engineers must possess the technical competency to provide services to their managers and partners to lead the implementation of innovative and emerging technologies and best practices.

The Bridge Program Manual (BPM) is intended to provide basic program and technical information to aid Bridge Engineers in delivering the FHWA Bridge Program in an efficient manner. It should help to concentrate their efforts on maintaining a high degree of technical competence and to respond to routine needs of the Federal-aid delivery process.

This Bridge Program Manual was developed by a small group of FHWA Bridge Engineers with review

and comment by many bridge engineers throughout FHWA and under the direction of the Bridge Leadership Council (BLC). Questions and comments on the content should be directed to the following or to any member of the Bridge Leadership Council:

Overall maintenance of the Manual.....	Wil Dooley
Section 1.....	Larry O'Donnell
Section 2.....	Bruce Johnson
Section 3.....	Dan Byer
Section 4.....	Helene Cook
Section 5.....	Helene Cook
Section 6.....	Steve Chase
Section 7.....	Curtis Monk
Appendix.....	Edgar Small

DESIGN REVIEW

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Preliminary Plan Review

Preliminary Plan Review is often referred to as Type, Size and Location review (commonly known as TS&L) for new and replacement structures. It refers to the type of structure selected, general size of the bridge, geometry and clearances, length and width, horizontal and vertical alignment, and the actual location of the bridge itself.

The preliminary plan reviews provide the opportunity for the Division Bridge Engineers to have major input on the type of structure being designed. Major items to be addressed include: use of high performance materials, use of new technologies, new innovative materials, opportunities for accelerated construction, unique/creative new uses of known materials, constructability, appropriateness of construction techniques, maintainability, inspectibility, cost-effectiveness, aesthetic requirements, corrosion protection strategy, improved details to eliminate existing problem areas on bridges (i.e., bridge expansion joints, fatigue prone details, bearings, etc.) hydraulic/scour analysis and deck drainage, geotechnical requirements and types of foundations. Preliminary design studies should consider the bridge location, length, width, span arrangement and superstructure system considering traffic requirements, safety measures, channel configuration, stream flow, etcetera. Feasible alternatives for a proposed bridge crossing, along with their merits and shortcomings, should be identified and discussed.

Emphasis should be placed on design considerations for a 100-year service life with minimum future maintenance requirements. Life cycle cost analysis should be used for major and unusual structures to determine the appropriate type of materials to be used. For major and unusual structures and major interchanges, so-called Bridge Preliminary Reports should be considered to formulate the decision for the type or types of structures to advance to final design. To address accelerated bridge construction, prefabricated elements and systems should be considered at this time.

During this stage we determine the overall aspects of the bridge. We see the structure layout, substructure locations, span lengths and hydraulic opening. The bridge should provide adequate openings for the facilities and features being crossed. If an existing bridge is being replaced, we see how the new bridge compares to the old bridge. Should it be longer or shorter, and wider or narrower than the existing?

Does the site require any special construction considerations? Were certain commitments for the bridge design or actual bridge type made during the environmental process? Were context sensitive design issues explored, and/or commitments made. How can traffic be maintained during construction, whether staged construction, or by on-site or off-site detours? Staged construction may limit the available design options or require additional width. And how compatible is the design for future rehabilitation and maintenance of traffic?

A review of HBRRP participation should also be made at this stage, if in fact those types of funds are being used. Special design features being incorporated for context sensitive solutions and aesthetics may be very costly. Approach roadway costs may be excessive (Refer to the Chapter 1, "Approach Roadway Funding," for more specific information).

Major cost savings can be realized during the TS&L phase, as cost-effective and efficient material types are determined, and as decisions are made as to which designs should be further developed beyond the preliminary stage. Foundation design decisions are being finalized as to which type is most cost effective for the structure as a whole. Moreover, it is during this phase

that cost effective span arrangements are determined, and structure types are chosen based on what is most cost effective for required span lengths. For traditional bridges, shorter spans are generally more cost effective if the substructure cost is low. Whereas, high substructure cost may dictate longer spans for the most cost-effective design.

