OFFICE OF SPECIAL FUNDED PROJECTS

INFORMATION AND PROCEDURES GUIDE

CHAPTER 2: TYPICAL PROJECT INFORMATION

STRUCTURES & ENGINEERING SERVICES
DIVISION OF ENGINEERING SERVICES
DEPARTMENT OF TRANSPORTATION
STATE OF CALIFORNIA

2024

Updates and information concerning the contents of this guide may be obtained from:

Office of Special Funded Projects and Structure Local Assistance (OSFP/SLA) page
or
Contact the Caltrans, Office of Special Funded Projects, American Council of Engineering Companies (ACEC) representative.

The Office of Special Funded Projects has prepared the contents of this guide. When necessary, revisions are made and posted on the web site listed above. It is the responsibility of all that use this guide to verify it is current and appropriateness for the use intended, to obtain the revisions, and to disregard obsolete or inapplicable information.

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Other documents referenced in this Guide are available at the Caltrans internet website: https://dot.ca.gov/ or https://dot.ca.gov/manuals/

INDEX TO ABBREVIATIONS:

AAA	Advertise, Award and Administer
AASHTO	AASHTO LRFD Bridge Design Specifications
ACEC	American Council of Engineering Companies
A&E	Architectural and Engineering Contract
APS	Advance Planning Study
BLCCA	Bridge Life-Cycle Cost Analysis
BD	Bridge Design
BDD	Bridge Design Detail
BDM	Bridge Design Memo
BDP	Bridge Design Practice
CA	California Amendments to AASHTO LRFD Bridge Design Specifications
CMGC	Construction Manager/General Contractor
DB	Design Build
DES	Division of Engineering Services
DRP	Draft Project Report
EE	Earthquake Engineering
GS	Geotechnical Services
MTD	Bridge Memos to Designers
OC	Overcrossing
OH	Overhead (railroad)
OSFP	Office of Special Funded Projects
PDPM	Project Development Procedures Manual
PDT	Project Development Team
PID	Project Initiation Document
POC	Pedestrian Overcrossing
PM	Project Manager
RP	Project Report
PS&E	Plans, Specifications and Estimate
PUC	Pedestrian Undercrossing
QC	Quality Control
SC	Structures Construction
SDC	Caltrans Seismic Design Criteria
SM&I	Structures Maintenance and Investigations
SOE	Structure Office Engineer
SFP	Special Funded Projects
STP	Structure Technical Policies
UC	Undercrossing
UP	Underpass (railroad)
VECP	Value Engineering Change Proposal

2 TYPICAL PROJECT INFORMATION

2.1 BRIDGE, EARTH RETAINING SYSTEM (ERS), PUMP PLANT NAMES AND NUMBERS

The Bridge, ERS, and pump plant Numbering System is used for the identification of bridges/ERS/pump plants and other structures under the jurisdiction of Caltrans. This includes structures Caltrans owns, performs maintenance reviews, or has other record responsibilities. Bridge and pump plant names and numbers are determined and assigned by the Structure Maintenance and Investigations unit. ERS names and numbers are determined and assigned by the Earth Retaining Systems Committee.

Typical structures that are routinely assigned bridge numbers consist of state highway bridges, pumping plants, MSE walls, and buildings. Other types of walls and structures are occasionally assigned bridge numbers on a case-by-case basis.

Requests for bridge/ERS/pump plant numbers and bridge/ERS/pump plants names for structures shall be made through OSFP Liaison Engineer and shall include:

- Request for Structure Asset Name and Number form (MTCE-0101) or Request for ERS Structure Asset Number form (ERS SAN Request Form)
- General Plan of the bridge/ERS/pump plant.
- County and State Route Identification Number
- Post Mile at Beginning of Bridge (to the nearest .01 PM)
- Site Map or Strip Map of enough detail to clearly indicate the relationship of the street names and names of the pertinent features near the bridge site.

The assigned bridge/ERS/pump plant name, number, and year constructed shall be painted on all structures. Locations indicating where to paint the bridge number, name, and year constructed on a structure shall be shown on the General Plan in accordance with *Bridge Design Details*.

The bridge/ERS/pump plant name and number shall be requested and assigned in the preliminary design phase (Type Selection or 35% design level).

