IDAHO TRANSPORTATION DEPARTMENT

BRIDGE DESIGN LRFD MANUAL

DECEMBER 2024



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CHAPTER 0

POLICY & PROCEDURES

GENERAL INFORMATION

The Idaho Transportation Department LRFD Bridge Design Manual (BDM) has been prepared to provide bridge design engineers with a guide to the design criteria, analysis methods, and detailing procedures for the preparation of highway bridge structure construction plans, specifications, and estimates.

The BDM is intended to supplement and provide interpretation of the AASHTO LRFD Bridge Design Specifications. Chapters 1-14 and the referenced articles in those chapters correspond the AASHTO LRFD Bridge Design Specifications.

The LRFD Bridge Design Manual provides guidelines and standard details that are workable, serviceable, and reasonably economical. In addition, these guidelines and details have been approved by FHWA for general use. Bridge drawings are not to be considered standard drawings, but should be used as a starting point and modified to meet conditions for each bridge design. Any departure or deviation from these guidelines and standard details in this manual will require prior approval, and may result in delay caused by obtaining approval.

It will continue to be the responsibility of the designers to exercise their best engineering judgment when designing and ensure the guidelines and details provided in the LRFD Bridge Design Manual are applied properly.

All new bridges that carry traffic on Interstate Highways and Ramps or US and State Highways shall be designed using the AASHTO LRFD Specifications and the guidelines in this manual unless otherwise approved by the Bridge Engineer.

All rehabilitation, widening and modification to existing structures may use the AASHTO Standard Specification of Highway Bridges-17th Edition or the AASHTO LRFD specification if it is economically feasible.

Commentary
Superstructure, substructure, and foundation bridge elements shall be designed by LRFD.

The term “new Bridges” shall be interpreted to include both new and total replacement bridges.

This Policy applies to all States-initiated federal-Aid funded projects, not just those funded with Highway Bridge Program funds, including on system and off-system projects.

Revisions:

April 2008	Added Commentary.
Dec 2024	Added statement that bridge standard details need to be revised for each project and are not standard drawings. Revised commentary to delete reference to converting to LRFD Design.

CONSTRUCTION DRAWINGS

Submittal
Working drawings shall be submitted by the contractor in accordance with subsection 105.02 of the Standard Specifications for Highway Construction.

Submittal Review
Review of shop drawings, falsework drawings, and erection drawings is a normal duty of the Engineer of Record and must be thorough, accurate, and complete. The review should verify that the submittal is in accordance with the design plans, specifications, ITD QA Manual, AASHTO Guide Specifications for Bridge Temporary Works, and governing design/construction codes.

If information is incomplete, the engineer shall request that the additional data be submitted in writing and shall not approve the shop drawings until the information has been received and reviewed. No verbal approval shall be given to a contractor, supplier, or fabricator. All approvals, verbal and written, shall be given to the Resident Engineer.

Approval of materials is generally the responsibility of the Materials Engineer. The Bridge Section will provide advice/recommendations on materials when requested.

Construction drawings will be reviewed promptly upon receipt of complete information and at a speed consistent with thoroughness and accuracy in accordance with ITD Standard Specifications 105.02.

The shop drawing approval stamp should be on every sheet on the drawings and the cover sheet of the design calculations for submittals reviewed only by the Bridge Section, such as prestressed girder shop drawings, railing, expansion joints, etc.

Professional Engineer's Stamp
For products designed by the fabricator, i.e. precast culverts, MSE walls, etc., all shop drawing sheets should be stamped by an engineer licensed in Idaho in addition to the cover sheet for the design calculations.

When the shop drawings are for a product that has been designed by the Engineer of Record, i.e. steel girders, the shop drawings do not need to be stamped.

Archives
PDF files of the approved shop drawings for all elements that become a permanent part of the structure shall be submitted by the Contractor and shall be retained with the contract plans for the structure.

Review Procedure for Shop Drawing Submittals Reviewed by Multiple Sections

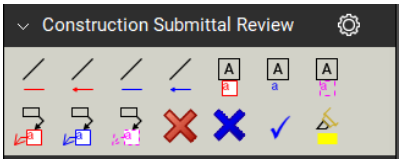
When ITD receives construction submittals for contractor-designed retaining walls, temporary shoring, sign structures with foundations, drilled shafts, etc., they require multi-discipline reviews by HQ Bridge, HQ Materials Geotechnical Engineer, and the District.

For submittals reviewed by multiple sections:

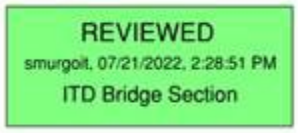
- The District project manager (PM) or CEI consultant will create a Bluebeam session and invite the appropriate reviewers.
- The first sheet of the submittal will have a review comment legend.



- All reviewers will use the Construction Submittal Review Tool Chest to make comments being mindful of the color used. The District will make the final decision if the Contractor needs to re-submit the document, or approve with corrections noted. However, reviewers can recommend a resubmittal to the District PM after they have completed their review.



- When a reviewer has completed their review, they will apply a "Reviewed" stamp containing their name, date, and time to the front sheet of the submittal.



- The corrected, final document will be saved on ProjectWise with a stamp that says "Document Accepted by, <name & date of the PM>"
- Submit record drawings in accordance with Section 677 of the Standard Specifications. Original final design calculations do not need to be updated and resubmitted to reflect a change in design conditions. All construction changes should be recorded with correspondence to the District Engineer that documents approval for the change that may include memos, supplemental calculations, or details.

Revisions:

April 2008	Added information on Submittal & Archives.
Aug 2016	Added electronic pdf files for as-built submittal. Changed Article number from 0.1 to 0.01.
Sep 2020	Deleted reference to 22"x34" 3 mil mylars for Archive shop drawings.
May 2021	Added clarification for stamping shop drawings/design calculations.
Oct 2023	Added Review Procedure for shop drawings reviewed by multiple sections.
Dec 2024	Changed "Checking" to "Review" and revised criteria. Added construction drawings shall be reviewed in accordance with 105.02. Added fabricator designed products shop drawings stamped by an Idaho PE. Added record drawings submitted in accordance with Section 677 and original design calculation do not need to be updated for construction changes.

CONSULTANT PROJECT REVIEW PROCEDURE

State Bridge Projects

Consultants are used on state bridge projects when the workload exceeds the capacity of the Bridge Section or when special expertise is required.

A Bridge Section Engineer will be assigned when a new bridge design project is provided to the consultant. The reviewing engineer should have experience in the design of structures similar to the one to be reviewed. The Review Engineer will then become the contact for technical questions raised by the consultant throughout the design phase. This communication allows early identification of critical design areas and reduces the chances of major revisions.

The Review Engineer will not generally perform an exhaustive check on the design. All details, plans, and related work will be reviewed to ensure conformance with the criteria that follows.

The consultant shall apply his own seal and signature to the plans, and thereby assumes full responsibility for their correctness and general conformance with good engineering practice.

The following indicates the degree and type of checking to be performed by the Bridge Section:

Structure Concept Study Review

All concept studies will be thoroughly reviewed to ensure adequate evaluation of:

- Structure types that are compatible to the site conditions
- Preliminary cost estimates
- Advantages/disadvantages of each structure type
- Economy, feasibility, and constructibility
- Structure types recommended for additional study or final design

A review of the bridge layouts will be made to ensure that span lengths, clearances, and all site conditions are adequately addressed.

Final Situation and Layout

Plans should be thoroughly checked by using the checklist located in Chapter 17 of the Bridge Design Manual (*BDM)*. Conformance of grades, alignments, and other data between roadway and bridge plans should be checked.

The hydraulic and foundation criteria shown on the plans shall conform to the approved ITD-211 Bridge Structures Hydraulic Survey and approved Geotechnical Engineering Report.

Final Design Review

Plans should be reviewed for completeness, constructibility, compliance with current ITD standards, and good engineering practices.

A review of major structural elements should be performed. However, no stress analysis is generally required unless the detail appears questionable.

Pay items and Special Provisions should be reviewed for conformance with the Standard Specifications. Quantity calculations and rebar schedules are generally not checked in detail.

Design calculations shall be on 8.5"x11" paper with a proper heading and with an index. The signature, date and Idaho seal of a registered engineer of the consulting firm shall be on a title sheet.

Final Plan Review

Plans will be checked for all changes required by the Final Design Review.
The signature, date and Idaho seal of a registered engineer of the consulting firm shall be on each drawing.
Any new or significantly modified Special Provisions shall be added to the X:drive SPB folder.

LPA Projects with Federal-Aid Funds

Counties and cities also frequently use Consultants to design bridges for LPA projects with Federal Aid funds under LHTAC project management.

Under the LHTAC Stewardship Agreement 2020, LHTAC will review/approve TS&L, S&L, and PS&E documents. ITD will provide review comments when requested.

LHTAC shall follow all procedures listed in the Bridge Design Manual.

Occasionally from time to time, there may be a need on a specific LPA project to deviate from procedures in the Bridge Design Manual. When these situations arise, LHTAC shall document the specific reasons for the deviation including the proposed changes. This information shall be shared with ITD for review and approval. This information shall be retained in the project's file records.

In accordance with the LHTAC Stewardship Agreement 2020, ITD has authority to review LPA projects with Federal-aid funds and may audit these projects at its discretion to ensure adherence to Bridge Design Manual procedures.

Revisions:

Oct 2016	Changed Article number from 0.2 to 0.02.
Nov 2019	Deleted "placed in a binder" from the design calculation requirements in Final Design Review.
Sep 2020	Changed name of "Phase 4 Foundation Report" to "Geotechnical Engineering Report" to agree with the Materials Manual. Added LHTAC Stewardship procedures.
July 2021	Revised ITD-210 to ITD-211 to conform to the ITD Bridge Hydraulics Manual.

CONSULTANT SUBMITTAL PROCEDURE

Local Sponsor Projects
Sponsors shall make all submittals to the Local Highway Technical Assistance Council (LHTAC) for review and approval. LHTAC will make distribution to the necessary ITD Sections for review if needed. Submittals should be posted into ProjectWise in the Bridge/Review folder for the project.

State Consultant Projects
Consultants shall make all submittals to the District Project Manager, and the District will make distribution to the necessary ITD Sections for review. Submittals should be posted into ProjectWise in the Bridge/Review folder for the project. Returned transmittals by the Bridge Section will be sent to the District project manager and posted on ProjectWise.

Submittal Criteria
The following data is required for the various submittals:

Project Concept Report
A Concept Report or Project Charter for the project shall be prepared according to the criteria in the Roadway Design Manual. A bridge concept study shall be developed as required for the Alternate Solutions & Cost. A copy of the approved Concept Report shall be submitted with the TS&L Report. On small projects, the Concept Report and TS&L Report may be combined into one document.

Type, Size & Location Report
Show as much of the following data as possible on the layout drawing.
Refer to Article 0.07 for TS&L Report criteria.
Consultants are encouraged to contact the Bridge Section/LHTAC during development of the structure concept.

New/Replacement Bridges and Culverts
A submittal of data is to be made showing the concepts of the structures. Drilling for the foundation investigation for multi-span structures should be delayed until the concept is approved. The data should include:

- Bridge layout showing plan and elevation views
- Bridge cross-section
- Roadway cross-section
- Stream cross-section,
- Vicinity map
- Preliminary profile grade
- Draft Geotechnical Engineering Report (if available)
- Draft ITD-211 Bridge Structures Hydraulic Survey (if available)
- Other data pertinent to type or location selection
- Cost Estimate. Add a 30% contingency amount.

Roadway Walls
Consult the Group leader if a TS&L Report is required for each project. The report should include:

- Brief project description
- Vicinity map
- Data pertinent to the type and location selection
- Recommended wall type for the project with support from the Geotechnical Engineering Report
- Cost Estimate. Add 30% contingency amount.

Final Situation and Layout Review

New/Replacement Bridges and Culverts
The plans shall consist of the following:

- Situation and layout. Refer to Articles 17.2 and A17.1 in Chapter 17 of the BDM.
- Foundation investigation sheet
- Sketches or views of unusual structural details
- Abutment/pier details to clarify the concept
- Stage construction details

The plans shall also be accompanied by:

- Approved Geotechnical Engineering Report
- Approved ITD-211 Bridge Structures Hydraulic Survey.
- District approved roadway profile and alignment data
- Topographic map with contours
- Cost Estimate. Add a 20% contingency amount.

Roadway Walls
The plans shall consist of the following:

- Situation and layout. Refer to Articles 17.2 and A17.1 in Chapter 17 of the BDM.
- Foundation investigation sheet
- Wall typical Section
- Stage construction details

The Bridge Section shall approve the Situation and Layout plans for State consultant projects before proceeding with final design.

LHTAC shall approve the Situation and Layout plans for LPA consultant projects with Federal-Aid funds before proceeding with final design.

Intermediate Design Reviews
If needed, these reviews can be handled informally between the Local Public Agency/State Consultant and the Bridge Section/LHTAC.

- Cost Estimate. Add a 5% contingency amount.

Final Design Review
The submittal shall include the following:

- Drawings in reproducible form
- Special Provisions
- Cost Estimate. No contingency amount.
- Quantity Calculations
- Construction Schedule
- Design Calculations
- Check Calculations
- Consultant QA/QC Check Lists
- Initial Load rating with aa staged construction and final conditions

Plans, Specifications, Estimates
After the consultant has made the necessary corrections from the Final Design Review, the final drawings and the revised final design data shall be submitted. The Bridge Section will publish a PS&E letter of acceptance. In the transmittal letter the Bridge Section will include a list of anticipated construction submittal reviews and items that will require fabrication inspection for the project. On Local Sponsor Projects, LHTAC will arrange for a supplemental engineering agreement to cover this additional work.

SS4 format will only be allowed for projects started before June 2020. All new projects shall be detailed using ORD format.

Stamped and signed sheets shall be wet stamped and signed or digitally signed using third party software. Adobe or Blue Beam does not meet the requirements of third party software.

Plans (SS4 format)

The final drawings shall include the following:

- 22"x34" 3 mil (minimum) mylars stamped by the Engineer
- Electronic drawings in .pdf format with electronic stamp
- Electronic CADDS files in .dgn format

Plans (ORD format)

The final drawings shall include the following:

- 11"x17" prints on 28 lb (minimum) paper and stamped & signed by the Engineer of Record
- Electronic drawings in .pdf format of the signed and stamped plans
- Electronic CADDS files in .dgn format

Design Calculations

- A title page shall have the bridge name, project number, project key number, and drawing number and shall be stamped by an Engineer licensed in Idaho.
- The calculations shall be indexed, and pages numbered.
- The calculations shall be submitted in .pdf format.

Load Rating

Local Sponsor Projects

There is no load rating performed as part of the PS&E submittal. The load rating shall be completed within 45 days of the bridge being opened to traffic. The consultant doing the load rating shall be selected from ITD's Load Rating Term Agreement list. This consultant may or may not be the firm that designed the bridge. The load rating shall include the items listed below.

State Consultant Projects

Initial Load rating for all structure types except contractor designed structures shall be performed as part of the Final Design submittal and shall be done in accordance with Article 0.04 and revised for any changes or comments for the PS&E submittal. Final load rating shall be completed prior to the bridge being opened to traffic. Load rating for contractor designed structures shall be done after approval of the shop drawings as part of the Supplemental Agreement for construction support and prior to the bridge being opened to traffic.

To maximize the efficiency of its operations, the Department has selected the AASHTOWare Bridge Design and Rating software (BrDR formerly known as VIRTIS) for load rating. BrR or BrDR software shall be used to do the rating for the structure types listed below. For structure types not listed below, curved girders, or structures with complex geometry, alternate rating software may be used, but needs to be approved in advance by the ITD Asset Management Office.

The Load Rating will be completed using Load and Resistance Factor Rating (LRFR) method. The Load Rating will be run using the Load Factor Rating (LFR) method and results will be reported on the LFR Summary Form. The LFR results are for information only and are not required to be signed and sealed. Coding instructions for the BrDR software are in Chapter 6 of the Idaho Manual for Bridge Evaluation. (http://itd.idaho.gov/Bridge/IMBEFirstEdition.pdf)

Structure types that shall be rated in BrR or BrDR:

- Prestressed girders
- Steel rolled girders, plate girders, or built-up sections
- Reinforced concrete girders
- Timber stringers
- Trusses
- Cast-in-place or precast box culverts and stiffleg culverts
- CMP or metal arch pipes with cover greater than span/8 as defined in the MBE

Load rating submittal shall include:

- AASHTOWare BridgeRating software file (XML electronic file only)
- Load Rating Summary Form (LRFR) Signed and Sealed by the Load Rating Engineer (PDF electronic file only)
- Load Rating Summary Form (LFR) (PDF electronic file)
- Excel Load Rating Summary Form (LRFR and LFR) (MS Excel electronic file only)
- Load Rating Supporting Calculations (native file format and PDF electronic file only)

Load Rating on Rehabilitation Projects

When consultants are involved with bridge rehabilitation projects the load rating shall be reviewed and updated by ITD as required by the MBE.

Revisions:

April 2008	Added TS&L Report requirements in Structure Concept Review. Added requirement for Virtis load rating.
July 2009	Added Check Calculations & QA/QC check lists submittal at Final Design.
July 2010	Revised plans, specifications, & estimate submittal section to include updated load rating information.
March 2011	Added Concept Report for project. Renamed "Structure Concept Report" to "TS&L Report".
Feb 2012	Added Design Calculations format requirements Changed reference to Bridge Asset Management Changed reference to District PDE for returning comments on State projects. Changed reference to LHTAC for returning comments on LPA projects.
August 2012	Clarified Load Rating for New Bridges Added Guidance for Load Rating of Bridge Rehabilitation Projects
Sept 2012	Changed "should" to "shall" for the Situation Layout and Final Design Review attachments.
October 2013	Deleted the requirement for Load Rating on Local Sponsor Projects at the PS&E submittal stage. Added requirement for load rating after construction is completed be done by a consultant on the ITD Load Rating Term Agreement list within 180 days of the bridge being opened to traffic. Clarified that the initial load rating on State sponsored projects shall be done at the PS&E submittal stage and final load rating be completed within 90 days of the bridge being opened to traffic. Rehab load rating shall be done by ITD staff.
May 2014	Revised notation of VIRTIS to BrR. Added reference to BrR coding instructions in Chapter 6 of the Idaho Manual for Bridge Evaluation.
March 2015	Final load rating for Local Sponsor projects completion date changed to 45 days after bridge opened to traffic to allow QA/QC process to be completed prior to the 180 day mandated limit. Final load rating for State Sponsor projects completion date changed to 45 days after bridge opened to traffic to allow QA/QC process to be completed prior to the 90 day mandated limit.
Oct 2016	Changed Article number from 0.3 to 0.03.

Oct 2017	Added a requirement of submitting a cost estimate with a contingency amount for each review stage. The intent of this requirement is to keep a closer track of the project cost during the design phase and allow changes in programming costs to occur at an early stage. Clarified when the load rating shall be done for precast culverts.
Feb 2018	Added reference to Articles 17.2 & A17.1 in the Final Situation Layout Review Added Stage construction details in the Final Situation Layout Review. Added abutment/pier details to clarify the concept in the Final Situation Layout Review
Nov 2019	Changed submittal of drawings for the Final Design Review from "reproducible form" to ".pdf format". Added "minimum" for thickness of 3 mil mylars for PS&E submittal. Changed PS&E plan submittal from "11x17 prints" to ".pdf format". Added PS&E Design Calculation submitted in .pdf format. Changed final precast culvert load rating from being completed within 45 days of the bridge opening to traffic to being completed prior to the bridge opening to traffic. Added precast culvert load rating done as part of construction support Supplemental Agreement.
Sep 2020	Added PS&E Plans submittal requirements for SS4 & ORD format. Changed name of "Phase 4 Foundation Report" to "Geotechnical Engineering Report" to agree with the Materials Manual. Changed reference to AASHTOWare Bridge Rating software (BrR) to Bridge Design and Rating software BrDR).
July 2021	Revised ITD-210 to ITD-211 to conform to the ITD Bridge Hydraulics Manual.
Sept 2021	Revised Load Rating procedures and submittal requirements.
Apr 2022	Deleted requirement for stamped calculations at Final design review.
Dec 2024	Added Project Charter to Project Charter Report. Corrected "geological" to "geotechnical". Added criteria for roadway walls for TS&L and S&L. Added load rating to Final Design Review submittal list. Deleted man-hour estimate for checking shop drawings and added list of reviews and items requiring plant inspection. Added criteria for SS4 or ORD format. Added criteria for stamping sheets. Added CMP or arch pipes to BrR rated structure types.

IN-HOUSE DESIGN & CHECKING PROCEDURES

The primary aim in both designing and checking is to produce a structure that will safely carry the anticipated loads.

The design team, consisting of the designers, checkers, senior independent reviewers, and structural detailers, is responsible for developing a set of practical, clear, and concise design notes, plans, and specifications by the assigned due date with the allotted manpower.

The *BDM* provides standard details that are workable, serviceable, and reasonably economical. In addition, these details have been approved by FHWA for general use.

Design Calculations
The design calculations shall be prepared on 8½"x11" sheets. The cover sheet for the final design notes of record shall be stamped by the designer & checker, and shall be indexed with numbered pages. The design calculations of record shall be archived and returned to the designer/checker. A sample form for stamping the design calculations is shown on page A0.1. An electronic copy is available on the X:drive in the Bridge Design Aids folder.

Cost Estimate
To keep a closer track of the project cost during the design phase, a cost estimate with a contingency amount should be prepared at each milestone review. The intent of this requirement is to identify project cost increases at an early stage and allow for changes in the programming cost.
The following contingency amount is recommended;

TS&L	30%
S&L	20%
Final	10%
PS&E	0%

Designer
The designer's primary responsibilities include:

- Design concept and layout
- Structural design
- Preparing complete and legible calculations
- Producing a complete set of plans and specifications
- Stamping contract plan sheets (if licensed as a professional engineer)
- Reviewing shop drawings
- Resolving construction problems
- Load rating new/replacement bridges and bridge rehabilitation projects in accordance with the latest version of the AASHTO *Manual for Bridge Evaluation* and the *ITD Manual for Bridge Evaluation*. See below for ITD load rating procedures.

The designer should advise and get concurrence from the Group Leader whenever deviating from approved office standards and practices.

The designer should inform the Group Leader of any areas of the design that should receive special attention during checking and review.

The designer's responsibilities also include the following project planning activities:

- Obtain roadway horizontal alignment, profile grade, and typical section
- Assist the PM with developing the design schedule for PSS
- Identifying tasks and planning order of work
- Preparing design criteria for inclusion in the front of the design calculations
- Determining the number and titles of plan sheets
- Coordinating plan sheet detailing
- Computation of quantities and preparing the Bridge Summary Sheet for the Roadway plans.
- Preparing the Cost Estimate, Construction Schedule CPM Chart, and Special Provisions

Any new or significantly modified Special Provisions shall be added to the X:drive SP BRIDGE folder.

Design Calculations

The following format shall be used in resolving the design checker's calculations comments:

√ Agree, will make update

X Disagree, provide green comment with explanation

The designer and design checker shall meet and resolve comments.

Plans

The designer shall provide the detailer with a new set of red-line plans showing the resolved changes to be made.

Design Checker

The primary purpose of a design check is to ensure that the designer has not, through an error in mathematics, misunderstanding of the specifications, or other cause, produced an unsafe design.

The design checker's primary responsibilities include:

- Verifying the design theory and correct interpretation of the design code to the level of accepting responsibility for stamping the record design calculations if needed.
- Accuracy and completeness of the design calculations to confirm the structural adequacy of the components
- Design check using the BrDR software
- Independent check of all geometry and elevations
- Verifying the accuracy and completeness of the load rating
- Stamping the contract plan sheets if the designer is not a licensed professional engineer or if the design engineer is not available.

The design calculations should not be checked until the Situation Layout check is completed and any differences are resolved with the designer. If revisions are necessary, the designer should revise the design and details before the design checker proceeds.

The following format shall be used in reviewing/checking the design calculations:

AGREE highlight in yellow

CHANGE show correction in red

CHECK show comment in blue

The check notes shall be returned to the designer who will coordinate changes. After the comments have been resolved, the design checker shall verify all resolved changes have been made by using a purple check mark next to the comment √**.**

An independent analysis is the preferred methodology for the checker unless approved by the Group Leader. The design checker may perform an independent analysis by using a methodology different from the original design. For designs checked by an experienced engineer, the check may be completed using line-by-line verification of the original calculation sheets and initialed by the checker. For special designs or those done by inexperienced designers, the Group Leader may require a more complete design check by the design checker.

Plan Checker

The primary purpose of a plan check is to ensure plans meet ITD standards and are constructible, consistent, clear, and complete. The checker's responsibilities should include, but not be limited to, the following items:

Situation and Layout

- Make a complete check of the geometric layout, dimensions, and elevations. Conformance of grades, alignments, and other data between roadway and bridge plans should be checked.
- Check the Typical Section for conformance to the roadway width and bridge railing curb-curb requirements
- Check the girder spacing and type, and slab thickness for conformance to the Typical Section and office standards

Component Details

- Verify that the details are in agreement with the approved design calculations

The following format shall be used in reviewing the plans:

AGREE	mark in yellow
CHANGE	show correction in red
CHECK	show comment in blue
DELETE	mark items to delete in green

After the designer and plan checker have resolved all comments, the plan checker shall verify all resolved changes have been made by using a blue check mark next to the comment √.

Structural Detailer
The structural detailer's primary responsibilities include:

- Preparing neat, correct, and easy to follow plan sheets conforming to current detailing standards
- Drawing details to scale
- Assisting the designer/checker with verifying dimensions and elevations that have been calculated by the designer/checker
- Assisting the designer/checker with verifying dimensions and elevations that have been calculated by the designer/checker
- Assisting the designer/checker with verifying quantities that have been calculated by the designer/checker

The detailer shall indicate that the red-lined changes have been made by placing a green check mark next to the change √.

Group Leader
The Group Leader should work closely with the designer, design checker, and structural detailer during the design and plan preparation phases to help avoid major changes late in the design process.

The Group Leader's primary responsibilities include:

- Compatibility of design and details within the project
- Determining the level of checking required by considering the complexity of the structure and the skill of the designer
- Approving the design criteria prepared by the designer before start of design
- Monitoring the design and detailing process and providing guidance and assistance as required
- Reviewing the design calculations for completeness and for agreement with office criteria and practices
- Reviewing the plans for completeness, constructibility, and agreement with office criteria and practices
- Reviewing the PS&E data for completeness and for agreement with office criteria and practices

State Bridge Engineer
The Bridge Engineer's primary responsibilities include:

- Providing leadership to support quality structural design for bridge projects.
- Facilitating resolution of major project design issues.

IN-HOUSE LOAD RATING PROCEDURES

To maximize the efficiency of its operations, the Department has selected the AASHTOWare Bridge Design and Rating software (BrDR formerly known as VIRTIS) for load rating. The BrDR software shall be used to do the rating for the structure types listed below. For structure types not listed below, or structures with complex geometry, alternate rating software may be used, but needs to be approved in advance by the ITD Asset Management Office.

The Load Rating will be completed using Load and Resistance Factor Rating (LRFR) method and reported on a stamped LRFR summary form. The Load Rating will be run using the Load Factor (LFR) method and results will be reported on the LFR Summary Form. The LFR results are for information only and are not required to be signed and sealed. Coding instructions for the BrDR software are in Chapter 6 of the Idaho Manual for Bridge Evaluation. (http://itd.idaho.gov/Bridge/IMBEFirstEdition.pdf)

Structure types that shall be rated in AASHTOWare BrDR:

- Prestressed girders
- Steel rolled girders, plate girders, or built-up sections
- Curved steel girders
- Reinforced concrete girders
- Multi-cell conventionally reinforced concrete box girders
- Post-tensioned girder/floorbeam systems
- Timber girders
- Trusses
- Cast-in-place or precast box culverts and stiffleg culverts
- CMP or metal arch pipes with cover greater than span/8 as defined in the MBE

Load rating submittal shall include:

- AASHTOWare BridgeRating software file (XML electronic file only)
- Load Rating Summary Form (LRFR) Signed and Sealed by the Load Rating Engineer (PDF electronic file only)
- Load Rating Summary Form (LFR) (PDF electronic file)
- Excel Load Rating Summary Form (LRFR and LFR) (MS Excel electronic file only)
- Load Rating Supporting Calculations (Native file format and PDF electronic file)

New/Replacement Bridge Projects

Initial BrDR Load Rating Model

For all structure types except contractor designed structures, initial load rating models shall be based upon the plans for the Final Design submittal and shall be revised for any changes or comments and submitted with the PS&E package. The HL-93 LRFR inventory rating,including future loads, shall be 1.10 or higher for new bridges on the state system, unless approved by the Group Leader. Future loads (i.e. future wearing surface, future utilities) shall be input into the model at the final design and PS&E stage. The future loads shall be removed for the updated load rating completed at the end of bridge construction. The load rating model should be done by the Bridge Designer and checked by a Design Checker or a load rating engineer. Initial Load rating should include models for all staged conditions and complete bridge condition.

Once the load rating model has been checked and all the checkers comments have been resolved, the designer shall send an e-mail to the ITD Load Rating Engineer stating the model is ready for the Q/A process with a link to the location of the documents needed to perform a review.

Final BrDR Load Rating Model

The final load rating shall be completed within 90 days of opening the bridge to traffic.

Contractor designed structure load rating shall be done after approval of the shop drawings by the Engineer who approved the shop drawings.

At time of shop drawing approval the load rating file shall be revised if necessary in order to reflect changes that would affect the load capacity of the bridge such as the use of alternate prestressed concrete girders, strand size and location or for steel girders possible adjustments to flange thickness or stiffener spacing. The bridge designer is in the best position to know what changes have been made (if any) during shop drawing approval and whether the BrDR model needs to updated.

It is extremely rare that any other field adjustments during construction will affect the load rating, however the load rating is to be updated based on the data in the initial inspection report. The load rating at this stage is considered to be final and the designer shall send an email to the ITD Load Rating Engineer stating the model is ready for the Q/A process. If there are changes, the original checker should check the changes to the load rating and a link to the revised load rating files shall be emailed to the ITD Load Rating Engineer.
The approved shop drawings shall be included in the linked folder.

Bridge Rehabilitation Projects

Consistent with the opening statement of Article 0.04 that "The primary aim in both designing and checking is to produce a structure that will safely carry the anticipated loads", all bridge rehabilitations projects shall have their load ratings reviewed and updated as necessary.

Early in the bridge rehabilitation project development the designer should verify that a load rating file exists for the bridge that is to be rehabilitated. If a load rating file does not exist for the bridge, the designer shall contact the Bridge Asset Management Office to request preparation of the initial load rating file.

The load rating file should be updated to reflect the rehabilitation project changes, such as the addition of asphalt wearing surfaces, bonded silica fume overlays and rail retrofits. It is not necessary to update the BrDR file for application of 3/8" epoxy overlays or healer/sealer treatments.

It is not necessary for the bridge designer to restamp the original Load Rating Summary Sheet. The purpose of the review and updating of the load rating and load rating file for rehabilitation projects is not to recreate or invalidate the existing load rating, but ensure that we have not substantially reduced the live load capacity of the bridge. The bridge designer will document changes made to the load rating file and email a copy of the documentation to the ITD Load Rating Engineer.

In regards to bonded silica fume overlays, historically the design practice has been to design for a minimum of 15 psf of additional future wearing surface in the original design (currently we design for 28psf of additional future wearing surface). The addition of a bonded overlay will not decrease the original design capacity. Changing the BrDR model to reflect the new deck thickness including the bonded concrete overlay will produce a conservative load rating and is acceptable practice.

The designer shall send an email stating the load rating file is ready for the Q/A process indicating no changes or an updated Load Rating Summary Sheet included at a linked folder location with the Final Design submittal. If during the Q/A process the ITD Load Rating Engineer determines revisions are needed, comments will be sent to the bridge designer for resolution. This shall be completed no later than the PS&E submittal for the project.

Bridge widening, strengthening, or full deck or superstructure replacement rehabilitation projects shall be treated as new bridges for the purposes of load rating and all the provisions for load rating of new bridges will apply.

Revisions:

June 2006	Added paragraph for Design Calculations. Added preparation of design criteria in Designer's Responsibilities. Added paragraph for duties of Bridge Engineer.
April 2008	Added load rating responsibility for Designer
July 2009	Added requirement for microfilming check calculations.
Feb 2012	Added In-House Load Rating Procedures section
August 2012	Clarified In-House Load Rating Procedures section Added new heading and paragraphs for load rating of Bridge Rehabilitation Projects
June 2013	Added designer responsibility to obtain roadway line, grade, & typical section data. Added plan checker duty to verify conformance of grades and alignments between roadway & bridge plans when checking the situation layout.
May 2014	Revised notation of VIRTIS to BrR. Added reference to BrR coding instructions in Chapter 6 of the Idaho Manual for Bridge Evaluation.
Mar 2015	Deleted requirement to archive design check calculations.
Oct 2016	Changed Article number from 0.4 to 0.04.
Oct 2017	Added a paragraph on Cost Estimates. Clarified when precast culvert load ratings shall be done.
Sep 2020	Added "reviewing shop drawings" to Designer's primary responsibility. Added checking design in BrDR software to Design Checker's primary responsibility. Changed reference to AASHTOWare Bridge Rating software (BrR) to Bridge Design and Rating software BrDR). Added precast culvert final load rating shall be done by the Engineer who approved the shop drawings.
Sep 2021	Revised Load Rating procedures and submittal requirements.
June 2022	Added color format for reviewing/checking plans and calculations.
Oct 2023	Added stamping contract plans and preparing the Bridge Summary Sheet for the Roadway Plans to Designer's responsibilities. Changed format for resolving calculations to A, P, and D Revised Design Checker's responsibilities Revised Structural Detailer's responsibilities Revised duties of the Bridge Engineer. Added additional structure types to be load rated using BrDR. Revised Load Rating procedure to an electronic submittal format.
Dec 2024	Changed contingency amount for S&L from 15% to 20%. Changed contingency amount for Pre-final at 5% to Final at 10%. Changed Designer's responsibilities from preparing a CPM chart to assisting the PM with the design s chedule for PSS. Changed the format for resolving the design checkers comments to "Agree" or "Disagree". Changed the color of verifying design changes from blue to purple check mark. Added independent analysis is the prefeered methodology for design checking. Added marking plan items to be deleted in green. Added initial Load Rating should include models for both staged and final conditions.

MAJOR OR UNUSUAL BRIDGES

Many major or unusual structures are designed to utilize features that are at the edge of today's state-of-the-art or unique fracture critical details that often require special consideration during construction, inspection, and maintenance.

The following FHWA policy is to be followed in the preparation of design documents for major or unusual bridges to help avoid construction problems and provide guidelines for on-going maintenance:

- FHWA Memorandum November 13, 1998
  Project Oversight Unusual Bridges and Structures

Unusual bridges are those that have any of the following:

- Difficult or unique foundation problems
- New or complex designs with unique operational or design features
- Bridges with exceptionally long spans
- Bridges being designed with procedures that depart from currently recognized acceptable practices

Examples of unusual bridges include:

- Cable-stayed
- Suspension
- Arch
- Segmental Concrete
- Movable
- Truss

Examples of bridge types that deviate from AASHTO bridge design standards or AASHTO guide specifications for highway bridges include:

- Major bridges using LRFD design specifications
- Bridges requiring abnormal dynamic analysis for seismic design
- Bridges using a three-dimensional computer analysis
- Bridges with spans exceeding 500 feet
- Bridges with major supporting elements of ultra high strength concrete or steel

A manual for the inspection and maintenance of the structure shall be prepared during the design process that includes explicit guidelines and instructions. The lead designer, whether the ITD Bridge Section or a Consultant does the design, will be responsible for the preparation of the inspection and maintenance manual. The manual will identify critical areas to be inspected and recommend maintenance procedures. The following areas will be addressed as well as any other areas requiring special attention:

Deck
Girders
Expansion Joints
Bearing Units
Piers or Columns
Abutments
Connections
Fracture Critical Members (to be marked on the drawings)
Member cracking or deformation

Copies of the manual shall be sent to the District and Bridge Asset Management.

Commentary

The FHWA November 13, 1998 Memorandum is available at http://www.fhwa.dot.gov/bridge/unusual.htm
The FHWA Implementing Guidance memorandum is available at http://www.fhwa.dot.gov/bridge/sec1305.htm

Revisions:
Oct 2016 Changed Article number from 0.5 to 0.05.

PUBLIC CONVENIENCE

The Bridge Section is committed to public safety and the enhancement of public convenience in all our operations. The Bridge Section shall strive to comply with Board Policy 4002, Public Convenience.

The following are goals to increase both safety and public convenience:

Inspection: Eliminate or minimize traffic interference during inspection operations

Permits: Review overweight permits in a timely manner.

Design: Minimize traffic interference during construction.
Access for inspection and maintenance shall be considered as part of the design, with emphasis on utilization and safety of personnel. All facilities shall be designed to prevent unauthorized access to the structure.
Bridges replacements should enhance commercial routes.

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Revisions:
Oct 2016 Changed Article number from 0.6 to 0.06.

Oct 2017 Revised Board Policy number from B-01-01 to 4002.

TYPE, SIZE & LOCATION REPORT for STATE CONSULTANT & LHTAC PROJECTS

GENERAL

The purpose of the TS&L Report is to provide enough background information so that reviewers can effectively evaluate the proposed final design and the concepts it is based on. The report should describe the project, the proposed structure, and give reasons why the bridge type, size, and location were selected. The report should concisely summarize the information. A separate TS&L Report shall be prepared for each structure except minor projects such as deck joint rehabilitations or rail retrofits.

The intent of the TS&L Report is the collection of pertinent data required for the design of the structure, in addition to documentation of design decisions. Pertinent data shall be extracted from other discipline reports and summarized in this Report for use by the structure designers. There are many approaches to selecting a structure type for a particular project depending upon the project goals. It is common that the structure selection is not driven by least cost, but more on constructability issues like site conditions, minimizing interruptions to the traveling public, environmental impact or aesthetic considerations. The TS&L report should document the tradeoffs between competing project goals and reasonably discuss and resolve an appropriate solution.

A more detailed overall project cost may need to be developed at the TS&L stage in order to reasonably evaluate project goals and to ensure the project remains within budget.

Even though the Hydraulics Report or Geotechnical Engineering Report may not be available at the time the TS&L Report is prepared, always include comments about assumptions made in consultation with the Hydraulics or Foundation Engineer.

The TS&L Report will include the following sections, where applicable. Not all sections will apply to all structures.

REPORT OUTLINE

General Background
- Project description
- Structure location (may include roadway plan & profile and aerial photography)
- Right-of-way restrictions
- Permits and restrictions
- Utility conflicts or restrictions
- Railroad clearances or restrictions
- Design Specifications

Environmental
- Wetlands
- Historical Sites
- Contaminated areas
- Recreation areas
- Threatened Species areas
- Environmental commitments listed in the environmental documentation

Design Concepts Rationale for:
- Building new bridge versus widening existing one
- Use of bridge versus culvert
- Foundation support assumptions
- Assumed pile or bearing capacity loads
- Assumed lateral soil pressure against abutment
- Seismic load assumptions

Geometry and Layout
- Roadway width
- Traffic volumes
- Profile grade
- Horizontal alignment
- Design exceptions
- Sidewalks
- Railing

Hydraulics
- Waterway opening
- High water elevation
- Clearance
- Bank protection
- Floodway information
- Deck drains

Foundations
- Piling or spread footings
- Fills, surcharges
- Settlement
- Lateral earth loads
- Seismic loads

Structure Features
- Span length and span arrangement
- Type of superstructure
    - Girder type and spacing
    - Fixity at abutment & piers
    - Location of expansion joints
    - Deck thickness and corrosion protection system
    - AASHTOWare BrDR shall be used unless approved by the ITD Group Leader. Rationale for using any structure type that can't be rated using AASHTOWare BrDR. In-House load rating procedures in Article 0.04 list structure types that can be load rated using AASHTOWare BrDR.
- Type of substructure and location
- Alternate structure types considered and estimated costs
- Stage construction and detour requirements
- Aesthetics
- Maintenance considerations
- Feasibility of construction

Recommendations
- As part of the recommendations, include a preliminary Situation and Layout drawing of the recommended alternative. ITD will provide guidance during scoping on the number of alternatives to assume for requiring Situation and Layout drawings.

Many bridge replacement projects require a Biological Assessment. To aid in the process, try to address as many of the following subjects as practical.
- Project timing and chronology
- Alignment and span configurations of the new bridge in relation to the existing bridge
- Proposed treatment of the runoff and comparison of the number of drains on the existing bridge to the number of drains on the new bridge.
- Discuss the sizes, numbers, and removal methods of the existing bents, footings and piles within the Ordinary High Water Mark.
- Discuss the sizes, numbers, and construction methods of the new bents, footings and piles within the Ordinary High Water Mark.
- Method of dewatering
- Method of removal and disposal of existing bridge members with lead based paint
- Discuss the construction and removal methods for detour bridges, work bridges, or falsework within the Ordinary High Water Mark
- Extent and duration of heavy machinery work in the wetted channel
- Amount or extent of fill and/or riprap
- Possible staging area and access
- Amount and type of vegetation to be removed outside and within the Ordinary High Water Mark
- Amount of wetland impacted
- Any planned mitigation

Revisions:

April 2008	Added new article.
May 2014	Expanded the issues to be covered and discussion of possible solutions.
Oct 2016	Changed Article number from 0.7 to 0.07.
Sep 2020	Changed name of "Phase 4 Foundation Report" to "Geotechnical Engineering Report" to agree with the Materials Manual. Changed title of article to include LHTAC projects.
Oct 2023	Added using superstructure types that can be rated using AASHTOWare BrDR. Added a requirement of including a preliminary S&L drawing of the recommended alternative.

BRIDGE PLANS

Plan sheets for the following type of projects should be prepared as Bridge Plans using the bridge sheet title block shown on page B17.5 for SS4 format and B17.5A for ORD format.

- New and replacement structures
- Rehabilitation/repair or widening of existing structures
- Retaining walls attached to the structure
- Roadway retaining walls not attached to the structure that are over 10’ tall and/or have significant length.

Projects started in SS4 format should be completed using SS4. New projects should use ORD format.

New/replacement structures and retaining walls will be assigned a new bridge drawing number by the Group leader.

The drawing number for rehabilitation/repair or widening of existing structures shall be the drawing number of the first sheet of the existing plans followed by an alphabetic character. The alphabetic character shall start with “A” for the first modification to the structure and increment for succeeding projects. This procedure allows for the original plans and all modifications to the structure to be archived together. The format for the drawing number shall be 12345-A.

Retaining wall plans include walls attached to the structure and any walls associated with any structure or roadway embankment. All types of walls are intended including cast-in-place and MSE.

STANDARD DRAWINGS

Bridge Standard drawings are being developed and not all standard drawings are available in ORD format at this time. ORD drawings are posted on ProjectWise folder Headquarters/Standards/Bridge Standard Drawings. ORD bridge border is on ProjectWise folder Headquarters/Standards/Borders.

Revisions:

April 2008	Added new article.
Mar 2015	Revised reference to B17.3 to B17.5
Oct 2016	Changed Article number from 0.8 to 0.08.
Oct 2017	Added requirements for roadway retaining walls.
Nov 2019	Added format of modification drawing number.
Sep 2020	Added reference to SS4 & ORD title block. Added policy that projects started in SS4 will be completed in SS4 and new projects should use ORD. Added status of ORD standard drawings and location of ORD standard drawings in ProjectWise.
Apr 2021	Revised location of ORD drawings in ProjectWise.

CONSULTANT QUALITY ASSURANCE/QUALITY CONTROL

The purpose of the quality assurance and quality control (QA/QC) procedure is to improve the quality of the structural designs, plans, and other deliverables. ITD Bridge Section requires consultants to complete a design, design check, and senior independent review on all submittals for all phases of the project including reports, plans, calculations, specifications, estimate, and other deliverables. The design, design check, and senior independent review shall each be completed by a different qualified individual. QA/QC activities shall be completed and documented prior to submitting to ITD for review.