Here are some general guidelines for cost-effective bridge types:

Structure Type	Cost Effective Span
Box culverts	6 to 20 feet
Prestressed voided slabs	30 to 60 feet
Rolled beams	50 to 90 feet
Prestressed beams	40 to 150 feet
Plate girders	80 to 250 feet
Box girders	150 to 250 feet
Concrete arch	200 to 600 feet
Steel arch	350 to 750 feet
Steel Trusses	350 to 900 feet
Concrete segmental	300 to 1000 feet
Cable stayed	600 to 2000 feet
Suspension bridge	2000 feet plus

Geotechnical and foundation reports should also be submitted and reviewed at this TS&L stage. However, the report may only be in draft stage at this time, or may not yet be available. The report may not be completed until the bridge design is well along, say the 60-70% stage. **Refer to Geotechnical section later in this chapter.**

Hydraulics and scour reports should be submitted at this TS&L stage for review of design adequacy. Piers and abutments that are not skewed/aligned in the direction of stream flow can substantially aggravate scour at those substructures. Geomorphologic conditions should be considered. Stream stability is an extremely important consideration, which if not considered could result in detrimental consequences to the bridge. **Refer to Hydraulics and Scour section later in this chapter.**

Non-proprietary products must be included as alternates to proprietary products, unless the following is applied. Three or more proprietary products, if known, are generally considered sufficient for contract document bidding purposes. When a sole source product or material is deemed necessary, justification is required. That justification is essentially a public interest finding. A sole source product can also be incorporated if it is treated as an experimental feature.

Inspection access should be provided on all bridges. When inspection walkways are required, they should be shown on the preliminary plans submitted for TS&L approval.

For projects on the NHS, the bridge railing must be successfully crash tested in accordance with NCHRP Report 350. The bridge railing must meet Test Level 3 (TL3) or greater. This requirement is provided in a paper that was presented to the AASHTO Highway Subcommittee on Bridges and Structures on May 14, 1986. An Office of Engineering memorandum dated May 30, 1997, officially transmitted that paper to the field. The LRFD Specifications provide the various test levels corresponding to NCHRP Report 350. Except as required per the above for the NHS, until nationally recognized selection procedures exist, the user agency determines

where a feature of a demonstrated test level is appropriate for use. On the Interstate for example, some states require TL5 for all new bridges; in other states TL4 is considered the norm.

Also, refer to this site http://safety.fhwa.dot.gov/fourthlevel/hardware/bridgerailings.htm for listings of crash tested bridge railings. Proposed bridge railings that have not been successfully crash-tested may be approved by the Division for use on the NHS, if the railing is very similar in design to one that has been successfully crash tested, and expected to act in a crash worthy fashion. Consultation with the Washington Office of Safety Design prior to approving such a railing is highly recommended. For non-NHS projects, the State sets the standards to be used; most states use crash testing requirements, whereas some states may use the railing design requirements in the AASHTO Standard Specifications for Highway Bridges.

The Americans With Disabilities Act needs to be considered on every project where pedestrian/bicycle traffic must be accommodated. The Americans With Disabilities Act Accessibility Guidelines have been adopted as standards by the Department of Justice and the Department of Transportation. A waiver to the requirements may be requested on a case-by-case basis. In general a waiver is difficult to obtain and based on severe local conditions. Requests for waivers should be submitted together with a justification to the Office of Program Administration, HIPA-20, for approval. Refer to this site for more information http://www.fhwa.dot.gov/programadmin/pedestrians.html

Attached to the end of this chapter for your information and use is a design review checklist titled "Final Scope Document/Initial Design Review Guidelines for Bridges and Structures." And here is a listing of additional design items recommended:

1. Life Cycle Costing should be done for any situation where a choice must be made for structure type.
2. Geometrics should be as simple as can be obtained, to avoid excessive design and construction effort to accommodate such things as spiral and vertical curves. Sag curves should be avoided if at all possible.
3. Continuous designs should be encouraged whenever possible.
4. New technology should be encouraged where practical.
5. Rehabilitation projects should have a thorough condition evaluation report prepared before any plan detail is developed. It should be detailed and comprehensive enough to effectively design the rehabilitation.

Alternate Designs

The current regulation on alternate design appears in 23 CFR 635.411(b). That evolved following the notice on Alternate Designs for Bridges in the "Federal Register" dated August 15, 1995. That notice provides a good reference.

That notice issued a revised statement of FHWA policy on the development of alternate designs for major bridges that would be constructed with Federal-aid highway funds. The notice made the new policy on the use of alternate bridge designs optional. Thus, alternate designs may be used by the State Highway Agencies at their discretion.

Alternate bidding is a method used to minimize the overall cost of Federal-aid projects through increased competition. In theory, allowing alternate designs and/or construction methods will attract the greatest number of bidders and result in the lowest possible bid prices.