2.2 PLANS

The submittal of plans is required at various milestones through the project development process. The plans must conform to the preparation and submittal requirements that are outlined below. The electronic plans shall be submitted in PDF format and DGN format for State AAA projects at PS&E submittal. Structure plans must be one structure per PDF file.

2.2.1 PREPARATION OF STRUCTURE PLANS

The preparation of structure plans shall conform to the detailing and formatting standards contained in the *Plans Preparation Manual* and the *Bridge Design Details* manual. The plans shall be prepared using the most current standards--this includes the most current Caltrans formatted border sheets, Standard Detail Sheets (XS sheets), and Standard Plans.

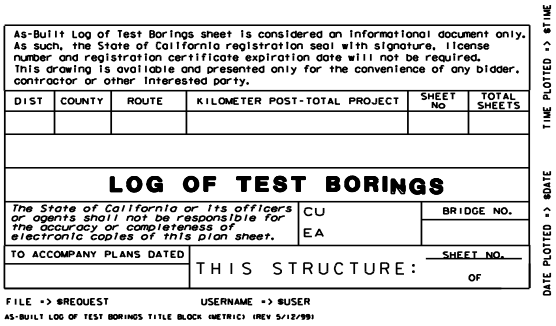
The Caltrans formatted border sheets that must be used for structure plans are those that contain “Prepared for the State of California” in the lower title blocks. Examples of the following formatted sheets can be found at Structure Borders.

- Advance Planning Study
- General Plan
- Foundation Plan
- General Detail
- Log of Test Borings
- Log of Test Borings Title Block (to be affixed to As-Built LOTB)

In addition to the requirements above, electronic plans shall conform to the *CADD User’s Manual* and the most current detailing guidelines, seed files, bridge detail cells, and cell libraries which are all available at: Structure Borders.

2.2.2 AS-BUILT LOG OF TEST BORINGS TITLE BLOCK

The title blocks below shall be attached to as-built log of test boring sheets that are included in the structure plans.



As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date will not be required. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST	COUNTY	ROUTE	KILOMETER POST-TOTAL PROJECT	SHEET NO	TOTAL SHEETS

LOG OF TEST BORINGS

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

CU
EA

BRIDGE NO.

TO ACCOMPANY PLANS DATED

THIS STRUCTURE:

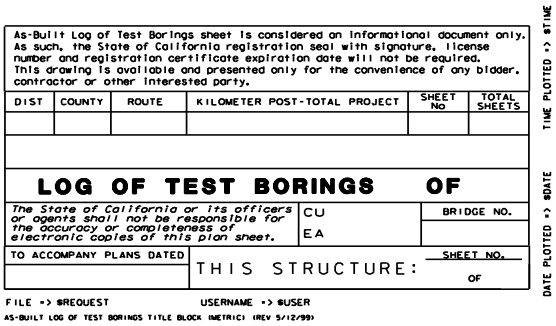
SHEET NO.
OF

FILE => $REQUEST USERNAME => $USER

AS-BUILT LOG OF TEST BORINGS TITLE BLOCK (METRIC) (REV 5/12/99)

TIME PLOTTED => $TIME

DATE PLOTTED => $DATE



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AS-BUILT LOG OF TEST BORINGS TITLE BLOCK (METRIC) (REV 5/12/99)

TIME PLOTTED => $TIME

DATE PLOTTED => $DATE

2.2.3 STRUCTURE PLANS ON NON-CALTRANS BORDERS.

For some locally advertised projects it may be acceptable to use non-Caltrans borders for the structure sheets. Typically, large projects that are mostly outside Caltrans right-of-way and maintained by others may use non-Caltrans borders for the structure sheets. The OSFP Liaison, design consultant, and local entities must agree to the use of non-Caltrans borders for the structure sheets in the PA&ED or early in the PS&E phase.
In lieu of using Caltrans Structure Plan Sheet Borders, provide Caltrans information block on the lower left corner of all bridge structure sheets.

Dist	**Co**	**Rte**	**PM**
xx	Xxx	Xxx	Ww – ww
EA: xx-xxxxxx			
PID: xx xxxx xxxx			
Bridge Name: xxxxx			
Br. No.: xx-xxxx			
Structure Sheet Name: xxxxxxxx			
Structure Sheet Number: xx **of** xx			
To be signed upon approval by Str oversight liaison		Date of approval	
Design Oversight		**Date**	

2.3 FOUNDATION REPORT

A Foundation Investigation is required for all structures (bridges, tunnels, retaining walls, sound walls, tie-back walls, overhead signs, maintenance stations, culverts, pumping plants/stations, toll plazas, etc.) when new, widening, retrofit, or modifications to existing structures are proposed. A Foundation Report is required to summarize the findings of the investigation and to provide foundation recommendations for the structure design and construction.