Either the designer or checker shall be licensed as a professional engineer in Idaho. Both the design calculations and check calculations shall be submitted to ITD. The design calculations of record shall be stamped by a professional engineer in Idaho unless it was completed by a non-licensed engineer. If the design was completed by a non-licensed engineer, the check calculations shall be stamped by a professional engineer in Idaho and will become the design calculations of record. Independent calculations will be required unless a line by line check is approved by ITD.

Quality Assurance

Quality Assurance consists of the steps needed to verify quality and to document procedures were followed. This should be a defined set of procedures, with measurable and verifiable actions. The quality assurance manager or project manager will ensure the QA/QC procedures were followed, properly documented, and the documentation is submitted to ITD.

Quality Control

Quality Control consists of a complete design check and a separate senior independent review of the design, calculations, plans, specifications, reports, estimate, and other aspects of a submittal. Quality control should be thorough, appropriate to the project, and documented.

The primary purpose of the design check is to ensure that the design has not produced an unsafe or inadequate design through an error in mathematics, misunderstanding of the specifications, or other cause. Checking consists of a detailed verification of the design and details. This includes detailed checking of the design calculations, plans, quantities, reports, estimates, and specifications. The complete check shall be carried out by an engineer other than the engineer responsible for the design. This design check shall be carried out by another consultant when the design consultant does not have adequate in-house capabilities to provide this check. If an non-licensed engineer performs design or checker duties, the corresponding designer or checker must be an experienced professional engineer in Idaho with at least 10 years of experience (unless approved by ITD Bridge Section) to ensure a safe, quality design.

The senior independent review consists of verifying general conformance of the design with project objectives. This includes general features of design, constructability, and presentation of the design. The senior independent review shall be carried out by a professional engineer separate than the individuals responsible for the design and design check. The senior independent review shall be carried out by another consultant when the design consultant does not have adequate in-house capabilities to provide this review. Unless approved by ITD Bridge Section, the senior independent reviewer must have a minimum of 15 years of bridge design experience and familiar with ITD Bridge design standards.

Responsibilities

Designer

The designer's primary responsibilities include but are not limited to:

- Preparing design criteria for inclusion in the front of the design calculations
- Determining the number and titles of plan sheets
- Obtaining roadway horizontal alignment, profile grade, and typical section
- Coordinating with the geotechnical engineer
- Developing the bridge concept and layout
- Completing the structural design
- Preparing complete and legible calculations
- Coordinating the plan sheet detailing
- Producing a complete set of plans and specifications
- Calculating the bridge bid item quantities

- Preparing the quantity and cost estimate, construction schedule CPD chart, and special provisions
- Load rating new/replacement bridges and bridge rehabilitation projects in accordance with the latest version of the AASHTO Manual for Bridge Evaluation and the ITD Manual for Bridge Evaluation.

Design Checker
The design checker's primary responsibilities include but are not limited to:

- Verifying the design theory and correct interpretation of the design code
- Confirming accuracy and completeness of the design calculations to confirm the structural adequacy of the components
- Verifying that the details are in agreement with the approved design calculations
- Completing an independent check of the geometric layout and all geometry. Checking conformance of grades, alignments, and other data between roadway and bridge plans.
- Checking the typical section for conformance to the roadway width and bridge railing curb-curb requirements.
- Checking the girder spacing and type, and slab thickness for conformance to the typical section and ITD standards
- Verifying the plans are clear, constructible, accurate, free of errors, meet the intent of the project, portray all required information necessary for construction, and are in accordance with ITD standards
- Verifying the accuracy and completeness of the load rating

Senior Independent Reviewer
The Senior Independent Reviewer's primary responsibilities include but are not limited to:

- Checking the bridge design and details against interfacing disciplines (e.g. roadway plans, drainage plans, hydraulic report/ design, geotechnical engineering report, etc.)
- Reviewing the plans for completeness, constructability, and agreement with ITD standards and practices
- Reviewing the reports, specifications, and estimate for completeness, consistency, and for agreement with ITD standards and practices
- Verifying that the bid items, bid item names, and quantities are consistent between the plans and estimate
- Reviewing the PS&E documents for completeness and for agreement with ITD standards and practices
- Reviewing the load rating for completeness and agreement with ITD standards and practices

Project Manager/Structures Lead
The Project Manager's or Structures Lead's responsibilities include but are not limited to:

- Coordinating with ITD Bridge
- Identifying tasks and planning order of work
- Developing and obtaining ITD Bridge concurrence of the design criteria before start of design
- Reviewing the Situation and Layout to assure that the most cost-effective and appropriate structure type is selected for a particular bridge site
- Monitoring the design and detailing process and providing guidance and assistance as required
- Determining the appropriate engineer for checking by considering the complexity of the structure and the skill of the designer
- Obtaining concurrence or approval from ITD Bridge whenever deviating from approved office standards and practices
- Informing ITD Bridge of any areas of the design that should receive special attention during review
- Facilitating resolution of major project design issues.

Revisions:

July 2009	Added new article.
Oct 2016	Changed Article number from 0.9 to 0.09.
May 2021	Added clarification to the QA/QC procedures and individual responsibilities

PS&E PROCEDURE

State Bridge Projects

After the necessary corrections from the Final Design Review have been made, the Bridge Section shall publish a PS&E letter of acceptance. Form letters for ITD in-house projects, and ITD consultant projects are at X:Form Letters.

In the transmittal letter for consultant projects, the Bridge Section will include an estimate of man-hours for checking shop plans and construction drawings.

The final cost estimate shall be input into the Bridge Section Cost Estimate database program by the Bridge Section and a copy of the estimate shall be included with the transmittal letter.

The following documents shall be placed in the respective District/Project/prj/Bridge/PS&E folder on ProjectWise

- Transmittal letter
- Stamped, signed plans
- Cost estimate
- Special provisions
- Quantity calculations
- Construction CPM

The following documents shall be placed in the respective District/Project/prj/Bridge/Analysis folder on ProjectWise

- Stamped, signed design calculations
- Stamped, signed load rating summary form

An e-mail shall be sent to the District project manager and all others noted for distribution on the form letter.

LHTAC Bridge Projects

After the necessary corrections from the Final Design Review have been made, LHTAC shall publish a PS&E letter of acceptance.

LHTAC shall provide ITD Bridge Section with an Estimator final cost estimate in PDF format. The cost estimate shall be input into the Bridge Section Cost Estimate database program by the ITD Bridge Section.

The following documents shall be placed in the respective LHTAC/Project/prj/Bridge/PS&E folder on ProjectWise

- Transmittal letter
- Stamped, signed plans
- Cost estimate
- Special provisions
- Quantity calculations
- Construction CPM

The following documents shall be placed in the respective LHTAC/Project/prj/Bridge/Analysis folder on ProjectWise

- Stamped, signed design calculations
- Stamped, signed load rating summary form

Revisions:

Oct 2016	Added new article.
Nov 2019	Deleted reference to who can prepare the cost estimate.
Sep 2020	Listed the location in ProjectWise to place PS&E documents. Added the location in ProjectWise to place design calculations and load rating summary form. Added cost estimate prepared by ITD Bridge Section. Added procedures for STATE or LHTAC bridge projects.

STAGE CONSTRUCTION

Non-Redundant Superstructures

Existing Bridges

For concrete girder bridges, providing a minimum of three existing concrete girders in every stage is preferable. An existing concrete two-girder system is acceptable provided there is internal redundancy in the girders. Internal redundancy in reinforced t-beam girders is provided if there are multiple layers of flexural reinforcement with multiple bars in each layer. Internal redundancy in prestressed girders is provided by multiple layers of strands.

For steel girder bridges, provide a minimum of three existing steel girders in every stage unless approved by the ITD Group Leader.

Proposed New Bridges

A new bridge with a non-redundant two-steel girder system during stage construction is acceptable provided the girders are designed for the non-redundant steel tension member (NSTM) condition. If the two-girder system does not carry traffic for more than 12 months it would not require a NSTM inspection; only a routine inspection would be required before being opened to traffic. If the two-girder system will carry traffic for 12 or more months, a routine inspection is required before being opened to traffic, and an NTSM inspection is required within the first 12 months of the bridge opening to traffic.

A new prestressed concrete two-girder bridge is acceptable. A routine inspection would be required before being opened to traffic. Consult your Group Leader if the two-girder system will be in operation for more than 12 months.

Load Rating

If staged construction is used

At all times during construction, the operating load rating of the existing bridge or portions thereof shall not drop below the operating load rating for the existing bridge. This ensures that the over legal weight annual permit holders will not have reduced access to the bridge during construction. The designer must provide some method by which to control over legal weight single trip permits during stages of construction. This can be by means of a BrR model of the various stages of construction which can be run for permit requests. If approved by the District Engineer, a recommendation of no single trip permits during construction can be made.

If a temporary highway bridge is to be used

All temporary bridges that carry highway traffic must be designed in accordance with the AASHTO LRFD Bridge Design Specifications, current edition, and the ITD Bridge Design LRFD Manual, current edition. The designer must provide some method by which to control over legal weight single trip permits while the temporary bridge is open to the public. This can be by means of a BrR model which can be run for permit requests. If approved by the District Engineer, a recommendation of no single trip permits during construction can be made

Revisions:

Oct 2016	Added new article.
Nov 2019	Changed reference to AASHTO LRFD Bridge Design Specifications to “current edition”. Changed “”If the political climate permits” to “If approved by the District Engineer”.
Oct 2023	Added directions for two-girder non-redundant bridges.

Hydraulic Reports
Signing and sealing of hydraulic reports and ITD 0211 forms will be done by the engineer of responsible charge. As with all engineering work, the responsibility for accuracy and completion rests with the engineer of responsible charge. Acceptance of these documents will be done as shown below.

- Hydraulic reports for LHTAC projects will be prepared by LHTAC personnel or their contracted consultant engineers. Acceptance by the LHTAC Administrator.

- Hydraulic reports for ITD projects which include bridges will be prepared by ITD Bridge personnel or contracted consultant engineers. Responsibility for preparing the hydraulics reports will be assigned on a project by project basis. Acceptance by the ITD State Bridge Engineer.

- Hydraulic reports for ITD projects which include roadway hydraulics will be prepared by ITD district personnel or their contracted consultant engineers. Acceptance by the District Engineer. Technical assistance will be available through the Design/Traffic Services Engineers.

Hydraulic Reports for ITD Bridge Projects

Quality Assurance
Hydraulic Reports for ITD bridge projects must have three separate people involved with the preparation; the person who prepares the model and report, an engineer who checks the model and report, and the engineer that provides the senior independent review of all deliverables. The checker and the senior level reviewer must be licensed engineers in the State of Idaho. The preparation of the model and report must be under the direction of a licensed engineer, but may be done by personnel that do not have an engineering license.

Deliverables
The following items will be submitted to the ITD Bridge Section for review.

- Hydraulic Report prepared in accordance with the ITD Bridge Hydraulics Manual.
    - Hydraulic Risk Assessment Memo (HRAM) prepared in accordance with the ITD Bridge Hydraulics Manual
    - Include Signed and Sealed ITD Form 211 as the first appendix to the Hydraulics Report
    - Completed ITD 211form. http://apps.itd.idaho.gov/apps/formfinder2dmz
- Quality Assurance Documents (provide this separately from the Hydraulics Report)
    - Completed hydraulic model checklist. Refer to article A0.2 or A0.3 in the ITD Bridge LRFD Manual.
    - Comment form documenting the reviewer's comments and the responses to those comments.
    - Completed Hydraulic Quality Assurance Form. Refer to Appendix E of the ITD Bridge Hydraulics Manual.
- Final Hydraulic Model files
    - Existing & Proposed model files provided in a zip file.
    - Include only final model files Ensure models are functional and remove all unnecessary files.

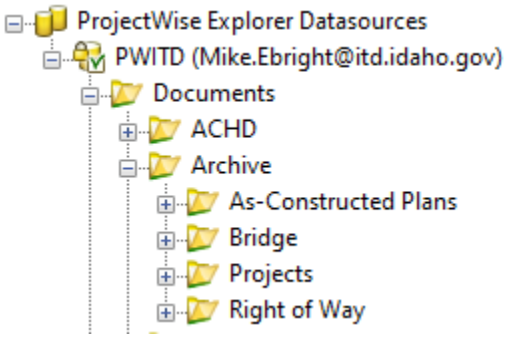
Revisions:

November 2016	Added new article.
Sept 2020	Added deliverables and clarified sections
July 2021	Revised ITD-0210 to ITD-0211 to conform to the ITD Bridge Hydraulics Manual. Referenced ITD Bridge Hydraulics Manual rather than ITD Bridge Design Manual.
Dec 2024	Added HRAM to deliverables list.

IN-HOUSE ARCHIVE PROCEDURES

Bridge project data shall be archived in ProjectWise when construction is complete and the bridge is open to traffic.

The following is the ProjectWise folder tree:



The Bridge Archive folder files documents by the Bridge Key Number using the following format:

- single bridges shall be the bridge key numbers, e.g. BK15182.
- twin bridges shall be both bridge key numbers separated by a slash, e.g. BK17110/17115.
- bridges with spans ≤10' along centerline of roadway on the State System shall be the drawing number preceded by an S, e.g. S17200.
- bridges with spans ≤20' along centerline of roadway on the Local & Off System shall be the drawing number preceded by an S, e.g. S15600.
- walls shall be the drawing number preceded by a W, e.g. W19300.

The Bridge Key Number folder contains the following sub-folders:

Photographs
Drawing Number

Create a new Drawing Number folder for each new project modifying the original bridge plans.

The Drawing Number folder contains the following sub-folders and the documents to be retained for historical record when a project is archived to provide uniformity of historical bridge records. All file names shall start with the drawing number, e.g. 17985 Hydraulic Report, 17985 Bridge Plans

CONTRACT

- Award of contract letter
- Contract Proposal Front Cover, Contractor Bid Proposal sheet, and Notice of Letting sheet
- Bridge related Notes to Contractors
- Bridge related Supplemental Specifications
- Bridge Special Provisions

Bundle bullet items 2-5 and label "Contract".

CORRESPONDENCE

- PS&E approval letter for the contract plans
- Letters documenting bridge construction problems

Bundle bullet item 2 letters in chronological date order and label "Correspondence".

DESIGN CALCULATIONS

- Engineer of Record Design Calculations
- Shop Drawing Design Calculations

The design notes should not include the checker's calculations, quantity calculations, or any other extraneous data.

CHANGE ORDERS

- Bridge related Change Orders

BRIDGE REPORTS

- TS&L Report for new/replacement projects
- BCOR for rehabilitation projects

HYDRAULIC REPORTS

- HRAM Report
- Hydraulic Report
- Zipped hydraulic model files. Contact Herb McDowell

ENGINEERING REPORTS

- Geotechnical Engineering Report
- Pile Reports
  Include the following in bullet item 2:
  - Pile Driving Criteria Memo
  - Pile Driving Summary Report
    - ITD 973 Pile Layout
    - ITD 972 Pile Length & Capacity
  - ITD 971 Individual Pile Driving Record
  - ITD 970 Test Pile Record
  - Dynamic Pile Testing Report

AS-BUILT BRIDGE PLANS

Mark changes to the drawing with a revision symbol triangle and note in the revision block of the title block.

Add attributes to the bridge plans file to aid in searching. Attributes can only be added to files and not folders. Select the bridge plan file and hit the space bar to open the attributes dialog box.
Enter data for the following:

BRIDGEDWGN	BRIDGE DRAWING NUMBER
BRIDGE KEYN	BRIDGE KEY NUMBER
COMMENTS	ENTER “BRIDGE DRAWING”
COUNTY	COUNTY NAME
DESCRIPTION	ENTER ROUTE AND FEATURE INTERSECTED
DISTRICT	SELECT DITRICT FROM DROP DOWN MENU
DWGDATE	ENTER YEAR CONSTRUCTED
FEDPROJNUM	PROJECT NUMBER
KEYNUM	PROJECT KEY NUMBER
ROUTENAME	NAME OF ROUTE ACROSS THE BRIDGE

Save and close the dialog box when data entry is completed.

SHOP DRAWINGS

Approved shop drawing for products that become a part of the permanent structure.
Label the shop drawings for each product “Bridge #xxxxx Drawing #xxxxx-SD Sheet 1 of xx” in the lower right corner margin of each drawing.
The following list contains most of the products that become a part of the permanent structure:

- Prestressed girders
- Steel girders
- Post-tensioning drawings
- Precast culverts
- Metal pipes
- Expansion Joints
- Stay-in-place metal deck forms
- Bearings
- Metal Railing
- Retaining Walls

EXISTING BRIDGE PLANS

If the project requires removal of the original structure, list the drawing numbers of the bridge to be removed on the Removed Bridges Drawing List located at X:Bridge Drawings. The original plans will be removed from the Record Center storage and send to the Historical Society.

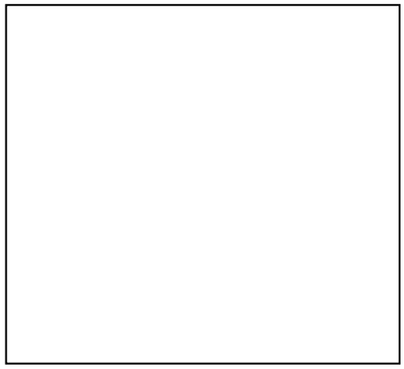
Stamp the plans for the original structure in the reduced plan book with the red rubber stamp to indicate it has been removed and show the new structure drawing number.

Revisions:

Dec 2024	Added new article.

Idaho Transportation Department
Bridge Design Calculations

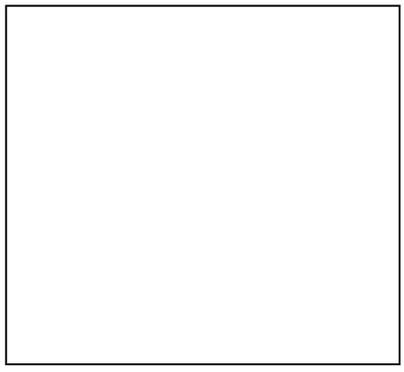
Structure:
Route & Feature Intersected:
Project Number:
Key Number:
Bridge Drawing Number:
County:
Bridge Inspection Number:



Superstructure (Structural Steel):
Designer:
Checker:

Deck Placement Sequence:
Designer:
Checker:

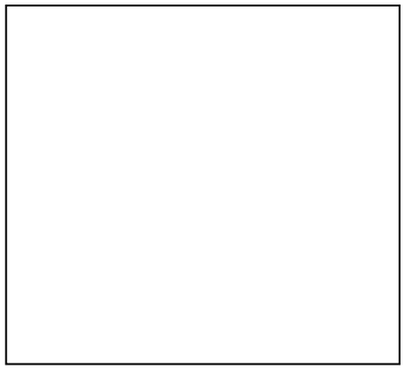
Deck:
Designer:
Checker:



Expansion Joints:
Designer:
Checker:

Bearings:
Designer:
Checker:

Utilities & Deck Drains:
Designer:
Checker:



Approach Slab:
Designer:
Checker:

Abutments:
Designer:
Checker:

Piers:
Designer:
Checker:



CHAPTER 1

INTRODUCTION

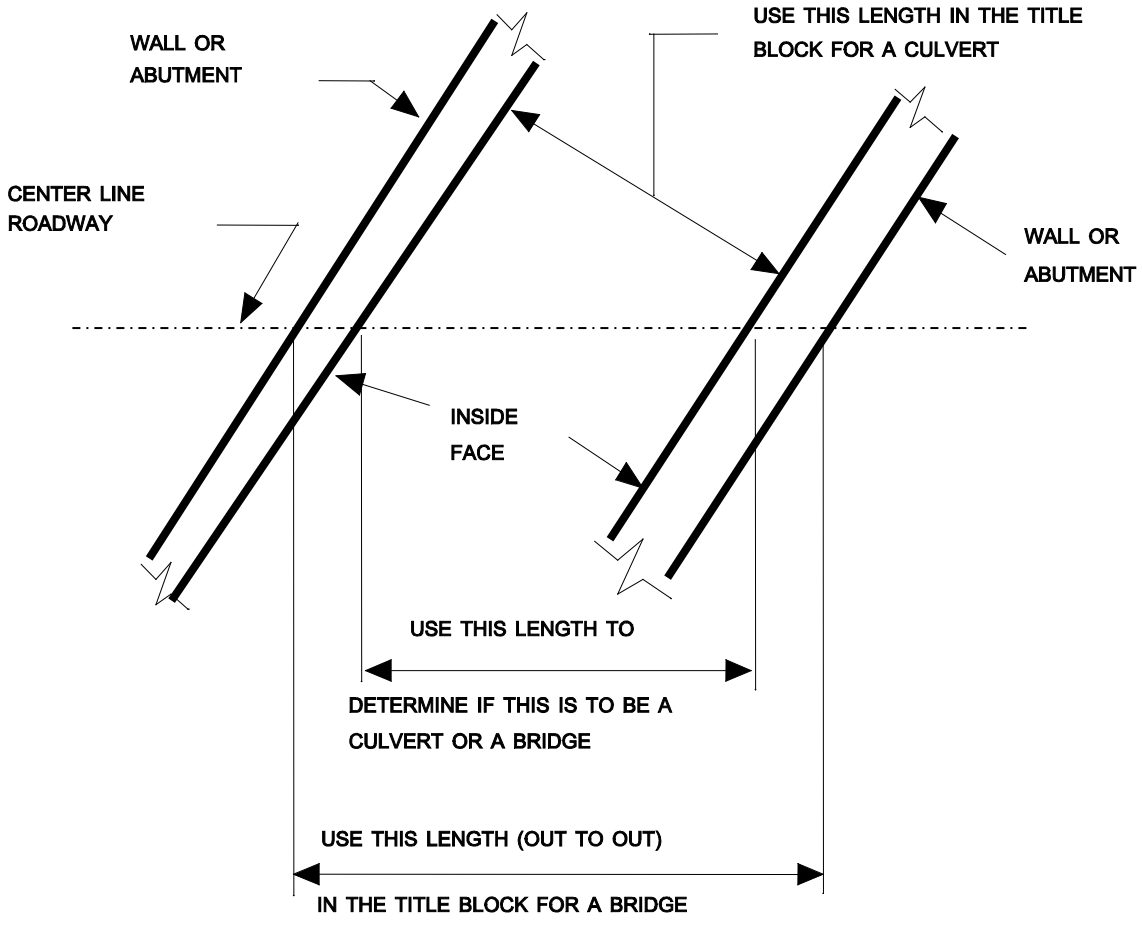
1.2 DEFINITIONS

PEDESTRIAN UNDERPASSES
Buried culverts that serve as pedestrian crossings shall be designated “pedestrian underpasses”.

DESIGNATION OF CULVERTS AND BRIDGES ON DRAWINGS
To determine whether a structure should be designated as a Culvert or a Bridge, the structure shall be measured along the centerline of roadway from the inside face of wall or abutment. If the measured length is 20 feet or less it shall be designated a culvert, if greater than 20 feet it shall be designated a bridge.

In drawings that are designated as "Culverts" the length shown in the title block shall be the clear span measured perpendicular to the walls.

In drawings that are designated as "Bridges" the length shown in the title block shall be the out to out distance of the abutments or walls measured along the centerline of roadway.



Commentary

The definition of “bridge” is in accordance with the Federal-Aid Policy Guide Title 23 CFR Section 650.403.

If the structure type is a stiffleg culvert or box culvert refer to BDM Article 17.2 for orientation of the PLAN on the S&L sheet regardless of the span length.

If the stiffleg culvert or box culvert span length exceeds 20’, show in the Title Block “25’ Box Culvert Bridge”

Revisions:

Jan 2022	Added designation of "pedestrian underpass" for buried culverts serving as pedestrian crossings.
Dec 2024	Added commentary for culvert designation in the Title Block and orientation on the S&L sheet.

1.3.3 DUCTILITY

All Structures shall be designed to be ductile. The η_D factor shall be 1.0 unless measures in addition to those already in the code are used.

1.3.4 REDUNDANCY

All Structures shall be designed to be Redundant. The η_R factor shall be 1.0 unless measures in addition to those already in the code are used. Two girder and three girder bridges shall be classified as not redundant and the η_R factor shall be 1.05.

1.3.5 OPERATIONAL IMPORTANCE

The minimum η_I factor shall be 1.0 corresponding to “typical bridges”.

A η_I factor of 1.05 corresponding to “critical or essential bridges” shall be considered when the criteria below apply. If the criteria below apply, consult your Group Leader.

- If the structure is on a route that services an emergency facility (hospital, firestation, etc.) or a major transportation facility and the detour for the emergency facility is greater than one mile, the structure should be classified as “critical or essential”.

- If the structure carries utilities (water, gas, and power) and these utilities would be considered essential in the case of a natural disaster or emergency, the structure should be considered “critical or essential”.

All bridges that are classified as “Critical” under section 3.10.5 shall be considered “Critical or Essential” under section 1.3.5 for η_I purposes.

Additional References ..\03 Load and Load Factors\3.10.5 Importance Categories.doc

Revisions:

April 2008	Changed reference to 3.10.3 to 3.10.5 to agree with the 2008 Interims and deleted ADT & Detour Length Table. Added minimum value.
Oct 2015	Reformatted article. Revised “important” to “critical or essential” to comply with the Code Article.

CHAPTER 2

GENERAL DESIGN

PROTECTION OF USERS

When a pedestrian walkway is provided on a highway bridge the walkway shall be separated from the adjacent roadway by one of the following methods:

- When the design speed is less than 45 mph a raised walkway with a minimum height barrier curb of 6 inches shall be provided.

- When the design speed is 45 mph or greater, traffic or combination railing shall be provided.

All bridge railing shall meet the requirements of Section 13 of the AASHTO LRFD Bridge Design Specifications.

Commentary

The LRFD Bridge Design Specifications require walkways to be separated from the roadway with the use of a traffic or combination rail on high-speed urban expressways. The Definition for “Speed-Low/High” is in Article 13.2.

Revisions:

June 2006 Revised the low/high design speed to 45mph to conform to the 2006 Interims.

2.3.3 CLEARANCES

For all structures with an opening greater than 10', refer to the ITD Bridge Hydraulics Manual.
All structures with an opening less than 10' shall use the Roadway Design Manual – Section 600.

2.3.3.1 NAVIGATIONAL

Bridges over US Coast Guard navigable waters shall meet the vertical clearance required by the Coast Guard or exceed the requirement of the USCG Bridge permit.

The State of Idaho is in the 13th District of the U.S. Coast Guard. The Waterways Management Branch within the 13th District handles bridge permitting and modifications. From time to time, the Coast Guard makes navigability determinations of specific waterways, or portions thereof, in order to determine its jurisdiction on those waterways. Copies of these determinations are maintained by the District Commander in the 13th District office. Decisions are subject to change and are available for review on lists and charts. Inquiries concerning whether a determination has been made for specific waters, for the purposes of Coast Guard jurisdiction, should be directed to the District Commander of the 13th District. The current contact for bridge permitting in the 13th District is:

Steve Fischer
13th Coast Guard District
Waterways Management (dpw)
Bridge Program Administrator/Chief
Thirteenth Coast Guard District
(206)220-7282
steven.m.fischer3@uscg.mil

Attached is a list of Navigable Water in the State of Idaho. These are legal determinations not necessarily determinations that a water way is in fact presently navigated. The information is dated December, 2017.

These are navigable Coast Guard waters in Idaho:
Bear Lake
Clark Fork River (from mouth to 2 miles upstream of city of Clark Fork, ID)
Clearwater River (from mouth to approx. 2 miles upstream from city of Orofino, ID)
Coeur d'Alene Lake
Coeur d'Alene River (from mouth to Rose Lake, ID)
Deadwood River
Kootenai River (entire river in Idaho)
Lake Pend Oreille
Moyie River (entire river in Idaho)
North Fork of Clearwater River (all of Dworshak Reservoir pool)
Payette River, South Fork
Pend Oreille River (entire river in Idaho)
Priest Lake
Priest River (from mouth to Priest Lake)
Salmon River (from mouth to City of Salmon, ID at Bridge Key 17885)
Sand Creek (from mouth to 2 miles upstream, near Sandpoint, ID)
Snake River (from mouth to Swan Falls Dam)
Spokane River (from Washington state line to Lake Coeur d'Alene)
St. Joe River (from mouth to Bridge Key 20355, about 13 mi. east of St. Maries, ID as the crow flies)

These waterways have been considered but found to NOT be navigable Coast Guard waters in Idaho:
American Falls Reservoir
Latour Creek (tributary of Coeur d'Alene River)
Middle Fork of the Salmon River
North Fork of Payette River
Pack River (tributary of Lake Pend Oreille)
Payette Lake
Payette River
Squaw Creek (tributary to Payette River)
St. Maries River
Teton River

The Bridge Inspection Report also identifies navigable Coast Guard waters in item 38, Navigation Control. A2.7 lists the bridges over navigable waters as of March 2021.

2.3.3.2 HIGHWAY VERTICAL

All new bridges are to be designed for 17'-0" of vertical clearance. This clearance may be reduced with prior approval from the Roadway Design Engineer, Maintenance Engineer, and Bridge Engineer, but is not to be less than 16'-0".

During construction, as much vertical clearance as possible is desirable, with 14'-9" being the minimum desirable. The minimum legal vertical clearance is 14'-0". Check with the Permits Unit in Headquarters for restrictions for each particular site.

2.3.3.3 HIGHWAY HORIZONTAL

Roadway

The structure width is generally controlled by the geometry of the approaching roadway. The required roadway widths are established in the *Roadway Design Manual*, Appendix A. For NHS Rural Highways & Local Roads refer to Appendix A.10. For Non-NHS Rural Roadways refer to Appendix A.15.

A desirable feature of a bridge structure is a full, continuous shoulder so that a uniform clearance to roadside elements is maintained. The actual roadway typical section proposed by the District should be carried through the bridge. The face of bridge rail is set to match the face of the approach roadway rail. The shy-line offset is the distance from the edge of traveled way beyond which a roadside object will not be perceived as an obstacle by the typical driver to the extent that the driver will change the vehicle's placement or speed. The offset distances shown in the Table below are recommended desirable values.

SHY-LINE OFFSET TABLE – ROADWAY RAILING	
DESIGN SPEED (MPH)	SHY-LINE OFFSET (FEET)
80	12
70	9
60	8
55	7
50	6.5
45	6
40	5
30	4

Refer to sketches on A2.4 to determine the required bridge width.

Horizontal clearances should be verified with the District and the Bridge Engineer.

Sidewalks

Sidewalks should be included on bridges if the bridge is on a pedestrian access route or sidewalks exist on the approaches to the bridge. During new construction, the lifespan of the bridge should be considered in conjunction with the planned land development in the surrounding area to determine whether sidewalks should be provided.

Raised sidewalks with a 6" minimum curb height (preferred) should be provided but should not exceed 7" at the traffic face. A combination rail separating the sidewalk from the roadway is not required if the speed is 45 mph or less.

When the speed is greater than 45 mph, provide a 42" combination rail, 42" three-tube curb mount rail, or 42" single slope concrete parapet between the roadway and at-grade sidewalk.

The sidewalk width is exclusive of the width of the curb. The minimum sidewalk clear width for pedestrian users is 5'-0" but a clear width of 6'-0" should be provided if the sidewalk is immediately adjacent to the back of the roadway curb.

The minimum sidewalk clear width for two-directional shared use path is 10'-0". 11' to 14' widths are recommended when the pedestrian users are 30% or more of the total users and total user volumes are more than 300 total users in the peak hour.

Cross slopes should be a minimum of 1% but not more than 2%. To provide construction tolerance, specify 1.5%.

Refer to sketches in A2.4.

2.3.3.4 RAILROAD OVERPASS

For bridges carrying the railroad over the highway, the vertical clearances for highway crossings shall apply.
For bridges carrying highways over the railroad, the minimum vertical clearance shall be 23'-6" from the top of rail at a point directly over the centerline of track.

For exceptions, e.g. widening of existing structures, the railroad and PUC approvals should be obtained prior to final layout.

The UPRR and BNRR/SANTA FE "Guidelines for Railroad Grade Separation Projects" have not been approved by FHWA and are considered guidelines only. The dimensions shown as minimums on the Guidelines should be considered as maximums for the purpose of determining span lengths. Exceptions to the standards that will reduce the bridge cost should be considered in the preliminary design stage of the project. Any exceptions to the standards must be approved by the railroad Chief Engineer and approval should be obtained prior to the final layout.

Some of the items where exceptions should be considered on a project-by-project basis are:

- Ditch width
- Location of the railroad pole line to eliminate or reduce the distance between the pier and the ditch slope.
- Elimination of splash boards
- Use of 1½:1 slopes on slope paving

MSE Walls within the Railroad right-of-way require written justification and request for variance for the proposed design.

The Guidelines are at https://www.up.com/cs/groups/public/documents/document/pdf_rr_grade_sep_projects.pdf

FHWA Memorandum titled *Guidelines for the Design and Construction of Grade Separation Highway Structures over or under Railroads* issued April 16, 2013.

- Federal-Aid funds are not eligible to participate in costs solely for the benefit of the railroad.
- If the railroad establishes to the satisfaction of the State transportation agency and FHWA that it has definite demand and plans for installation of additional tracks within a reasonable time, for grade separation structures Federal funds may be used to provide space for more tracks than are in place. If FHWA is not satisfied regarding the demand and plans, participation would be limited to the cost of a structure that spans the existing tracks.
- If a railroad wants to protect their bridges against over-height vehicles by providing sacrificial beams, as long as the vertical clearance criteria established by the State transportation agency is met for the specific route under the bridge, installation of such beams should be allowed as it would not restrict any highway traffic on that route. This work would be solely for the benefit of the railroad, and would not be eligible for Federal funding. The railroad would have to incur these additional costs.
- For parapets, railings and fencing for use on NHS highways over railroads, the railroad's standards govern. On a Federal-Aid project, FHWA would participate in these costs.
- For a Federal-aid non-NHS highway over a railroad, the Federal share should be limited if the State transportation agency goes beyond its own normal standards to meet higher railroad standards.

Revisions:

April 2008 — Added Coast Guard clearance requirement for bridges.
Modified waterway clearance requirements with the concurrence of the Hydraulics Engineer.

Added references to highway horizontal sketches in A2.6.
Changes culvert width for concrete porta-rail to roadway width + 10'-8".
Changed minimum railroad vertical clearance to 23'-4" to comply with BNSF/UPRR Guidelines for Railroad Grade Separation Projects, January 2007.
Added references to railroad drawings in A2.3.

June 2013	Added clarification to FHWA Memorandum titled *Guidelines for the Design and Construction of Grade Separation Highway Structures over or under Railroads* issued April 16, 2013
Mar 2015	Added requirements for using MSE Walls on Railroad right-of-way. Revised curb-curb width for culverts with clear zone not provided using concrete porta-rail to roadway width + 7'-10".
Aug 2016	Changed the span length to 20' or less and greater than 20' to agree with the Roadway Design Manual in Article 2.3.3. Added freeboard criteria for haunched girders. Increased minimum vertical clearance to 23'-6" to comply with UPRR/BNSF Guidelines for Railroad Grade Separation Projects dated May 2016. Replaced railroad standard drawings in A2.3 with 1/05/2016 drawings.
March 2018	Revised Article 2.3.3.1 to identify navigable Coast Guard waterways. Revised Article 2.3.3.3 for the required bridge width to meet the criteria for rail offset distance in standard drawing 612-1 which is taken from Table 5-7 of the AASHTO Roadside Design Guide, 4th Edition 2011.
Nov 2019	Deleted railroad standard drawings from Article A2.3 and added a link to the Guidelines.
May 2021	Corrected email address for Steve Fischer. Added Article A2.7 that lists bridges over navigable waters.
Oct 2023	Revised reference from A2.6 to A2.4 in Highway Horizontal paragraph to match renumbered article.
Dec 2024	Deleted clearance criteria for bridges and culverts over waterways and provided a link to the ITD Bridge Hydraulic Manual. Added criteria for width of sidewalks based on AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, 2nd Edition section 3.3.9.

2.5.2.1.1 Materials

WEATHERING STEEL SELECTION CRITERIA

The purpose of the office standard is to provide guidelines to the engineer for the proper application of uncoated weathering steels and to make recommendations for maintenance to ensure continued performance of the steel. This criteria is taken from the FHWA Technical Advisory "Uncoated Weathering Steel in Structures", T5140.22, dated October 3, 1989.

DESIGN

Selection Criteria

1. Environmental considerations where weathering steel may not be used.
    - High rainfall, high humidity or persistent fog.
    - Industrial areas where chemical fumes may drift onto the structure. If the sulfur trioxide level is greater than 2.1 mg/100 cm^2/day average, weathering steel shall not be used. This would apply near fertilizer plants, such as the FMC Plant in Pocatello, Potlatch Plant in Lewiston, etc.
2. Geometrics and location
    - Grade Separations - The so-called "tunnel effect" is produced by the combination of narrow depressed roadway sections between vertical retaining walls, narrow shoulders, bridges with minimum vertical clearances and deep abutments adjacent to the shoulders as are found at many urban/suburban grade separations. These roadway/bridge geometrics combine to prevent roadway spray from being dissipated by air currents and can result in excessive salt in the spray being deposited on the bridge steel. Figure 1 shown below is representative of situations where use of uncoated weathering steel should be avoided where winter deicing salt use is significant.

    NOTE: There is no evidence of salt spray causing excessive corrosion in cases of narrow bridges with wing walls parallel to the over crossing road.

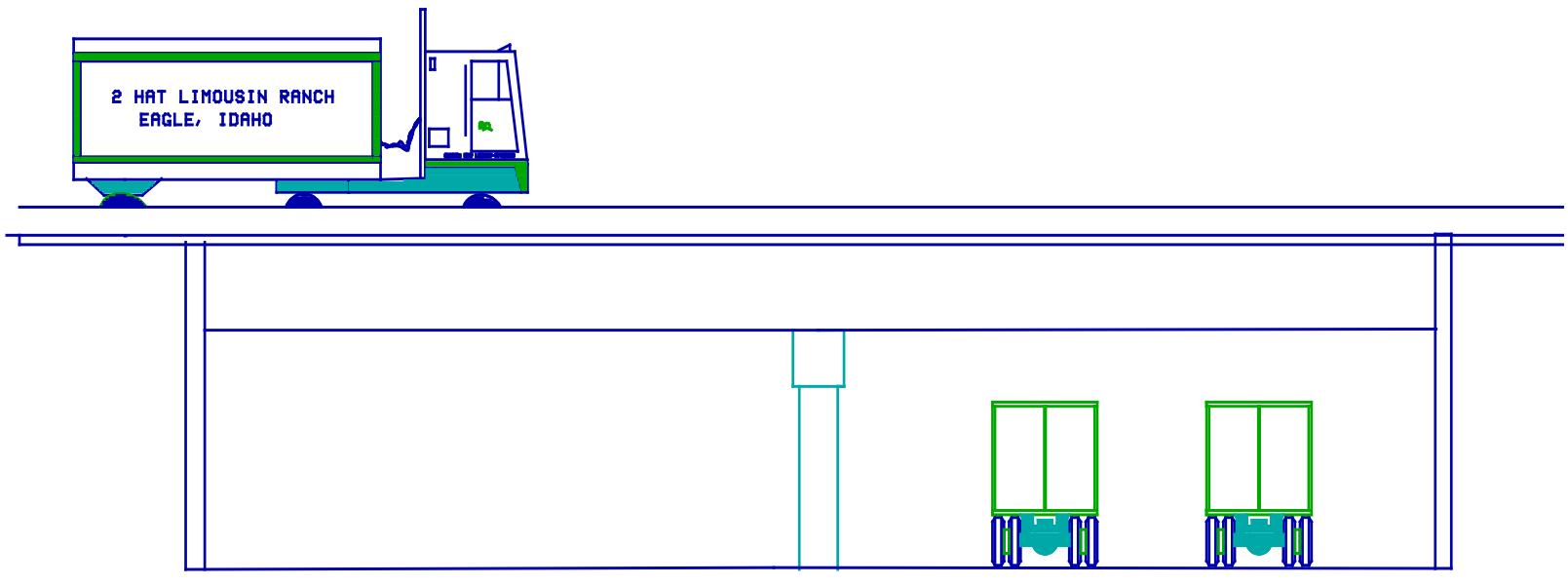


Figure 1 DEPRESSED ROADWAY TUNNEL EFFECT

    - Low Level Water Crossings - Sufficient clearance over bodies of water must be maintained so that spray or condensation or water vapor does not result in prolonged periods of wetness of the steel. Clearance to bottom flange of at least 10 feet over sheltered, stagnant water and at least 8 feet over running water is recommended.
3. Method of Selection
    - The Bridge Engineer, in cooperation with the Group Leaders, will make the selection. The selection will be based on stress, economics, environmental considerations, and aesthetics.
    - The selection will be made at the preliminary design stage.

Design Details

When weathering steel is used, the following design details should be utilized.

1. Controlling Roadway Drainage

   This is the first line of defense against localized corrosion by eliminating the exposure of the steel to contact with drainage from the roadway above, especially in areas where roadway salts are used.

   a. Joints:

      - To the extent possible, bridge joints should be eliminated. Virtually every bridge with joints has problems (corrosion, rideability, maintenance) attributable to the joint.
      - Extensive experience has shown that obtaining a permanent water-tight bridge joint is an elusive goal. Therefore, when joints are necessary, the assumption should be that the joints will leak and that drainage will contact the steel. Therefore, all steel within a minimum distance of 1 1/2 times the depth of the girder from the joint should be coated. In addition, Finger Joints shall not be used with weathering steel bridges unless given prior approval of the Bridge Engineer.
      - Drip bars on the top and bottom of the lower flanges can be effective in intercepting drainage and preventing it from running long distances along the flange and causing corrosion of the uncoated steel. However, welding of any attachment to the tension flange should be considered only after a thorough analysis of the impact of the attachment on fatigue life of the member.

   b. Drains

      - The spacing between drainage scuppers should be maximized in accordance with established hydrologic and hydraulic design. The FHWA Publication HEC 21, "Bridge Deck Drainage Guidelines", provides sound recommendations in this regard. Refer to Bridge Design Manual Article 2.6.6 for a design procedure. As scupper spacing increases, the volume of water required to pass through each scupper increases, thus creating velocities high enough to flush outlets clogged by deposits from low volume rainfalls.
      - Scupper downspouts should be designed and placed such that drainage will not contact the steel surface. However, details used to connect scuppers to drain pipes have often created more problems than they have prevented. Do not use flat runs of piping and elbows which clog or connections that separate. Careful detailing is critical.
      - Scupper drain pipes should not be routed through closed box sections where leakage inside of the box is possible, and may go undetected for long periods of time.

2. Other Features

   a. Water Traps

      - All details must be designed to provide natural drainage. Small copes in corners of plates or small drain holes are easily plugged, and should not be relied on to provide drainage.

   b. Box Sections

      - Box sections that are too small to provide for adequate visual inspection and access for maintenance personnel should be painted and weep holes to allow proper drainage and circulation of air should be provided.
      - Larger boxes should be detailed to minimize the entrance of water, debris and dirt that can promote corrosion. They must also provide for natural drainage of water that may enter and adequate access for inspection, cleaning and maintenance when necessary. Precautions should include:
         1. Locked covers or screens over access holes to prevent the entry of animals and birds or unauthorized personnel. Covers over manholes should be on hinges and provided with a lock to allow easy access by inspection personnel.
         2. Provision of positive drainage and adequate ventilation to minimize the wetting of the interior surfaces from water or condensation.
         3. Painting of the inside of the box members should be considered. Weep holes should also be provided to allow for proper drainage and air circulation.

   c. Concrete Surfaces

      After passing over uncoated weathering steel, drainage leaves dark, non-uniform and often unsightly stains on concrete surfaces. This problem can be mitigated, if desired, by using one or more of the following approaches:

      - Wrapping the piers and abutments during construction to minimize staining while the steel is open to rainfall.
      - Allowing/requiring the contractor to remove staining with a commercial solvent after completion of construction.