Alternate bidding procedures should be used when more than one alternate is judged equal over the design service life and there is a reasonable possibility that the least costly design approach will depend on the competitive circumstances. The potential for using alternates will normally be developed through design studies and value engineering analysis during project development. Careful consideration should be made, as anticipated savings should justify the costs for additional designs.

The bidding documents and contract plans should clearly indicate the design criteria and the type of alternate designs or contractor options that will be acceptable. The contractor should be permitted to bid any designated alternate that is consistent with their expertise and equipment.

Note: As further background, from December 1979 to August 1995, FHWA policy required the development of alternate bridge designs for major bridge structures that were estimated to cost more than a specified dollar amount (initially $5 million, then revised to $10 million in June 1988). That policy was established to get the best possible value in an unstable market by requiring alternate bridge designs. The analysis of cost data from 1979 through 1987 indicated that the alternate bridge design policy resulted in an average savings of $2 million for each major bridge project. Although that policy was effective in providing large savings in the design and construction of major structures, it was discontinued on August 15, 1995. The revised FHWA policy allows States to use their discretion in providing alternate designs where appropriate.

Final Design
(And/Or Advanced Detail Plan Review)

Final Design plans are generally prepared to provide a formal review of the structure as it progresses. This is to review the design before it gets too far along, and to ensure that the design is within the scope of the project. There is no Federal requirement that Final Design plans be developed or submitted to the FHWA; however, the State generally prepares them. There may be a formal agreement between the State and the FHWA Division, regarding their development and submittal at specific stages of completion (e.g. 60% plans).

Below is a listing of appropriate design guidelines for Final Design plans, many of which should also be considered during preliminary plan review. Consideration must be given to future inspection needs, maintenance and rehabilitation of these structures. Polices should be employed, considering best practices, and necessary compromises to balance economic, environmental and bridge-specific goals.

1. Designs should reference the appropriate AASHTO Specifications including subsequent interim Specifications.
2. The design should reference the appropriate AASHTO Guide specifications.
3. Preliminary studies should check girder spacing, related to span arrangement, for optimum design.
4. Minimum vertical clearance should be provided.

5. Deck cross slopes should not be less than 2% for drainage purposes.
6. Provisions should be made for corrosion protection for deck reinforcement, and corrosion protection strategies for all structural elements, with particular emphasis in aggressive situations and/or environments such as decks subject to deicing salts, and bridges subject to heavy salt spray or located in marine environments.
7. Using available technology, decks should be designed to last the life of the bridge.
8. Consideration should be given to minimizing the number and types of bearings. In addition, consideration should be given in the design for the possibility of future bearing replacement. Replacement of bearings implies the use of jacks to lift the superstructure off the permanent bearings. The position of these jacks, and allowable jack loads should be indicated on the drawings. The distribution reinforcement to accommodate the jack loads should be provided in the top of the piers and the soffit of the superstructure. Further, the transverse analysis of the superstructure should consider the relocation of reactions when the jacks are engaged to replace the permanent bearings.
9. Elimination of bridge deck joints should be considered in any alternate that is studied, as leaking joints are the major causes of deterioration of superstructure and substructure elements.
10. There are non-proprietary expansion joints (i.e., Finger Joints) that are acceptable alternates to proprietary joint systems.
11. The latest AASHTO Specifications, with Charpy V-notch toughness requirements where required, should be used to specify structural steel.
12. The use of High Performance Steel should be considered wherever appropriate.
13. Special considerations should be given to eliminating fatigue prone details and using improved fatigue connections. To reduce the effects of out-of-plane bending in girders, all the vertical connection plates for cross frames and diaphragms should be rigidly connected to both top and bottom flanges of the beam or girder.
14. Generally, the minimum fillet size called for in ANSI/AASHTO/AWS Bridge Welding Code should control the fillet size and need not be shown on the plans unless a larger weld is required for stresses.
15. Consideration should be given to allowing a contractor the option to use all bolted connections for cross frames and diaphragms in lieu of the welded connections.
16. Consideration should be given to allowing a contractor the alternative of providing a thicker web plate and eliminating the need for stiffeners on plate girders.
17. High Performance Concrete should be considered for all applications. In addition, the use of light weight high performance concrete and self-consolidating concrete should be considered as appropriate to reap their benefits.
18. The U.S. Coast Guard approval for navigational clearances should be submitted along with the preliminary plans for our review.
19. An inspection and maintenance guide for the future operation of each major or unusual bridge should be developed for the owner along with the development of design and construction plans.
20. The State should require formal constructability and maintainability reviews by the designer (State or consultant) to determine the practicality and feasibility of erection/construction of the structure as assumed in the design as well as adequacy for future maintenance.
21. Design of the structure and preparation of contract documents should include a thorough integrated drawing review to determine that the mild reinforcing and prestressing steel layouts shown on the plans do not present congestion problems that

will hamper placement of concrete. The integrated drawings should be of a sufficiently large scale to enable the designer to detect any conflicts and congestion.