A separate Foundation Report for each structure shall be developed in accordance with Caltrans requirements including the two following publications and webtool:

- *Geotechnical Manual*
- *Soil and Rock Logging Manual, Classification, and Presentation Manual*
- Caltrans ARS Online

Foundation reports shall conform to generally accepted standards of professional practice and all applicable rules and regulations of the California Board of Registration for Professional Engineers and Land Surveyors and the California Board of Registration for Geologists and Geophysicists.

The (preliminary/final) Foundation Report, LOTB, responses to comments, design and check calculation, etc shall be separate parts of a submittal. These documents shall be separate PDF or doc files.

The Foundation Investigation shall be conducted under the supervision of, and the Foundation Report signed by, a Registered Civil Engineer or Certified Engineering Geologist who specializes in foundation engineering for bridge structures. The geotechnical professional of record shall include his/her State of California registration seal, license number, expiration date and signature on all submittals of Foundation Reports, addenda and/or amendments to the Foundation Report, and Log of Test Boring (LOTB) sheets.

Structure Preliminary Geotechnical Report (SPGR) and/or Preliminary Foundation Report (PFR) are used during the early stages of a structure project and shall be included as part of an Advance Planning Study (APS). PFR is used for Type Selection submittal. The SPGR and PFR are used to document existing foundation conditions, make preliminary foundation recommendations, and identify the need for additional investigations and studies.

Prior to conducting boring explorations in the field, consultants are encouraged to submit a boring plan for comment. This submittal is not mandatory but is recommended as an attempt to ensure the planned number, location, depths of borings, types of borings, soil tests, testing frequency, etc. appear enough. The review time for the boring plan will normally be less than four weeks.

The Final Foundation Report shall contain foundation recommendations that are complete, concise and definite. The recommended foundation systems shall be cost-effective, performance-proven, and constructible. However, alternative foundation types shall be briefly discussed and the reasons for those being excluded clearly stated. When construction problems for the recommended foundation types are anticipated, solutions to these problems shall be discussed.

It is imperative that the structure Project Engineer, geotechnical professional, engineering seismologist, corrosion engineer, hydrology and hydraulics engineer, and specification engineer maintain close communication during the development of the Foundation Report, Contract Plans, and Special Provisions. Foundation recommendations as shown in the Foundation Report, Contract Plans, and Special Provisions must be adequate, consistent, complete, and made with the Design Engineer's concurrence.

LOTB sheets shall be drafted and submitted alongside of the Foundation Report and included in the Contract Plans. As-Built LOTB sheets shall also be included as part of the Foundation Report and Contract Plans.

Draft foundation reports are required as part of the Unchecked Details (65%) submittal and through the subsequent PS&E submittals until review comments are resolved. Once resolved, the consultant shall submit a Final Foundation Report.

Construction contract change orders that revise, modify, or affect original foundation recommendations shall be submitted to Caltrans for review and approval prior to any action taken by the contractor. Additional foundation investigations and reports shall be prepared and submitted as necessary to support the change. The final version of the report shall be submitted once all the comments have been addressed satisfactorily.

Upon completion of construction, As-Built structure foundation documentation, including pile driving logs and construction notes, shall be submitted to Caltrans for record keeping.

2.4 HYDRAULICS REPORT

Thorough hydrologic investigations and hydraulics reports are required for structures in, over, or adjacent to streams and waterways which may affect the design or construction of the structure.

The investigations and preparation of reports shall be performed by a Registered Civil Engineer who is competent in hydrologic investigations and studies, and shall conform to the *AASHTO LRFD Bridge Design Specifications,* current *California Amendments, Highway Design Manual, Structure Technical Policies, Bridge Design Memo, Bridge Memo to Designers,* and other applicable Caltrans policies and procedures.