- Applying epoxy or some other material to coat and/or seal the concrete surfaces against staining.

d. Overlapping surfaces
If water is allowed to flow over overlapping joints, capillary action can draw the water into the joint and cause "rust-pack" to form. Therefore, the contact surfaces of overlapping joints must be protected from intrusion of rainfall and runoff. This applies to non-slip-critical bolted joints as well as to overlapped joints such as those in tapered high mast lighting poles. The faying surfaces should be painted or sealed to prevent the capillary penetration. In slip-critical bolted splices, "rust-pack" should not occur when the bolts are spaced as per AASHTO specifications.

e. Fascia Girders
There is no evidence that coating the entire fascia girder will add to the service life of an otherwise uncoated bridge. Therefore do not paint exterior girder except in the area of expansion joints.

MAINTENANCE

Effective inspection and maintenance programs are essential to ensure that all bridges reach their intended service life. This is especially true in the case of uncoated weathering steel bridges. The following maintenance actions should be done routinely:

Inspection

Implement inspection procedures that recognize the unique nature of uncoated weathering steel and the conditions resulting from excessive corrosion damage. Develop inspection guidelines that highlight the structural features to be inspected and also illustrate the difference between the desired oxide coating and excessive rust scaling. Measurements of the oxide coating thickness should be taken during each bridge inspection and recorded in the bridge inspection reports.

Controlling Roadway Drainage To the extent feasible the following should be done:

- Divert approach roadway drainage away from the bridge structure.
- Clean troughs of open (finger) joints and reseal "watertight" deck joints.
- Maintain deck drainage systems (scuppers, troughs, etc.) in order to divert deck drainage away from the superstructure steel and substructure units.
- Periodically clean and repaint all steel within a minimum distance of 1 1/2 times the depth of the girder from bridge joints.

Other Maintenance

- Remove dirt, debris and other deposits that hold moisture and maintain a wet surface condition on the steel. In some situations, hosing down a bridge to remove debris and contaminants may be practical and effective. Some agencies have a regularly scheduled program to hose down their bridges.
- Maintain screens over access holes in box sections to prevent entrance by animals and birds.
- Remove growth of nearby vegetation that prevents the natural drying of surfaces wet by rain, spray or other sources of moisture.

Commentary

FHWA Technical Advisory T5140.22 can be found at http://www.fhwa.dot.gov/legsregs/directives/techadvs/t514022.htm

HEC-21 can be found at http://www.fhwa.dot.gov/bridge/hec21.pdf

2.5.2.3 MAINTAINABILITY

Bearing Replacement

New bridges with replaceable bearings should have provisions shown on the plans for jacking the superstructure. Refer to Article 3.4.3 for jacking forces.

The minimum space for the jacks should be 10” in height and 11” in diameter.

An additional jacking stiffener in front of the bearings may be required on steel girder bridges. Concrete girder bridges should provide room to either jack on the girder in front of the bearings or jack on the diaphragm beside the bearings.

2.5.2.4 RIDEABILITY

Approach Slabs

Application

Approach slabs shall be used when the roadway approaches are concrete pavement or with integral abutments as specified in Article 11.6.1.3. When the approaches are asphalt pavement and the abutment is not an integral type, the designer shall determine the need for an approach slab with the concurrence of the Group Leader. If the approach slab is not constructed when the bridge is built then it will probably never be required. For this reason, do not provide a paving notch in the abutment or the dowel bars for an approach slab if one is not required for the original design.

Design Notes

The 12" thickness assumes a 10' unsupported span. This meets the requirements of AASHTO Article 2.5.2.6.3 for simple spans.

Dead loads include the weight of the approach slab, concrete parapets, and 2⅜" future wearing surface.

The design is based upon Strength 1 and Service 1.

Standard Drawing Notes

The Standard Drawing shall be modified to meet the details for each specific project. Only the details that apply should be shown. If any of the design parameters are exceeded, the design should be checked.

Designer Notes

Place the abutment joint detail shown on the Approach Slab Details – Sheet 3 on the abutment details sheet. This will show the approach slab dowel bars that need to be placed in the abutment.

Geosynthetic Reinforced Abutment Backfill (GRAB) is not required if an approach slab is used. Consult with your Group Leader if both GRAB and an approach slab are requested by the District or Geotechnical Engineer.

GRAB shall not be used on buried structures unless approved by the ITD Group Leader.

Revisions:

Sep 2020	Added reference to Article 11.6.1.3 for integral abutments that requires approach slabs when the total thermal movement is greater than ¾".
Oct 2023	Added Designer Notes for showing approach slab joint detail on the abutment sheet. Added note for use of GRAB with an approach slab and not used on buried structures.

2.5.2.5 UTILITIES

UTILITIES INSTALLED WITH NEW CONSTRUCTION

General

Utility facilities should be allowed on structures in accordance with the ITD Utility Accommodations Policy. If utilities are allowed on the structure, the bridge designer shall determine the method of attachment and the location.

Bridge plans shall include all hardware specifications and details for the utilities installed during original construction. All materials and workmanship shall be in accordance with the current edition of the Idaho Transportation Department Standard Specifications for Highway Construction. Water, sewer, and gas lines shall only be installed during original construction.

Provisions for future telephone, power, and cable utility attachments shall include installation of sleeves from the roadway shoulder through the abutment backwall, intermediate diaphragms, and pier diaphragms. Threaded inserts shall also be provided in the bottom of the deck slab for future utility hangars.

Design Criteria

All utilities and utility supports shall be designed according to the AASHTO LRFD Bridge Design Specification to resist Strength and Extreme Event Limits States. This includes and not limited to dead load, expansion, surge, and earthquake forces.

Location

Utilities should be located, if possible, such that a rupture or support failure will not result in damage to the bridge, the surrounding area, or be a hazard to traffic. The utility installation shall be located so as to minimize the effect on the appearance of the structure and shall not affect bridge maintenance or bridge inspection activities. For new construction, the utility should be installed between girders. For attachment to an existing bridge, the utilities may be installed on the cantilevered portion of the deck. Utilities shall not be attached above the bridge deck nor attached to the railings or posts. Utilities and supports must not extend below the bottom of the superstructure. When appurtenances such as air release valves are required, care should be taken to provide adequate space.

Termination at Bridge Ends

Utility conduit and encasements shall extend beyond the end of the bridge/approach slab and shall extend to the roadway shoulder using acceptable bends or radius sweeps. Conduits and encasements installed for future use shall have the ends capped. The details shall be shown on the bridge plans and coordinated through the Utilities Engineer.

Expansion Joints

The utilities shall be designed with a suitable expansion system as required to prevent longitudinal forces from being transferred to bridge members.

Water mains generally remain a constant temperature and are anchored in the ground at the abutments. However, the bridge will move with temperature changes and seismic forces. Pipe support systems must be designed to allow for the bridge movements. For short bridges, this generally means the bridge will move and the utility will not since it is anchored at the abutments. For long bridges that require pipe expansion joints, design must carefully locate pipe expansion joints and the corresponding longitudinal load-carrying support.

Electrical conduits that use PVC should have an expansion device for every 100’ of pipe due to the higher coefficient of expansion. If more than two joints are specified, a cable or expansion limiting device is required to keep the ends from separating.

Pipelines for Fluids and Gases

The pipeline material shall be appropriate to handle the capacity and loads required, with due care taken to protect the structure and traffic. All pipelines carrying fluids and gases shall be encased the length of the structure in an acceptable encasement pipe and braced for lateral loading. The space between the carrying pipe and the encasement sleeve shall be effectively vented and drained beyond the structure at each end and at high points. Generally, a sleeve approximately 3” larger than the outside diameter of the encasement pipe shall be used to pass the utility through concrete diaphragms or abutments.

Pipelines transporting fluids and gases shall provide shut-off valves, either manual or automatic, at or near each end of the structure to provide a means of control in case of an emergency.

All pipe systems under pressure shall state the maximum operating and test pressure on the plans.

When exposed steel utility lines and supports are attached to a painted structure, they shall be painted in accordance with ITD Standard Specifications and the final coat shall match the bridge color. Any painted surfaces damaged during construction shall be cleaned and painted as directed by the Engineer. Any paint splatters shall be removed from the bridge.

Volatile Fluids
The utility company shall make provisions to electrically insulate pipelines carrying volatiles from its support.

Water and Sewer Lines
Water and Sewer lines should be steel pipe. Transverse support or bracing shall be provided for all water lines to carry Strength and Extreme Event Lateral Loading.

In box girders (closed cell), a rupture of a water line will generally flood a cell before emergency response can shut down the water main. This will be designed for an Extreme Event II load case, where the weight of water is a dead load (DC). Additional weep holes or open grating should be considered to offset this Extreme Event.

Water or sewer lines to be placed lower than adjacent bridge footings shall be encased if failure can cause undermining of the footing.

Telephone, Power, and Cable Conduit
All conduits shall be rigid. Conduits shall be galvanized steel pipe, PVC pipe of a UL approved type, or an approved equal. Schedule 40 PVC shall be used when the conduit is encased in concrete. Schedule 80 PVC shall be used when the conduit is exposed. All metal fittings shall be galvanized in accordance with AASHTO M-111 or M-232 (ASTM A-123 or A-153 respectively). PVC pipe may be used with suitable consideration for deflection, placement of expansion fittings, and of freezing water within the conduits.

Utility Supports
Where such conduit is buried in concrete curbs or barriers or has continuous support, such support is considered to be adequate. Where hangers or brackets support conduit at intervals, the distance between supports shall be small enough to avoid excessive sag between supports. Utility supports shall be designed so that any loads imposed by the utility installation do not overstress the conduit, supports, bridge structure, or bridge members.

Designs shall provide longitudinal and transverse support for loads from gravity, earthquakes, temperature, inertia, etc. It is especially important to provide transverse and longitudinal support for single rod and other similar inserts that cannot resist moment.

Attachment of conduits or brackets to non-prestressed concrete members shall be with epoxy bond anchors. There should be a minimum of 3” edge distance to the centerline of bolt holes in concrete. Drilling into prestressed concrete members for utility attachments shall not be allowed. All welding must be approved and welding across main members will not be permitted. All steel in utility supports, including fastenings and anchorages, shall be galvanized in accordance with AASHTO M-111 or M-232 (ASTM A-123 or A-153 respectively).

The following types of supports are generally used for various utilities. Selection of a particular support type should be based on the needs of the installation and the best economy.
<u>Concrete Embedment</u>
This is the best structural support condition and offers maximum protection to the utility. Its cost may be high for larger conduit and the conduit cannot be replaced.

<u>Pipe Hangers</u>
Utility lines should be suspended by means of cast-in-place anchors, whenever possible. This is the most common type of

support for utilities to be hung under the bridge deck. This allows the use of standard cast-in-place inserts and is very flexible in terms of expansion requirements. Refer to Bridge LRFD Manual pages B2.4A and B2.4B for suggested details. To avoid complete failure of the utility hanger system by failure of one hanger for heavy pipes over traffic (10" water main or larger), the Extreme Limit State should be used assuming one hangar has failed. Vertical Anvil Insert, Figure 282 or similar inserts, will not provide resistance to longitudinal forces. Transverse supports must be provided by a second hanger extending from a girder or by a brace against the girder. Where PVC conduit is to be supported by hangers or pedestals at intervals, the distance between supports shall be small enough to avoid excessive sag of the conduit. Refer to Article A2.5 for recommended support spacing for PVC pipe.

UTILITIES INSTALLED ON EXISTING BRIDGES

General

Requests to install utilities on existing structures should follow the procedures outlined in the ITD Guide for Utility Management. Utilities shall not be allowed to attach to a highway structures until approved by ITD. Attachment details should be shown on the existing bridge plan sheets that can be obtained from the ITD Bridge Section. Design for utilities attached to existing structures should follow the same requirement as utilities installed with new construction. Any existing utilities on the same side of the structure as the proposed utility should be shown on the plans. The utility company shall be responsible for calculating design stresses in the utility and design of the support system. All calculations shall be on 8½"x11" paper and stamped by an engineer licensed in Idaho. Plans shall be either 11"x17" or 22"x34" sheets and stamped by an engineer licensed in Idaho.

Pipelines for Fluids and Gases

Bridges are not designed to carry the extra weight of future pipelines for fluids and gases. Adding these pipelines to an existing bridge will normally produce an overstress in the members. Design calculations are required to verify that no overstress occurs in the members and the live load carrying capacity of the bridge is not reduced.

Revisions:

June 2006	Added new article.
Aug 2016	Added criteria for Schedule 40 or Schedule 80 PVC conduits.

2.5.2.6.2 CRITERIA FOR DEFLECTION

Structures shall be designed according to the provisions of this article.

2.5.2.6.3 CRITERIA FOR SPAN -TO-DEPTH RATIOS

Flexural members of bridge structures shall be designed to have adequate stiffness to limit deflections or any deformations that may adversely affect the strength or serviceability of the structure at service load plus impact.

The minimum span to depth ratios are recommended unless computation of deflection indicates that lesser depths may be used without adverse effects.

The span length of members that are not built integrally with their supports shall be considered the clear span plus the depth of the member but need not exceed the distance between centers of supports.

The span length of continuous members shall be considered at the faces of support. When fillets making an angle of 45 degrees or more with the axis of the member are built monolithic with the member and support, the face of support shall be considered at a section where the combined depth of the member and fillet is at least 1.5 times the thickness of the member.

Reference: Span length definitions are from Article 8.8 of the AASHTO Standard Specifications, 16th Edition.

Revisions:
Aug 2016 Added reference to 16th Edition for definition of span length.

2.5.3 CONSTRUCTIBILITY

All provisions of this article shall apply. Refer also to Article 6.10.3.2 for Steel Structures.

2.6.6 ROADWAY DRAINAGE

I. BASIC CONCEPTS

In the design of bridge drainage facilities, the aim is to keep the traveled way free from hazardous flooding except infrequent, excessively heavy rainstorms. Roadway drainage inlets must be provided to remove water upstream of the structure.

To remove the storm water from the bridge deck, the standard drain inlet shall be used. The deck is used to carry the storm water to these drain inlets. The drains are placed according to hydraulic principles and located next to the curbing. The collected water should be dropped over the median or slope paving. Flexible sealers are used at expansion joints to prevent undesirable leakage through the deck. As a minimum, place one Type I Deck Drain upstream (approximately 10 ft), of any expansion joint to reduce leakage onto the substructure. The intent is to remove the gutter flow ahead of the expansion joint except for larger storms that will infrequently splash over the drain and wet the expansion joint.

The preferred drain is the Type 1. Use the type 2 drain when a larger opening is required by the design procedure. The Type 3 drain should only be used with voided slabs, box beams, and deck bulb tee type structures.

For further reference, see Hydraulic Engineering Circular No. 21, May 1993, "Design of Bridge Deck Drainage."

II. DECK DRAIN LOCATION

1. Avoid locations over Highway or Railroad travel way as piping will be required.

2. Locate over medians, water or slope paving. If over a median, provide a suitable splash pad or downspout to eliminate unsightly erosion.

3. Low points. Usually these will include at least one and frequently all four corners of the bridge deck. In each case the drain shall be placed as close to the corner of the deck as practicable.

4. In the case of bridges where the approach grade is downward toward the bridge, removal of runoff must be handled in the roadway plans. Runoff exiting the structure must be handled similarly. Assurances to this effect should be obtained from the appropriate area engineer. If received verbally, record it in writing and file it in the subject files. Note on **Situation & Layout** sheet for roadway plans to pick up runoff and the volume of runoff involved.

5. Flat areas will require further investigation. Check if bridge can be sloped.

6. Trash, gravel, and ice are the main consideration in designing drainage piping systems.

III. DESIGN PROCEDURE

Refer to Bridge Design Manual Appendix 2.1

Commentary

HEC-21 can be found at http://www.fhwa.dot.gov/bridge/hec21.pdf

Refer to NCHRP 67 for designing drainage piping systems.

Bridge Deck Drain Design Procedure

DEFINITION OF SYMBOLS

A = contributing drainage area (acres)

C = Runoff coefficient (ratio of impervious to pervious drainage area). Use 0.9

d = water film depth Use 0.006 ft.

E = inlet interception efficiency

$$E = R_f * E_o$$

E_o = Ratio of frontal flow to total gutter flow

$$E_o = 1 - \left[1 - \frac{W_d}{T}\right]^{2.67}$$

G1 = Incoming tangent grade on a vertical curve. Ft/ft

G2 = Outging tangent grade on a vertical curve. Ft/ft

i = design rainfall intensity (in/hr) Use the value from the Rational Method and compare to the Avoidance of Hydroplaning and Driver Vision Impairment.

Rational Method

1. Select the rainfall intensity zone from the map.
2. Make a trial selection of duration and compute the trial intensity.

$$t_c = t_0 + t_g \qquad t_0 = 0.93 * \frac{(W_p * n)^{0.6}}{(C * i)^{0.4} * S^{0.3}} \qquad t_g = 484 * \frac{S_x * T^2}{C * i * W_p}$$

3. Using the trial intensity value, compute the total time of concentration
4. The design intensity is the value when the trial duration equals the calculated total time of concentration.

Avoidance of Hydroplaning

$$i = \left[\frac{64904.4}{C * n}\right]\left[\frac{S_x}{\left(S_x^2 + S^2\right)^{0.25}}\right]\left[\frac{d^{1.67}}{\left(W_p - T\right)}\right] \text{ (in/hr.)}$$

Driver Vision Impairment

i = 4.0 in/hr

IDF = intensity-duration-frequency curve. See Figure 1 for the Rainfall Intensity Zone. The inlet design is based upon a 25-year frequency. The intensity for a given duration can be computed from the following equations:

Zone 1	duration < 60 minutes	$i = 10^{0.894094 - 0.55912 * \log(duration)}$
	duration > 60 minutes	$i = 10^{1.132115 - 0.69398 * \log(duration)}$
Zone 2	duration < 60 minutes	$i = 10^{1.132076 - 0.60121 * \log(duration)}$
	duration > 60 minutes	$i = 10^{1.375147 - 0.75708 * \log(duration)}$

K = inlet interception coefficient on vertical curve bridges

$$K = 1 - (1 - E) * \left(\frac{S_u}{S}\right)^{0.5}$$

L_c = distance between deck drains after the first inlet (ft)

Drains on tangent grade

$$L_c = \frac{43560 * Q_f * E}{C * i * W_p}$$

Drains on flat grade

$$L_c = \frac{1312 * S_x^{1.44} * T^{2.11}}{(n * C * i * W_p)^{0.67}}$$

L_0 = distance to first deck drain (ft)

$$L_0 = \frac{43560 * Q_f}{C * i * W_p}$$

L_D = length of deck drain parallel to gutter flow (ft)

Type 1 Drain = 0.78 ft.

Type 2 Drain = 0.79 ft.

L_{vc} = length of vertical curve (ft)

n = Manning's friction coefficient (0.016)

P = total inlet perimeter for flat grade bridges (ft)

$$P = \frac{\left(C * i * W_p\right)^{0.33} * T^{0.61}}{102.5 * S_x^{0.06} * n^{0.67}}$$

Q_f = full gutter flow at design spread (cfs)

$$Q_f = \frac{0.56}{n} * S_x^{1.67} * S^{0.5} * T^{2.67}$$

Q_R = flow calculated with rational formula (cfs)

$$Q_R = C * i * A$$

R_f = frontal flow interception efficiency

$$R_f = 1 - 0.09 * \left(V - V_0\right)$$

S = grade of bridge deck at a given drain (ft/ft)

Drains on vertical curve

$$S = G1 + \frac{\left(G2 - G1\right) * X}{L_{vc}}$$

S_u = longitudinal grade for upstream inlet on vertical curve bridge

S_x = cross slope of deck (ft/ft)

T = design spread (ft) The design spread is calculated assuming that the gutter flow can spread across the full shoulder width on bridges with not more than 2 traffic lanes. For bridges with more than 2 traffic lanes, the gutter flow can spread across the full shoulder width and half of the adjacent traffic lane width.

V = gutter flow velocity (ft/sec)

$$V = \frac{1.12}{n} * S_x^{0.67} * S^{0.5} * T^{0.67}$$

V_o = Velocity of flow at which splash-over first occurs over a grate (ft/s.)

Type 1 Drain

$$V_0 = 10^{0.50299 * \log\left(L_d\right) + 0.759359}$$

Type 2 Drain

$$V_0 = 10^{0.654078 * \log\left(L_d\right) + 0.474699}$$

W_p = width of pavement contributing to runoff (ft) equals the width of deck from the face of curb to high point of crown.

W_D = width of deck drain at right angle to gutter flow (ft)

Type 1 Drain = 0.448 ft

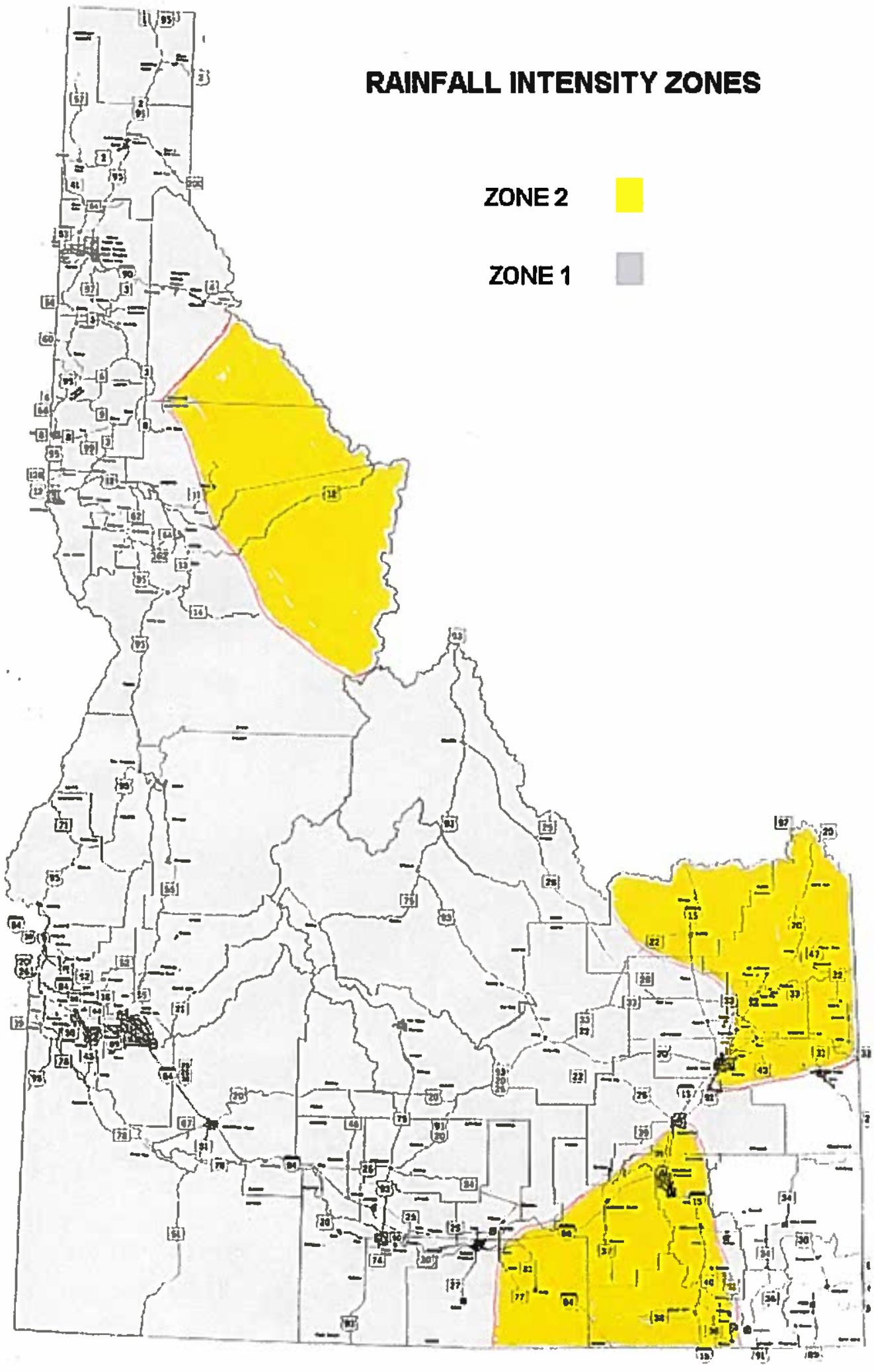
Type 2 Drain = varies

X = distance from the PC of a vertical curve to the inlet (ft)

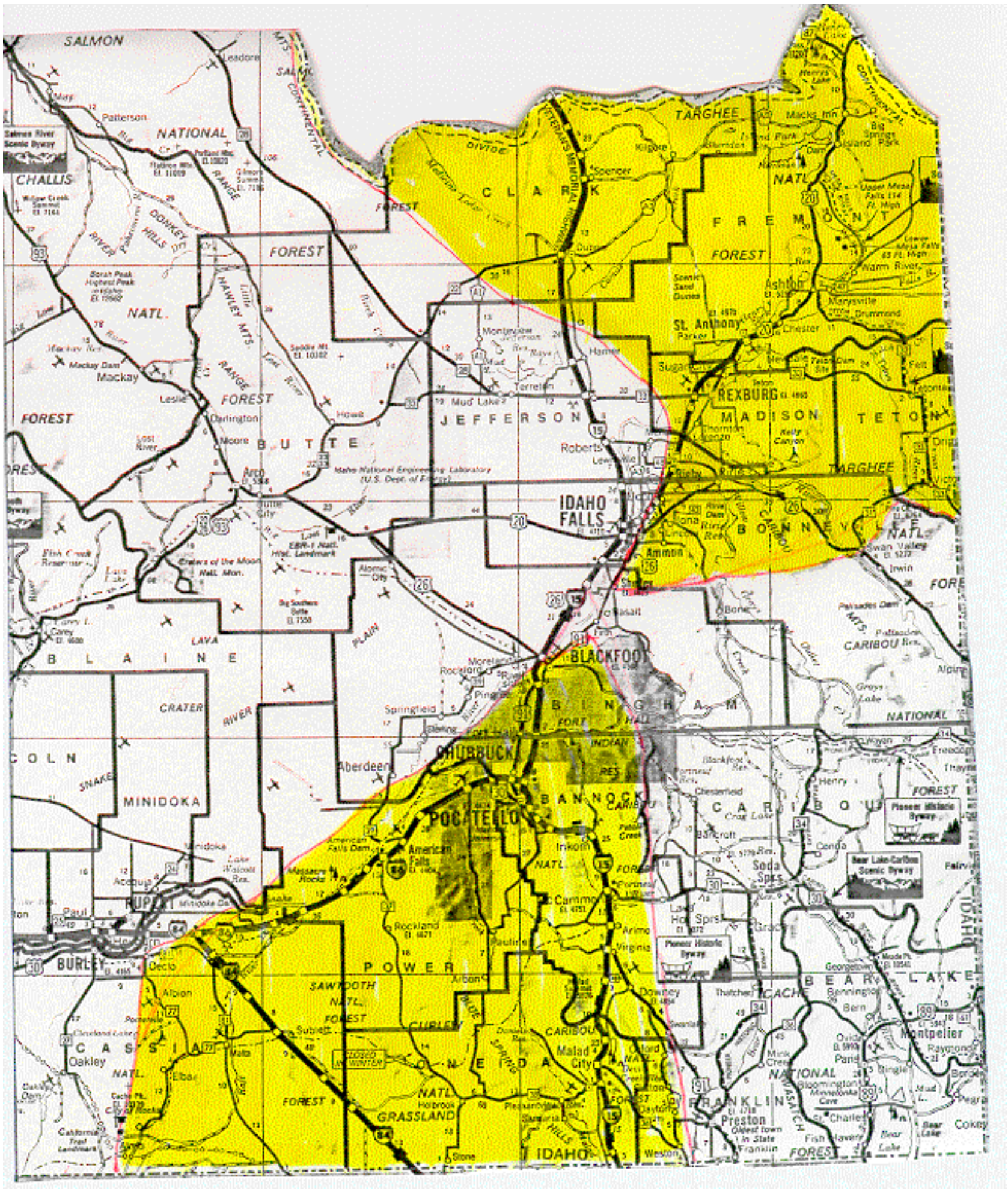
X_T = distance from PC of a vertical curve to the turning point (ft)

$$X_t = \frac{-G1 * L}{\left(G2 - G1\right)}$$

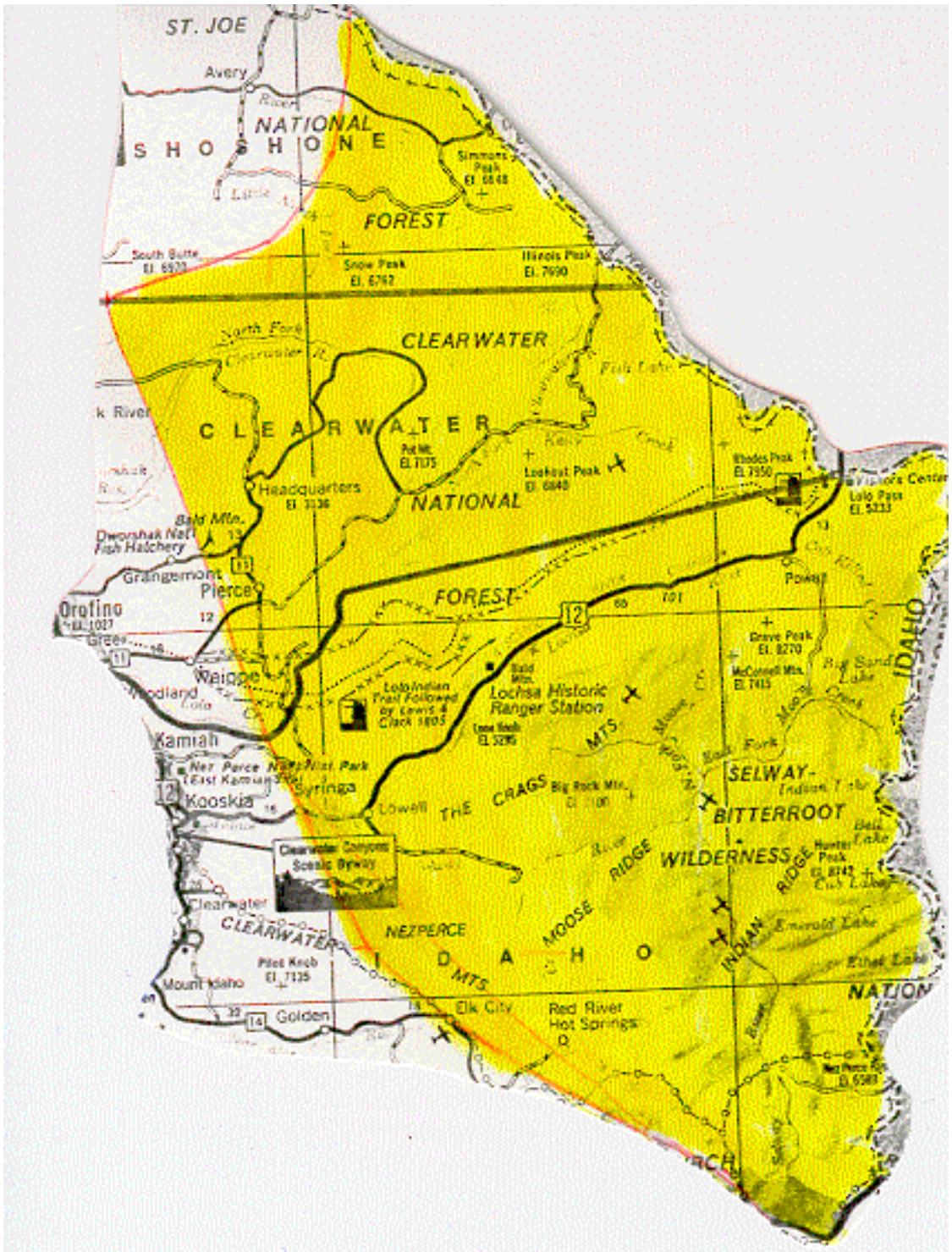
Figure 1



ZONE 2 – INSET 1



ZONE 2 – INSET 2



DESIGN PROCEDURE FOR CONSTANT GRADE BRIDGES

If the bridge grade is less than 0.3 percent, then the procedure for flat bridges should be followed.

1. Determine the rainfall intensity.
    - Calculate the intensity using the Rational Method
    - Calculate the intensity using the Avoidance of Hydroplaning Method
    - Intensity due to Vision Impairment is 4.00 in/hr.
    - Use the Rational Method value for the design intensity
    - Compare the Rational Method value to the Avoidance of Hydroplaning and Vision Impairment values
2. Calculate the full gutter flow, Q_f, at the design spread, T.
3. Calculate the distance to the first inlet, L_0, from the upslope end of the bridge.
4. Determine if inlets are needed on the bridge.
    - If L_0 is greater than the total bridge length, no inlets are required.
    - If L_0 is less than the total bridge length, calculate the spacing between inlets, L_c.
5. Space inlets at L_c until the end of the bridge is reached.
6. Design the bridge end treatment.

    Inlets beyond the end of the bridge should be sized for a flow. Energy dissipation devices should be provided, if necessary, at the toe to prevent erosive velocities.
    - Where debris is a problem, assume a percentage of blockage of the drains.
    - Assume a duration time and design spread width.
    - Calculate the intensity using the Rational Method.
    - Compute t_c and compare to the assumed duration time. Iterate until the assumed and computed values are equal.
    - Compute the design flow.
    - Compute the spread.
    - Iterate until the assumed duration and spread values are equal to the computed values.

DESIGN PROCEDURE FOR FLAT GRADE BRIDGES

Bridges with vertical curves are nearly flat at their low or high points. For bridges with grades less than 0.3 percent at the high or low points of vertical curves or on a constant grade, check the required inlet spacing assuming the bridge is flat. Use the flat spacing if it is less than the spacing required for a constant grade.

1. Determine the rainfall intensity using the Rational Method.
    - Use a duration of 5 minutes
    - Determine the Rainfall Intensity Zone for the bridge site and compute the intensity
2. Calculate the constant inlet spacing, L_c.
3. Determine if inlets are needed on the bridge.
    - If L_c is greater than the total bridge length, no inlets are required.
4. If inlets are needed, calculate the required inlet perimeter, P.
5. Design the bridge end treatment.

DESIGN PROCEDURE FOR VERTICAL CURVE BRIDGES

1. Compute the distance from the turning point of the vertical curve to each end of the bridge.
2. Determine the rainfall intensity using the Rational Method.
    - Assume a duration and compute the intensity.
    - Compute the time of concentration, t_c, by summing the gutter and overland flow times, t_0 and t_g.
    - Iterate until t_c equals the assumed duration.
3. Determine the spacing to the first inlet.
    - Assume a distance from the turning point to the first inlet and compute the slope at that point.
    - Compute the gutter flow, Q_f., at the design spread.
    - Compute the distance to the first inlet, L_0, letting K=1.
    - Iterate the process until the trial and computed values are equal.
    - If L_0 is greater than the distance from the turning point to the end of bridge, than inlets are not required.
4. Determine the spacing to the next inlet, if required.
    - Select a trial spacing
    - Compute the local slope, S.
    - Calculate the gutter flow, Qf.

- Compute the inlet efficiency, E.
- Compute the interception coefficient, K.
- Compute the inlet spacing and compare to the trial value.
- Iterate the process until the trial and computed values are equal.

5. Repeat step 4 until the sum of the inlet spacing is greater than the distance from the turning point to the end of bridge.
6. Repeat steps 3, 4, & 5 for the drains on the other side of the turning point.
7. Design bridge end treatment.

EXAMPLE 1 - TANGENT GRADE BRIDGE WITH NO INLETS REQUIRED

EXCEL or MATHCAD programs can be used to complete the design process. *Drains on tangent grade(.xls or .mcd)* is on the X: drive in the LRFD Design Aids, Section 2 folder.

Given:	500 ft bridge	S = 0.03	S_x = 0.02
	W_p = 18 ft	T = 10 ft	n = 0.016
	C = 0.9	Zone 2	d = 0.006 ft

Step 1. Calculate the Design Rainfall Intensity

a. Rational Method

Assume duration of 44 minutes

$$i = 10^{1.132076 - 0.60121 * \log(duration)} = 10^{1.132076 - 0.60121 * \log(44)} = 1.39\ in/hr$$

$$t_0 = 0.93 * \frac{(W_p * n)^{0.6}}{(C * i)^{0.4} * S^{0.3}} = 0.93 * \frac{(18 * 0.016)^{0.6}}{(0.9 * 1.39)^{0.4} * 0.03^{0.3}} = 1.15\ \text{min}utes$$

$$t_g = 484 * \frac{S_x * T^2}{C * i * W_p} = 484 * \frac{0.02 * 10^2}{0.9 * 1.39 * 18} = 42.95\ \text{min}$$

$$t_c = t_0 + t_g = 1.15 + 42.95 = 44.10\ \text{min}$$

The assumed time of 44 minutes is approx. equal to the computed time of 44.10 minutes.

Therefore, use i = 1.39 in/hr.

b. Avoidance of Hydroplaning

$$i = \left[\frac{64904.4}{C * n}\right]\left[\frac{S_x}{(S_x^2 + S^2)^{0.25}}\right]\left[\frac{d^{1.67}}{(W_p - T)}\right] = \frac{64904.4}{0.9 * 0.016} * \frac{0.02}{(0.02^2 + 0.03^2)^{0.25}} * \frac{0.006^{1.67}}{(18 - 10)} = 11.56\ in/hr$$

c. Avoidance of Vision Impairment

i = 4.00 in/hr

d. Design rainfall intensity = 1.39 in/hr

Step 2. Compute full gutter flow based on the design spread of 10'.

$$Q_f = \frac{0.56}{n} * S_x^{1.67} * S^{0.5} * T^{2.67} = \frac{0.56}{0.016} * 0.02^{1.67} * 0.03^{0.5} * 10^{2.67} = 4.12\ cfs$$

Step 3. Starting at the upslope end of the bridge, compute the distance to the first inlet.

$$L_0 = \frac{43560 * Q_f}{C * i * W_p} = \frac{43560 * 4.12}{0.9 * 1.39 * 18} = 7969.94\ ft$$

Step 4. Since L_0 is greater than the total bridge length (500 ft), no inlets are required.

Step 5. Design the bridge end treatment.

- Since no drains are required, the assumed blockage = 0%
- Assumed duration = 4.5 minutes Assumed spread = 6 feet

$$i = 10^{1.132076 - 0.60121 * \log(duration)} = 10^{1.132076 - 0.60121 * \log(4.5)} = 5.49\ in/hr$$

$$t_0 = 0.93 * \frac{(W_p * n)^{0.6}}{(C * i)^{0.4} * S^{0.3}} = 0.93 * \frac{(18 * 0.016)^{0.6}}{(0.9 * 5.49)^{0.4} * 0.03^{0.3}} = 0.67\ \text{min}$$

$$t_g = 484 * \frac{S_x * T^2}{C * i * W_p} = 484 * \frac{0.02 * 6^2}{0.9 * 5.49 * 18} = 3.92\ \text{min}$$

$$t_c = t_0 + t_g = 0.67 + 3.92 = 4.59\ \text{min}$$

4.59 minutes are approx. equal to the assumed value of 4.5 minutes.

- Compute the design flow with the percent blockage

$$Q = C * i * A - [(blockage) * E * (number\ of\ \ drains) * V]$$

$$A = \frac{W_p * (length\ of\ \ bridge)}{43560} = \frac{18 * 500}{43560} = 0.207\ acres$$

$$Q = 0.9 * 5.49 * 0.207 - [0] = 1.02\ cfs$$

- Check the design spread with the new computed flow. Compute the spread by solving the gutter flow equation for T.

$$Q_f = \frac{0.56}{n} * S_x^{1.67} * S^{0.5} * T^{2.67}$$

$$T = \left(\frac{Q_f * n}{0.56 * S_X^{1.67} * S^{0.5}} \right)^{\frac{1}{2.67}} = \left(\frac{1.02 * 0.016}{0.56 * 0.02^{1.67} * 0.03^{0.5}} \right)^{\frac{1}{2.67}} = 5.93 \ ft$$

  This is approximately equal to the assumed value of 6 feet.

- Select an inlet that will handle 1.02 cfs and provide a pipe or paved ditch to convey the design flow from the drain to the toe of the embankment. Provide energy dissipation, if necessary, at the toe to achieve nonerosive velocities.

EXAMPLE 2 - TANGENT GRADE BRIDGE WITH INLETS REQUIRED

EXCEL or MATHCAD programs can be used to complete the design process. *Drains on tangent grade(.xls or .mcd)* is on the X: drive in the LRFD Design Aids, Section 2 folder.

Given:	2000 ft bridge	S = 0.01	S_x = 0.02
	W_p = 34 ft	T = 10 ft	n = 0.016
	C = 0.9	Zone 2	d = 0.006 ft
	W_D = 1.0 ft	L_D = 1.50 ft	

Step 1. Calculate the Design Rainfall Intensity

- Rational Method

  Assume duration of 12.25 minutes

$$i = 10^{1.132076 - 0.60121 * \log(duration)} = 10^{1.132076 - 0.60121 * \log(12.25)} = 3.00\ in/hr$$

$$t_0 = 0.93 * \frac{(W_p * n)^{0.6}}{(C * i)^{0.4} * S^{0.3}} = 0.93 * \frac{(34 * 0.016)^{0.6}}{(0.9 * 3.00)^{0.4} * 0.01^{0.3}} = 1.73\ \text{min}utes$$

$$t_g = 484 * \frac{S_x * T^2}{C * i * W_p} = 484 * \frac{0.02 * 10^2}{0.9 * 3. * 34} = 10.53\ \text{min}$$

$$t_c = t_0 + t_g = 1.73 + 10.53 = 12.25\ \text{min}$$

  The assumed time of 12.25 minutes is equal to the computed time of 12.25 minutes.
  Therefore, use i = 3.00 in/hr.

- Avoidance of Hydroplaning

$$i = \left[\frac{64904.4}{C * n}\right]\left[\frac{S_x}{\left(S_x^2 + S^2\right)^{0.25}}\right]\left[\frac{d^{1.67}}{\left(W_p - T\right)}\right] = \frac{64904.4}{0.9 * 0.016} * \frac{0.02}{\left(0.02^2 + 0.01^2\right)^{0.25}} * \frac{0.006^{1.67}}{(34 - 10)} = 4.89\ in/hr$$

- Avoidance of Vision Impairment

  i = 4.00 in/hr

- Design rainfall intensity = 3.00 in/hr

Step 2. Compute full gutter flow based on the design spread of 10'.

$$Q_f = \frac{0.56}{n} * S_x^{1.67} * S^{0.5} * T^{2.67} = \frac{0.56}{0.016} * 0.02^{1.67} * 0.01^{0.5} * 10^{2.67} = 2.38\ cfs$$

Step 3. Starting at the upslope end of the bridge, compute the distance to the first inlet.

$$L_0 = \frac{43560 * Q_f}{C * i * W_p} = \frac{43560 * 2.38}{0.9 * 3.00 * 34} = 1127.92\ ft$$

Step 4. Since L_0 is less than the total bridge length (2000 ft), inlets are required.

Step 5. Space inlets at L_c until the end of the bridge is reached.

- Compute the frontal flow ratio, E_0.

$$E_0 = 1 - \left[1 - \frac{W_d}{T}\right]^{2.67} = 1 - \left(1 - \frac{1.0}{10}\right)^{2.67} = 0.245$$

- Compute the gutter velocity.

$$V = \frac{1.12}{n} * S_x^{0.67} * S^{0.5} * T^{0.67} = \frac{1.12}{0.016} * 0.02^{0.67} * 0.01^{0.5} * 10^{0.67} = 2.38\ fps$$

- Compute the splash-over velocity.

$$V_0 = 10^{0.654078 * \log(L_d) + 0.474699} = 10^{0.654078 * \log(1.50) + 0.474699} = 3.89\ fps$$

- Compute the frontal flow intercept efficiency $R_f = 1 - 0.09 * (V - V_0) = 1 - 0.09 * (2.38 - 3.89) = 1.136$
  Maximum R_f = 1.0
- Compute the inlet efficiency $E = R_f * E_0 = 1.0 * 0.245 = 0.245$
- Compute the constant spacing between the remainder of the inlets.

$$L_c = \frac{43560 * Q_f * E}{C * i * W_p} = \frac{43560 * 2.38 * 0.245}{0.9 * 3.00 * 34} = 276.57\ ft$$

- Compute the number of drains per side

$$number = \frac{(bridge\ length) - L_0}{L_c} = \frac{2000 - 1129.33}{276.57} = 3\ drains$$

Step 6. Design the bridge end treatment.