22. A Load Rating Analysis should be performed for all new and rehabilitated structures. This will meet NBIS requirements as well, to have current load ratings for all structures.
23. Details should be sufficient to develop shop drawings.
24. Field welding should be avoided whenever possible on structural members.
25. Drainage scuppers should be avoided over traffic.
26. Drainage in many instances can be taken off the bridge itself, and handled at the end of the bridge.
27. Drainage systems should provide "clean outs" or easily maintainable details, avoiding details like pipes cast into piers or closed drainage behind backwalls.
28. Deck pour sequence should be clearly shown and performed in such a way as not to damage the bridge (eg. eccentric loading on arches, overstressing negative moment areas).
29. A fracture control plan should be provided with all fracture critical bridges.
30. Try to avoid fatigue prone details such as cover plates.
31. Fill sequencing or dynamic foundation methods should be clearly shown and logically performed to prevent damage to the bridge (eg. large fills placed and left in place for a period of time before pier/abutment piles are placed).
32. Ensure that all bolted splices for main members are designed as slip critical connections.
33. All pinned details should avoided.
34. Staging should be done in such a manner that eccentric loadings will not, or will only marginally affect substructure designs (eg. very large footings that are designed simply to accommodate staging).
35. Seismic loading must be considered in such a way that excessive and unnecessary stiffness does not result in oversized footings or substructure connections with superstructures.
36. In seismic areas, ensure that the column reinforcement is such that upon column rupture the concrete is contained within the reinforcing cage.
37. In seismic areas, ensure that beam seats are adequately sized to prevent drop off of the superstructure.
38. In seismic areas, ensure that bearings can dissipate energy. In all cases avoid rocker/pedestal bearings.
39. Streams carrying debris should be identified, and substructure units should be designed accordingly to facilitate effective passage of the debris.
40. Avoid welding constraints such as intersecting welds.
41. Ensure that reinforcing steel lap length is either noted or shown on the plans.
42. Ensure that reinforcing has the proper embedment length (eg. length from top of pier into the pier cap)
43. Ensure that pile embedment length within the footing is shown.
44. Ensure that any down drag on piling is accounted for in the design.
45. For integral abutments, ensure that piling is arranged in such as way to accommodate translational movement.
46. For semi-integral abutments, ensure that they are detailed properly to allow for movement and to protect the fill behind the abutment.
47. Ensure that environmental conditions are conducive to the use of the material chosen (eg. avoid a continual wetting environment for weathering steel)
48. Ensure that for curved girders the cross framing is designed as a main member.

49. Ensure that piers have the proper protection (eg. dolphins for piers in the navigable channel, and crash walls for piers near railroads).
50. Verify that beam seat and deck evaluations appear reasonable and logical (ie, superelevations and crowns agree at piers and abutments).
51. Any backup bars should be removed and ground smooth after welding operations..
52. Low maintenance details should always be incorporated on bridges (eg exposed steel should not pond water, and snow removal should be easy).
53. For any unusual details, or those unfamiliar, get RC or Headquarters assistance.
54. Structures relying on earth fill for their stability should have the fill sequence shown or explained on the plans.
55. Structure demolition procedures should be engineered (eg. removing prestressed superstructures, removing decks on spandrel arches, removing decks on post tensioned structures.)
56. The proper design of crown sections for adjacent concrete box girders should provide for uniform contact along the face of the girder. Either a tapered vertical shear key or a sloped face on the girder wall can be specified.
57. Variance of cambers in prestressed girders can be accommodated through varying the haunch or varying the deck thickness. However, this would need to be anticipated in the design of the superstrucuture. It is difficult to reasonably place tight design tolerances on camber, without associated costs being passed along to the owner and becoming excessive. Negative camber should be avoided.