A separate Hydraulic Report shall be prepared for each structure and shall bear the State of California registration seal, license number, expiration date and signature of the Engineer responsible for its preparation. In addition, the report shall include the following basic information:

- District, County, Route, Post-Mile (PM) and Kilometer-Post (KP), and Expenditure Authorization (EA)
- State assigned Bridge Name, Bridge Number, and other pertinent information for the applicable structure
- A brief description of the hydrology, Hydrologic Summery Table
- Scour Summary and Data Table,
- Constraints or requirements which influence the selection of available alternatives, e.g. roadway geometric needs or drift way requirements
- Location of property at risk and a description of the potential damage
- Calculations to determine velocities, water surface elevations, backwater, and scour depth. HES-RAS computer model must be provided as well as contour mapping depicting cross section locations utilized for the computer model. An executable copy of the software used (with documentation) must be submitted if requested by the OSFP Liaison Engineer.

Generally, two types of hydraulics reports are required during the development of a structure project--a Preliminary Hydraulics Report (PHR) and a Final Hydraulics Report (FHR).

A PHR is required for the development of Advance Planning Studies (APS) at the Project Study Report (PSR) stage or at the Project Report (PR) stage. The PHR shall identify hydrologic factors and parameters that will affect the selection of the

structure. The PHR does not necessarily have to be based on a thorough hydrologic study, but the study must be detailed enough so the proper structure layout and type can be identified. The PHR must be submitted for review as part of the APS submittal.
A draft FHR and the HEC-RAS model are required for the Structure Type Selection process and the development of the structure General Plan.

As structure project documents are developed (Contract Plans, Special Provisions, Foundation Report, and Hydraulics Report), it is imperative that the structure Project Engineer, specification engineer, geotechnical professional, hydrology engineer, and hydraulics engineer maintain close communication so that these documents address all pertinent factors completely, consistently, and with the Project Engineer's concurrence.

The Project Engineer shall have the responsibility for obtaining relevant hydrologic information required for the Hydrologic Summary Table and the Scour Data Table to be placed on the Foundation Plan sheet of the contract plans.

2.5 FIELD ASSESSMENTS

Properly conducted Field Assessments are a technique that has proven successful in establishing the project scope while reducing potential design issues, construction issues and cost escalation. For this reason, sponsoring agencies and consultants should use Field Assessments to help ensure successful projects.

Field Assessments should occur at several critical stages of project development and should be attended by representatives of the key engineering disciplines involved in the project whose input may be critical in decisions made. This includes representatives from the sponsoring agency consultants, the District, and the OSFP Liaison Engineer. It is incumbent on the representatives to collectively use their knowledge and experience to ensure the project is properly scoped, to look for potential problems, to determine potential courses of action, and to review proposed solutions.

Following are the different project stages where Field Assessments are recommended. The Liaison Engineer is available to assist with the planning and to participate in these Assessments.

2.5.1 PROJECT INITIATION OR PROJECT APPROVAL AND ENVIRONMENTAL DOCUMENT PHASE

Early in the Project Initiation (PID) or Project Approval/Environmental Document (PA/ED) phase, Field Assessments allow for the identification of the project constraints and development of a variety of potential solutions. Constructability, utilities, traffic and other constraints should be examined and documented for use in developing suitable alternatives for structure Advance Planning Studies (APS).

2.5.2 PRELIMINARY DESIGN PHASE (TYPE SELECTION)

The project site should be assessed for changes that have occurred since the development of the previous planning study. This is especially important when considerable time has passed since the approval of the APS, PSR, or PR.

2.5.3 PS&E PHASE

This Field Assessment allows for a comprehensive review of the final plans and specifications against the latest field conditions. It is especially important that Highway and Structure Construction staff attend this assessment, so their input can be incorporated prior to the completion of the contract documents.

2.6 MISCELLANEOUS STRUCTURES

In addition to bridge structures, OSFP has oversight responsibilities for miscellaneous transportation-related structures within the State right-of-way that are designed by others. These miscellaneous structures include, but are not limited to, the following structure types:

- Earth Retaining Systems (Retaining Walls)
- Soundwalls
- Bridge mounted signs
- Barrier Mounted Signs on Structures
- Overhead Sign Structures
- Culverts and Drainage Structures
- Pumping Plants
- Vehicular, pedestrian, rail, and other tunnel types
- Buildings (toll plazas, maintenance stations, etc.)

2.6.1 OVERSIGHT RESPONSIBILITY

Design responsibilities for miscellaneous structures are delineated in the *Highway Design Manual.* For some miscellaneous structures, the design responsibility is assigned to the District and for others to DES. When the responsibility for a miscellaneous structure is assigned to DES, OSFP has the corresponding oversight responsibility.