- Since drains are required, assume blockage = 50%
- Assumed duration = 15.5 minutes Assumed spread = 10.6 feet

$$i = 10^{1.132076 - 0.60121 * \log(duration)} = 10^{1.132076 - 0.60121 * \log(15.5)} = 2.61\ in/hr$$

$$t_0 = 0.93 * \frac{(W_p * n)^{0.6}}{(C * i)^{0.4} * S^{0.3}} = 0.93 * \frac{(34 * 0.016)^{0.6}}{(0.9 * 2.61)^{0.4} * 0.01^{0.3}} = 1.83\ \text{min}$$

$$t_g = 484 * \frac{S_x * T^2}{C * i * W_p} = 484 * \frac{0.02 * 10.6^2}{0.9 * 2.61 * 34} = 13.62\ \text{min}$$

$$t_c = t_0 + t_g = 1.83 + 13.62 = 15.45\ \text{min}$$

15.45 minutes are approx. equal to the assumed value of 15.5 minutes.

- Compute the design flow with the percent blockage

$$Q = C * i * A - [(blockage) * E * (number\ of\ drains) * V]$$

$$A = \frac{W_p * (length\ of\ bridge)}{43560} = \frac{34 * 2000}{43560} = 1.56\ acres$$

$$Q = 0.9 * 3.21 * 1.56 - [0.50 * 0.245 * 3 * 2.38] = 2.79\ cfs$$

Check the design spread with the new computed flow. Compute the spread by solving the gutter flow equation for T.

$$Q_f = \frac{0.56}{n} * S_x^{1.67} * S^{0.5} * T^{2.67}$$

$$T = \left(\frac{Q_f * n}{0.56 * S_X^{1.67} * S^{0.5}} \right)^{\frac{1}{2.67}} = \left(\frac{2.79 * 0.016}{0.56 * 0.02^{1.67} * 0.01^{0.5}} \right)^{\frac{1}{2.67}} = 10.61\ ft$$

This is equal to the assumed value of 10.6 feet.

- Select an inlet that will handle 2.79 cfs and provide a pipe or paved ditch to convey the design flow from the drain to the toe of the embankment. Provide energy dissipation, if necessary, at the toe to achieve nonerosive velocities.

EXAMPLE 3 – FLAT GRADE BRIDGE

EXCEL or MATHCAD programs can be used to complete the design process. *Drains on flat grade(.xls or .mcd)* is on the X: drive in the LRFD Design Aids, Section 2 folder.

Given:	4000 ft bridge	T = 10 ft	S_x = 0.02
	S = 0	n = 0.016	C = 0.9
	W_p = 34 ft	Rainfall Zone = 2	t_c = 5 minutes

Step 1. Determine the rainfall intensity.

- Rational Method

$$i = 10^{1.132076 - 0.60121 * \log(duration)} = 10^{1.132076 - 0.60121 * \log(5)} = 5.15\ in/hr$$

- Avoidance of Hydroplaning

$$i = \left[\frac{64904.4}{C * n}\right]\left[\frac{S_x}{\left(S_x^2 + S^2\right)^{0.25}}\right]\left[\frac{d^{1.67}}{\left(W_p - T\right)}\right] = \frac{64904.4}{0.9 * 0.016} * \frac{0.02}{\left(0.02^2 + 0\right)^{0.25}} * \frac{0.006^{1.67}}{\left(34 - 10\right)} = 5.17\ in/hr$$

- Driver Vision Impairment i = 4.00 in/hr
- Design intensity = 5.15 in/hr

Step 2. Compute the inlet spacing

$$L_c = \frac{1312 * S_x^{1.44} * T^{2.11}}{\left(n * C * i * W_p\right)^{0.67}} = \frac{1312 * 0.02^{1.44} * 10^{2.11}}{\left(0.016 * 0.9 * 5.15 * 34\right)^{0.67}} = 325.32\ \ ft$$

Step 3. Since L_c is less than the bridge length (4000 ft), inlets are needed.

Step 4. Compute the total inlet perimeter

$$P = \frac{\left(C * i * W_p\right)^{0.33} * T^{0.61}}{102.5 * S_x^{0.06} * n^{0.67}} = \frac{\left(0.9 * 5.15 * 34\right)^{0.33} * 10^{0.61}}{102.5 * 0.02^{0.06} * 0.016^{0.67}} = 4.26\ \ ft$$

If the inlet is adjacent to the curb, then the sum of the other 3 sides should equal the computed inlet perimeter. A curb opening should equal the computed inlet perimeter.

Solutions.

- Number of inlets required on each side of the deck.

$$Number\ of\ \ drains = \frac{L_b - L_c}{L_c} = 11.3 \qquad \text{Use } N_D = 12$$

$$Drain\ Spacing = \frac{L_b}{N_D + 1} = 307.69\ \ ft$$

- Type 2 Drain
  12 drains spaced at 307.69 feet along the length of bridge.

$$Width\ of\ \ drain = \frac{4.26 - 0.79}{2} = 1.74\ \ ft$$

- Type 1 Drain
  12 locations spaced at 307.69 feet along the length of bridge.
  P_1 = 2*0.448 + 0.78 = 1.676
  Number of drains required at each location = 4.26 / 1.676 = 2.6 Use 3

EXAMPLE 4 – VERTICAL CURVE BRIDGE

EXCEL or MATHCAD programs can be used to complete the design process. *Drains on vertical curve(.xls or .mcd)* is on the X: drive in the LRFD Design Aids, Section 2 folder.

Given: 3000 ft bridge; S_x = 0.02; T = 10 ft
n = 0.016; C = 0.9; W_p = 34 ft
d = 0.006 ft; W_D = 1.0 ft; L_D = 1.5 ft
Zone 2; G1 = 0.01; G2 = -0.01
Length of vertical curve = 3000 ft
PC station = 10+00; Begin bridge station = 10+00

Step 1. Compute the distance from the turning point of the vertical curve to each end of the bridge.

- Locate the distance of the turning point from the PC.

$$X_t = \frac{-G1 * L}{(G2 - G1)} = \frac{-0.01 * 3000}{(-0.01 - 0.01)} = 1500 \ ft$$

- Compute the distance from the turning point to each end of the bridge.
  Since the length of bridge and vertical curve are equal,
  $L_{e1} = L_{e2}$ = 1500 ft

Step 2. Determine the rainfall intensity (turning point to end of bridge)

- Rational Method S = absolute value (G2) = 0.01
  Assume duration of 12.25 minutes

$$i = 10^{1.132076 - 0.60121 * \log(duration)} = 10^{1.132076 - 0.60121 * \log(12.25)} = 3.01 \ in/hr$$

$$t_g = 484 * \frac{S_x * T^2}{C * i * W_p} = 484 * \frac{0.02 * 10^2}{0.9 * 3.01 * 34} = 10.53 \text{ min}$$

$$t_0 = 0.93 * \frac{(W_p * n)^{0.6}}{(C * i)^{0.4} * S^{0.3}} = 0.93 * \frac{(34 * 0.016)^{0.6}}{(0.9 * 3.01)^{0.4} * 0.01^{0.3}} = 1.73 \text{ min}$$

$$t_c = t_0 + t_g = 1.73 + 10.53 = 12.25 \text{ min}$$

The assumed time of 12.25 minutes is equal to the computed time. Therefore, use i = 3.01 in/hr.

- Avoidance of Hydroplaning

$$i = \left[\frac{64904.4}{C * n}\right]\left[\frac{S_x}{(S_x^2 + S^2)^{0.25}}\right]\left[\frac{d^{1.67}}{(W_p - T)}\right] = \left(\frac{64904.4}{0.9 * 0.016}\right) * \frac{0.02}{(0.02^2 + 0.01^2)^{0.25}} * \frac{0.006^{1.67}}{(34 - 10)} = 4.89 \ in/hr$$

- Avoidance of Vision Impairment
  i = 4.00 in/hr
- Design rainfall intensity = 3.01 in/hr

Step 3. Assume the distance to the first inlet from the turning point to the end of bridge = 848 ft
Distance from PC to first inlet, X = 848 + 1500 = 2348 ft.

- Compute the slope at the assumed first inlet location

$$S = G1 + \frac{(G2 - G1) * X}{L_{vc}} = 0.01 + \frac{(-0.01 - 0.01) * 2348}{3000} = -0.00565$$

Use the absolute value of S. Therefore, S = 0.00565 ft/ft

Step 4. Compute the gutter flow at the design spread

$$Q_f = \frac{0.56}{n} * S_x^{1.67} * S^{0.5} * T^{2.67} = \frac{0.56}{0.016} * 0.02^{1.67} * 0.00565^{0.5} * 10^{2.67} = 1.79 \ cfs$$

Step 5. Compute the distance to the first inlet and compare to the assumed value.
K = 1.0 for the first inlet

$$L_c = \frac{43560 * Q_f * K}{C * i * W_p} = \frac{43560 * 1.79 * 1.0}{0.9 * 3.01 * 34} = 848.07 \ ft$$

Assumed value of 848 ft equals computed value of 848.07 ft.
Inlets are required since the distance to the first inlet, 848 ft, is less than the distance from the turning point to the end of bridge, 1500 ft.

Step 6. Determine the spacing to the next inlet.

- Assume a distance to the next inlet and compute the slope at that point
  Assume 381 ft to the next drain
  X = 1500 + 848 + 381 = 2729 ft from the PC

$$S = G1 + \frac{(G2 - G1) * X}{L_{vc}} = 0.01 + \frac{(-0.01 - 0.01) * 2729}{3000} = -0.00819$$

  Use the absolute value of S. Therefore, S = 0.00819.

- Compute the gutter flow at the design spread

$$Q_f = \frac{0.56}{n} * S_x^{1.67} * S^{0.5} * T^{2.67} = \frac{0.56}{0.016} * 0.02^{1.67} * 0.00819^{0.5} * 10^{2.67} = 2.16\ cfs$$

- Compute the inlet efficiency, E.

$$E_0 = 1 - \left[1 - \frac{W_d}{T}\right]^{2.67} = 1 - \left(1 - \frac{1.0}{10}\right)^{1.67} = 0.245$$

$$V = \frac{1.12}{n} * S_x^{0.67} * S^{0.5} * T^{0.67} = \frac{1.12}{0.016} * 0.02^{0.67} * 0.00819^{0.5} * 10^{0.67} = 2.155\ fps$$

$$V_0 = 10^{0.654078 * \log(L_d) + 0.474699} = 10^{0.654078 * \log(1.5) + 0.474699} = 3.889\ fps$$

$$R_f = 1 - 0.09 * (V - V_0) = 1 - 0.09 * (2.155 - 3.889) = 1.156$$

  Maximum R_f = 1.0

$$E = R_f * E_0 = 1.0 * 0.245 = 0.245$$

- Compute the interception coefficient, K.

  Su = 0.00565
  S = 0.00819

$$K = 1 - (1 - E) * \left(\frac{S_u}{S}\right)^{0.5} = 1 - \left[(1 - 0.245) * \left\{\frac{0.00565}{0.00819}\right\}^{0.5}\right] = 0.373$$

- Compute the inlet spacing and compare to the assumed value.

$$L_i = \frac{43560 * Q_f * K}{C * i * W_p} = \frac{43560 * 2.16 * 0.373}{0.9 * 3.01 * 34} = 380.72\ ft$$

  The computed length of 380.72 ft equals the assumed value of 381 ft.

Step 7. Repeat step 6 for each inlet until the end of the bridge is reached.
Since the bridge is this example is symmetrical, the drain configuration will be the same from the turning point to both the begin/end of bridge. The following table summarizes the inlet spacing.

Spacing of inlets from the turning point to begin/end bridge

Inlet	Spacing, Li Feet	Station	Slope, S Ft/ft	Gutter flow, Q cfs
	848.07			
1		3348.07	0.00565	1.79
	380.72			
2		3728.79	0.00819	2.16
	357.40			

Only 2 drains are required on the bridge. The 357.40 ft to the third drain puts it at station 4086.19, which is beyond the end of the bridge.

Step 8. Design bridge end treatment

- Since drains are required, assume blockage = 50%
- Assumed duration = 23.5 minutes Assumed spread = 11.75 feet

$$i = 10^{1.132076 - 0.60121 * \log(duration)} = 10^{1.132076 - 0.60121 * \log 23.5} = 2.03\ in/hr$$

$$t_0 = 0.93 * \frac{(W_p * n)^{0.6}}{(C * i)^{0.4} * S^{0.3}} = 0.93 * \frac{(34 * 0.016)^{0.6}}{(0.9 * 2.03)^{0.4} * 0.01^{0.3}} = 2.02 \text{ min}$$

$$t_g = 484 * \frac{S_x * T^2}{C * i * W_p} = 484 * \frac{0.02 * 11.75^2}{0.9 * 2.03 * 34} = 21.50 \text{ min}$$

$$t_c = t_0 + t_g = 2.02 + 21.50 = 23.52 \text{ min}$$

23.5 minutes are equal to the assumed value.

- Compute the design flow with the percent blockage

$$Q = C * i * A - [(blockage) * E * (number\ of\ drains) * V]$$

$$A = \frac{W_p * (length\ of\ bridge)}{43560} = \frac{34 * 3000}{43560} = 2.34\ acres$$

$$V = \frac{1.12}{n} * S_x^{0.67} * S^{0.5} * T^{0.67} = \frac{1.12}{0.016} * 0.02^{0.67} * 0.01^{0.5} * 11.75^{0.67} = 2.653\ fps$$

$$Q = 0.9 * 2.03 * 2.34 - [0.50 * 0.245 * 2 * 2.653] = 3.63\ cfs$$

- Check the design spread with the new computed flow. Compute the spread by solving the gutter flow equation for T.

$$Q_f = \frac{0.56}{n} * S_x^{1.67} * S^{0.5} * T^{2.67}$$

$$T = \left(\frac{Q_f * n}{0.56 * S_X^{1.67} * S^{0.5}} \right)^{\frac{1}{2.67}} = \left(\frac{3.63 * 0.016}{0.56 * 0.02^{1.67} * 0.01^{0.5}} \right)^{\frac{1}{2.67}} = 11.71\ ft$$

This is equal to the assumed value of 11.75 feet.

- Select an inlet that will handle 3.63 cfs and provide a pipe or paved ditch to convey the design flow from the drain to the toe of the embankment. Provide energy dissipation, if necessary, at the toe to achieve nonerosive velocities.

SLOPE PAVING

Slope protection under bridges shall generally be provided under the end spans of grade separations and interchange structures and at railroad overpasses. Slope protection shall be concrete or crushed rock. Consult with the District to determine which one shall be used.

Concrete slope paving shall be used in urban and suburban areas where vandalism could be a problem. Vandalism may be anticipated even if pedestrian traffic is prohibited under the bridge. Concrete slope paving may also be required by a duly constituted authority such as a railroad company. The maximum recommended slope for concrete slope paving is 2:1.

Crushed rock of approximately 4" maximum dimension may be used at locations where vandalism is not likely to be a problem. The District should verify that a material's source for the rock is readily available.

Avoid unpaved areas between slope paving and sidewalks. Avoid conducting water drained from slope paving across the top of a sidewalk.

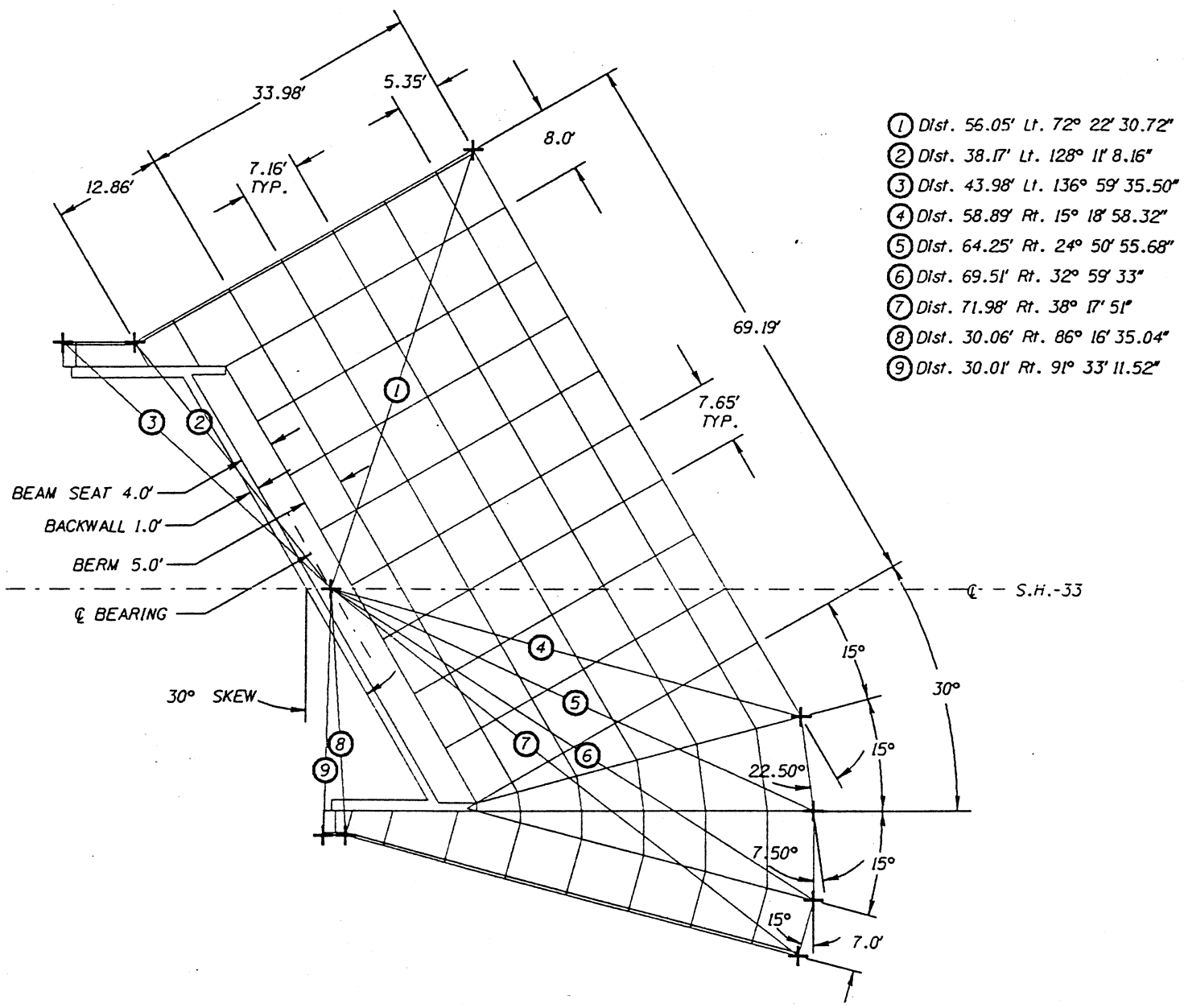
For dual structures over 15º skew, the end flared section shall be the same as for single structures over 15º skew.

The center section shown on the standard drawing is typical for all dual structures at any skew angle with medians not more than 76' edge to edge of traveled lanes. For median strips greater than 76' use two single structures.

Welded wire fabric may be deleted if fiber reinforced concrete is used. Modify the Standard Drawing details accordingly and add the following note to the Standard Drawing:

> Polypropylene fibrillated fibers, Fiber Mesh MD or equal, shall meet the material specifications of ASTM C-1116, Type 111 Section 4.1.3 (Synthetic Fiber Reinforced Concrete or Shotcrete). The weight of the fibers shall be 1.5 lb/cy.

Calculate the data shown in the following sketch and show on the drawing to make the field layout easier.



Revisions:

April 2008	Added instructions for location and type of slope paving.
Aug 2016	Changed weight of fibers from 0.056 pcf to 1.5 lb/cy.

Properties & Support Spacing for PVC Pipe

Where PVC conduit is to be supported by hangers or pedestals at intervals, the distance between supports shall be small enough to avoid excessive sag of the conduit.

Recommended support spacing and tabulated properties of PVC pipe are shown in the following Table.

SCHEDULE 80 PVC					
Nominal size	O.D. – inches	Average I.D. inches	Minimum Wall Thickness inches	Pounds per 100 ft	Support Spacing-feet
½”	0.840	0.526	0.147	21.3	4.5
¾”	1.050	0.722	0.154	28.9	4.5
1”	1.315	0.936	0.179	42.4	5
1¼”	1.660	1.255	0.191	58.6	5.5
1½”	1.900	1.476	0.200	71.1	5.5
2”	2.375	1.913	0.218	98.4	6
2½”	2.875	2.290	0.276	150.0	6.5
3	3.500	2.864	0.300	201.0	7
4	4.500	3.786	0.337	293.8	7.5
5	5.563	4.768	0.375	407.8	8
6	6.625	5.709	0.432	561.0	9
8	8.625	7.565	0.500	852.2	9.5

Spacing shown is set for a 100° maximum temperature.

The physical properties of PVC material are:

E = 410,000 psi
Tensile Strength = 7300 psi at 78°F
Working Stress in Bending = 4.0 ksi
Temperature coefficient = 0.035” per 100°/ft

Commentary

The Table was taken from the July 2005 WSDOT Bridge Design Manual. The values were obtained from ASTM D1785 and Harvel Plastics.

Revisions:

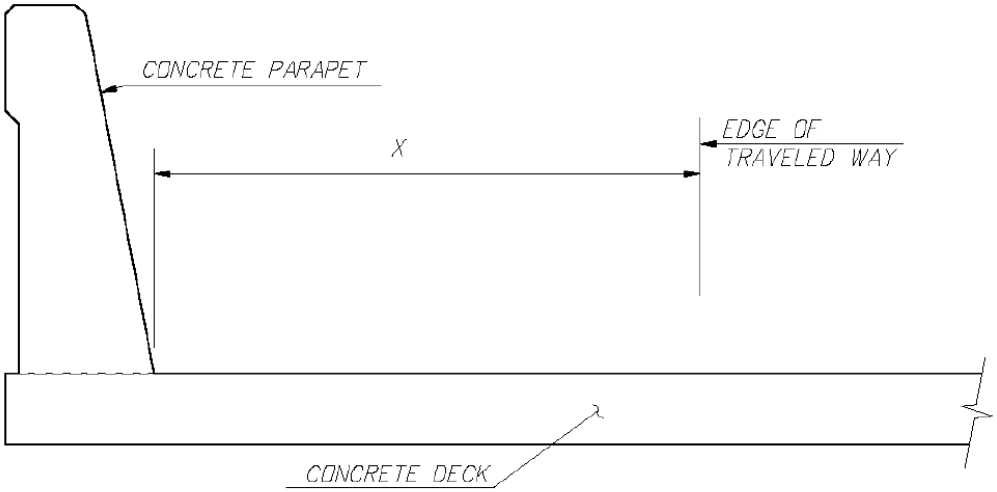
June 2006 Added new article.
Oct 2023 Renumbered article from A2.5 to A2.3
Deleted Schedule 40 PVC data since only Schedule 80 PVC is utilized.

STRUCTURE WIDTH

X = shy-line offset distance from the Table in Article 2.3.3.3

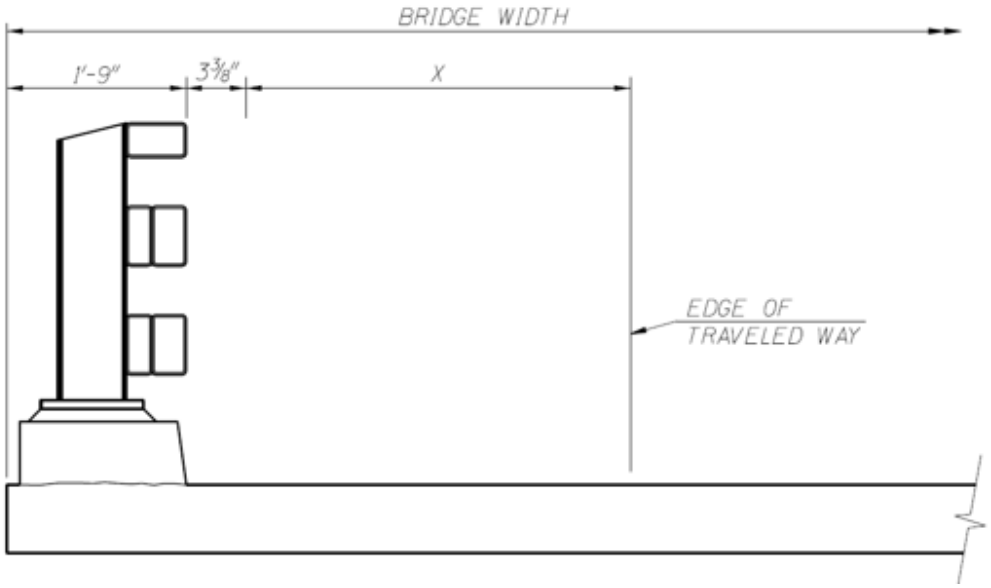
BRIDGES – NO SIDEWALK

42" Single Slope Concrete Parapet

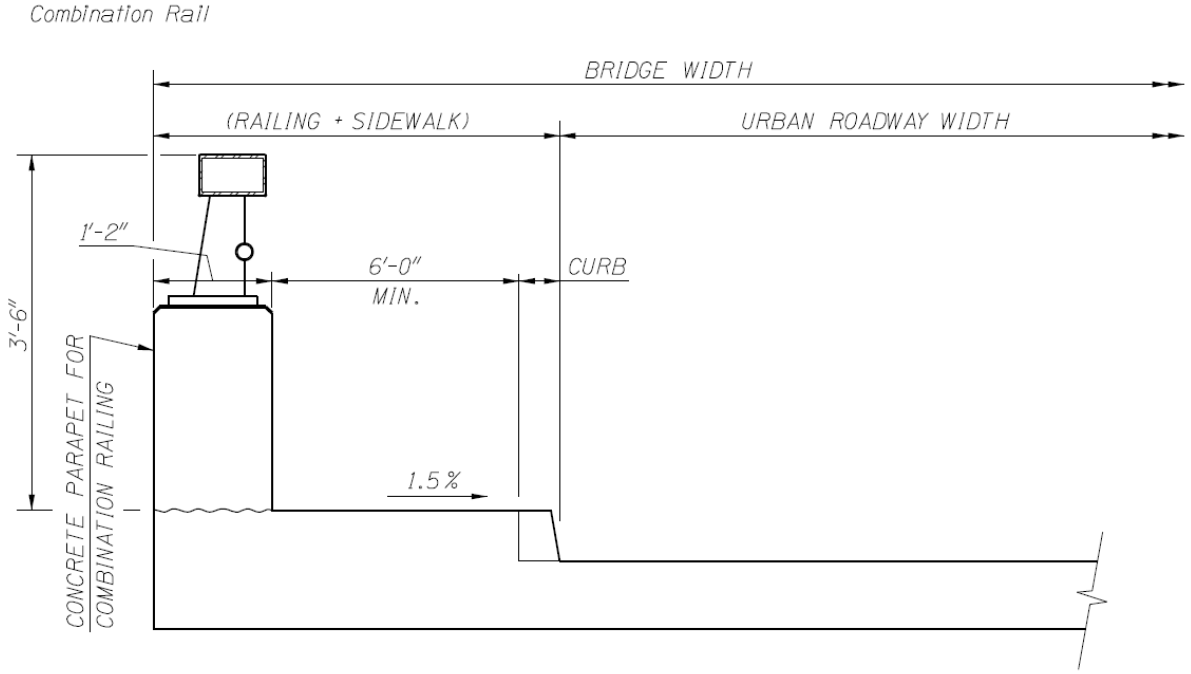


BRIDGES - NO SIDEWALK

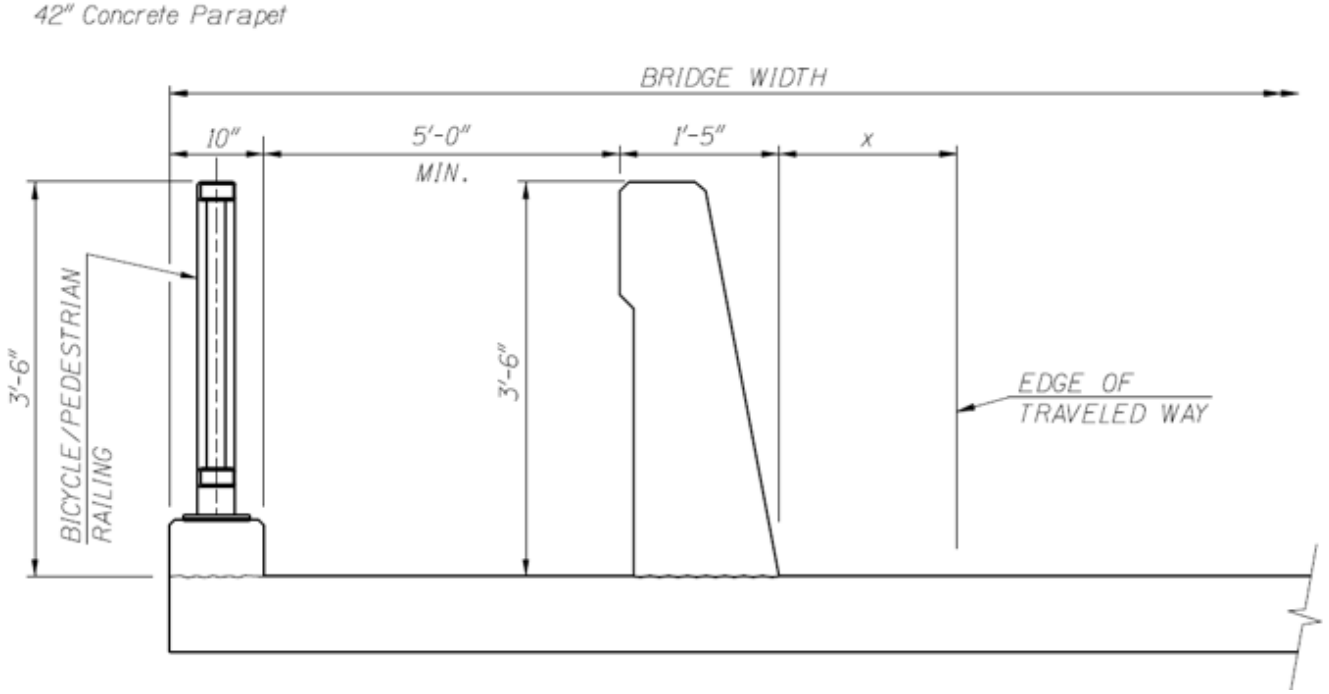
3-Tube Curb Mount Rail



BRIDGES – RAISED SIDEWALK WITH SPEEDS 45mph AND LOWER

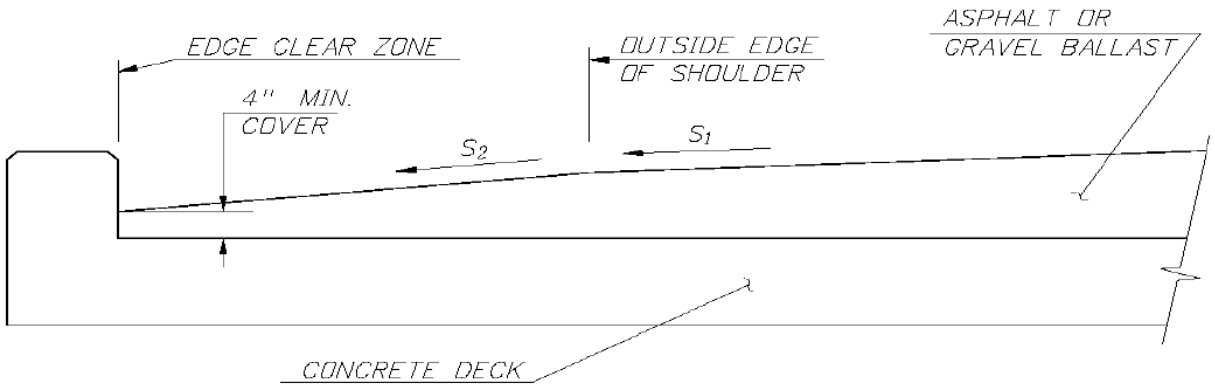


BRIDGES – AT-GRADE SIDEWALK FOR SPEEDS OVER 45mph



CULVERTS – CLEAR ZONE PROVIDED

Clear zones for NHS routes are shown in Roadway Design Manual Appendix A.10 Figure A-2**.**
Clear zones for Non-NHS routes are shown in Roadway Design Manual Appendix A.15.09

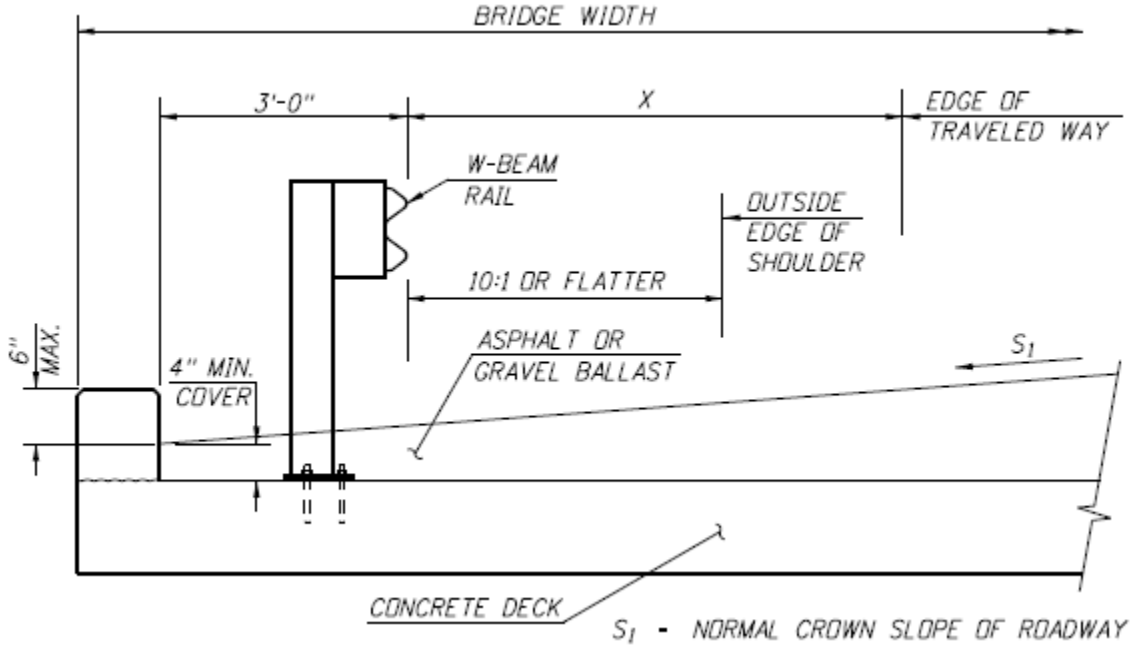


S_1 = NORMAL CROWN SLOPE OF ROADWAY

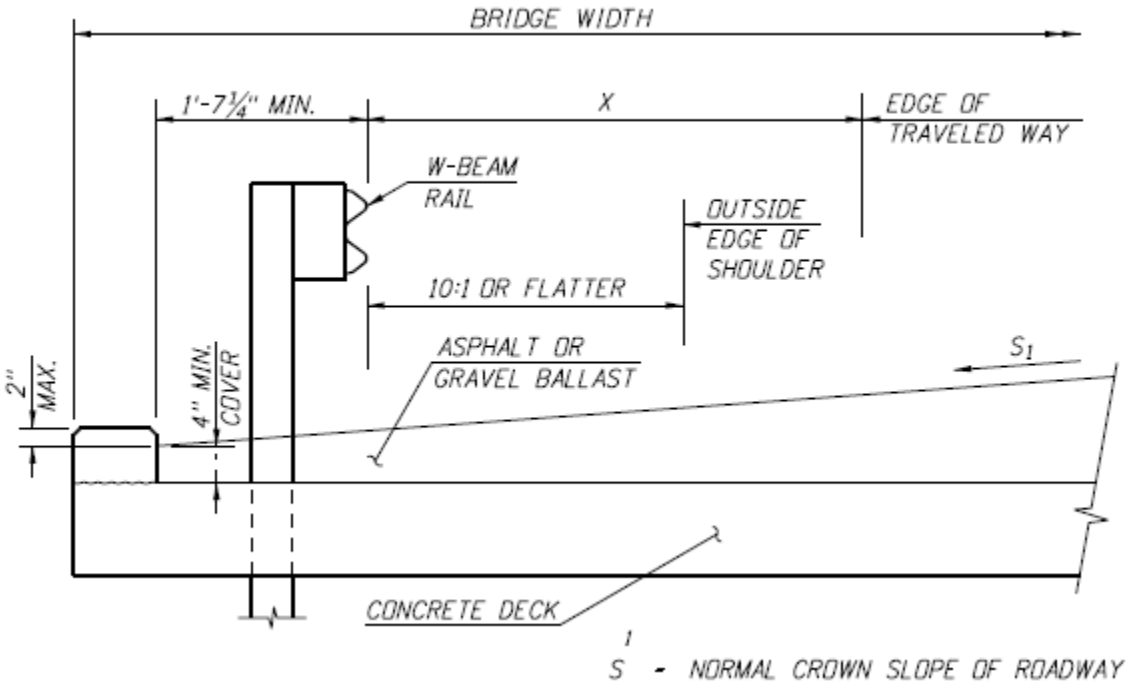
S_2 = 4:1 OR FLATTER

CULVERTS – CLEAR ZONE NOT PROVIDED

Metal Rail with posts attached to the culvert

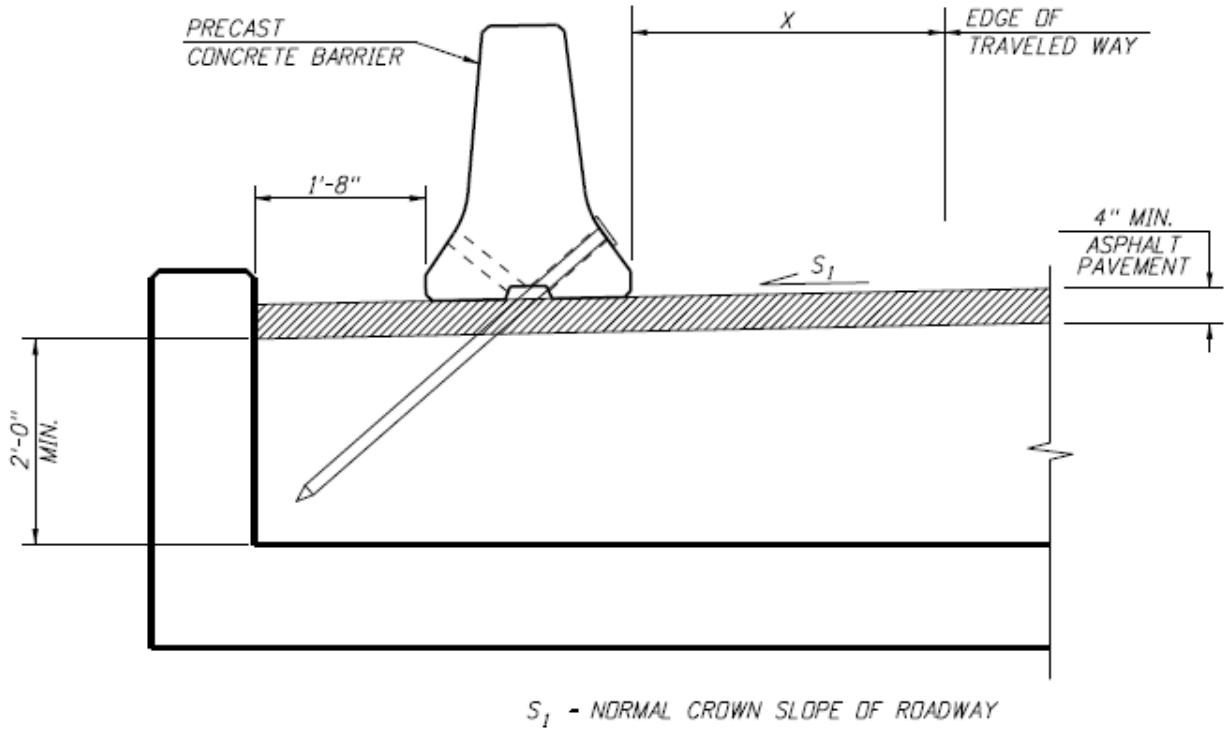


Metal Rail with no posts attached to the culvert
Refer to Roadway Standard Drawing 612-1

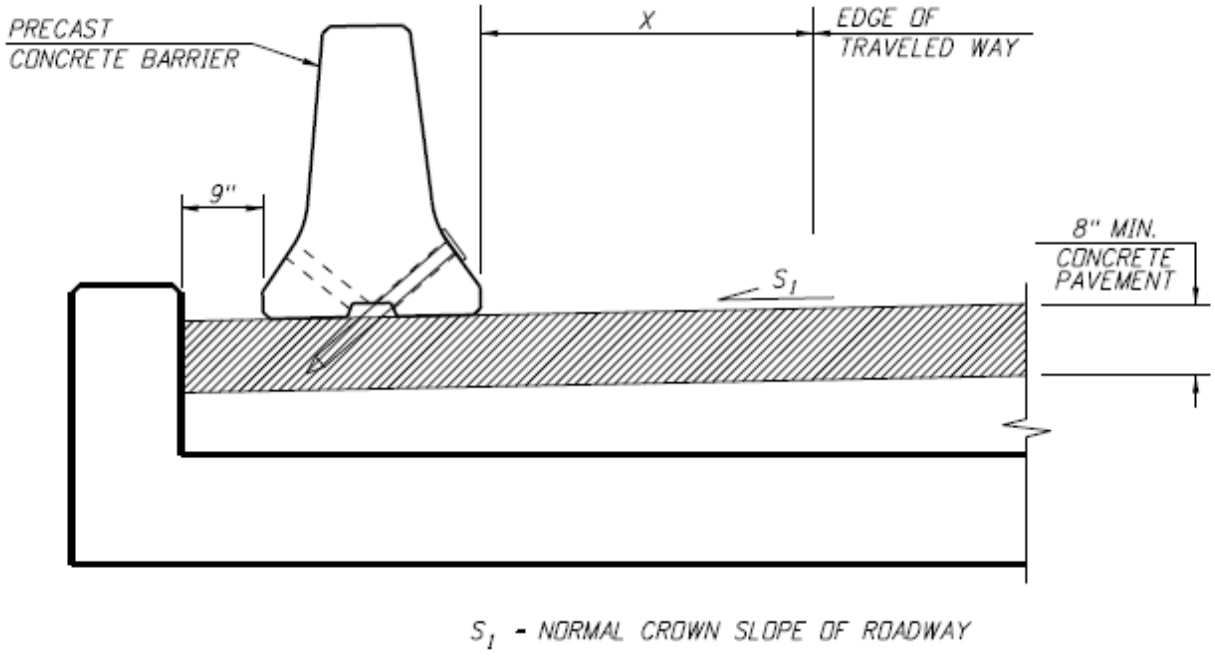


CULVERTS – CLEAR ZONE NOT PROVIDED

Pinned Precast Concrete Barrier with asphalt pavement– Standard Drawing 612-18

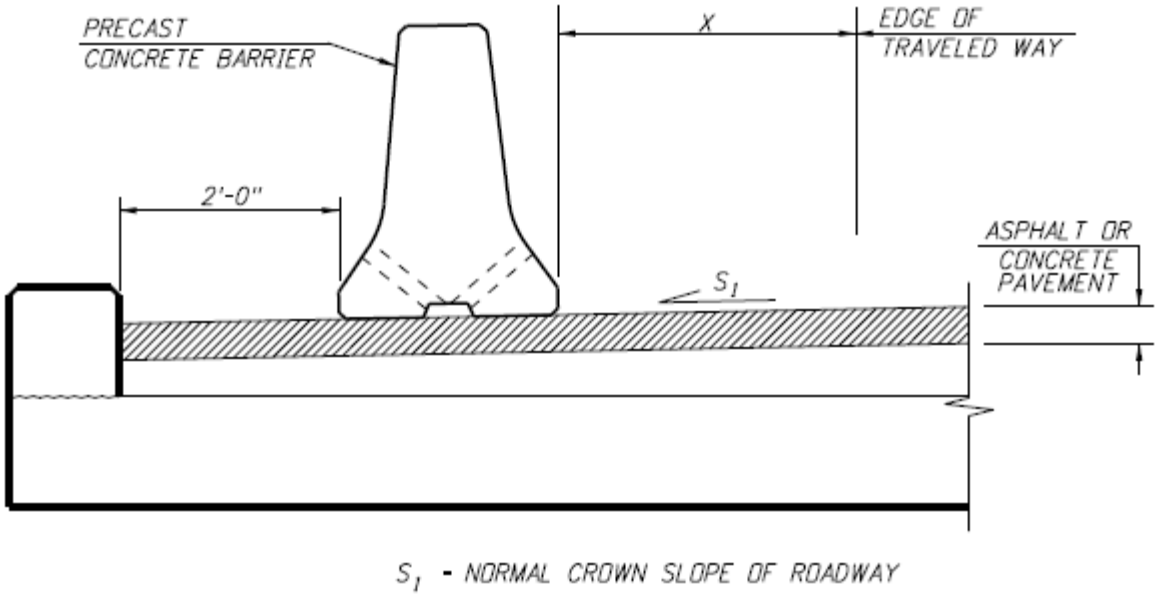


Pinned Precast Concrete Barrier with concrete pavement– Standard Drawing 612-18



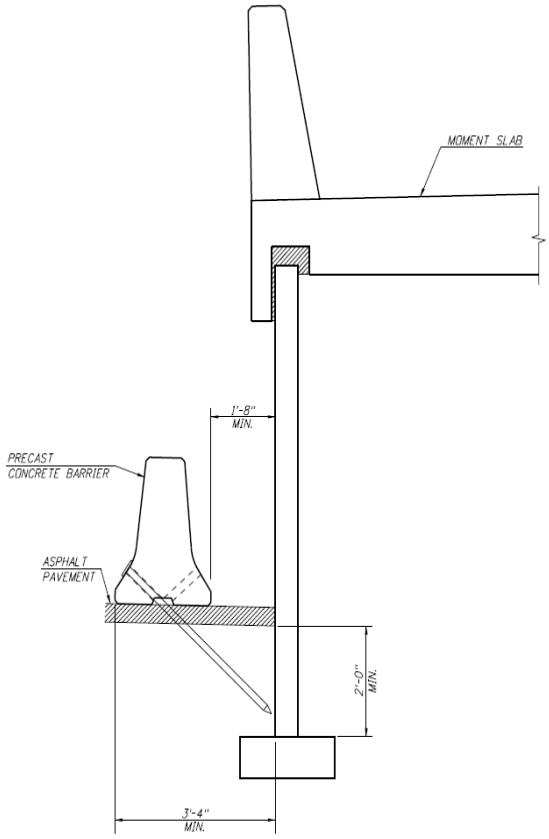
CULVERTS – CLEAR ZONE NOT PROVIDED

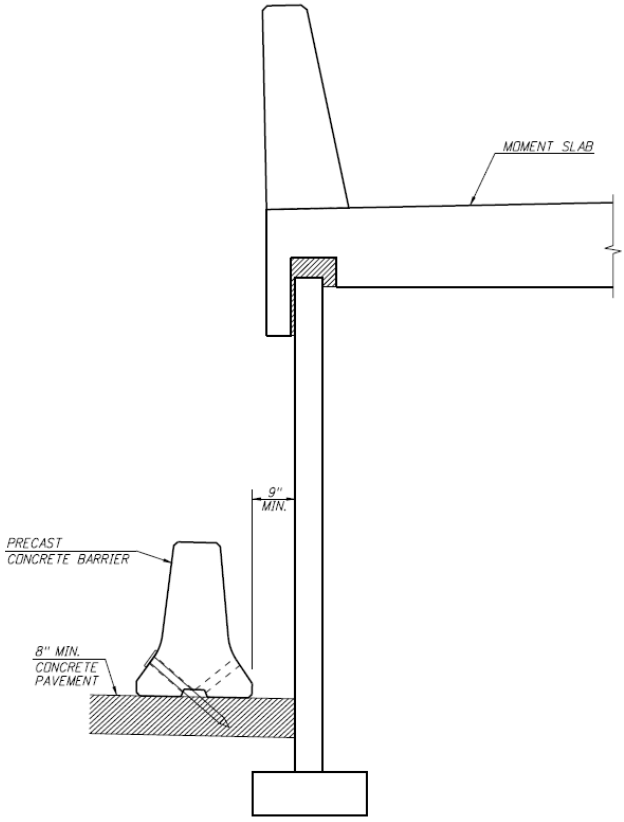
Free-Standing precast concrete barrier - Standard Drawing 612-18



MSE WALLS
The offsets from the wall to the TL-3 precast concrete barrier satisfy the zone of intrusion specified in the AASHTO Roadside Design Guide Figure 5-28.