Plans, Specifications and Estimate Review

At this stage of project development, the Plan, Specifications, and Estimate (PS&E) package for a project is submitted for review and approval. A typical PS&E package will include a set of the completely detailed project plan sheets, the project contract proposal, and a copy of the design engineer's construction cost estimate. The package may include other items such as right-of-way certificates, environmental permit applications, or other documentation specific to the project. The PS&E review consists of examining the submitted package for consistency with the project's scope of work, conformity to acceptable engineering design and construction practices, Federal-aid eligibility, environmental compliance, and adherence to all appropriate Federal rules and regulation. The review also ensures that all previous comments, such as those made at the Advanced Detail Plan (ADP) review have been satisfactorily resolved. In some instances, ADP's may not have been submitted, thus the PS&E review represents the initial evaluation of project plans. Once PS&E approval has been granted, the project can be authorized to proceed to construction. If outstanding issues arise during the PS&E review, a request can be made to resolve the issues prior to granting PS&E approval, or the PS&E can be approved with conditions placed on the project authorization, which must be satisfactorily addressed prior to the award of the contract. Sometimes, the State needs to issue addenda to resolve certain aspects of the contract package. The State Highway Agency shall provide assurance that all bidders have received all issued addenda. Addenda for projects that require FHWA oversight must be approved by FHWA because they represent a change to the approved PS&E.

Guidelines for preparing the PS&E are found in the non-regulatory supplement of 23 CFR 630, Subpart B. Section 4.c.6 of that supplement pertains to bridges, and therein includes a listing of several items that should be included in the contract plans for bridges.

a. A site plan,

b. Location and log of each foundation sounding or boring indicating the results of the subsurface explorations,
c. A profile of the crossing,
d. Typical cross section,
e. Sectional drawings, as needed, to detail structure completely,
f. Quantities of materials required,
g. Reinforcing bar list and bar bending diagrams,
h. Design loadings, stresses, class(es) of concrete, and grade(s) of steel,
i. Drainage area and applicable runoff of hydraulic properties,
j. Design and construction details, and all other details essential to completeness, and,
k. Reference to applicable specifications.

References:

- FAPG, Subchapter G, Part 630, Subpart B, Plans, Specifications and Estimates and Non-regulatory Supplement
- FAPG, Subchapter G, Part 635, Subpart A, Contract Procedures and Non-regulatory Supplement
- FAPG, Subchapter G, Part 635, Subpart C, Physical Construction Authorization and Non-regulatory Supplement

Design Exceptions for the NHS

For projects on the NHS, formal approval is required for 13 controlling criteria: design speed, lane and shoulder width, bridge width, structural capacity, horizontal and vertical alignment, grade, stopping sight distance, cross slope, superelevation, and vertical and horizontal clearance. On FHWA-oversight projects, FHWA approves design exceptions. On State-oversight projects, the State approves design exceptions. Design features are generally improved upon as much as is feasible, when considering the approval of the design exceptions.

For bridges, the most applicable criteria are bridge width, structural capacity, and vertical clearance

Bridge width - The criteria contained in 23 CFR 625 apply in determining the width of all bridges to be constructed, reconstructed, or rehabilitated on the NHS. For rehabilitated bridges on non-freeway NHS, the provisions in 23 CFR 625 dealing with 3R projects (i.e. Resurfacing, Restoration, and Rehabilitation) may be applied (in other words, State DOT design criteria as approved by FHWA).

Structural Capacity - All new bridges on the Interstate system shall have at least an HS-20 structural capacity (*A Policy on Design Standards - Interstate System*). Rehabilitated bridges on the Interstate System should have an HS-20 structural capacity (*23 CFR 625, Non-regulatory supplement*). For all other projects on the NHS, refer to the AASHTO standards.

Vertical Clearance - Interstate System: 4.9 meters for rural interstates; 4.3 meters is allowed in urban areas when a 4.9-meter single route is provided (*A Policy on Design Standards - Interstate System*, July 1991). For all other NHS, 4.3 meters is the minimum vertical clearance (2001

AASHTO "Green Book"). The vertical clearance to sign trusses, pedestrian overpasses and to cross bracing of through-truss structures should be 5.1 meters.

For horizontal clearance, consult the AASHTO Green Book for guidance and the various cases provided for what would be the appropriate design based on the particular situation involved.

For projects on the NHS, bridge railing must be successfully crash-tested in accordance with NCHRP Report 350. The bridge railing must meet Test Level 3 (TL3) or greater. For more information, see the last paragraph in the Preliminary Plan Review section.