For certain miscellaneous structures (e.g. retaining walls, soundwalls, culverts) where Caltrans Standard Plans are available and appropriate for use at the planned site, the District will normally have the oversight responsibility.

For miscellaneous structures where the Standard Plans are not available or are available but not totally applicable are considered "**special designs**" and OSFP will have the oversight responsibility.

Districts, Sponsoring Agencies, and consultants are encouraged to coordinate with OSFP early in the project to identify special designs, to determine where the oversight responsibility will reside, and to avoid any duplication of project development and review effort.

2.6.2 PS&E DEVELOPMENT AND SUBMITTALS

Miscellaneous structures shall be designed in accordance to the *Highway Design Manual*, *AASHTO LRFD Bridge Design Specifications with California Amendments*, *Structure Technical Polices, Bridge Design Manual, Bridge Memo to Designers*, and other applicable Caltrans policies and procedures.

Refer to Structure Technical Polices 1.4 and Memo to Designer 1-29 for the Type Selection review meeting required of the miscellaneous structures.

Project development procedural requirements are generally the same as for bridge structures and shall meet the requirements in this Guide. Variation from these requirements (such as submittal requirements, review duration, etc.) are on a case-by-case basis and will be determined by the OSFP Liaison Engineer.

Pumping plants, tunnels, movable bridges, and mass transit or other types of building facilities are always considered on a case by case basis because these types of miscellaneous structures will require project specific design criteria, submittal requirements, and review timeframes.

The consultant or Sponsoring Agency should contact the Liaison Engineer, District Project Manager, and District Design Oversight Engineer in the early stages of the project to discuss miscellaneous structures so that the necessary requirements can be determined and considered in the project schedule.

2.7 COMPLEX BRIDGES

OSFP has oversight responsibilities for Complex Bridges within the State right-of-way that are designed by others. For Complex Bridge definition, see STP 1.3 titled Complex Bridges.

Typical bridge project delivery policies, procedures and requirements do not explicitly address added risk and technical challenges associated with Complex Bridges. Recent projects, both statewide and nationwide, have demonstrated the need for special technical and quality control and assurance policies to mitigate the risks and to ensure bridge and public safety. To ensure that Complex Bridges receive broad-based input and an appropriate level of quality assurance during delivery of the project, they are required to have the following:

- Project Specific Design Criteria
- Peer Review Panel
- Independent Check Free of Conflict of Interest

2.7.1 PROJECT SPECIFIC DESIGN CRITERIA

Projects involving Complex Bridges will require a Project Specific Design Criteria (PSDC). The Draft PSDC shall be included for review as part of the Type Selection Package. Approval of the final PSDC, by OSFP and the Peer Review Panel is required before 100% PS&E.

2.7.2 PEER REVIEW PANEL

The sponsoring agency will be required to retain a Peer Review Panel (PRP) comprising of 3 – 6 members (determined by the bridge complexity) for all Complex Bridge Projects. The PRP shall:

- Not be part of the design or independent check teams.
- At a minimum, be comprised of members that are experts with relevant and extensive design, construction and operations experience of the subject bridge type and be approved by OSFP.
  - ❖ The panel member/members representing construction of the subject bridge type shall be an expert with relevant and extensive construction experiences in fields of specifications, contract administration, and means and methods for the subject bridge type.
- Review the PSDC, Type Selection Package and PS&E.
- Provide assistance to the design team addressing complex technical issues and provide advice on analytical methodology.

- Provide their comments and recommendations on the Type Selection Report and the Initial PS&E.
- Develop a draft and final report noting the PRP comments and recommendations for review by OSFP and the sponsoring agency.
  - ❖ Draft Report at 95% PS&E
  - ❖ Final Report at 100% PS&E

2.7.3 INDEPENDENT CHECK

Due to the complexity of the structure, it is imperative that the independent check be free from any conflict of interest or appearance of conflict of interest. Therefore, the independent check shall:

- Be performed by engineers not familiar with the project and working out of a different office from that of the design team.
  - ❖ If this is not possible, a separate consulting firm shall perform the independent check.
  - ❖ The OSFP Liaison Engineer may require the independent check to be performed by another staff if a conflict of interest or lack of independence is identified.
- Be performed by engineers familiar with the selected structure type.
- Utilize different software than that used by the design team for the superstructure and substructure design.