Single Slope Concrete Parapet with Moment Slab

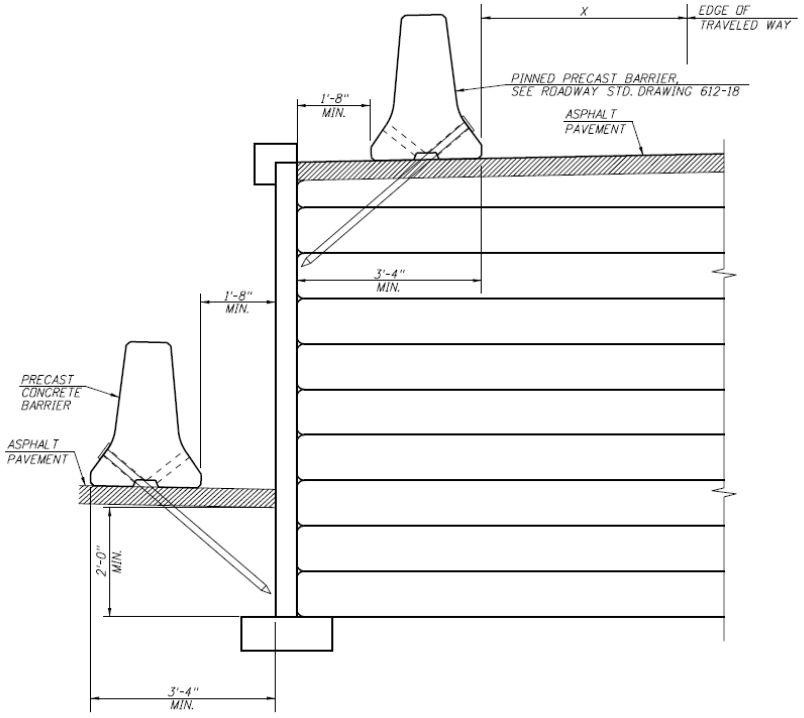


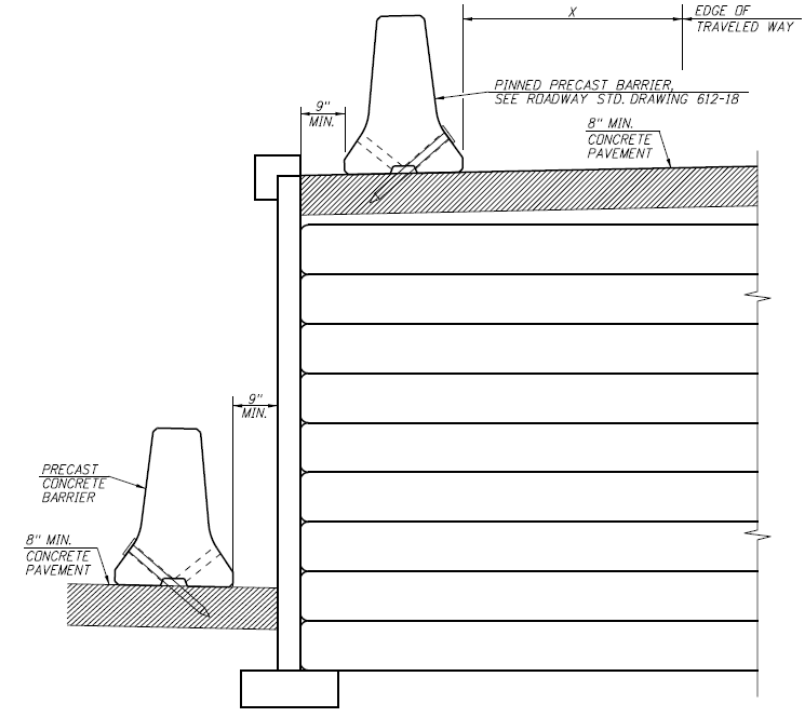


MSE WALLS

The offsets from the wall to the TL-3 precast concrete barrier satisfy the zone of intrusion specified in the AASHTO Roadside Design Guide Figure 5-28.

Precast Concrete Barrier with No Moment Slab

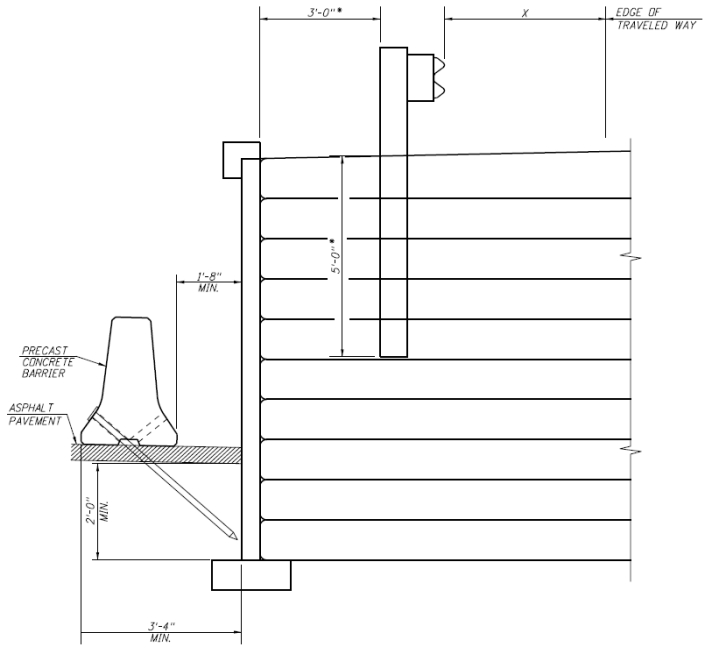




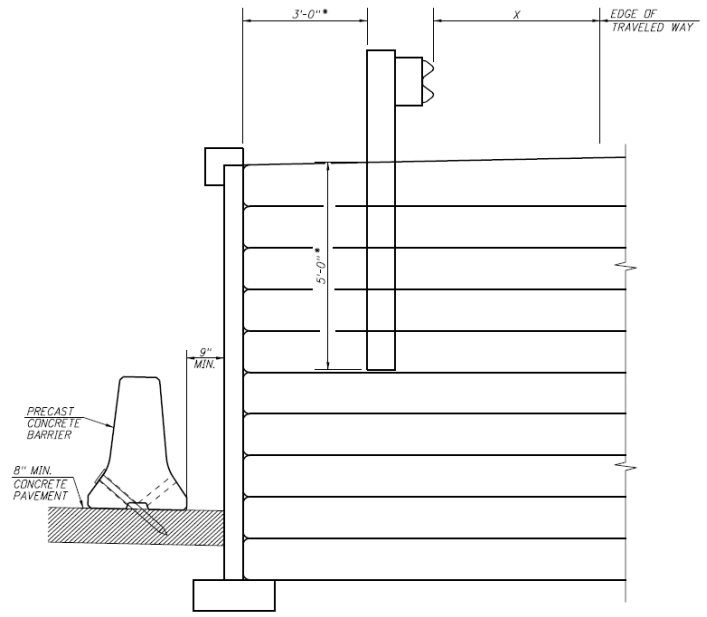
MSE WALLS

The offsets from the wall to the TL-3 precast concrete barrier satisfy the zone of intrusion specified in the AASHTO Roadside Design Guide Figure 5-28.

Metal Rail



* AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS ARTICLE 11.10.10.2

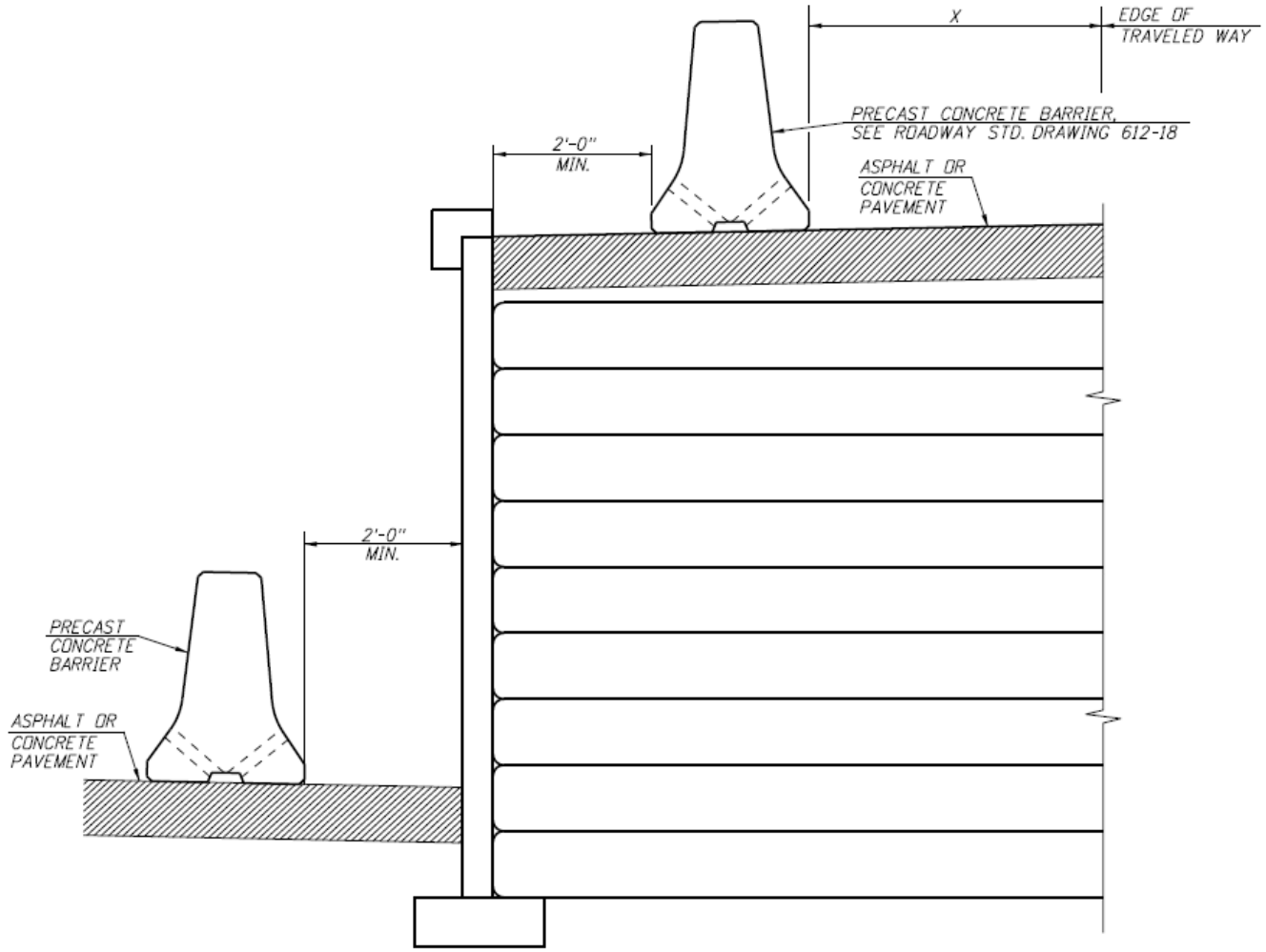


* AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS ARTICLE 11.10.10.2

MSE WALLS

The offset from the wall to the TL-3 precast concrete barrier satisfies the zone of intrusion specified in the AASHTO Roadside Design Guide Figure 5-28.

Free-Standing Precast Concrete Barrier



Revisions:

Nov 2019

Culverts – Clear Zone not Provided with posts attached to the culvert.
Specified 6" maximum height of curb above fill.
Specified 10:1 or flatter roadway slope beyond edge of traveled way.

Culverts – Clear Zone not Provided with no posts attached to the culvert.
Specified 2" maximum height of curb above fill.
Specified 10:1 or flatter roadway slope beyond edge of traveled way.

Culverts – Clear Zone not Provided with concrete parapet.
Changed from New Jersey parapet to 42" single slope parapet.
Changed shy distance from "X-4" to "X".
Specified 10:1 or flatter roadway slope beyond edge of traveled way.

Culverts – Clear Zone not Provided with staked concrete parapet.
Changed offset to face of curb from 3" to 20".
. Changed shy distance from "X-4" to "X".
Revised reference to Standard Drawing from 612-5 to 612-18.
Specified 10:1 or flatter roadway slope beyond edge of traveled way.

MSE Walls with Moment Slab
Changed from New Jersey parapet to 42" single slope parapet.
Added staked barrier in front of wall with a 20" offset.

MSE Walls with no Moment Slab
Revised reference to Standard Drawing from 612-15 to 612-18.
Changed offset at top of wall from 2' to 20".
Specified 10:1 or flatter roadway slope beyond edge of traveled way.
Changed shy distance from "X-4" to "X".
Added staked barrier in front of wall with a 20" offset.

MSE Walls with metal rail
Specified 10:1 or flatter roadway slope beyond edge of traveled way.
Added staked barrier in front of wall with a 20" offset

Oct 2023

Renumbered article from A2.6 to A2.4
Deleted Jersey parapet detail for bridges with no sidewalk.
Revised two-tube curb mount rail to 3-tube curb mount rail detail for bridges with no sidewalk.
Revised combination rail detail to Texas combination rail details for bridges with raised sidewalk.
Revised Jersey parapet with metal rail to 42" single slope parapet details for bridges with at-grade sidewalk.

Dec 2024	Corrected 3-Tube Curb Mount Rail with no sidewalk detail to show shy-line distance to 3⅜" from face of rail and 1'-9" from face of rail to edge of deck. Added 6'-0" sidewalk width to raised sidewalks with speeds 45mph and lower. Added 5'-0" sidewalk width to at-grade sidewalk for speeds over 45mph. Changed offset from face of curb to face of rail from 1"-8" to 1'-7.25" for metal rail detail spanning culvert to agree with roadway standard drawing 612-1 that shows 1'-4" offset to the back of the metal rail. Metal rail is 3.25" thick. Modified detail for culvert with clear zone not provided to show 4" minimum asphalt pavement depth and 2'-0" minimum fill depth to prevent 48" pin for barrier from penetrating the culvert top slab. The 48" pin also requires a 20" minimum offset from the face of edge beam to prevent the pin from penetrating the edge beam. Deleted 6" offset to back of parapet to end of coping, deleted Detail A. Changed offset of pinned barrier in front of MSE wall to 20" minimum for asphalt pavement and 9" for concrete pavement. Added detail for free-standing precast concrete barrier with 24" offset.

BRIDGES OVER NAVIGABLE WATERS

Bridges sorted by Bridge ID

BRIDGE_ID	FACILITY	FEATINT	OWNER
10000	US 2	PEND OREILLE R;OLDTOWN B	District 1
10010	US 2	PRIEST RIVER	District 1
10035	US 2	MOYIE R.GORGE;MOYIE BR.	District 1
10141	SH 3	CD'A RIVER;ROSE LAKE	District 1
10206	SH 7	CLEARWATER RIVER	District 2
10211	SH 7	N.FK. CLEARWATER RIVER	District 2
10360	US 12	US 12;SNAKE RIVER	District 2
10375	US 12	CLEARWATER RIVER;BNRR	District 2
10390	US 12	CLWATER R.;NPRR;ARROW BR	District 2
12200	US 20 26;FAP 21SPR	SNAKE RIVER;NYSSA BRIDGE	OR DOT
13795	US 30 EBL SPUR	SNAKE R;FRUITLAND BRIDGE	OR DOT
13811	US 95 SPUR	SNAKE RIVER; WEISER BR	District 3
14300	SH 45	SNAKE R.(WALTERS FERRY)	District 3
14565	SH 52	SNAKE RIVER;PAYETTE BR.	District 3
14671	SH 55	SNAKE RIVER(MARSING BR)	District 3
15315	I 84 EBL	SNAKE RIVER;ONTARIO BR	OR DOT
15320	I 84 WBL	SNAKE RIVER;ONTARIO BR	OR DOT
16735	I 90 WBL	SPOKANE RIVER	District 1
16740	I 90 EBL	SPOKANE RIVER	District 1
16905	I 90 EBL	CD'A LAKE;BLUE CREEK BAY	District 1
16910	I 90 WBL	CD'A LAKE;BLUE CREEK BAY	District 1
17885	US 93	SALMON RIVER;SALMON BR.	District 6
17890	US 93	SALMON RIVER;CARMEN BR.	District 6
18050	US 95	SNAKE RIVER;HOMEDALE BR.	District 3
18331	US 95	SALMON RIVER;GOFF BRIDGE	District 2
18350	US 95	SALMON R.;MCKINZIE BR.	District 2
18355	US 95	SALMON R.;AWARD BR.	District 2
18465	US 95	NPRR;CLEARWATER RIVER	District 2
18675	US 95	BLACKWELL SLOUGH	District 1
18680	US 95	SPOKANE R;PED/BIKE PATH	District 1
18715	US 95	PEND OREILLE R;SANDPOINT	District 1
18718	PEDESTRIAN OP	PEND OREILLE RVR PED BR	District 1
18725	US 2	SAND CREEK	District 1
18770	US 95	KOOTENAI R.&RR;BON FERRY	District 1
18796	US 95	MOYIE R;LOWER EASTPORT	District 1
18801	US 95	MOYIE R; UPPER EASTPORT	District 1
18896	SH 3	ST JOE RIVER	District 1
18901	SH 97	COEUR D'ALENE RIVER	District 1
19050	SH 200	BNRR;LAKE PEND OREILLE	District 1
19920	SMA3824;BNKS LWMN	DEADWOOD RIVER	Boise County
20295	STC 4783	N.FK.CLEARWATER;DENT BR	District 2
20355	STC 5711;ST JOE RV	ST JOE RIVER	Shoshone County
20440	SMA 7505	SPOKANE R.;POST FALLS BR	Post Falls HD
20615	STC 5770	PEND OREILLE RIVER	Bonner County
20620	S5779;DICKENSHEET	PRIEST RIVER	Bonner County
20630	STC 5783;EAST RVR	PRIEST R.;MC ABEE FALLS	Bonner County
20655	STC 5803;MOYIE RVR	MOYIE RIVER;MEADOW CREEK	Boundary County
20661	STC 5803;MOYIE RVR	MOYIE RIVER;MCDOUGAL CR	Boundary County
20666	STC 5803;MEADOW CR	MOYIE RIVER;RUTLEDGE CR.	Boundary County
20670	STC 5803;MOYIE RVR	MOYIE RIVER;SINCLAIR BR.	Boundary County
20725	STC 5804;COPELAND	KOOTENAI R.;COPELAND BR.	Boundary County
21495	BRYDEN CANYON ROAD	SNAKE RIVER;HIGH BRIDGE	Nez Perce County
26394	OR 86 (HWY 012)	SNAKE RIVER (OXBOW)	OR DOT
29030	COUNTY ROAD	N.FK.CLEARWATER;GRANDAD	IDL
29100	STC 4705	SALMON R;WHITEBIRD TRUSS	Doumecq HD

29360	COW CREEK ROAD	SALMON RIVER;LUCILLE BR	Idaho County
29385	STC4710;GRAVES CRK	SALMON RIVER	Keuterville HD
29398	SALMON R R;NF-1614	SALMON RVR (MANNING CRV)	Idaho County
29960	CHERRY LANE	CLEARWATER RIVER	Nez Perce County
29965	LENORE ROAD	CLEARWATER R;LENORE BR.	Nez Perce County
30055	COUNTY ROAD	ST JOE RIVER;ST JOE BR	Benewah County
30110	STC 7785;BRIDGE ST	SAND CREEK	City of Sandpoint
30127	STC 5788	CLARK FORK RIVER	Bonner County
30145	WHISKEY JACK	BOYER SLOUGH;SE KOOTENAI	Bonner County
30275	EARL LANE	MOYIE RIVER	Boundary County
30336	OLD ADDIE ROAD	MOYIE RIVER;ADDIE	Boundary County
30415	BULL RUN ROAD	CDA RIVER;ROSE LAKE BR	Kootenai County
30510	ANDERSON LAKE ROAD	CD'A RIVER;SPRINGSTON BR	Eastside HD
30543	HARBOR DRIVE	CHANNEL OF SPOKANE RVR	Kootenai County
33700	US 95	US 95NB OFF R;SAND CREEK	District 1
33705	US95 SB OFF RAMP	SAND CREEK	District 1
37075	Railroad Grade Road	ST. JOE RIVER	Benewah County

Revisions:

May 2021	Added new article Information dated March 2021.
Oct 2023	Renumbered article from A2.7 to A2.5

CHAPTER 2
STANDARD DRAWING REVISION LOG

B2.1A Approach Slab Details Sheet 1– Asphalt Pavement

March 2011	Added 20' length of approach slab in Section C-C.
	Revised pay limits in Section C-C to comply with 502.04.
	Revised dead man to an "L" shape.
Sept 2012	Revised Note 5 to list the requirements of ASTM C920 for the silicone sealant joint and deleted the references to Dow Corning & Watson Bowman.
	Added Detail C for limits of ¾" base material.
	Revised Note 1 to provide ¾" base material to the limits shown in Detail C.
June 2013	Deleted "Sleeper Beam" reference from note in View D-D.
	Changed Note 4 to Class 40AF concrete.
May 2014	Split details into 2 sheets by adding sheet B2.1I
	Changed abutment dowels to GFRP bars.
Aug 2016	Deleted 16" dimension in Section A-A for thickness of wingwall & joint filler.
Jan 2022	Labeled AS6 bars in PLAN.
	Added Subgrade Separation Geotextile Type 1 in Section C-C.
	Changed Jersey Parapet to Single Slope Parapet in Section A-A & Section B-B.
	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Deleted sheet.

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B2.1B Approach Slab Details Sheet 1– Asphalt Pavement

March 2011	Added 20' length of approach slab in Section C-C.
	Revised pay limits in Section C-C to comply with 502.04.
	Revised deadman to an "L" shape.
Sept 2012	Revised Note 5 to list the requirements of ASTM C920 for the silicone sealant joint and deleted the references to Dow Corning & Watson Bowman.
	Added Detail C for limits of ¾" base material.
	Revised Note 1 to provide ¾" base material to the limits shown in Detail C.
June 2013	Deleted "Sleeper Beam" reference from note in View D-D.
	Changed Note 4 to Class 40AF concrete.
May 2014	Split details into 2 sheets by adding sheet B2.1I
	Changed abutment dowels to GFRP bars.
Aug 2016	Deleted 16" dimension in Section A-A for thickness of wingwall & joint filler.
	Changed Section C-C in the PLAN to a longitudinal section.
	Denoted dimensions in Section C-C as perpendicular to abutment.
Oct 2017	Show location of View D-D in the PLAN.
Jan 2022	Labeled AS6 bars in PLAN.
	Added Subgrade Separation Geotextile Type 1 in Section C-C.
	Changed Jersey Parapet to Single Slope Parapet in Section A-A & Section B-B.
	Converted sheet to ORD format.
June 2022	Changed skew angle in title block from <20° to <45°.
	Added note "For skew between 25°-38°(left forward) use 0° skew at sleeper beam to avoid conflict with snow plow blades."
	Revised format of leader lines.
Oct 2023	Deleted sheet

B2.1C Approach Slab Details Sheet 1– Concrete Pavement

March 2011	Revised pay limits in Section C-C to comply with 502.04.
	Revised depth of concrete pavement notch in deadman to allow for variable depth pavement.
Sept 2012	Revised Note 5 to list the requirements of ASTM C920 for the silicone sealant joint and deleted the references to Dow Corning & Watson Bowman.
	Added Detail C for limits of ¾" base material.
	Revised Note 1 to provide ¾" base material to the limits shown in Detail C.
June 2013	Deleted "Sleeper Beam" reference from note in View D-D.
	Changed Note 4 to Class 40AF concrete.

CHAPTER 2
STANDARD DRAWING REVISION LOG

May 2014	Split details into 2 sheets by adding sheet B2.1I
	Changed abutment dowels to GFRP bars.
Aug 2016	Deleted 16" dimension in Section A-A for thickness of wingwall & joint filler.
Jan 2022	Labeled AS6 bars in PLAN.
	Added Subgrade Separation Geotextile Type 1 in Section C-C.
	Changed Jersey Parapet to Single Slope Parapet in Section A-A & Section B-B.
	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Deleted sheet

B2.1D Approach Slab Details Sheet 1– Concrete Pavement

March 2011	Revised pay limits in Section C-C to comply with 502.04.
	Revised depth of concrete pavement notch in deadman to allow for variable depth pavement.
Sept 2012	Revised Note 5 to list the requirements of ASTM C920 for the silicone sealant joint and deleted the references to Dow Corning & Watson Bowman.
	Added Detail C for limits of ¾" base material.
	Revised Note 1 to provide ¾" base material to the limits shown in Detail C.
June 2013	Deleted "Sleeper Beam" reference from note in View D-D.
	Revised Note 2 to place transverse reinforcement perpendicular to centerline of roadway.
	Changed Note 4 to Class 40AF concrete.
May 2014	Split details into 2 sheets by adding sheet B2.1I
	Changed abutment dowels to GFRP bars.
Aug 2016	Deleted 16" dimension in Section A-A for thickness of wingwall & joint filler.
	Denoted dimensions in Section C-C as perpendicular to abutment.
Jan 2022	Labeled AS6 bars in PLAN.
	Added "1 Set" to AS1, AS5, AS2B, AS2C.
	Added Subgrade Separation Geotextile Type 1 in Section C-C.
	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Deleted sheet

B2.1E Approach Slab Details Sheet 1– Asphalt Pavement

March 2011	Added 20' length of approach slab in Section C-C.
	Revised pay limits in Section C-C to comply with 502.04.
	Revised deadman to an "L" shape.
Sept 2012	Revised Note 5 to list the requirements of ASTM C920 for the silicone sealant joint and deleted the references to Dow Corning & Watson Bowman.
	Added Detail C for limits of ¾" base material.
	Revised Note 1 to provide ¾" base material to the limits shown in Detail C.
June 2013	Deleted "Sleeper Beam" reference from note in View D-D.
	Located Begin/End of bridge at stream face of abutment backwall.
	Changed Note 4 to Class 40AF concrete.
May 2014	Split details into 2 sheets by adding sheet B2.1I
March 2015	Changed reference to sleeper beam joint to Detail B.
Aug 2016	Deleted 16" dimension in Section A-A for thickness of wingwall & joint filler.
Jan 2022	Labeled AS6 bars in PLAN.
	Added Subgrade Separation Geotextile Type 1 in Section C-C.
	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
June 2023	Deleted sheet

B2.1F Approach Slab Details Sheet 1– Asphalt Pavement

March 2011	Added 20' length of approach slab in Section C-C.
	Revised pay limits in Section C-C to comply with 502.04.
	Revised deadman to an "L" shape.

CHAPTER 2
STANDARD DRAWING REVISION LOG

Sept 2012	Revised Note 5 to list the requirements of ASTM C920 for the silicone sealant joint and deleted the references to Dow Corning & Watson Bowman.
	Added Detail C for limits of ¾" base material.
	Revised Note 1 to provide ¾" base material to the limits shown in Detail C.
June 2013	Deleted "Sleeper Beam" reference from note in View D-D.
	Located Begin/End of bridge at stream face of abutment backwall.
	Changed Note 4 to Class 40AF concrete.
May 2014	Split details into 2 sheets by adding sheet B2.1I
March 2015	Changed reference to sleeper beam joint to Detail B.
Aug 2016	Deleted 16" dimension in Section A-A for thickness of wingwall & joint filler.
	Changed Section C-C in the PLAN to a longitudinal section.
	Denoted dimensions in Section C-C as perpendicular to abutment.
Oct 2017	Show location of View D-D in the PLAN.
Jan 2022	Labeled AS6 bars in PLAN.
	Added Subgrade Separation Geotextile Type 1 in Section C-C.
	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Deleted sheet

B2.1G Approach Slab Details Sheet 1– Concrete Pavement

March 2011	Revised pay limits in Section C-C to comply with 502.04.
	Revised depth of concrete pavement notch in deadman to allow for variable depth pavement.
Sept 2012	Revised Note 5 to list the requirements of ASTM C920 for the silicone sealant joint and deleted the references to Dow Corning & Watson Bowman.
	Added Detail C for limits of ¾" base material.
	Revised Note 1 to provide ¾" base material to the limits shown in Detail C.
June 2013	Deleted "Sleeper Beam" reference from note in View D-D.
	Located Begin/End of bridge at stream face of abutment backwall.
	Changed Note 4 to Class 40AF concrete.
May 2014	Split details into 2 sheets by adding sheet B2.1I
March 2015	Changed reference to sleeper beam joint to Detail B.
Aug 2016	Deleted 16" dimension in Section A-A for thickness of wingwall & joint filler.
Jan 2022	Labeled AS6 bars in PLAN.
	Added Subgrade Separation Geotextile Type 1 in Section C-C.
	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Deleted sheet

B2.1H Approach Slab Details – Concrete Pavement

March 2011	Revised pay limits in Section C-C to comply with 502.04.
	Revised depth of concrete pavement notch in deadman to allow for variable depth pavement.
Sept 2012	Revised Note 5 to list the requirements of ASTM C920 for the silicone sealant joint and deleted the references to Dow Corning & Watson Bowman.
	Added Detail C for limits of ¾" base material.
	Revised Note 1 to provide ¾" base material to the limits shown in Detail C.
June 2013	Deleted "Sleeper Beam" reference from note in View D-D.
	Located Begin/End of bridge at stream face of abutment backwall.
	Revised Note 2 to place transverse reinforcement perpendicular to centerline of roadway.
	Changed Note 4 to Class 40AF concrete.
May 2014	Split details into 2 sheets by adding sheet B2.1I
March 2015	Changed reference to sleeper beam joint to Detail B.
Aug 2016	Deleted 16" dimension in Section A-A for thickness of wingwall & joint filler.
Jan 2022	Labeled AS6 bars in PLAN.
	Added "1 Set" to AS1, AS5, AS2B, AS2C.
	Added Subgrade Separation Geotextile Type 1 in Section C-C

CHAPTER 2
STANDARD DRAWING REVISION LOG

June 2022 Revised format of leader lines.
Oct 2023 Deleted sheet

B2.1A Approach Slab Details Sheet 1– No skew

Oct 2023 Created new sheet 1 for no skew
Added bar dimensions for AS4 and AS6 bars.
Changed all references from "bottom" to "bot".
Added "max" to spacing of bars where dimension may vary
Moved sleeper beam and abutment details to new sheet 3.
Changed subgrade separation geotextile under the approach slab to a polyethylene sheet.
Changed the pay limits to begin/end approach slab.

B2.1B Approach Slab Details Sheet 1–Skewed

Oct 2023 Created new sheet 1 for skew with the sleeper beam perpendicular to the roadway centerline for both asphalt and concrete pavement.
Added bar dimensions for AS4 and AS6 bars.
Changed all references from "bottom" to "bot".
Added "max" to spacing of bars where dimension may vary
Moved sleeper beam and abutment details to new sheet
Changed subgrade separation geotextile under the approach slab to a polyethylene sheet.
Changed the pay limits to begin/end approach slab.

B2.1C Approach Slab Details – Sheet 2

Dec 2014 Created new sheet
Sept 2016 Moved expansion joint pay item from note 6 in Approach Slab to new note 5 for Expansion Joint.
Changed hot pour sealant reference to subsection 704.03. The 2015 Supplemental Specifications changed the reference from ASTM D3406 to ASTM D 6690, Type III.
June 2018 Added "or approved equal" to Recommended Manufacturer Table.
Nov 2019 Deleted "Installation Width" from table.
Deleted Expansion Joint Note 2.
Deleted "between face of curbs" from Expansion Joint Note 3.
Changed pay item from S501-06A to 566-005A in Expansion Joint Note 5 to agree with 2018 Standard Specifications.
Renumbered Expansion Joint Notes.
Changed "Depth" to "height" in Joint Table.
Revised format of approach slab notes to active voice, imperative mood.
Revised format of expansion joint notes to active voice, imperative mood.
Sep 2020 Revised note 1 to add "The cost of the material is incidental to bid item 502-435A".
May 2021 Revised Note 5 to specify subgrade separation geotextile Type 1.
Changed reference in Detail A to "compression seal expansion joint".
Jan 2022 Deleted "Range Width" from joint table.
Converted sheet to ORD format
June 2022 Revised format of leader lines.
Oct 2023 Renamed B2.1I to B2.1C
Revised notes to meet active voice, imperative mood and Writer's Style Guide.
Added subgrade separation geotextile type I under the ¾" base material.
Added approximate quantities of ¾" base material and subgrade separation geotextile type I.
Added "Nominal" to seal size in the joint table.
Changed name of joint in Detail A from "Compression Seal Expansion Joint" to "Bonded Preformed Joint".
Dec 2024 Changed name of "Detail A" to "Detail 1" and "Detail B" to "Detail 2".

B2.1D Approach Slab Details – Sheet 3

Oct 2023 Created new sheet with sleeper beam and abutment joint details.
Dec 2024 Changed name of "Detail A" to "Detail 1" and "Detail B" to "Detail 2".

CHAPTER 2
STANDARD DRAWING REVISION LOG

B2.2A Bridge Drain Details – Type 1

Nov 2019	Changed Concrete Class 40A to 40AF.
	Changed AASHTO M111 to ASTM A123 in Note 1.
	Changed AASHTO M-270 Gr 36 to ASTM A709 Gr 36 in Note 5.
	Revised format of notes to active voice, imperative mood.
Jan 2022	Changed Jersey parapet to Single Slope Parapet in Section B-B.
	Converted sheet to ORD format.
June 2022	Removed inch symbol from weld symbol and HSS designation.
	Revised format of leader lines.
Oct 2023	Revised notes to meet active voice, imperative mood and Writer's Style Guide.
	Deleted inch symbol from weld symbol in Section C-C.

B2.2B Bridge Drain Details – Type 2

March 2015	Revised note 3 for electronic shop drawings.
Nov 2019	Changed Concrete Class 40A to 40AF.
	Changed AASHTO M111 to ASTM A123 in Note 1.
	Changed AASHTO M-270 Gr 36 to ASTM A709 Gr 36 in Note 5.
	Revised format of notes to active voice, imperative mood.
Jan 2022	Changed Jersey parapet to Single Slope Parapet in Section A-A.
	Converted sheet to ORD format.
June 2022	Removed inch symbol from weld symbol and HSS designation.
	Revised format of leader lines.
Oct 2023	Revised notes to meet active voice, imperative mood and Writer's Style Guide.
Dec 2024	Changed name of "Detail E" to "Lower Bracket Detail" and "Detail D" to "Upper Bracket Detail".

B2.2C-1 Type 3 Bridge Drain Through Jersey Parapet

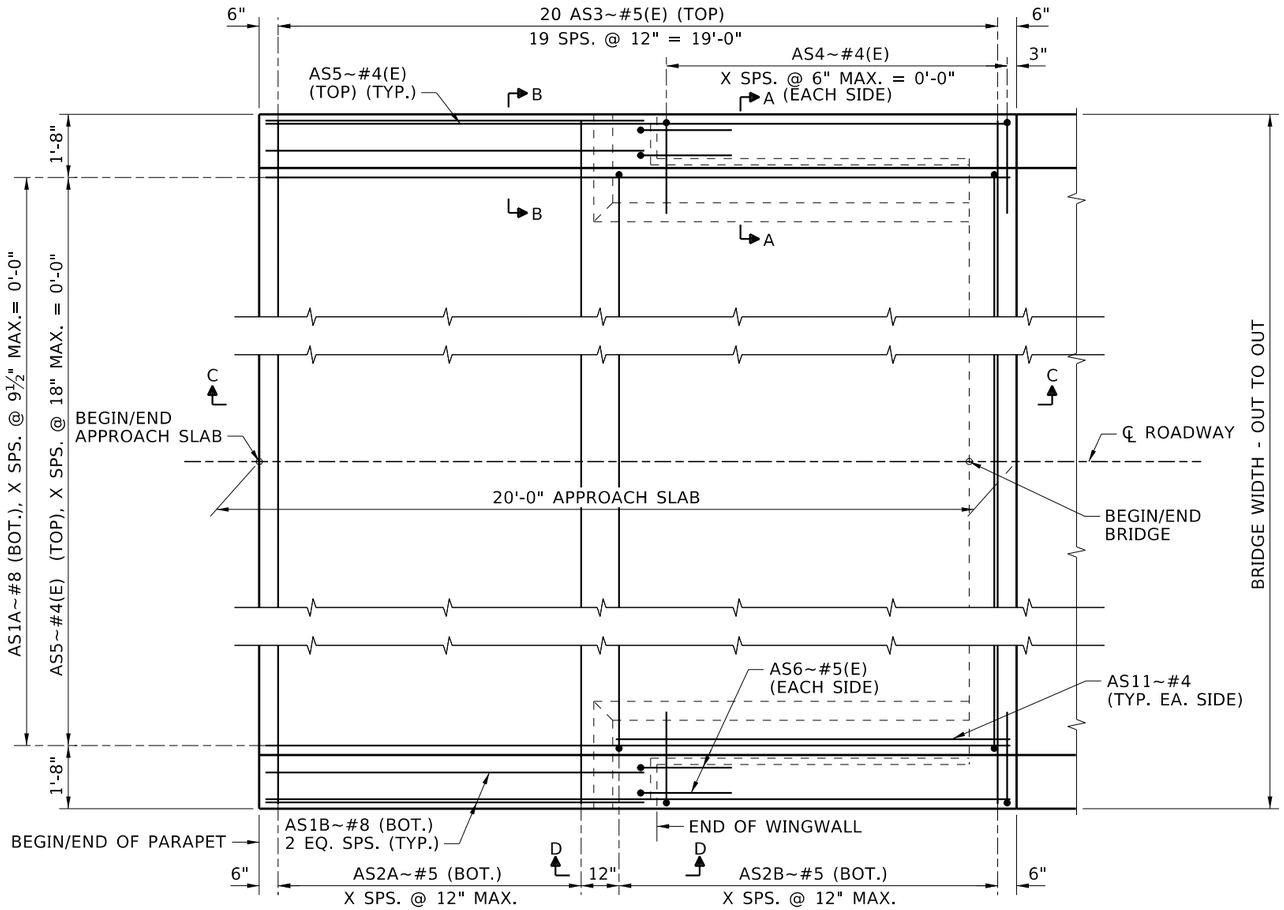
Aug 2016	Changed title of drawing to Type 3 Bridge Drain Through Parapet.
Nov 2109	Changed cost of drain to be incidental to prestressed girder bid item.
	Changed AASHTO M111 to ASTM A123 in Note 1.
	Revised format of notes to active voice, imperative mood.
Jan 2022	Converted sheet to ORD format.
June 2022	Removed slope of deck from Sections A-A.
	Removed inch symbol from HSS designation.
	Revised format of leader lines.
Oct 2023	Deleted sheet.