Reviews by Washington Office and Resource Center

The Office of Bridge Technology and the Resource Center will assist in the review of projects at the request of the Division office. The Office of Bridge Technology has retained responsibility and approval authority of preliminary plans for unusual bridges and structures on the Interstate System. This is by policy memorandum dated November 13, 1998. Specific definitions for what is meant by unusual bridges and unusual structures are found in that memorandum. Early and complete submissions are requested in order to facilitate more meaningful and expeditious reviews and approvals. This generally is not a problem, but on occasion, projects may come into the Division Office at a late date due to unforeseen circumstances, such as when a State Highway Agency (SHA) decides to change to Federal-aid funds during the plan development stage.

This policy on Headquarters review pertains to rehabilitation projects as well as new structures. The policy provides for delegation, upon consultation with Headquarters, when substantial and adequate experience in the Division office or Resource Center is available.

Oversight of Federal-aid projects in the Division Office is determined based on the stewardship agreement between the SHA and the Division. So, for example, projects estimated to cost below a certain dollar value on the Interstate System might not be subject to the Division office's detailed review of plans.

Preliminary Plans sent to HIBT for review should include all of the following, as applicable, at time of submission:

- Selected type of structure with alternates (if any)
- Plan and profile for approaches and main span
- Typical cross sections for approaches and main span
- Bridge geometry (line, grade, width and total length)
- Design criteria and specifications
- Seismic design criteria
- Method of construction (precast, cast-in-place, span-by-span, balance cantilever)
- Incremental launching, falsework, etc.
- Cable anchorages and corrosion protection system, if applicable
- Proposed substructure and foundation type
- Hydraulic design data
- Scour estimates and mitigation measures
- Geotechnical data

The Resource Center (RC) is always available to assist the Divisions with the review of design plans. Although there is no established policy on which projects to coordinate and how often, the Divisions are encouraged to take advantage of the specialty areas in which the RC can offer technical assistance. These areas include complex structures, LRFD for conventional structures, seismic design, high performance materials, finite element modeling, complex foundations, hydraulics/scour analyses, and geotechnical reports and exploration requirements. All requests for plan reviews are to be sent to the RC Structures Team Leader for distribution to the appropriate Team Specialist. RC specialists are available to review structural plans and attend project design meetings, visit construction project sites and research technical issues in order to resolve problems. We should utilize their experience and expertise as much as possible.

Coast Guard Coordination and Navigational Clearances

Guidance for United States Coast Guard coordination for Federal-aid projects is found in 23 CFR 650, Subpart H. The United States Coast Guard (USCG) has jurisdiction over all navigable waters. The USCG essentially requests early coordination with them on a project. As mentioned in the last paragraph of this section, the SHA generally does this coordination. Specific concerns that the USCG may have can easily be learned by contacting them. While certain types of work may not require an actual permit, the USCG may have some other concerns that would need to be addressed during the construction of the project for the safety of navigational traffic, even if that traffic is non-commercial in nature. For example, they may require navigational signals, signs, or notices to local mariners, and to alert recreational boaters during certain phases of construction. For rehabilitation projects, deck widening may or may not require a permit, depending on the extent of the widening.

As indicated in 23 CFR 650.805, the FHWA has the responsibility under 23 U.S.C. 144(h) to determine that a USCG permit is not required for bridge construction on certain waterways for Federal-aid projects. These particular waterways are described as: "(1) Those which are not used or are not susceptible for use in their natural condition or by reasonable improvement as a means to transport interstate or foreign commerce, and (2) which are a) non tidal, or b) if tidal, used only by recreational boating, fishing and other small vessels less than 21 feet in length." The SHA generally assists in providing the necessary backup information and support for FHWA to make this determination. A permit is not required if the above criteria are met and the FHWA has made that particular determination. As mentioned in the preceding paragraph, coordination is still necessary to address the USCG's concerns.

For non-navigable waterways, the USCG does not need to be contacted. When in doubt about this issue, the SHA or FHWA should consult with the USCG. A phone call should suffice. However, the SHA or FHWA may in fact be interested in written correspondence from the USCG, stating for the record that it is a non-issue.

The Division office can delegate the coordination aspects to the SHA, and this is generally the case. However, the determination that a bridge permit is not required, for those waterways as explained above, cannot be delegated. This determination is in writing, and should be provided to both the SHA and the USCG.

South Carolina best practice: Tidal crossings that have less than 5 feet of depth at low tide are typically exempt from USCG permit.