2.7.4 ADDITIONAL REQUIREMENTS

This Guide (California Department of Transportation's Office of Special Funded Projects Information and Procedures Guide) is to be followed including items noted above and the following:

- Designer and Independent Checker experience with similar type structures should be provided in the Type Selection Report subject to Caltrans approval.
- Electronic copies of the design calculations, independent check calculations, design and check computer files, contract plans and special provisions shall be provided to the OSFP Liaison Engineer.
- Review times noted in this manual will be increased for Complex Bridge Projects.

The Sponsoring Agency and/or Consultant shall contact the OSFP Liaison Engineer in the early stages of the project to discuss the Complex Bridge

Structure so that the necessary project delivery arrangements and requirements can be determined and considered in the project schedule.

2-8 LIGHTWEIGHT CONCRETE

Use of lightweight concrete (LWC) in lieu of normal weight concrete shall be justified and defined in a Project Specific Design Criteria (PSDC). Utilization of LWC in bridge superstructures provides a reduction in dead load and the potential to reduce seismic demands. In General, Caltrans seismic design philosophy promotes plastic hinging in columns with normal weight concrete for Ordinary Standard bridges. High seismicity sites and/or large axial load in columns pose challenges in the seismic design of bridges creating Ordinary Non-Standard bridge conditions. In such cases, Caltrans prioritizes response modification systems, such as base isolation, as the preferred choice of seismic design solution before the consideration of LWC. Bridges designed within state right of way proposing to utilize LWC in the superstructure must be approved by the Liaison Engineer and meet the following requirements:

Type Selection:

The Type Selection Report must include the design team's intention to utilize LWC as well as justification for using LWC, to be approved by the OSFP Liaison Engineer. Justification shall include the rationale for using LWC as well as calculations comparing LWC to other viable alternatives using normal weight concrete. The Type Selection Report needs to include a PSDC, which at a minimum should include the following items:

- Concrete weight (dry unit weight and design weight)
- Aggregate (source, size, saturation amount and breakdown)
- Cement content
- Amount of polymer fibers and shrinkage reducing admixture
- Coefficient of thermal expansion
- Creep and shrinkage components (such as relative humidity, ambient temperature, age of concrete at loading…)
- Locations where LWC is to be utilized (including limits near the bent cap as shown in Figure 1 below)
- Modulus of elasticity (MOE) assumptions
- Modulus of rupture assumptions
- Reinforcement development length
- Proposed lightweight concrete special provisions
- A cost comparison between the normal weight concrete, LWC and base isolation alternatives (if appropriate).

Seismic Design:
LWC shall not be used in Seismic Critical Members (SCM) and joints subjected to joint shear design requirements. Furthermore, since the seismic response of bridges with lightweight concrete SCMs and bent caps subjected to joint shear has not been thoroughly investigated, LWC shall not be placed within bent caps subjected to joint shear unless an alternative proposed solution is accepted. Figure 1 below shows limits of the different concrete types.