B2.2C Type 3 Bridge Drain Through Single Slope Parapet

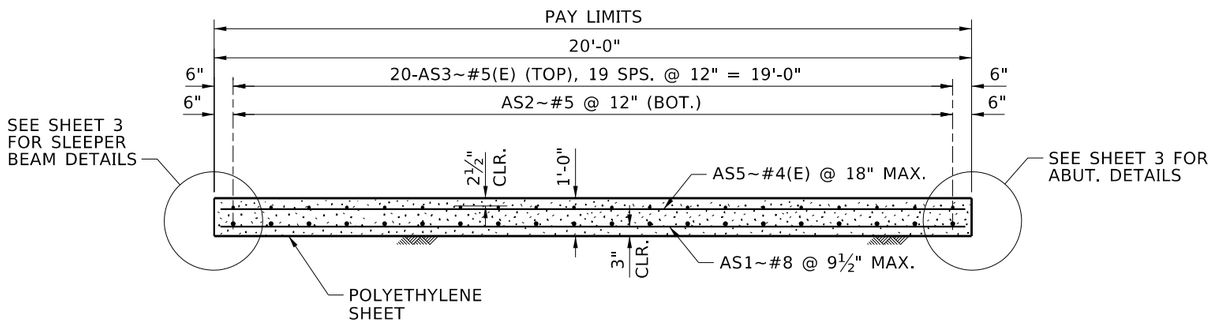
Jan 2022	Added new sheet in ORD format.
June 2022	Removed slope of deck from Sections A-A.
	Removed inch symbol from HSS designation.
	Revised format of leader lines.
Oct 2023	Revised notes to meet active voice, imperative mood and Writer's Style Guide.
	Renamed B2.2C-2 to B2.2C.
Dec 2024	Changed name of "Detail C" to "Trowel Finish Detail".

B2.3 Slope Paving Standard

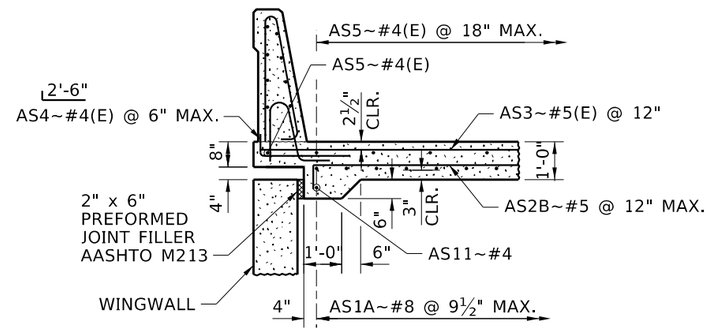
Oct 2017	Deleted reference to SSP-653 in note 1 since SSP-653 has been deleted.
Nov 2019	Revised format of notes to active voice, imperative mood.
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Revised note 1 for sterilization to refer to SSP 653 – Vegetation Control Group C and cost is incidental to pay item 623-005A.
	Combined notes 3 & 4 into note 3.
Dec 2024	Changed name of "Detail A" to "Detail 1" and added "Section C-C" title to detail.



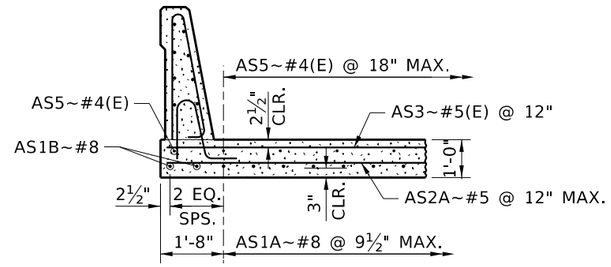
APPROACH SLAB - PLAN
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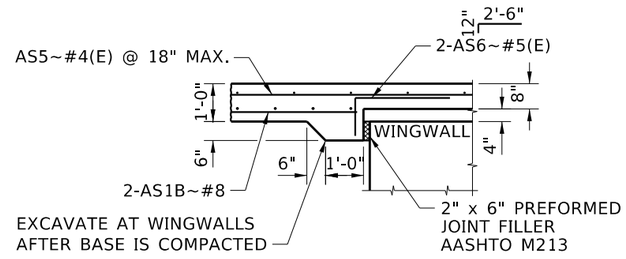
SECTION C-C
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SECTION A-A
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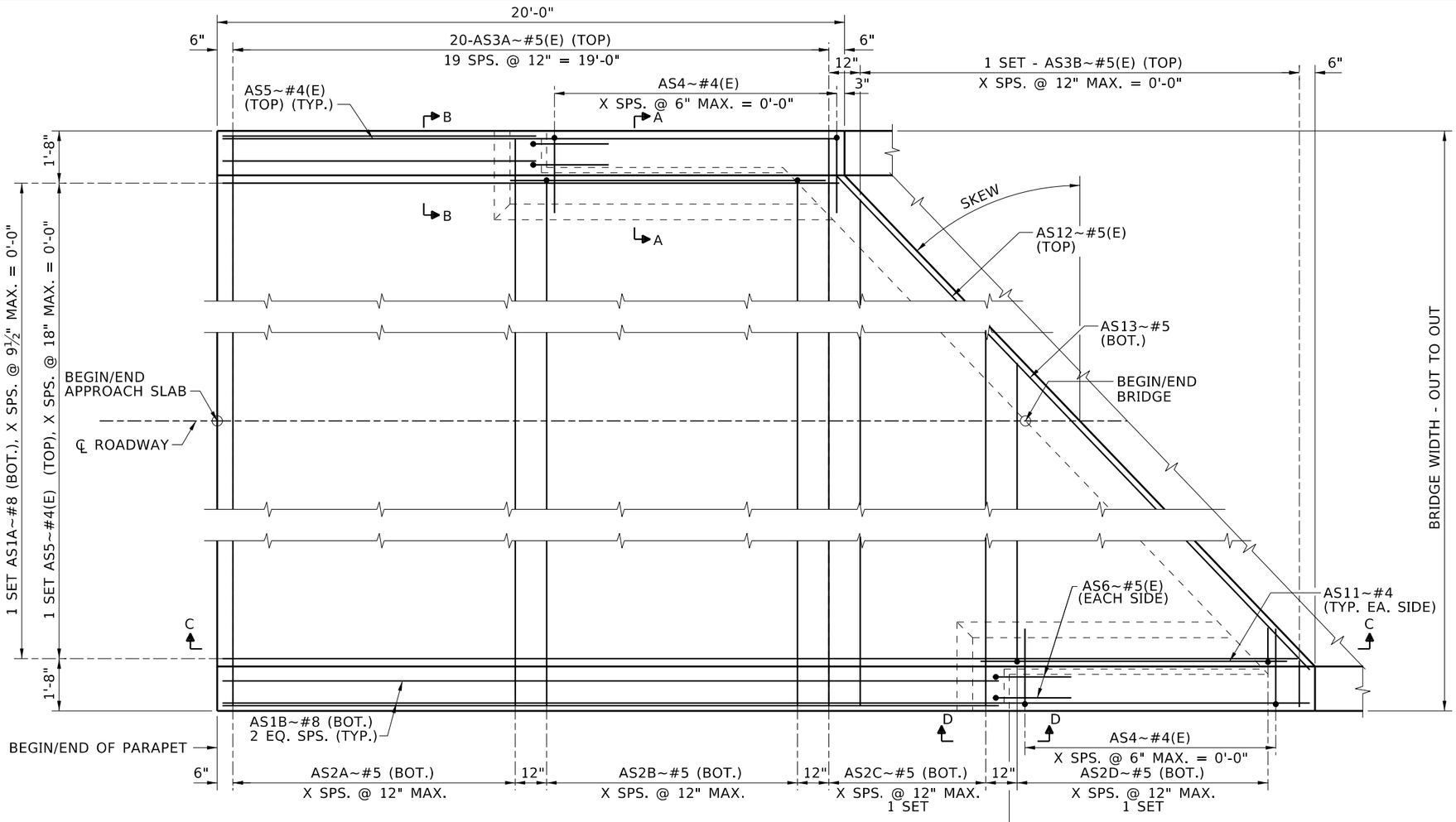
SECTION B-B
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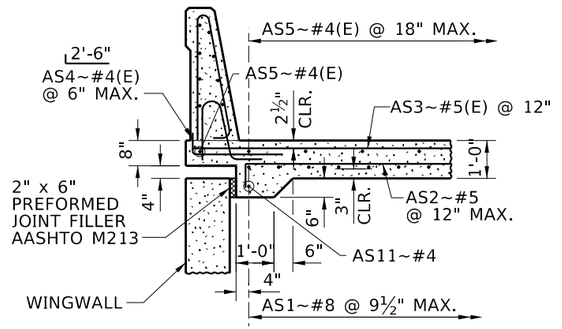
VIEW D-D
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NOTE TO DESIGNER
SHOW NORTH ARROW IN APPROACH SLAB PLAN.
REFER TO BDM ARTICLE 2.5.2.4.

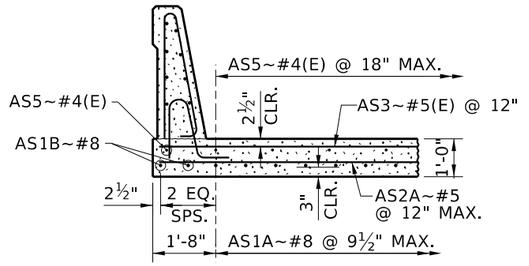
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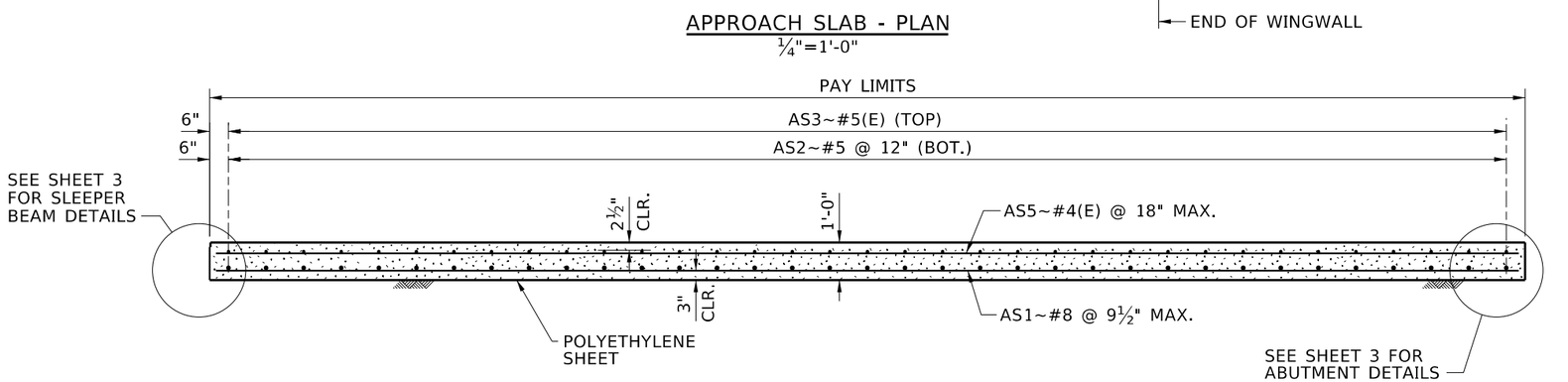
APPROACH SLAB - PLAN
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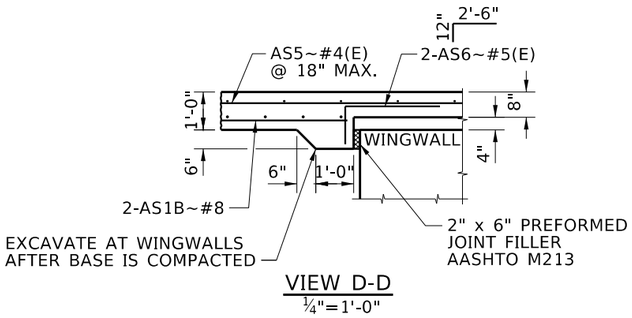
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SECTION B-B
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SECTION C-C
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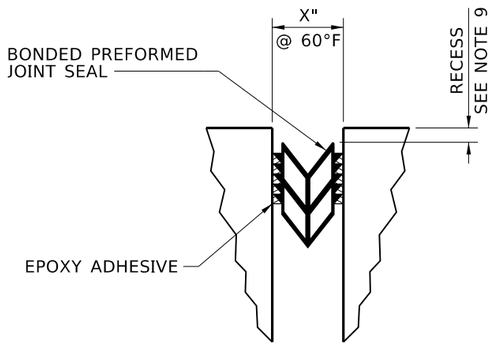
VIEW D-D
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NOTE TO DESIGNER
SHOW NORTH ARROW IN APPROACH SLAB PLAN.
REFER TO BDM 2.5.2.4.

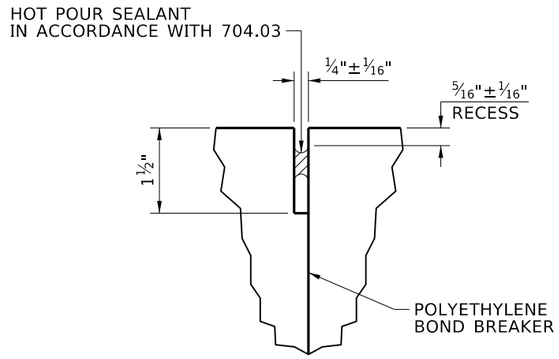
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△				DWG. CHECKED	DRAWING DATE: OCT 2023	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B2.1B	BRIDGE DWG. NO. / SHEET OF
△				CORRECTIONS					
△									

RECOMMENDED MANUFACTURERS OF THE SHOWN JOINT ASSEMBLY *				
LOCATION	MANUFACTURER	STYLE	NOMINAL SEAL SIZE (INCHES)	
			WIDTH	HEIGHT
	D.S. BROWN	J-XXX		
	WATSON BOWMAN ACME	Jeene-XXX		

* OR APPROVED EQUAL



DETAIL 1
NTS



DETAIL 2
NTS

NOTES

APPROACH SLAB

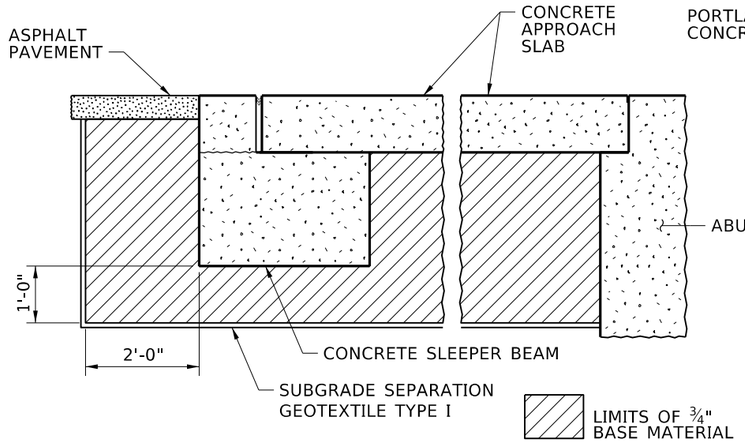
1. PROVIDE CLASS 40AF CONCRETE.
2. PROVIDE REINFORCEMENT IN ACCORDANCE WITH AASHTO M31 GRADE 60 TYPE S. EPOXY COAT THE TOP MAT OF BOTH TRANSVERSE AND LONGITUDINAL REINFORCEMENT IN ACCORDANCE WITH 708.02. PROVIDE BEND DETAILS IN ACCORDANCE WITH THE LATEST A.C.I. STANDARD PRACTICE AND AASHTO SPECIFICATIONS.
3. PLACE LONGITUDINAL REINFORCEMENT PARALLEL TO THE CENTERLINE OF THE ROADWAY; PLACE THE TRANSVERSE REINFORCEMENT PERPENDICULAR TO THE CENTERLINE OF THE ROADWAY.
4. PROVIDE ¾" TYPE A BASE MATERIAL COMPACTED TO MEET CLASS "A" COMPACTION REQUIREMENTS TO THE LIMITS SHOWN IN DETAIL C BEFORE POURING THE APPROACH SLAB. THE COST OF THE MATERIAL IS INCIDENTAL TO PAY ITEM 502-435A.
5. THE COST OF THE SUBGRADE SEPARATION GEOTEXTILE TYPE I IS INCIDENTAL TO PAY ITEM 502-435A.
6. PROVIDE 4 MIL (MIN.) POLYETHYLENE SHEET. THE COST IS INCIDENTAL TO PAY ITEM 502-435A.
7. PAYMENT FOR APPROACH SLAB IS PAY ITEM 502-435A.

EXPANSION JOINT

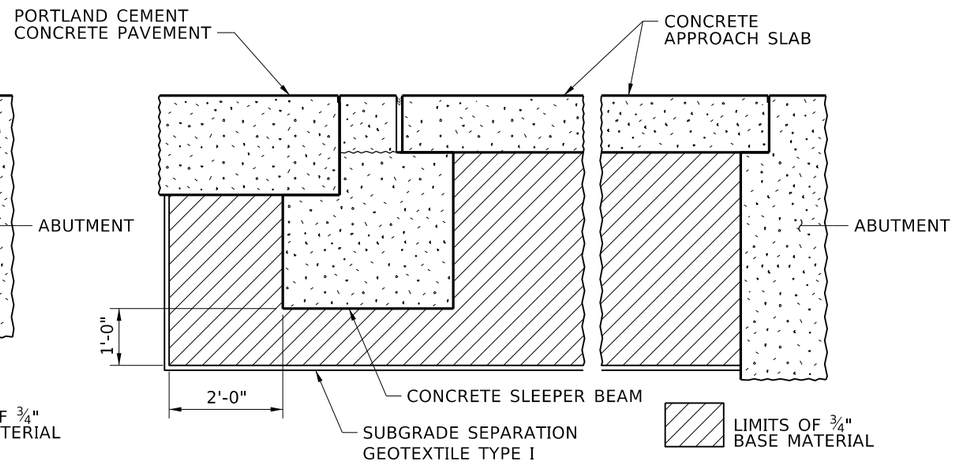
8. PROVIDE CONTINUOUS JOINT SEAL.
9. INSTALL THE SEAL IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
10. ADJUST EXPANSION JOINT X" FOR EVERY 10° CHANGE IN TEMPERATURE FROM THE MEDIAN TEMPERATURE OF 60°F AT THE TIME OF INSTALLATION OF THE JOINT.
11. PAYMENT FOR EXPANSION JOINT IS PAY ITEM 566-005A.

APPROXIMATE QUANTITIES (BOTH APPROACH SLABS)

CONCRETE	0 CY
PLAIN REINF.	0 LB
EPOXY REINF.	0 LB
¾" BASE MATERIAL	0 CY
SUBGRADE SEPARATION GEOTEXTILE TYPE I	0 SY

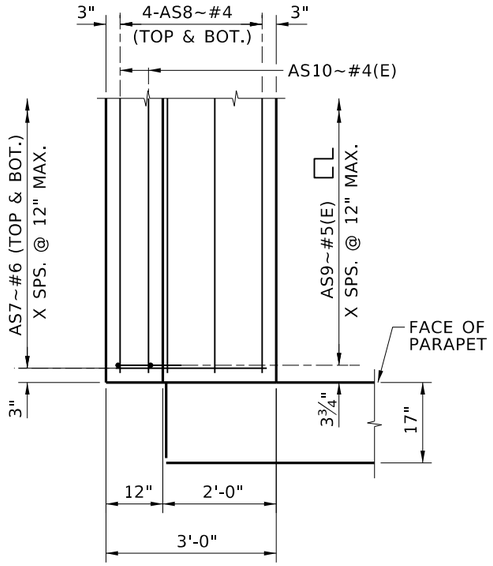


LIMITS OF ¾" BASE MATERIAL FOR ASPHALT PAVEMENT
⅜"=1'-0"

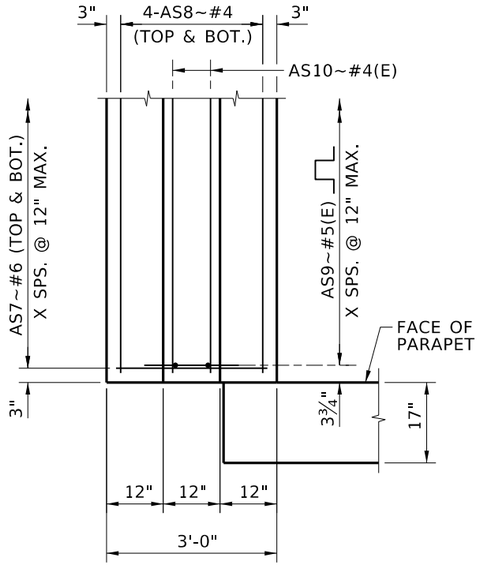


LIMITS OF ¾" BASE MATERIAL FOR CONCRETE PAVEMENT
⅜"=1'-0"

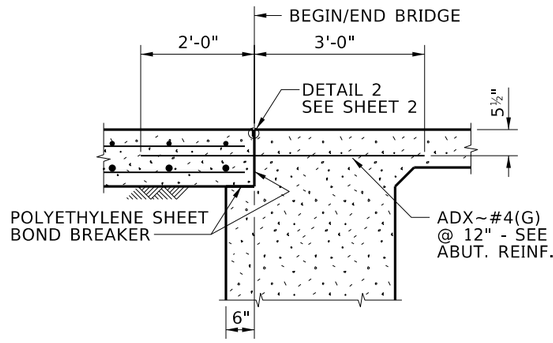
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NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards\Standard Bridge Drawings\B02_1C.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B2.1C	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



PLAN

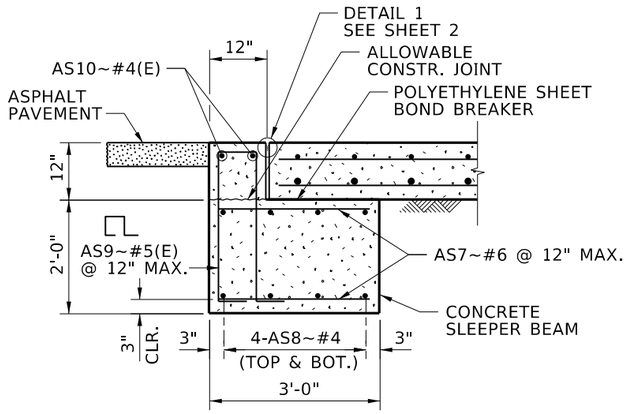


PLAN



NO ABUTMENT JOINT DETAIL

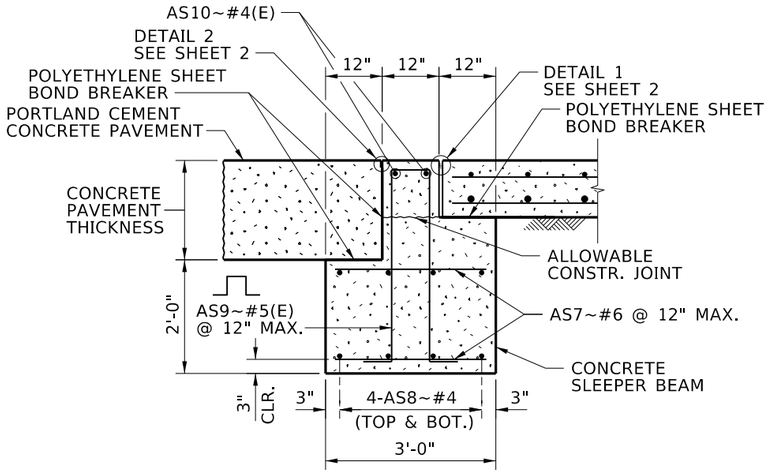
$\frac{3}{8}$"=1'-0"



ELEVATION

CONCRETE SLEEPER BEAM
ASPHALT PAVEMENT

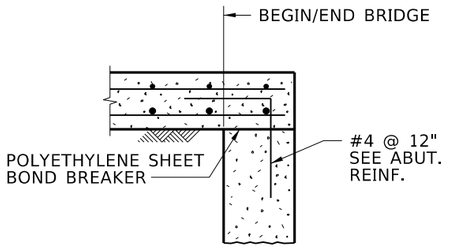
$\frac{3}{8}$"=1'-0"



ELEVATION

CONCRETE SLEEPER BEAM
CONCRETE PAVEMENT

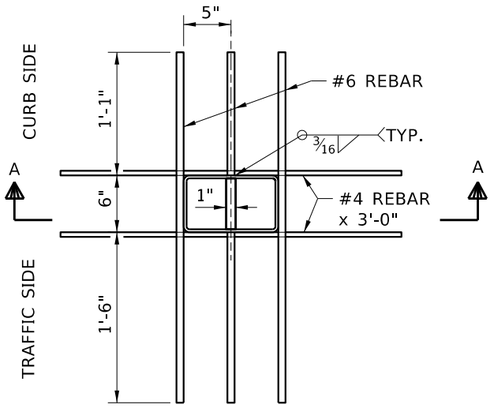
$\frac{3}{8}$"=1'-0"



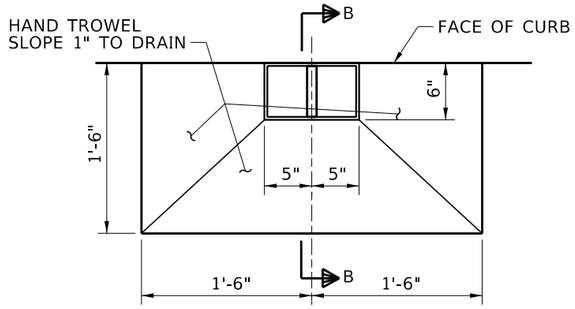
JOINT AT ABUTMENT DETAIL

$\frac{3}{8}$"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	APPROACH SLAB DETAILS - SHEET 3	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED					BRIDGE KEY NO.	
				DETAILED	CADD FILE NAME		PROJECT NO.		COUNTY	KEY NO.
				DWG. CHECKED	Standards\Bridge Standard Drawings\ B02_1D.DGN	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity		BRIDGE LRFD DESIGN MANUAL, B2.1D	BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:				



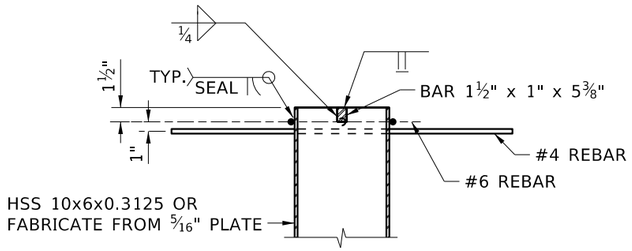
DRAIN PLAN
3/4"=1'-0"



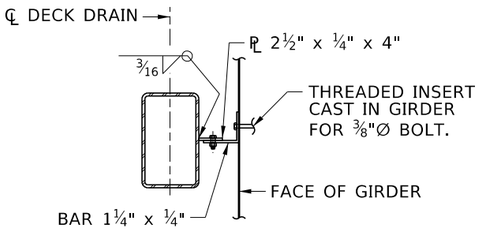
FINISHED DECK DRAIN PLAN
3/4"=1'-0"

DRAIN NOTES

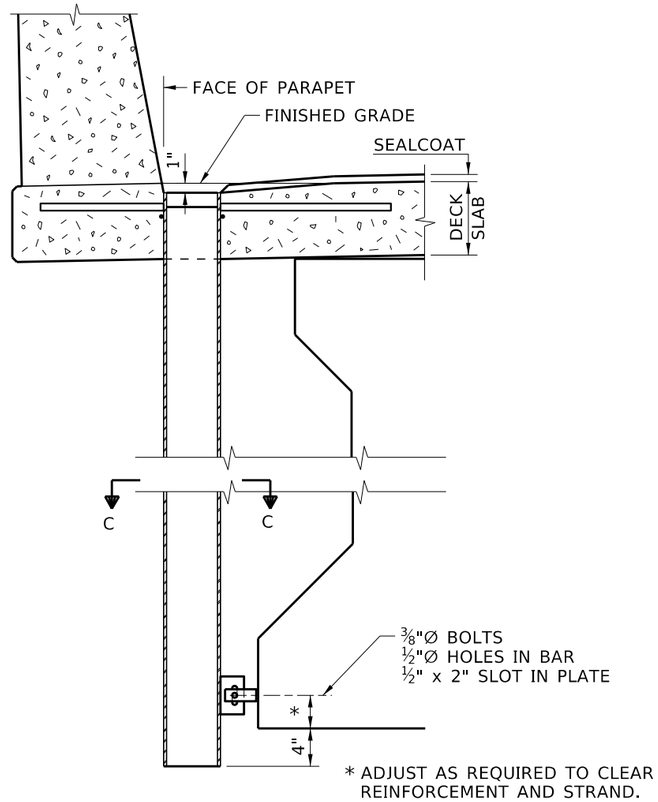
1. HOT DIP GALVANIZE DRAIN ASSEMBLY AFTER FABRICATION IN ACCORDANCE WITH ASTM A123.
2. SEAL WELD SEAMS NOT SHOWN WELDED.
3. GRIND SMOOTH SEAMS ON TOP OF THE DRAIN.
4. FIELD BEND OR CUT ANY BARS THAT CONFLICT WITH DRAINS.
5. PROVIDE STRUCTURAL STEEL IN ACCORDANCE WITH ASTM A709 GRADE 36.
6. PROVIDE STRUCTURAL STEEL TUBING IN ACCORDANCE WITH ASTM A500 OR A501.
7. PROVIDING AND INSTALLING THE DRAIN ASSEMBLIES IS INCIDENTAL TO PAY ITEM 502-310A.



SECTION A-A
3/4"=1'-0"



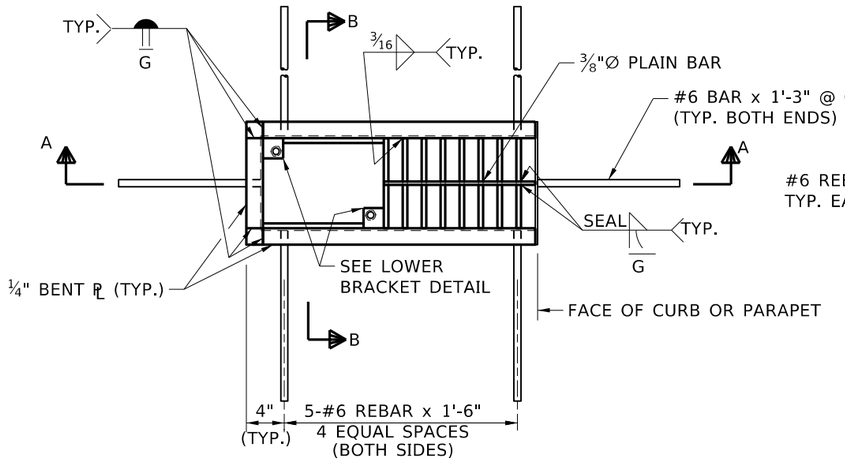
SECTION C-C
3/4"=1'-0"



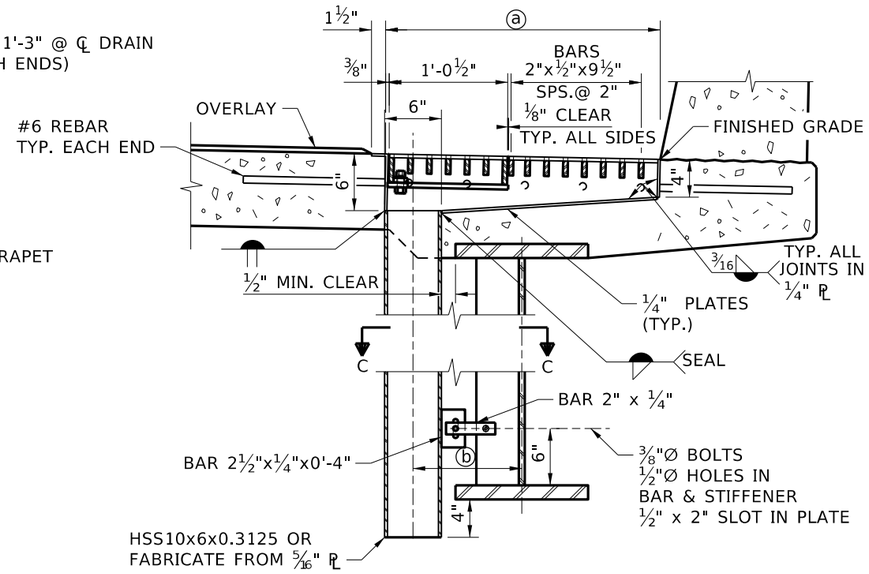
SECTION B-B
3/4"=1'-0"

DECK DRAIN LAYOUT
3/4"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	BRIDGE DRAIN DETAILS - TYPE 1	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
				DETAILED	Standards\Bridge Standard Drawings\ B02_2A.DGN				COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: OCT 2023	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B2.2A	BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						



DRAIN PLAN
3/4"=1'-0"
(REMOVABLE GRATING NOT SHOWN)

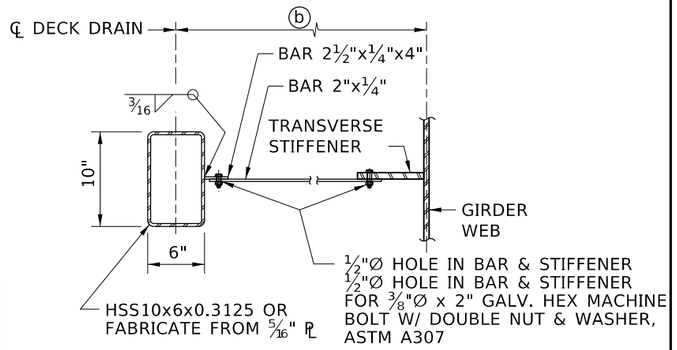


SECTION A-A
3/4"=1'-0"

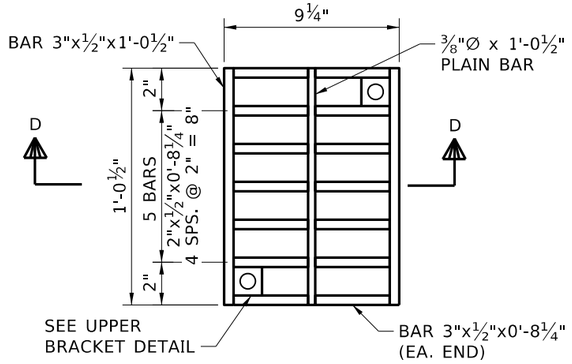
DIMENSION	
ⓐ	
ⓑ	

DRAIN NOTES

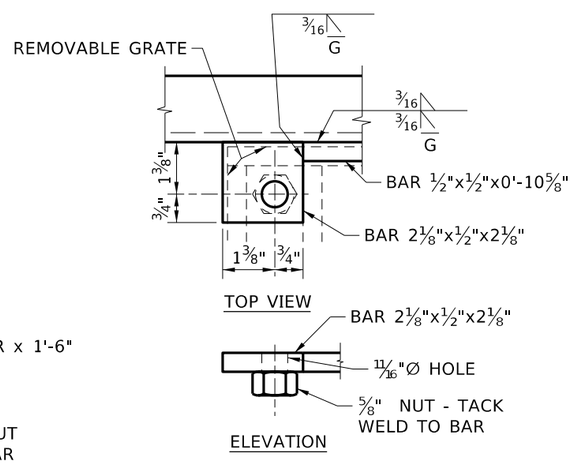
1. HOT DIP GALVANIZE DRAIN ASSEMBLY AFTER FABRICATION IN ACCORDANCE WITH ASTM A123.
2. SEAL WELD SEAMS NOT SHOWN. GRIND SMOOTH SEAMS ON TOP OF DRAIN.
3. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 105.02.
4. FIELD BEND OR CUT ANY BARS THAT CONFLICT WITH DRAINS.
5. PROVIDE STRUCTURAL STEEL IN ACCORDANCE WITH ASTM A709 GRADE 36.
6. PROVIDE STRUCTURAL STEEL TUBING IN ACCORDANCE WITH ASTM A500 OR A501.
7. PROVIDE 5/8" - 11 UNC x 1¾" STAINLESS STEEL HEXAGON SOCKET HEAD CAP SCREWS 18-8 SS.
8. PROVIDING AND INSTALLING THE DRAIN ASSEMBLIES IS INCIDENTAL TO PAY ITEM 502-310A.



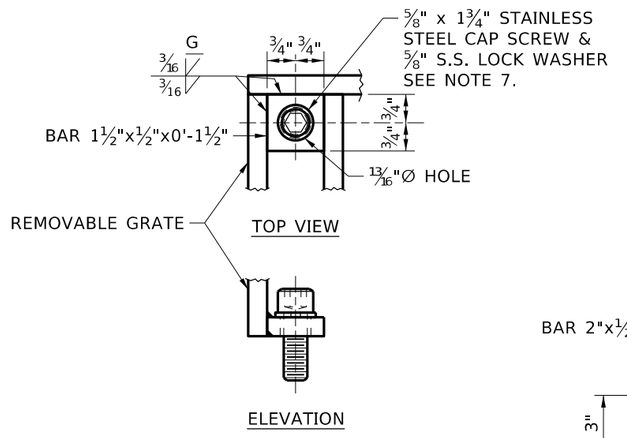
SECTION C-C
3/4"=1'-0"



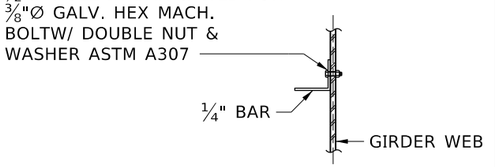
REMOVABLE GRATE
1½"=1'-0"



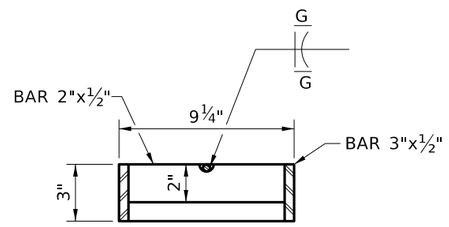
LOWER BRACKET DETAIL
3"=1'-0"



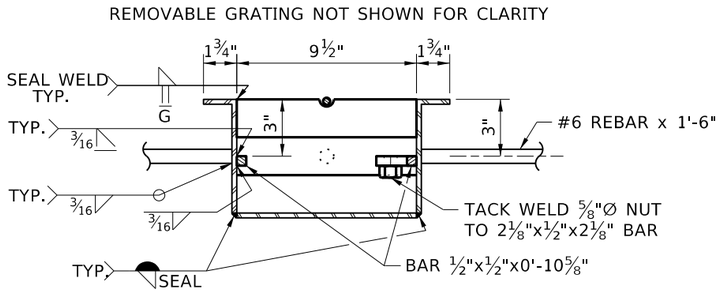
UPPER BRACKET DETAIL
3"=1'-0"



ALTERNATE CONNECTION DETAIL
3/4"=1'-0"

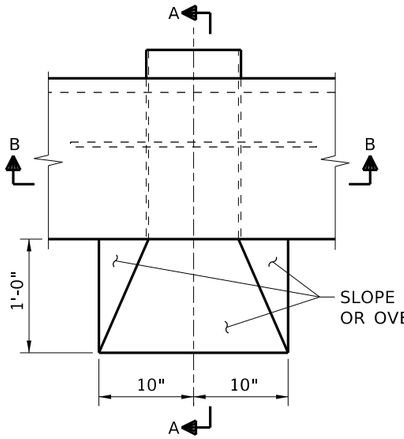


SECTION D-D
1½"=1'-0"

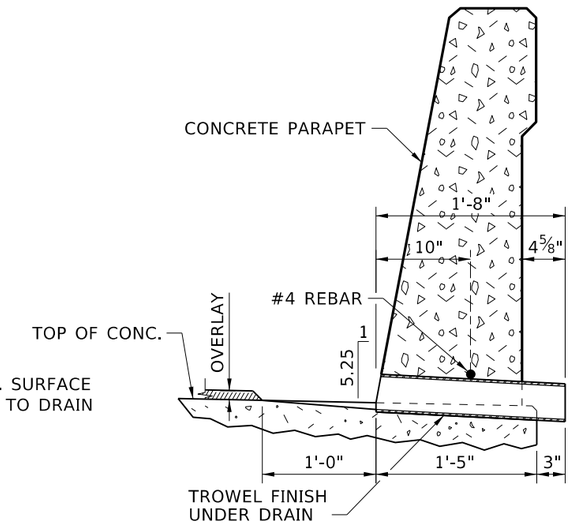


SECTION B-B
1½"=1'-0"

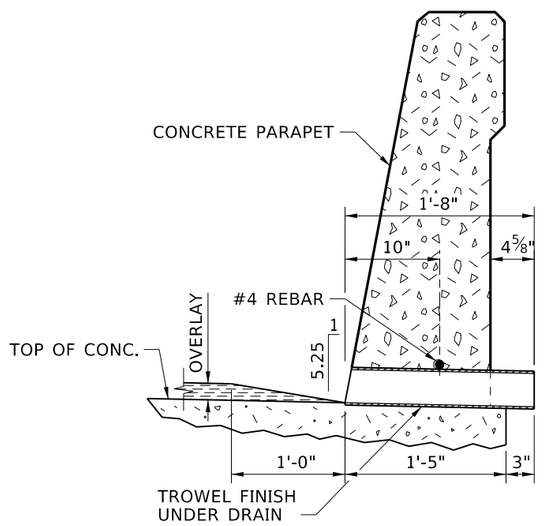
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	BRIDGE DRAIN DETAILS - TYPE 2	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards\Bridge Standard Drawings\ B02_2B.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B2.2B	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



PLAN
¾"=1'-0"



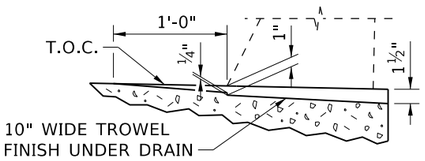
SECTION A-A
(CAST-IN-PLACE SLABS)
¾"=1'-0"



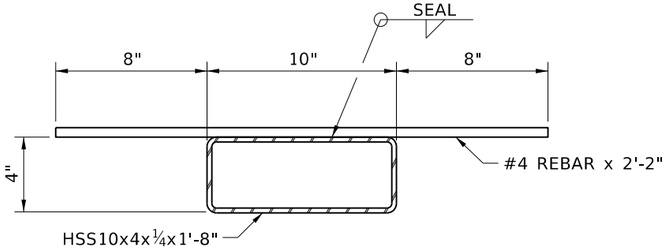
SECTION A-A
(PRECAST SLABS OR BOXES)
¾"=1'-0"

NOTES

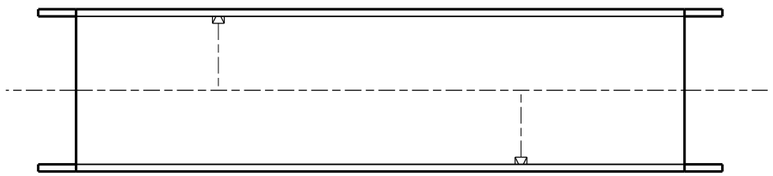
1. HOT DIP GALVANIZED DRAIN ASSEMBLY AFTER FABRICATION IN ACCORDANCE WITH ASTM A123.
2. ADJUST ANY BARS THAT CONFLICT WITH DRAIN.
3. PROVIDE STRUCTURAL STEEL TUBING IN ACCORDANCE WITH ASTM A500 OR A501.
4. PROVIDING AND INSTALLING THE DRAIN ASSEMBLY IS INCIDENTAL TO PAY ITEM 502-430A.



TROWEL FINISH DETAIL
¾"=1'-0"

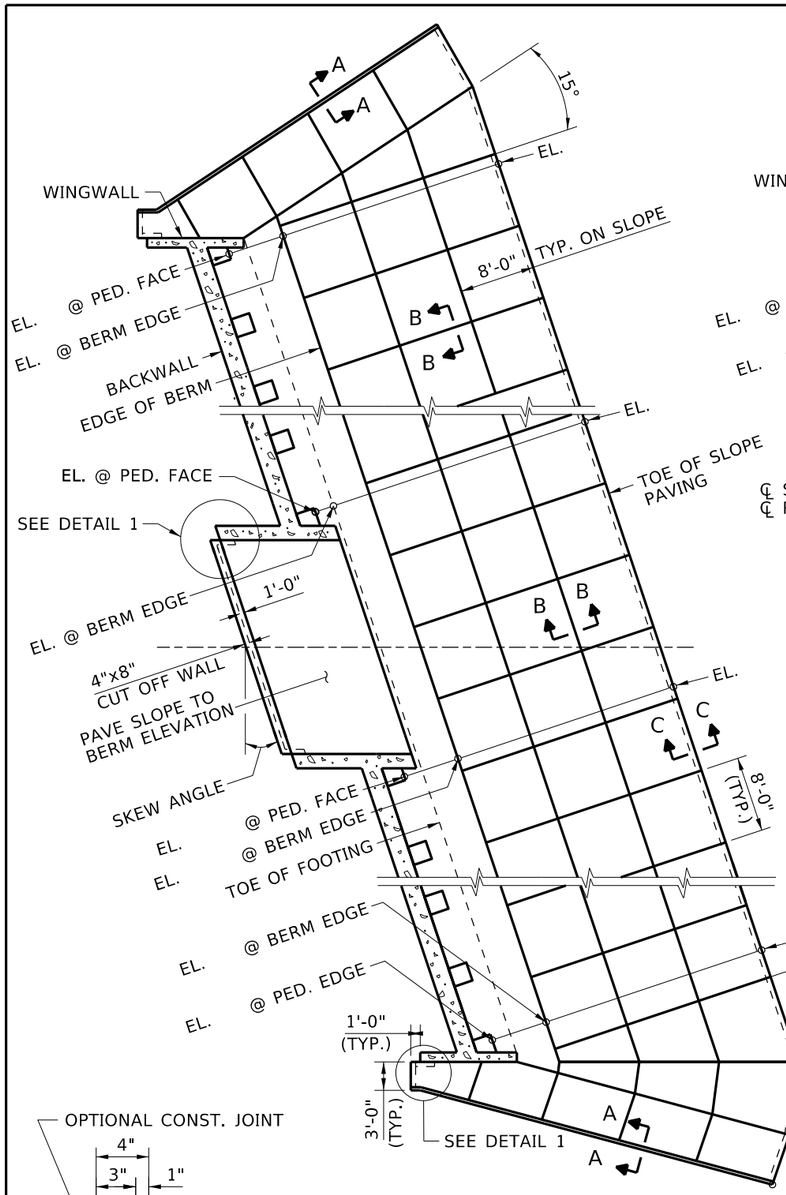


SECTION B-B
1½"=1'-0"

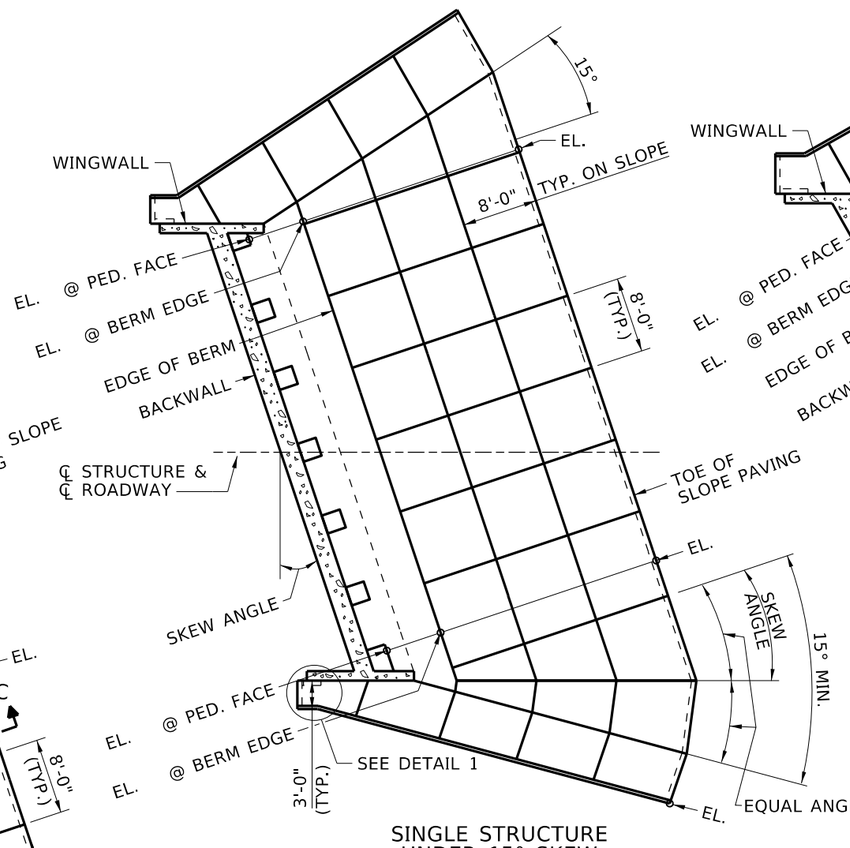


LOCATION
NTS

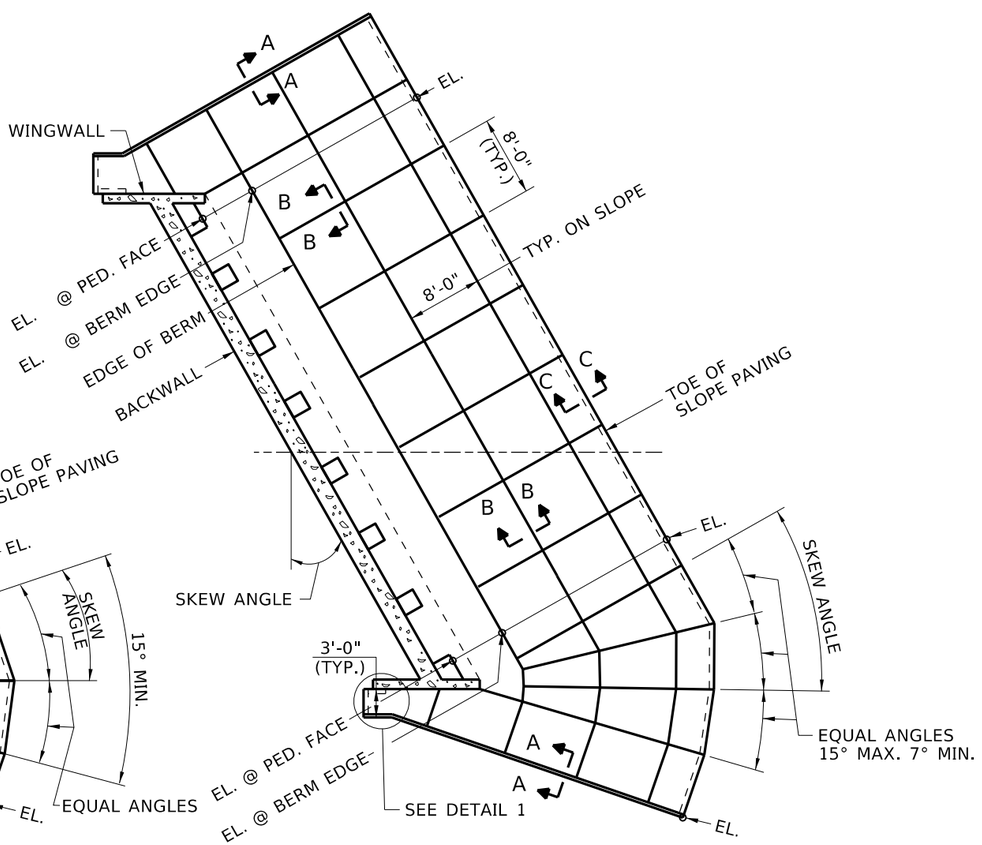
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	TYPE 3 BRIDGE DRAIN THRU PARAPET	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	FOR VOIDED SLAB, BOX BEAM, AND DECK BULB TEE TYPE STRUCTURES, SINGLE SLOPE PARAPET BRIDGE LRFD DESIGN MANUAL, B2.2C	BRIDGE KEY NO.	
				DETAILED	Standards\Bridge Standard Drawings\ B02_2C.DGN				COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						

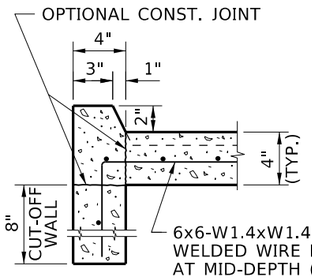


SINGLE STRUCTURE
UNDER 15° SKEW
NTS

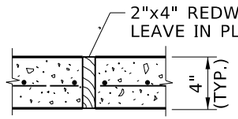


SINGLE STRUCTURE
OVER 15° SKEW
NTS



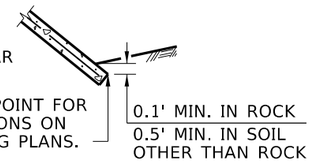


SECTION A-A
NTS

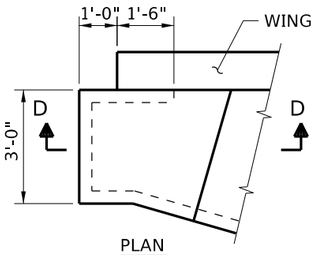


SECTION B-B
NTS

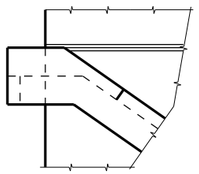
DUAL STRUCTURE
UNDER 15° SKEW
NTS



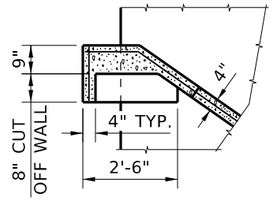
SECTION C-C
NTS



PLAN



ELEVATION



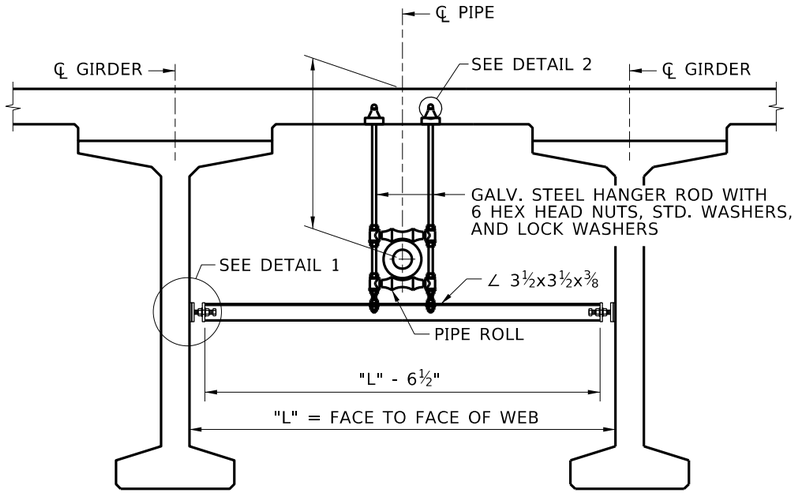
SECTION D-D

DETAIL 1
¼"=1'-0"

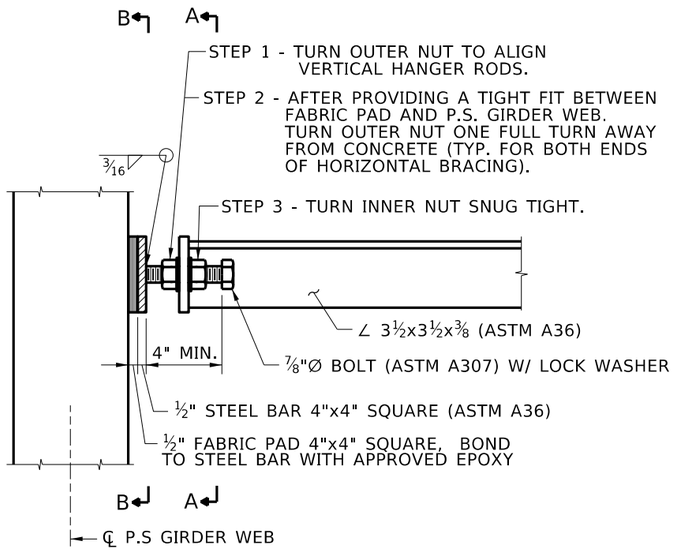
NOTES

1. TREAT THE AREA UNDER THE SLOPE PAVING IN ACCORDANCE WITH S.S.P. 653 - VEGATATION CONTROL GROUP C. THE COST IS INCIDENTAL TO PAY ITEM 623-005A.
2. PAVE ON 2:1± SLOPE FOR INTERSTATE BACKSLOPE.
3. PROVIDE ½" x 4" PREFORMED JOINT FILLER (AASHTO M213) BETWEEN SLOPE PAVING AND FACE OF ABUTMENT AND WINGWALLS. PROVIDE ALTERNATE ROWS OF PANELS THAT HAVE AN EXPOSED AGGREGATE SURFACE OR HEAVY BROOM FINISH.

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	SLOPE PAVING DETAILS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards\Bridge Standard Drawings\ B02_3.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B2.3	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



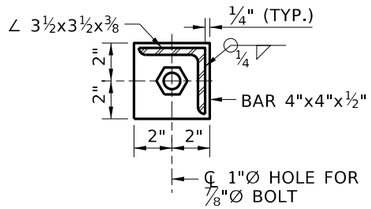
HANGER UTILITY SUPPORT
WATER AND SEWER LINES
⅜"=1'-0"



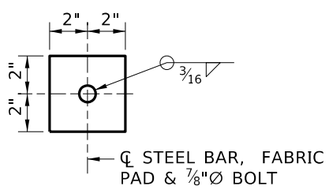
DETAIL 1
⅜"=1'-0"

NOTES

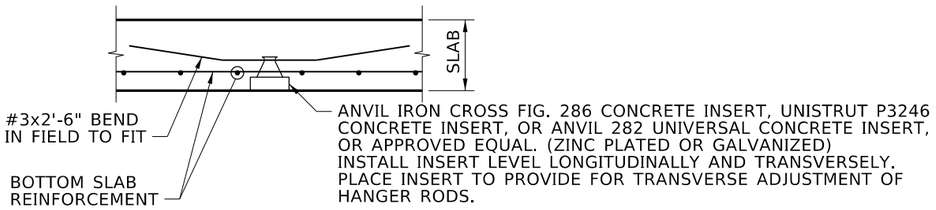
1. GALVANIZE MATERIALS AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 OR ASTM A153 EXCEPT PIPE ROLL.
2. PAINT ROLLERS WITH 3 COATS OF APPROVED GALVANIZING REPAIR PAINT.
3. CLEAN AND PAINT ANY PAINTED SURFACES DAMAGED DURING CONSTRUCTION AS DIRECTED REMOVE ANY PAINT SPLATTER FROM THE BRIDGE.
4. PROVIDE FABRIC PADS COMPOSED OF MULTIPLE LAYERS OF DUCK, IMPREGNATED AND BOUND WITH HIGH QUALITY OIL RESISTANT SYNTHETIC RUBBER, COMPRESSED INTO RESILIENT PADS IN ACCORDANCE WITH THE LATEST EDITION OF MIL C 882.
   PROVIDE THE NUMBER OF PLIES TO PRODUCE THE SPECIFIED THICKNESS, AFTER COMPRESSION AND VULCANIZATION.
5. PROVIDE PRE-FORMED FABRIC PADS WITH A SHORE A HARDNESS OF 90 ±5 IN ACCORDANCE WITH ASTM D2240.
6. PRE-FORMED FABRIC PADS WILL BE ACCEPTED BASED ON THE MANUFACTURER'S CERTIFICATE OF COMPLIANCE THAT THE MATERIALS FURNISHED CONFORMS TO THE PLAN AND SPECIFICATIONS.



SECTION A-A
1½"=1'-0"

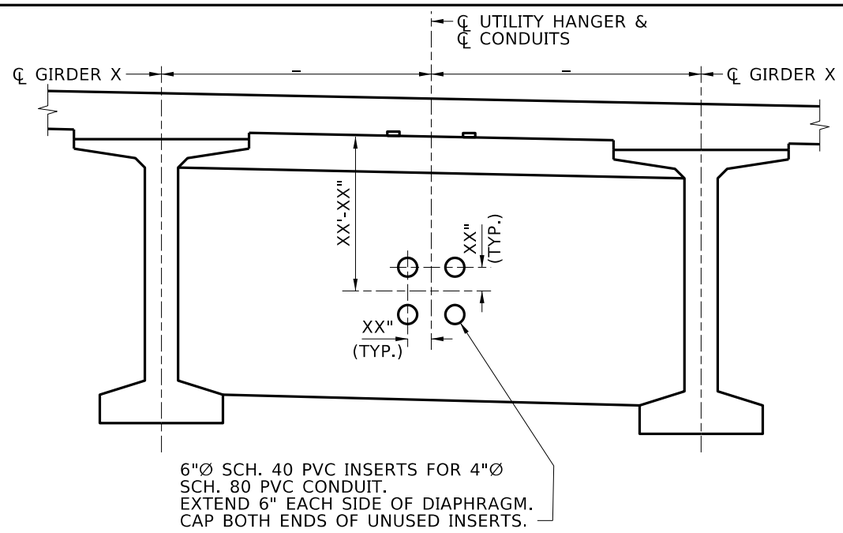


SECTION B-B
1½"=1'-0"



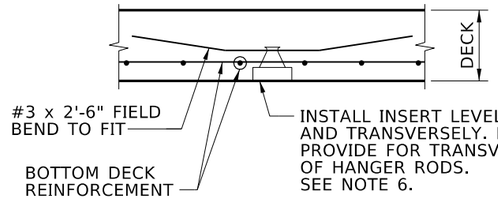
DETAIL 2
NTS

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	UTILITY HANGER FOR PRESTRESSED GIRDERS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	NEW CONSTRUCTION (WATER, SEWER AND GAS) BRIDGE LRFD DESIGN MANUAL, B2.4A	BRIDGE KEY NO.
				DETAILED	Standards\Bridge Standard Drawings\ B02_4A.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



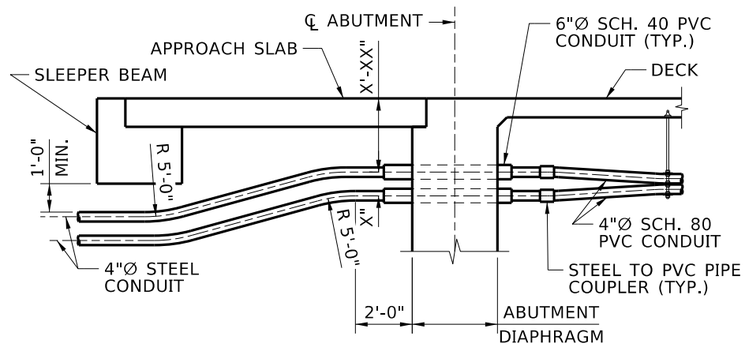
INTERMEDIATE DIAPHRAGM DETAILS

$\frac{3}{16}$" = 1'-0"



DETAIL 1

NTS

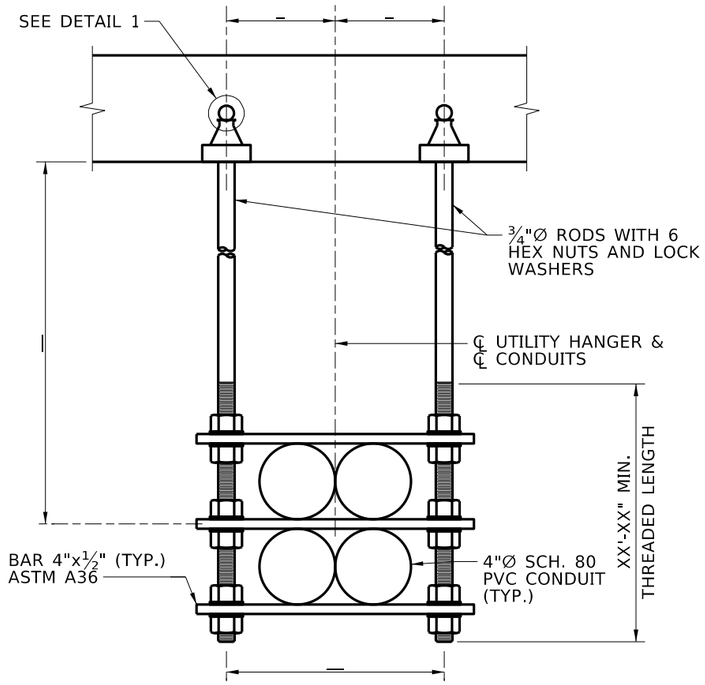


SECTION A-A

NTS

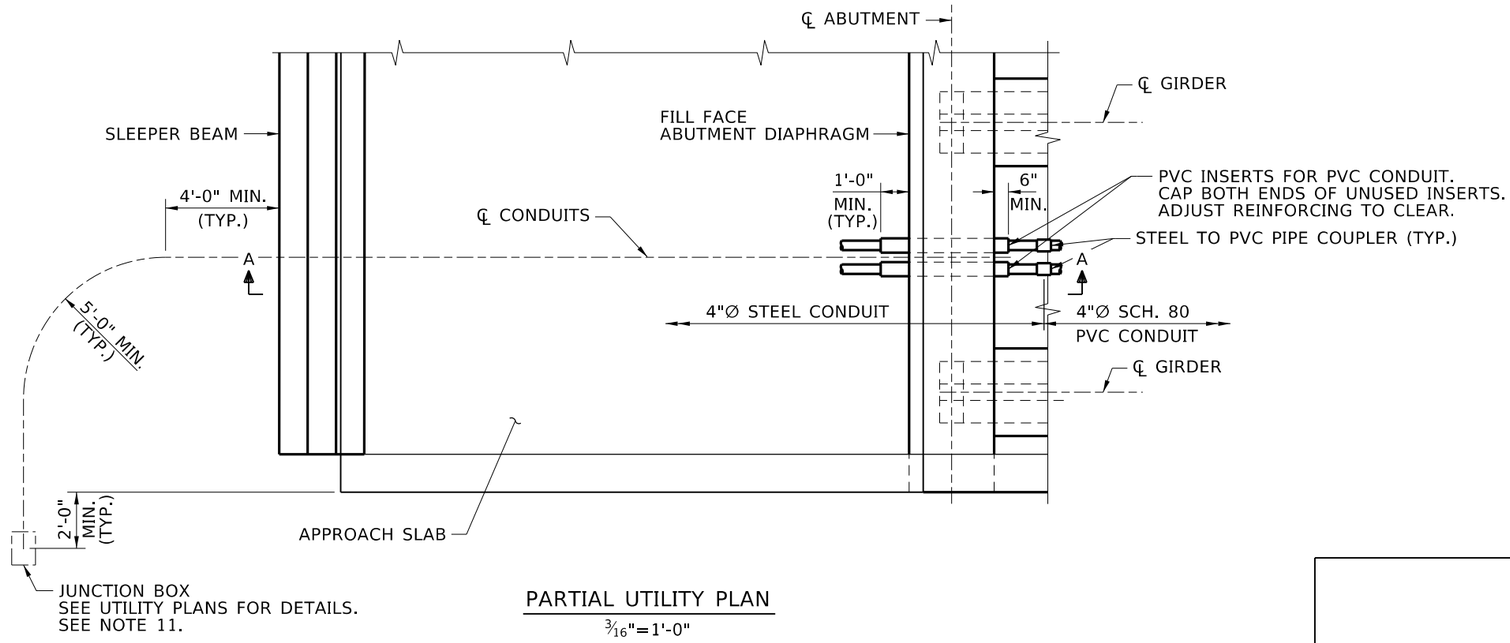
NOTES

1. INSTALL A PULL ROPE IN UNUSED CONDUIT AND CAP BOTH ENDS.
2. PROVIDE ANCHOR RODS IN ACCORDANCE WITH ASTM F1554 GRADE 36 AND GALVANIZED IN ACCORDANCE WITH ASTM A153.
3. PROVIDE NUTS IN ACCORDANCE WITH ASTM A563 GRADE A.
4. GALVANIZE STEEL MATERIALS AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 OR ASTM A153.
5. PROVIDE ONE SCH. 80 PVC PIPE EXPANSION COUPLER PER CONDUIT, PER SPAN (_ TOTAL). PROVIDE EXPANSION COUPLERS WITH ±1" MINIMUM MOVEMENT RANGE CAPACITY. LOCATE EXPANSION COUPLERS APPROXIMATELY AT MIDSPAN.
6. PROVIDE ZINC PLATED OR GALVANIZED CONCRETE INSERTS IN ACCORDANCE WITH ANVIL 282 UNIVERSAL CONCRETE INSERT, UNISTRUT P3246 CONCRETE INSERT, ANVIL IRON CROSS FIG. 286 CONCRETE INSERT, OR APPROVED EQUAL.
7. EXTEND PVC SLEEVES 6" BEYOND FRONT FACE OF ABUTMENTS AND 12" BEYOND FILL FACE OF ABUTMENTS. CAP BOTH ENDS OF UNUSED SLEEVES.
8. FIELD ADJUST ABUTMENT DIAPHRAGM REINFORCEMENT TO CLEAR SLEEVES.
9. FILL ANNULAR VOID BETWEEN 6"Ø PVC SLEEVES AND 4"Ø STEEL CONDUIT WITH GROUT FOLLOWING INSTALLATION OF CONDUITS.
10. COST OF FURNISHING AND INSTALLING CONCRETE INSERTS, INSERT REINFORCEMENT, UTILITY HANGER ASSEMBLIES, 4"Ø SCH. 80 PVC EXPANSION COUPLERS, 6"Ø PVC SLEEVES, 4"Ø SCH. 80 PVC CONDUITS, STEEL-TO-PVC PIPE COUPLERS, 4"Ø STEEL CONDUITS, AND GROUT ARE INCLUDED IN PAY ITEM "586-005A UTILITY CONDUIT".
11. SEE UTILITY PLANS FOR PROPOSED UTILITIES. DAYLIGHT UNUSED UTILITY CONDUITS TO PROPOSED JUNCTION BOX. CAP ENDS OF UNUSED UTILITY CONDUITS.
12. EXTEND 4"Ø STEEL CONDUITS SO THAT THEY DO NOT PENETRATE THROUGH A MSE WALL.



UTILITY HANGER DETAIL

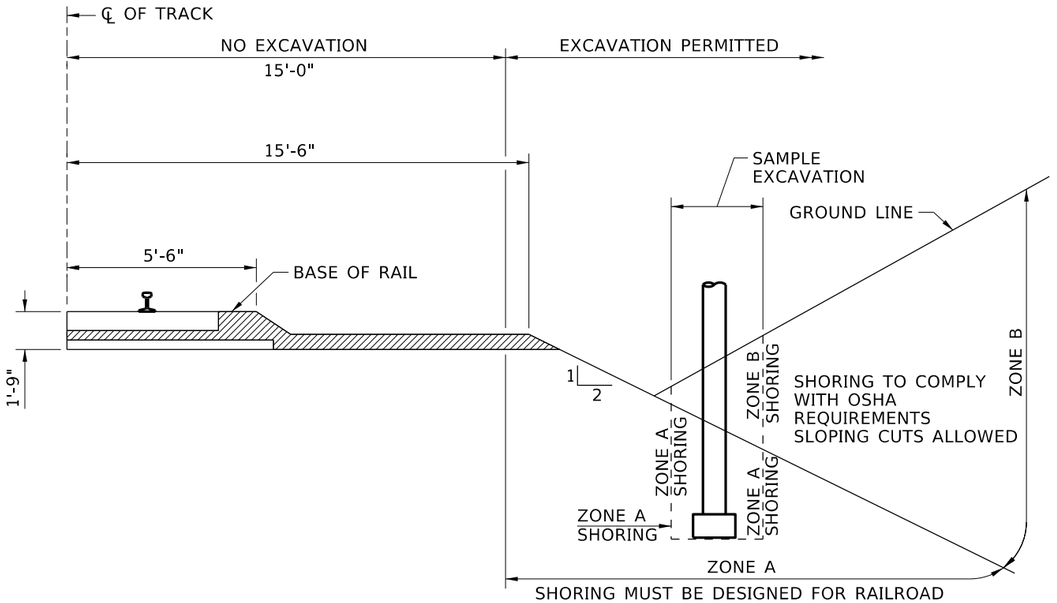
$\frac{3}{16}$"=1'-0"



PARTIAL UTILITY PLAN

$\frac{3}{16}$"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	UTILITY HANGERS FOR PRESTRESSED GIRDERS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	NEW CONSTRUCTION (POWER AND COMMUNICATION) BRIDGE LRFD DESIGN MANUAL, B2.4B	BRIDGE KEY NO.
△				DETAILED	Standards\Bridge Standard Drawings\B02_4B.DGN	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			COUNTY / KEY NO.
△				DWG. CHECKED	DRAWING DATE: DEC 2024				BRIDGE DWG. NO. / SHEET OF
△				CORRECTIONS					
△									



NOTE:
DIMENSIONS ARE MEASURED PERPENDICULAR TO ℄ TRACK.

SHORING MUST BE DESIGNED FOR RAILROAD LIVE LOAD SURCHARGE IN ADDITION TO OSHA STANDARD LOADS FOR EXCAVATION IN ZONE A.
APPLICABLE RAILROAD LIVE LOAD: COOPER E80
NO SLOPING CUTS ALLOWED

TRACK PROTECTION SHORING REQUIREMENTS

REFERENCE: UNION PACIFIC RAILROAD - BNSF RAILWAY GUIDELINES FOR TEMPORARY SHORING
NTS

RAILROAD CONSTRUCTION NOTES:

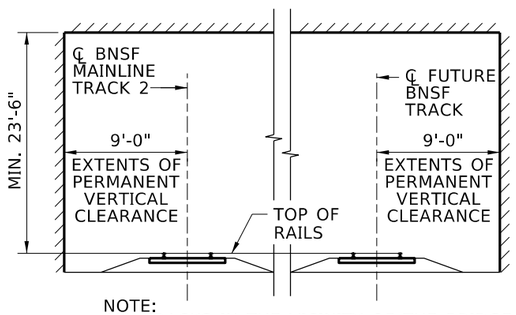
- DO NOT COMPROMISE SAFETY NOR IMPACT RAILROAD OPERATIONS WITH CONSTRUCTION ACTIVITIES AND PHASING.
- REFER TO THE RAILROAD'S COORDINATION REQUIREMENTS AS PART OF THE SPECIFICATIONS OR SPECIAL PROVISIONS OF THE PROJECT.
- SUBMIT SHORING PLANS AND DESIGN CALCULATIONS SIGNED AND SEALED BY AN IDAHO LICENSED PROFESSIONAL ENGINEER. DESIGN AND CONSTRUCT ANY SHORING SYSTEM THAT IMPACTS THE RAILROAD'S OPERATION OR SUPPORTS THE RAILROAD'S EMBANKMENT IN ACCORDANCE WITH RAILROAD GUIDELINES FOR TEMPORARY SHORING. PRIOR TO CONSTRUCTION, OBTAIN RAILROAD REVIEW AND APPROVAL OF SHORING. PLACE SHORING WITHIN THE LIMITS OF ZONE A FOR EXCAVATIONS AS SHOWN IN TRACK PROTECTION SHORING REQUIREMENTS DETAIL ON THIS SHEET BEFORE THE START OF EXCAVATION.
- PRIOR TO CONSTRUCTION, OBTAIN RAILROAD REVIEW AND APPROVAL OF RELEVANT CONSTRUCTION ITEMS, INCLUDING BUT NOT LIMITED TO, SHORING, TRACK & GROUND MONITORING, ERECTION, DEMOLITION, AND FALSEWORK. SUBMIT DETAILED PLANS INDICATING THE NATURE AND EXTENT OF WORK FOR APPROVAL BY THE RAILROAD BEFORE COMMENCING ANY WORK.
- PERFORM CONSTRUCTION ACTIVITIES WITHIN NATURALLY OCCURRING TRACK WINDOWS. COORDINATE ALL REQUESTS FOR CONSTRUCTION WORK WINDOWS WITH THE RAILROAD'S DESIGNATED REPRESENTATIVE TO ENSURE THAT THE WORK IS SCHEDULED TO ELIMINATE ANY POTENTIAL DISRUPTION TO THE RAILROAD'S OPERATION.
- DEMOLITION WITHIN THE RAILROAD'S RIGHT-OF-WAY OR DEMOLITION THAT MAY IMPACT THE RAILROAD'S TRACKS OR OPERATIONS SHALL COMPLY WITH THE RAILROAD'S DEMOLITION REQUIREMENTS.
- MAINTAIN THE PERMANENT VERTICAL AND HORIZONTAL DESIGN CLEARANCES, WHICH ARE SPECIFIED IN THE BID DOCUMENTS APPROVED BY THE RAILROAD IN RELATION TO THE TOP-OF-RAIL AND CENTERLINE OF EXISTING AND FUTURE TRACKS, RESPECTIVELY. REDUCTION OF THESE CLEARANCES IS NOT PERMITTED.
- PROVIDE THE MINIMUM PERMANENT VERTICAL CLEARANCE OF 23’-6” MEASURED FROM TOP OF HIGHEST RAIL TO THE LOWEST OBSTRUCTION UNDER THE STRUCTURE. MEASURE THE EXTENT OF THIS VERTICAL CLEARANCE A MINIMUM OF 9’-0” TO THE FIELD SIDE OF THE OUTERMOST EXISTING OR FUTURE TRACKS, MEASURED PERPENDICULAR FROM THE CENTERLINE OF SAID TRACKS. THE PERMANENT VERTICAL CLEARANCE SHALL EXTEND TO COVER ALL EXISTING AND FUTURE TRACKS, INCLUDING THE SPACE IN BETWEEN. (IN CURVED TRACK, 9 FEET SHALL BE INCREASED EITHER 6 INCHES TOTAL OR 1.5 INCHES FOR EVERY DEGREE OF CURVE, WHICHEVER IS GREATER.)
- VERIFY PERMANENT CLEARANCES THROUGHOUT CONSTRUCTION. SUBMIT A COMPLIANCE REPORT TO THE RAILROAD BEFORE PROJECT CLOSING. BRING DISCREPANCIES TO THE ATTENTION OF THE RAILROAD.
- VERIFY THE ELEVATION OF THE EXISTING TOP-OF-RAIL PROFILE BEFORE STARTING OF CONSTRUCTION.
- TEMPORARY CONSTRUCTION CLEARANCES, INCLUDING FALSEWORK CLEARANCES, SHALL COMPLY WITH FIGURE 1.
- CONSTRUCTION ACTIVITIES ARE NOT ALLOWED WITHIN THE TEMPORARY CONSTRUCTION CLEARANCE ENVELOPE.
- SUBMIT A PROPOSED METHOD OF EROSION AND SEDIMENT CONTROL AND HAVE THE METHOD APPROVED BY THE RAILROAD BEFORE BEGINNING ANY GRADING WITHIN THE RAILROAD RIGHT-OF-WAY.
- RAILROAD REQUIREMENTS DO NOT ALLOW WORK WITHIN 50 FEET OF TRACK CENTERLINE WHEN A TRAIN PASSES THE WORK SITE AND PERSONNEL MUST SECURE EQUIPMENT AND CLEAR THE AREA WITHIN 25 FEET OF THE TRACK CENTERLINE.

NOTES FOR UPRR PROJECTS:

- USE THE UNION PACIFIC RAILROAD PUBLIC PROJECTS MANUAL AS A GUIDE FOR ASSISTING IN ADMINISTERING, COORDINATING, PLANNING, AND IMPLEMENTING THIS PROJECT.
- FOR SPECIFIC RAILROAD REQUIREMENTS AND ADDITIONAL INFORMATION FOR UTILITIES, REFER TO WWW.UP.COM/CBUD.
- ABANDONMENT OF UTILITIES MUST FOLLOW THE UPRR GUIDELINES FOR ABANDONMENT OF SUBSURFACE UTILITY STRUCTURES.
- GIRDER SPLICES ABOVE UPRR TRACKS SHALL NOT REQUIRE FALSEWORK THAT ENCROACHES ON UPRR'S MINIMUM CONSTRUCTION CLEARANCE ENVELOPE.
- CONSTRUCTION ACTIVITIES MUST ADHERE TO THE MOST RESTRICTIVE PROVISIONS OF THE CURRENT UPRR AND AREMA STANDARDS AND GUIDELINES IN EFFECT AT THE TIME THE WORK IS EXECUTED.
- ALLOW A MINIMUM OF 4 WEEKS FOR REVIEW AND APPROVAL OF EACH SUBMITTAL. EXPECT LONGER REVIEW TIMES FOR SUBMITTALS NOT IN ACCORDANCE WITH THESE NOTES.

PROJECT SPECIFIC NOTES:

- ADDITIONAL VERTICAL CLEARANCE HAS BEEN PROVIDED TO ALLOW FOR ADJUSTMENT OF SAG IN VERTICAL CURVE, FUTURE TRACK RAISE, FLOOD CONSIDERATIONS, CONSTRUCTION AND MAINTENANCE PURPOSES. BRING DISCREPANCIES TO THE ATTENTION OF THE RAILROAD BEFORE CONSTRUCTION.
- THE PROPOSED GRADE SEPARATION PROJECT WILL NOT CHANGE THE QUANTITY OR CHARACTERISTICS OF THE FLOW IN RAILROAD DITCHES OR DRAINAGE STRUCTURES.
- DECK DRAINS WILL NOT BE USED ON THIS BRIDGE. STORM WATER WILL BE COLLECTED ON THE ROADWAY AT THE END OF THE STRUCTURE.
- TOP-OF-RAIL SURVEY HAS BEEN PERFORMED FOR 1000 FEET ON EITHER SIDE OF PROPOSED OVERHEAD STRUCTURE.



NOTE:
ALL TRACKS IN THE VICINITY OF THE BRIDGE ARE NOT SHOWN FOR CLARITY.

PERMANENT VERTICAL RAILROAD CLEARANCE

REFERENCE: UNION PACIFIC RAILROAD - BNSF RAILWAY GUIDELINES FOR RAILROAD GRADE SEPARATION PROJECTS SECTION 5.2
NTS

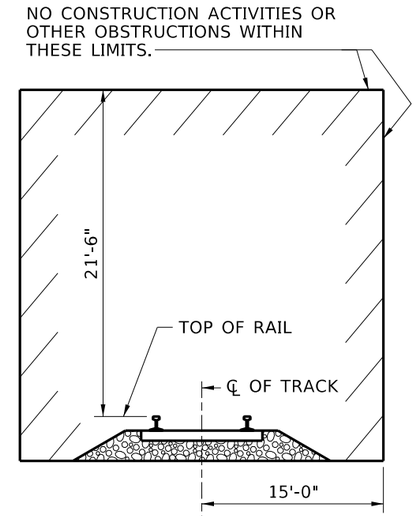


FIGURE 1

MINIMUM CONSTRUCTION CLEARANCE ENVELOPE (NORMAL TO RAILROAD)

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	RAILROAD DETAILS	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
				DETAILED	Standards\Bridge Standard Drawings\B02_5.DGN				COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B2.5	BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						

CHAPTER 3

LOADS

3.4.1 LOAD FACTORS

- γ_{EQ} shall be assumed as 0.0 for Extreme Event I Load Combination.
- γ_{SE} & γ_{TG} shall be taken as follows:

  0.0 for strength and extreme event limit states
  1.0 for service limit states if live load is not considered
  0.5 for service limit states with live load

Table 3.4.1-4

ITD practice is not to take advantage of the elastic gain, so use γ_{LL} = 0.8.

Commentary:

Refer to Bridge Design Manual Article 5.9.3, Loss of Prestress, for ITD design procedure.

Revisions:

Oct 2017	Added clarification to table 3.4.1-4 for ITD practice. Added Commentary

3.5.1 DEAD LOADS

All structures whose deck slabs will be exposed to traffic shall be designed for a future wearing surface.

Box girder bridges (steel, conventional reinforced, post-tension) shall be designed for a Type 1 or Type 2 dual protection system as specified in Article 5.14.
A Type 1 dual protection system shall have a future 1½" concrete overlay to replace the original top 1½" non-structural deck slab concrete. Use 18 psf for the value of the future wearing surface.
A Type 2 dual protection system shall have a future 1" concrete overlay to replace the original top 1" non-structural deck slab concrete. Use 12 psf for the value of the future wearing surface.

Prestressed or steel girders with a cast-in-place deck that do not have any overlay during original construction should be designed for a future overlay of 28 psf.

Bridges that have a PPC overlay during original construction shall be designed for a minimum 15 psf PPC overlay at original construction and 10 psf PPC future overlay.

Bridges that have an asphalt overlay with a spray-applied membrane during original construction shall be designed for a minimum 140 pcf*asphalt thickness and 28 psf future overlay.

Commentary:
When a spray-applied waterproofing membrane exists, only a partial removal of the existing asphalt is done to protect the membrane. Therefore, an additional 28 psf of future wearing surface should be included in the design.

Revisions:

May 2021	Added clarification for the weight of future overlays for different applications of overlays.
Oct 2023	Clarified the loads for box girder bridges. Added 9 psf of future ppc overlay for bridges with a ppc overlay during original construction.
Dec 2024	Changed minimum design load for PPC overlays from 10pcf at original construction to 15pcf and 9psf future load to 10psf. Clarified that the asphalt overlay load at original construction is equal to 140pcf*asphalt thickness.

3.6.1.1.2 MULTIPLE PRESENCE FACTORS

The factors specified in the Table shall not be applied in conjunction with approximate load distribution factors specified in Articles 4.6.2.2 and 4.6.2.3, except where the lever rule is used or where special requirements for exterior beams in beam-slab bridges, specified in Article 4.6.2.2d, are used.

Multiple presence factors are based on the directional CAADT. If directional CAADT percentages are not available, they may be assumed to be 60% of the total CAADT.

Number of Loaded Lanes	MPF for design year CAADT >1000 in one direction	Adjusted MPF for design year (0.95) 100≤ CAADT ≤1000 in one direction	Adjusted MPF for design year (0.90) CAADT <100 in one direction
1	1.20	1.14	1.08
2	1.00	0.95	0.90
3	0.85	0.81	0.77
>3	0.65	0.62	0.59

Commentary:

The multiple presence factor adjustment is described in C3.6.1.1.2.

Revisions:

April 2008 Added Commentary and listed adjustment factors in the table.

May 2014 Revised notation of ADTT to CAADT.

Dec 2024 Changed assumed CAADT from 50% to 60%.

3.6.1.2 DESIGN VEHICULAR LIVE LOAD

3.6.1.2.1 General

NEW CONSTRUCTION
Bridges and concrete culverts, which carry traffic on Interstates & Ramps, US, State Primary, and State Secondary highways, shall be designed for HL93 loading using the LRFD Design Code.

Metal pipes or precast concrete arches that carry traffic on Interstates & Ramps, US, State Primary, and State Secondary highways, shall be designed for HL93 design loading and standard gage tridem axle load of 120k (40k per axle with 4.5' spacing) using the LRFD Design Code for Strength II. Larger design loads may be required for metal pipe arches and precast concrete arches with a span over 25 feet. Contact the ITD Group Leader for guidance.

Local and Off-System bridges shall be designed for HL93 loading using the LRFD Design Code.

MODIFICATION OF EXISTING STRUCTURES
Where economically feasible, the modifications to structures carrying US, State, Interstate, and Local traffic should be designed for HL93 loading using the LRFD Design Code. When HL93 loading will require extensive upgrading to other structural elements, the live load used shall be determined by the Bridge Engineer.

Commentary:
Refer to Article 0.0 Commentary.

Revisions:

April 2008	Deleted 17th Edition Design for Local and Off System bridges. Added Commentary.
Oct 2023	Added loading for metal pipe arches and precast concrete arches.