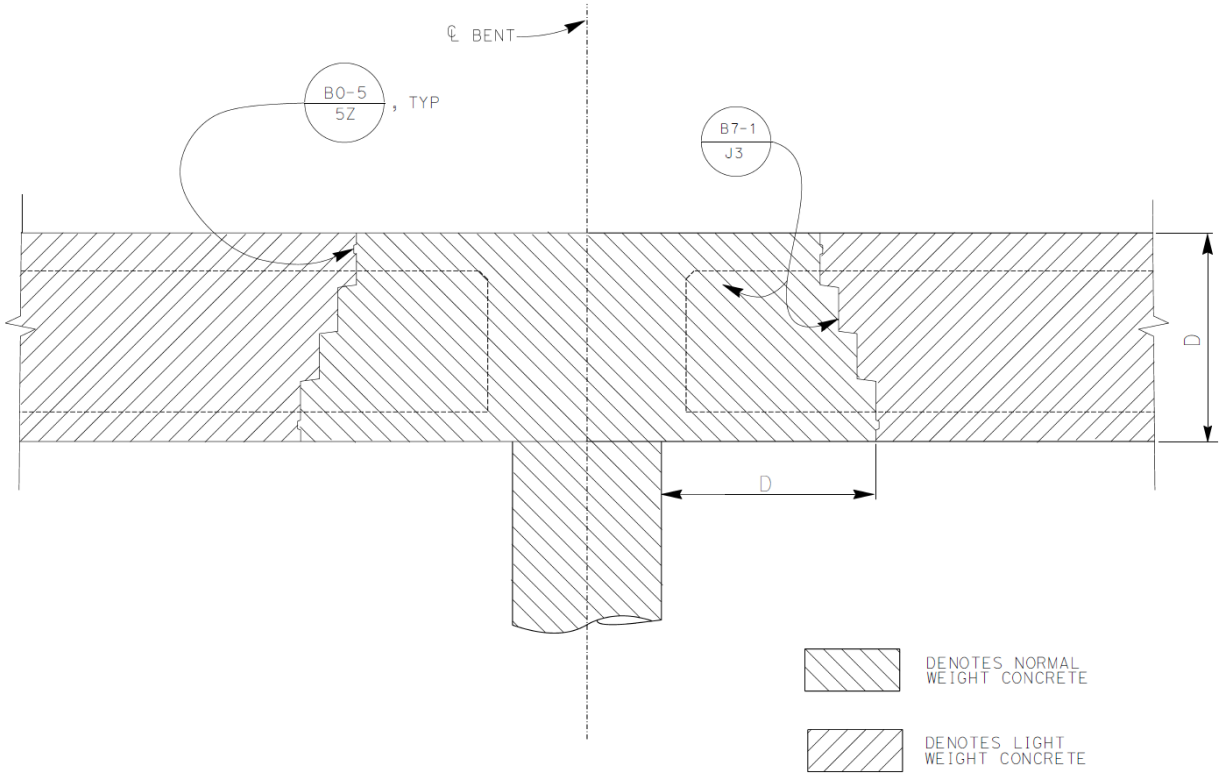

Figure 1

Durability:
Due to reduced durability, LWC shall not be used in a freeze thaw or a corrosive environment.

For bridges carrying vehicular traffic, a one-inch-thick polyester concrete overlay shall be placed in areas receiving vehicular traffic.

Constructability:
Constructability shall be addressed in the Type Selection Report. This shall include bridge schematic limits of concrete strengths and concrete types. Provide practical means & method of construction when normal weight concrete and LWC are both utilized in the same or adjacent structural elements along with proposed timing of concrete placement.

Project Special Provisions:
Past construction projects utilizing LWC have experienced challenges in meeting specified design parameters during construction. Therefore, project special provisions must be submitted in the Type Selection Report to address the following:

- Mix Prequalification
  - Shall be comprised of submitting certified test data or trial batch test reports that includes unit weight, air entrainment, temperature, impurities, slump, as well as Modulus of Elasticity (MOE) and Creep tests as noted under Section 90-1.01D(5)(b).
  - Soundness of aggregate: AASHTO T104. Light weight aggregates must have no more than 10% loss when tested for soundness under California Test 214.
  - Coarse Aggregate: The loss in Los Angeles rattler after 500 revolutions shall not exceed 55% per California Test 211.
  - Demonstrate that the LWC mix can be pumped to the maximum height and distance required for construction of the bridge.
- Frequency of Concrete Testing and Verification
  - Aggregate QC Tests
    - Moisture content of fine aggregate: ASTM C566 or electronically actuated moisture meter, a minimum of 1-2 times per each day of pour, depending on conditions.
  - Concrete QC Tests
    - Slump: ASTM C143/C143M, a minimum of once per 100 cubic yards or each day of pour, whichever is more frequent.
    - Density: ASTM C138, a minimum of every time slump is taken.
- Field Tests: Any deviation from the Standard Specifications should be noted.
- Lightweight concrete flexural testing based on California Test 523
- Lightweight aggregate shall be saturated at the manufacturing plant and saturation shall be maintained during shipping, trucking and storage until added to the approved concrete mix.
- Pre-wet or pre-saturated aggregates absorption is equal to or greater than the immersed 24-hour value under ASTM C127.
- Address required Development Length of Reinforcement.

2.9 OTHER COMPLEX STRUCTURES: TUNNELS, ….

Pending development

2.10 DESIGN BUILD (DB)

Pending development

2.11 CONSTRUCTION MANAGER/GENERAL CONTRACTOR (CMGC)

Pending development

2.12 SHARED FILE SUBMITTALS AND REVIEW

Pending development