3.6.1.3 APPLICATION OF VEHICULAR LIVE LOADS

3.6.1.3.1 General

All bridges will be designed for Strength I case using the controlling live load cases:

A. Lane Load + Design Tandem.
B. Lane Load + Design Truck.
C. Negative moment between points of contraflexure only.
    1. 90% of two Design trucks (with 14' axle spacing) going in the same direction a minimum of 50 feet apart (measured from the rear axle of the lead vehicle to the front axle of the trailing vehicle) + 90% lane load.
    2. Two Design tandems spaced 26' to 40' apart + lane load

3.6.1.3.2 Loading for Optional Live Load Deflection

The live load deflection should be based on the provisions of the AASHTO LRFD Bridge Design Specifications Article 3.6.1.3.2.

Revisions:
Dec 2024 Added reference to the AASHTO Bridge Code in 3.6.1.3.2

3.6.1.4.2 Fatigue Load – Frequency

Steel design requires the $ADTT_{SL}$ averaged over the design life of the bridge to determine which fatigue limit state applies. However, traffic growth is usually not predicted for the design life of the bridge. In lieu of project-specific information from the traffic data, determine $ADTT_{SL}$ as follows:

$$ADTT_{SL} = p\ ADTT_n$$

$$ADTT_n = \alpha\ (CAADT_0)\left(\frac{CAADT_{20}}{CAADT_0}\right)^{\frac{n\ years}{20\ years}}$$

Where:

p = Fraction of truck traffic in a single-lane. Use AASHTO Table 3.6.1.4.2-1.
α = Conversion factor from two-way traffic to one-way traffic.
= 0.60 when two-directional traffic data is provided
= 1.00 when one-directional traffic data is provided
n = 45 years

ADTT = **A**verage **D**aily **T**ruck **T**raffic
$ADTT_{SL}$ = *ADTT* in a single-lane in one direction
$ADTT_n$ = Estimated one-directional *ADTT* over the bridge's design life (construction + n years)

CAADT = **C**ommercial **A**verage **A**nnual **D**aily **T**raffic
$CAADT_0$ = *CAADT* at construction (i.e., 0 years)
$CAADT_{20}$ = *CAADT* at construction + 20 years

Commentary:

The 9th Edition of AASHTO LRFD has a design life of 75 years. As design data is a projection, the above method was adopted to avoid determining the $AADT_{SL}$ following a curve-fit and integral approach. The formula is based on the future value equation using simple interest, $FV = PV(1 + r)^n$.

The true value of n should fall between a linear average (1/2 x 75 years = 37.5 years) and a parabolic average (2/3 x 75 years = 50 years) but depends on the assumed curve-fit and traffic rate of change, r. The value of n selected provides a conservative $AADT_{SL}$ with the presumed curve-fit equation.

The higher α was selected (compared to 0.55 in the code) as it better reflects historical data trends submitted from traffic engineers.

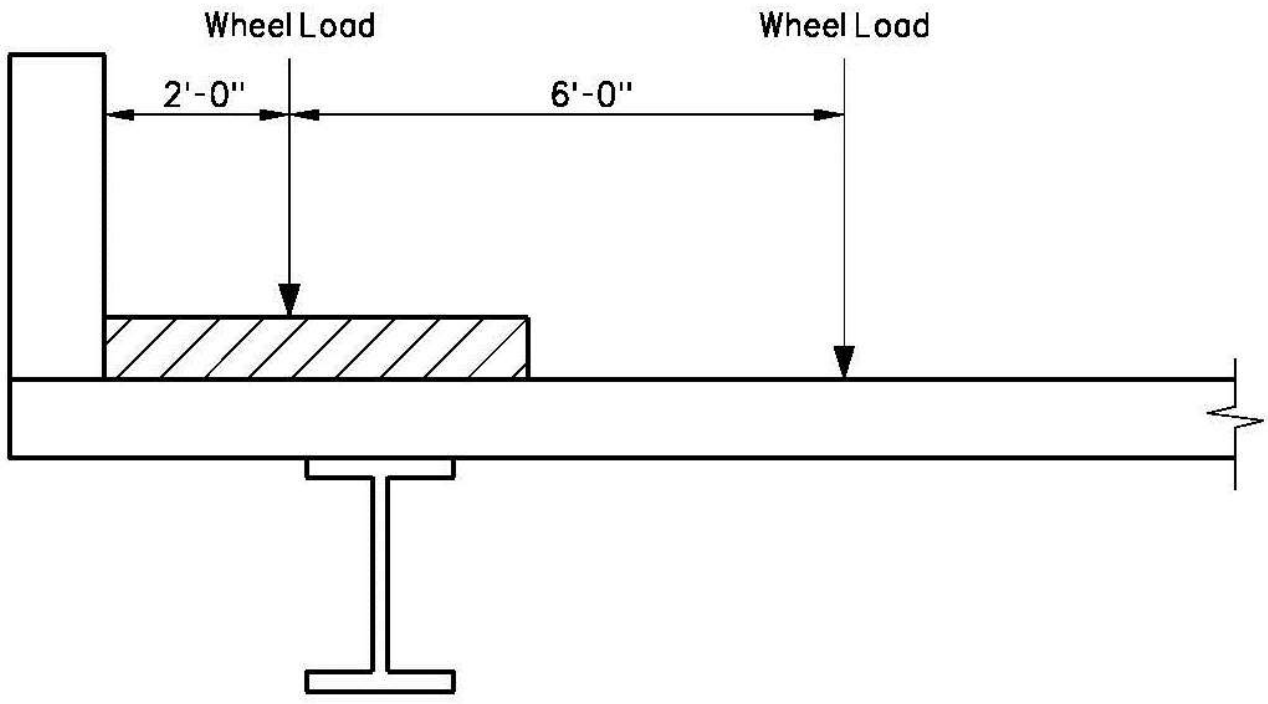
Revisions:

Oct 2023	Added new article.
Dec 2024	Changed reference to "Roadway Data Group" to "traffic data".

3.6.1.6 PEDESTRIAN LOADS

For the Strength and Service Limit States, the pedestrian and vehicular live loading (HL-93) shall be placed as stated in the commentary of article 3.6.1.1.2.

For the case of the vehicular live loading (HL-93) mounting the sidewalk, a Strength 1 only load combination is to be used. The vehicular live loading is to consist of one truck (without lane load) with a multiple presence factor of 1.2, with distribution factors determined by the lever rule, and on narrow bridges the rotation of the bridge cross section.



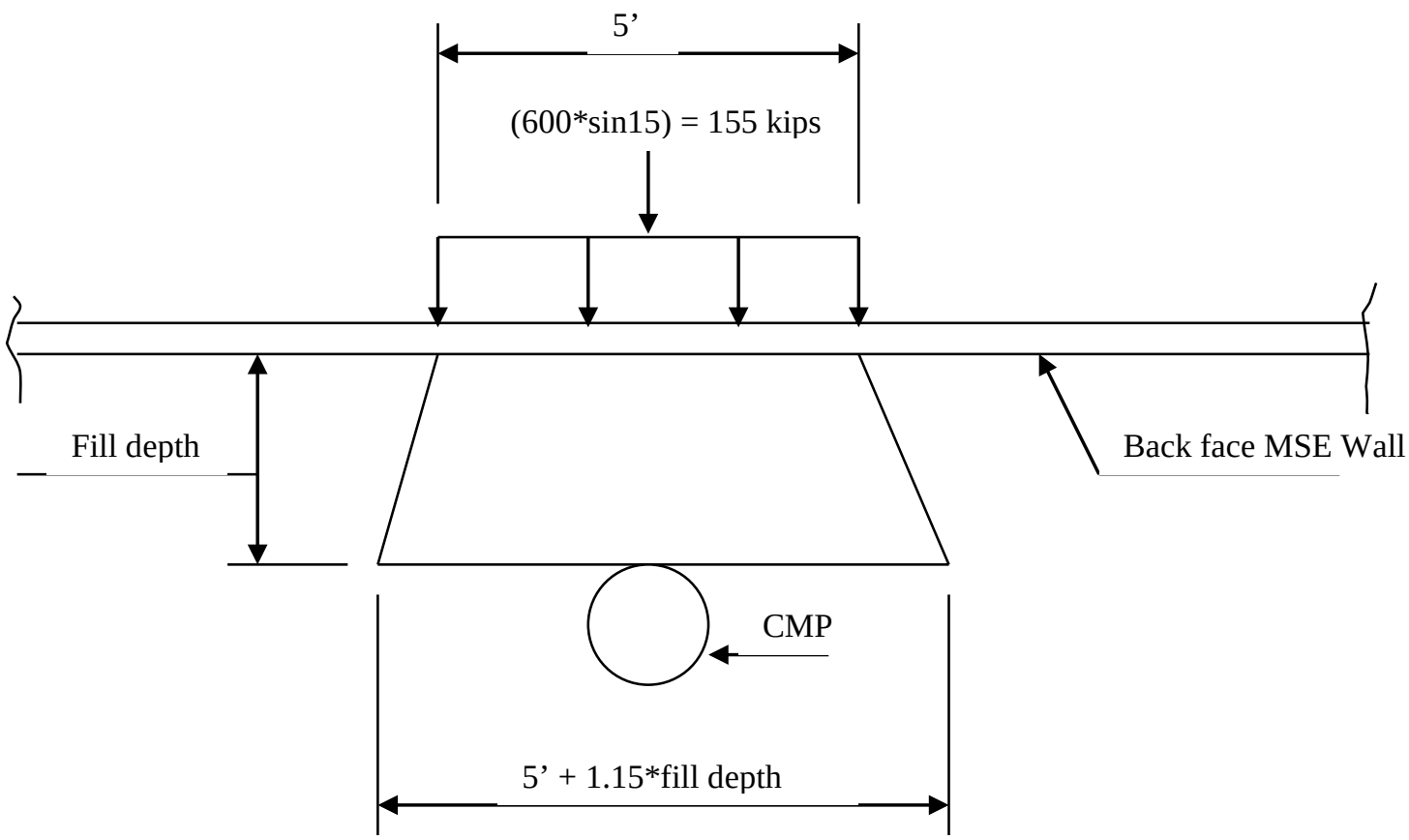
3.6.2 DYNAMIC LOAD ALLOWANCE

The Dynamic Allowance shall be applied only to the design truck or design tandem.

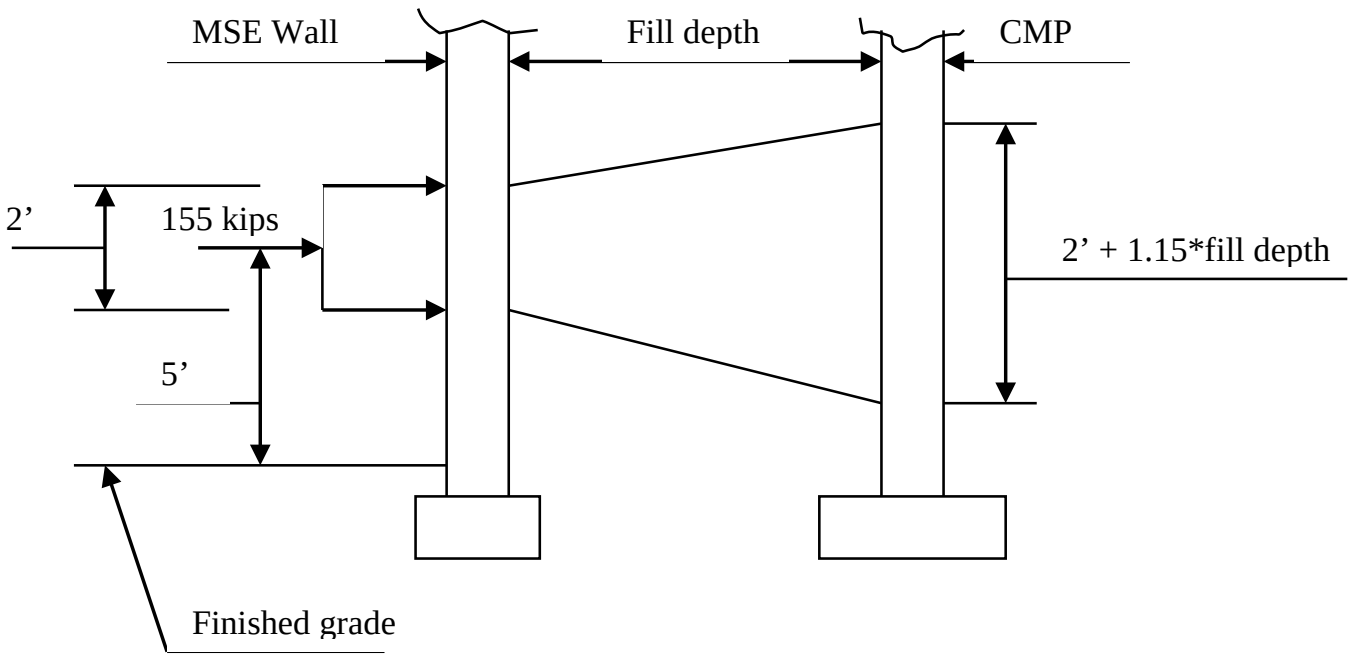
3.6.5 VEHICLE COLLISION FORCE

The provisions of this article shall also apply to columns of spill-through abutments contained within MSE wall fills. The 600-KIP collision force shall be assumed to act 15° to the edge of pavement at a distance of 5.0 feet above ground. Furthermore, the collision force shall be distributed over a MSE wall area not greater than 5.0 ft wide by 2.0 ft high and distributed through the fill in accordance with Article 3.6.1.2.6, where the fill depth shall be taken as the cover distance measured from the back face of the MSE wall panel to the face of the CMP pipe. The resulting pressure shall be assumed to act on the full diameter of the CMP and applied as a line load acting along the longitudinal axis of the column.

The following diagram assumes the MSE wall is parallel to the edge of pavement.



PLAN



ELEVATION

3.7.3 STREAM PRESSURE

The design high water elevation and velocity for the purposes of stream pressure calculations shall be based on Q_{100}.

For structures where the pier is aligned with the stream flow the lateral stream pressure applied to the side of the pier shall be based on an angle of 5° to allow for a change in the direction of flow over the life of the structure.

The average pressure of flowing water acting in the longitudinal or lateral direction on the substructure, p, shall be calculated using equation 3.7.3.1-1 or 3.7.3.2-1 respectively. The stream flow pressure distribution shall be triangular with 2•p located at the top of water elevation and zero pressure located at the flow line.

The stream flow forces shall be computed by the product of the stream flow pressure, taking into account the pressure distribution and the exposed pier area. In cases where the corresponding top of water elevation is above the low beam elevation, stream flow loading on the superstructure shall be investigated. The pressure acting on the superstructure shall be a uniform distribution equal to 2•p along the superstructure.

3.9.2.4.1 PIERS PARALLEL TO FLOW

The friction angle ϕ_f between the pier nose and the ice is defined by the following equation.

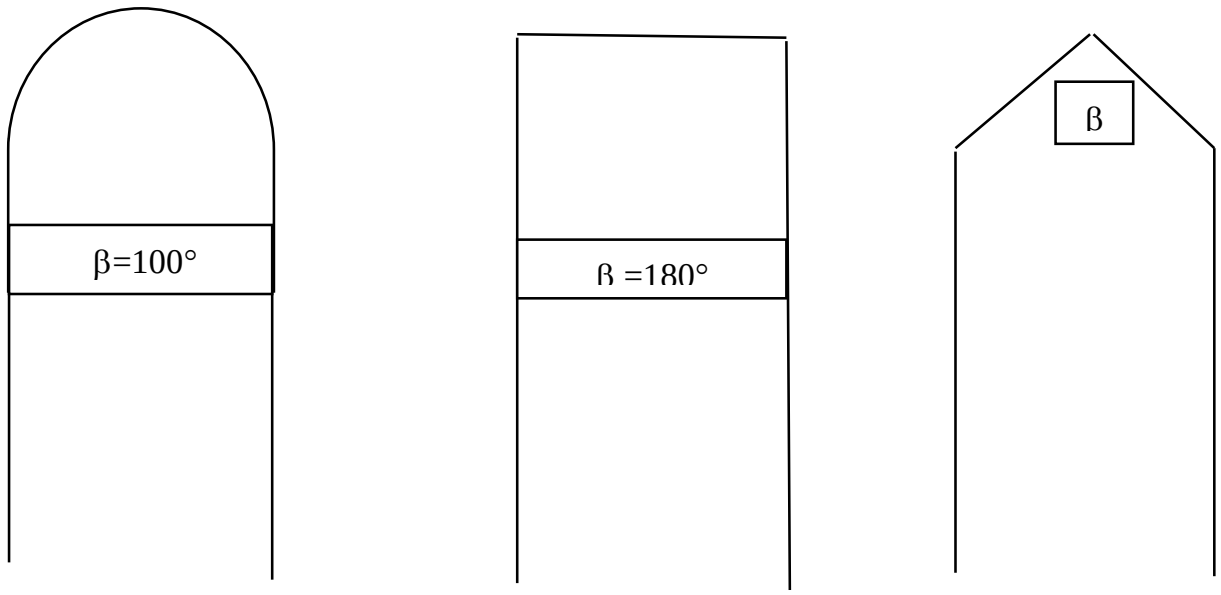
$$\phi_f = \tan^{-1} \mu$$

However, the coefficient of friction μ can not be established with great certainty. The Alberta Research Council uses $\mu = 0.18$ and the Alyeska Pipeline Co uses $\mu = 0.10$.

For most design cases $\phi_f = 0.0$ (which is conservative) should be used unless the loads become unrealistic in which case the following values should be $\mu = 0.10$ and $\phi_f = 5.7°$.

Changing the nose geometry β will have a bigger effect than changing ϕ_f .

β is defined as follows:



Note when $\beta = 180$ $F_t = 0$.

3.10.2 SEISMIC HAZARD

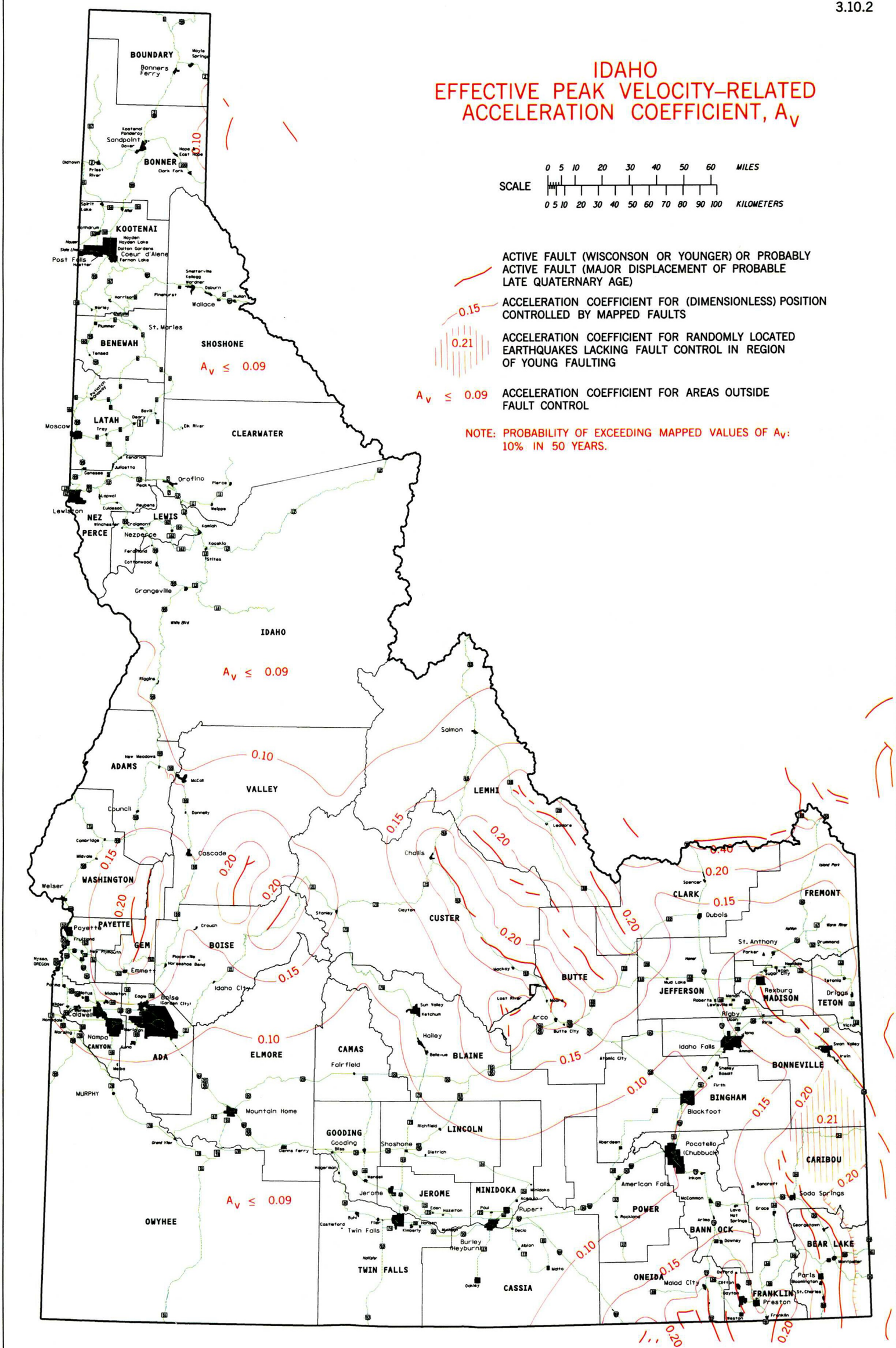
A site specific procedure shall be used if the site is within 6 miles of an active fault. The Geotechnical Engineer should be contacted to determine the response spectra. Site Specific Procedures are specified in the AASHTO LRFD Bridge Design Specifications Article 3.10.2.2.

Active fault locations for Idaho are shown on the following page.

Revisions:

April 2008	Revised article to agree with 2008 Interims. Revised map to only show active fault locations.
Dec 2024	Added reference to the AASHTO Bridge code.

IDAHO
EFFECTIVE PEAK VELOCITY–RELATED ACCELERATION COEFFICIENT, A_V



3.10.5 IMPORTANCE CATEGORIES

All bridges shall be classified to be at least “Essential”.

If the route that the structure is on services an emergency facility (hospital, firestation, etc.) or a major transportation facility and the detour for the emergency facility is greater than one mile, the structure should be classified as “Critical”.

If the structure carries utilities (water, gas, and power) and these utilities would be considered essential in the case of an earthquake or other emergency, the structure should be considered “Critical”.

The “Essential” and “Critical” classifications both correspond to the use of a 1000-yr return period event. This is the typical case.

For special cases, it may be may be desirable to use a return period event greater than 1000-yr for development of the response spectrum for a “Critical” bridge. Consult your Group Leader.

All bridges that are classified as “Critical” under section 3.10.5 shall be considered “Critical or Essential” under section 1.3.5 for η_I purposes.

If the bridge is classified as “Critical”, notify the District Materials Engineer and HQ Geotechnical Engineer since additional geotechnical work is required.

Additional References ..\01 Introduction\1.3.5 Operational Importance.doc

Revisions:

April 2008	Changed reference from 3.10.3 to 3.10.5 to agree with the 2008 Interims.
Oct 2015	Revised definition of critical or essential bridges.
Mar 2018	Added requirement to notify the District Materials Engineer/HQ Geotechnical Engineer for bridges classified as “Critical”.

3.10.9.3 – SEISMIC ZONE 2

Use a Response Modification factor, R, value of 1.0 for foundations located in Seismic Zone 2. Determine foundation design forces in accordance with Article 3.10.9.4.3f.

Commentary:

Per BDM Article 3.10.5, ITD classifies all bridges to be at least "Essential" for the Seismic Operational Classification. As a result, the recommendations in C3.10.9.3 are now specified as a requirement. This article aligns foundation design requirements of foundations for Seismic Zones 2 and 3,where foundations are dedsigned using an R-factor of 1.0 instead of 0.5R. This will reduce the possibility of the foundation being subjected to forces larger than design forces during a seismic event, particularly where the design is controlled by other load cases (e.g., CT loading). If unreduced elastic seismic forces result in foundations that are much larger than that required by other load cases, the foundation design may be verified using seismic design forces based on column plastic hinging in accordance with Article 3.10.9.4.3f.

Revisions:

Dec 2024 Added new article.

3.12.2.1 TEMPERATURE RANGE

All of Idaho can be assumed to be in the cold climate region. The base construction temperature for bridge structures may be assumed to be 60 degrees Fahrenheit.

The base construction temperature is the assumed temperature at which the structure is initially built. All temperature related movements should be determined based on the difference between the base temperature and the limits of the temperature ranges listed in Article 3.12.2.1.

The design base temperature of 60 degrees is the average of the Mean Daily Temperatures during the construction season of April through October for the following three cities:

Mean Daily Temperatures from NWS historic climate summaries

	April	May	June	July	August	September	October
Coeur d' Alene	46	55	62	69	68	59	49
Boise	49	58	66	74	73	63	52
Idaho Falls	44	53	61	68	67	57	46

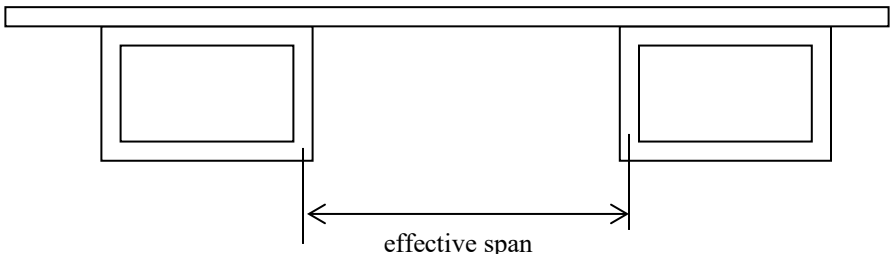
CHAPTER 4

ANALYSIS

4.6.2.1.6 CALCULATION OF FORCE EFFECTS

The effective span length for deck design for precast spread box beams or spread voided slabs shall be as shown below.

(Note minimum will be 4’-0”).



Revisions:
Dec 2024 Added spread voided slabs.

4.6.2.2 Beam-Slab Bridges

For bridges meeting the provisions of Article 4.6.2.2 that have cast-in-place composite decks, all dead loads applied to the composite section may be assumed to be applied equally to all girders.

Voided slabs connected by shear keys, tie rods and weld tabs or UHPC filled shear keys, shall be assumed that the connectivity is only enough to prevent relative vertical displacement at the interface and no distribution of dead loads shall be allowed. The exception is parapet loads can be distributed assuming 60% to the exterior girder and 40% to the first adjacent interior girder.

Deck Bulb-Tee girders connected by UHPC or generic equivalent filled shear keys, shall be assumed that the connectivity fully develops the reinforcement and can be designed fully continuous. Parapet and dead loads placed after the closure pour can be distributed to all girders.

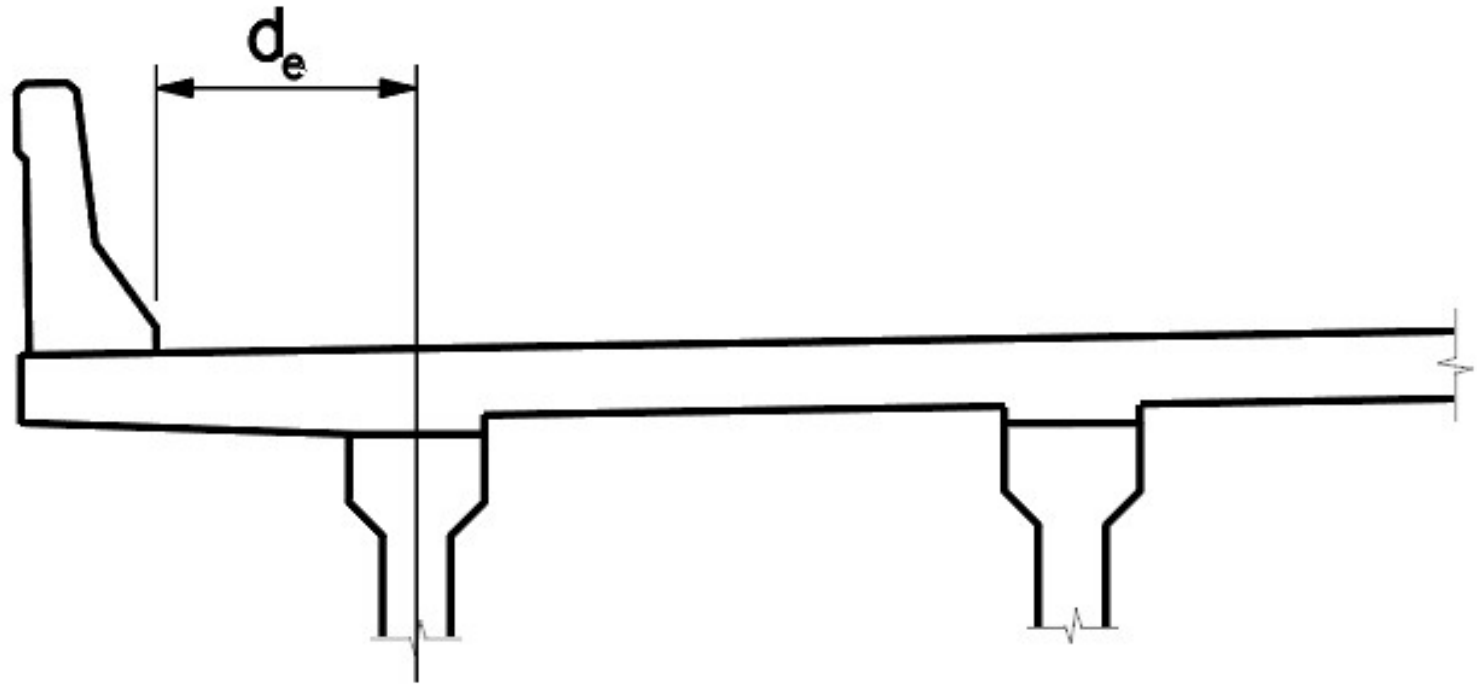
Commentary:
Assuming no distribution of loads across the interface of voided slabs connected by UHPC shear keys is conservative but provides a factor of safety.

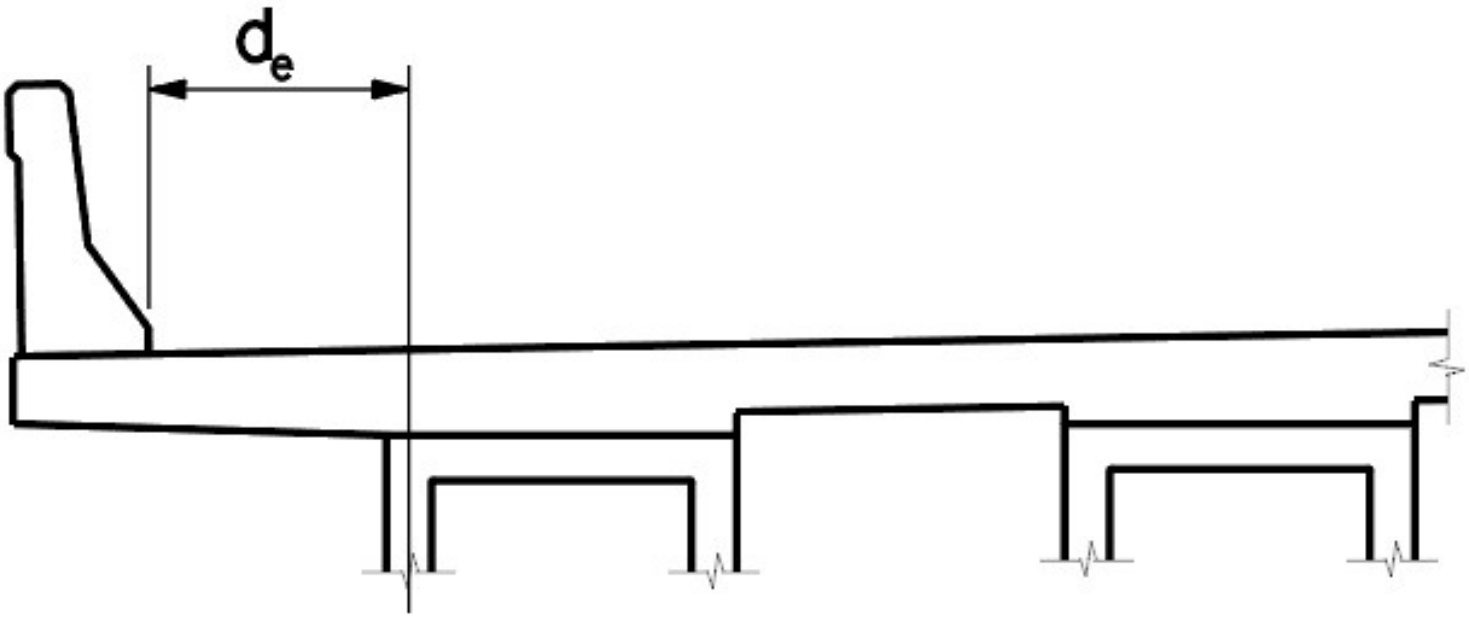
Revisions:

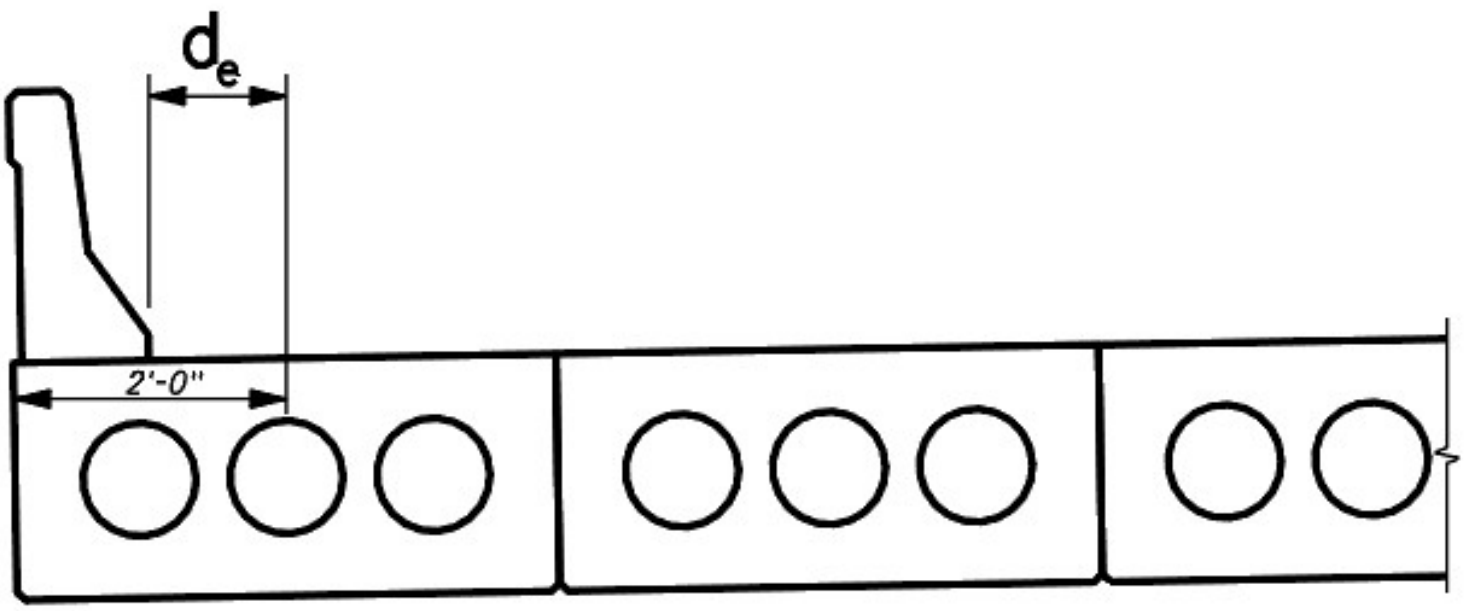
May 2021	Clarified the design distribution assumption for UHPC filled shear key connections. Added parapet load distribution. Added Commentary.
Dec 2024	Added parapet loads distributed to the first interior girder.

4.6.2.2.3b EXTERIOR BEAMS

The term d_e shall be defined as follows:







Revisions:

Sept 2012	Changed name of article to comply with 6th Edition. Added sketch for voided slabs.

4.7.4 ANALYSIS FOR EARTHQUAKE LOADS

4.7.4.1 General

The soil spring constants for piles, drilled shafts, or deep foundations can be modeled using the procedure in the FHWA Manual “Seismic Design of Highway Bridge Foundations” Report No. FHWA/RD-86/101.

Existing structures that require major rehabilitation and are in Seismic Zones 2, 3, and 4 shall be evaluated for seismic retrofit in accordance with the FHWA Manual “Seismic Retrofitting Guidelines for Highway Bridges” Report No. FHWA/RD-83/007.

Revisions:
April 2008 Deleted requirement for multi-mode analysis.

4.7.4.4 MINIMUM SUPPORT LENGTH

The minimum support length measured normal to the centerline of bearing (N) shall be along the centerline of girder.

Revisions:
Dec 2024 Added new article.

CHAPTER 5

CONCRETE

5.4 MATERIAL PROPERTIES

The designer is responsible for selecting the proper class of concrete for the degree of exposure and intended placement. The classes of concrete specified should meet the requirements of Section 502 of the Standard Specifications.

SCHEDULE OF CONCRETE
Concrete placement is divided into schedules for structures that have definite superstructure and substructure elements; e.g., prestressed girder bridges. Unscheduled concrete is used for culverts, retaining walls, etc.

- Schedule Number 1 concrete is intended for placement in the substructure. Typical placement is below the beam seats at abutment and piers.
- Schedule Number 2 concrete is intended for placement in the superstructure. Typical placement is above the beam seats.

Use Schedule Number 1 and Schedule Number 2 concrete for wingwalls that have a horizontal construction joint at the beam seat.
Use Schedule Number 1 concrete for wingwalls that do not have a horizontal construction joint at the beam seat.

CLASS OF CONCRETE
The class of concrete is specified in 100 psi 28-day strength. Refer to Bridge LRFD Manual Article 5.12 for additional requirements on classes of deck concrete.

Class	Strength-psi	
Seal	NA	Use for underwater placement for sealing cofferdams
15	1500	Use for a leveling course
30	3000	Not recommended for structural applications.
40AF		Recommended for decks and curbs/parapets to increase durability, reduce cracking, and provide higher entrained air content.
40A		Recommended for abutments, piers, pier caps, columns, wingwalls, and cast-in-place/precast culverts to provide higher entrained air content.
50AF		High Early Strength Concrete(HESC) Recommended for closure pours. HESC is not recommended where the least dimension of the component exceed 2'-0".

The properties for structural concrete placed underwater and HESC shall be specified by a Special Provision.

ALKALI SILICA REACTIVITY
All coarse and fine aggregate for concrete shall be tested for ASR according to the Standard Specifications subsection 703.02. Aggregates found to be potentially reactive shall require mitigating measures. The mitigative additives may be fly ash, lithium or other additives in any combination. The proposed mix design shall be tested with the mitigative additives.

Commentary
The contractor may add fly ash to enhance the mix design at his option.
Fly ash reduces the heat of hydration which results in reduced cracking.

Revisions:

June 2006	Fly ash concrete paragraph deleted and replaced with ASR paragraph to conform to the 2004 ITD Standard Specifications.
April 2008	Added Seal, Class 15, and Underwater structural concrete to Class of Concrete
June 2013	Deleted Class 40B concrete to conform to the January 2012 Supplemental Specifications. Deleted reference to 703.03 to conform to 2012 Standard Specifications. Added Class 40AF concrete for bridge decks and parapets. Deleted the first sentence in the Commentary to agree with the Standard Specifications.
Oct 2023	Clarified the use of Sch No 1 and Sch No 2 concrete in wingwalls. Revised the description of Class 40A and Class 40AF Deleted Bid Items paragraph.
Dec 2024	Added Class 50AF concrete. Added HESC to be specified by a Special Provision.

5.4.3 REINFORCING STEEL

5.4.3.3 Special Applications

The maximum length of #3 and #4 bars shall be 40'. The maximum length of #5 through #18 bars shall be 60'.

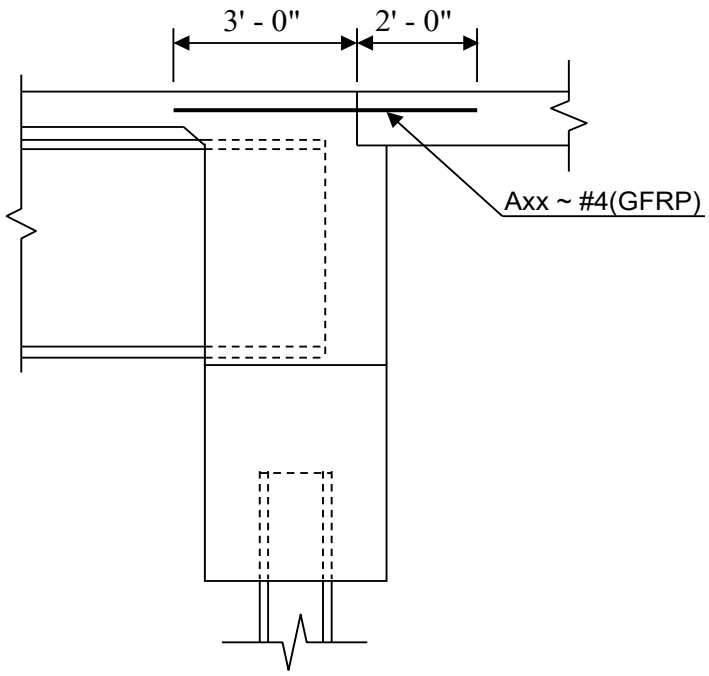
Specify AASHTO M31, Grade 60, Type S reinforcement for normal use. Specify AASHTO M31 Grade 60, Type W reinforcement if the yield strength needs to be limited or the reinforcement needs to be welded.

GLASS FIBER REINFORCED POLYMER (GFRP) REINFORCEMENT

'Glass Fiber Reinforced Polymer (GFRP) Reinforcement" shall be in accordance with Section 576.

Use in Integral Abutment to Approach Slab connection

The reinforcement is to be a #4 spaced at 12" on center and called out as shown in the diagram.



Revisions:

May 2014	Added GFRP information.
Nov 2019	Changed the reference to Section 576 of the Standard Specifications and deleted the special provision.
Oct 2023	Added direction for use of Type S or Type W reinforcement.

5.5.4.3 STABILITY

General

In recent years the use of high strength concrete, 0.6” diameter prestressing strand, and the construction industry’s ability to haul and erect increasingly heavy loads, it is practical and economical to construct very long precast prestressed concrete girders. With this capability to design, produce, and ship long girders the analysis of lateral girder stability during the design process has become essential. In the past this analysis has often been left to the responsibility of the girder fabricator and hauler. While it is still ITD policy to require the girder hauler to analyze the girder in transit, the designer shall check the girder stability while lifting them out of the forms and handling them in the yard.

DESIGN PROCEDURE

Lateral stability of the girder should be checked using the PCI *Recommended Practice for Lateral Stability of Precast, Prestressed Concrete Bridge Girders*.

The girder should be checked when the girder is lifted from the forms assuming a hanging girder, vertical cables, and no wind. This condition is shown in Example calculation 6.1.1 in the PCI Manual.

The location of the pick points used in the analysis shall be shown on the plans.

Revisions:

Nov 2019	Revised article to reference the PCI *Recommended Practice for Lateral Stability of Precast, Prestressed Concrete Bridge Girders* design procedure.

5.6.1 ASSUMPTIONS FOR SERVICE & FATIGUE LIMIT STATES

The following are ITD's preferred assumptions that differ from the LRFD Code:

.

- An effective modular ratio of n should be used for permanent loads and prestress.

Commentary

The computations require more effort to differentiate n and 2n, and the use of 2n for creep effects appears to increase f_s only 1-2%.

Revisions:

Oct 2017	Renumbered article from 5.7.1 to 5.6.1 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.
Sept 2021	Deleted requirement that modular ratio, n, is not rounded because it does not differ from the current AASHTO LRFD Bridge Design Specifications.

5.6.3.3 MINIMUM REINFORCEMENT

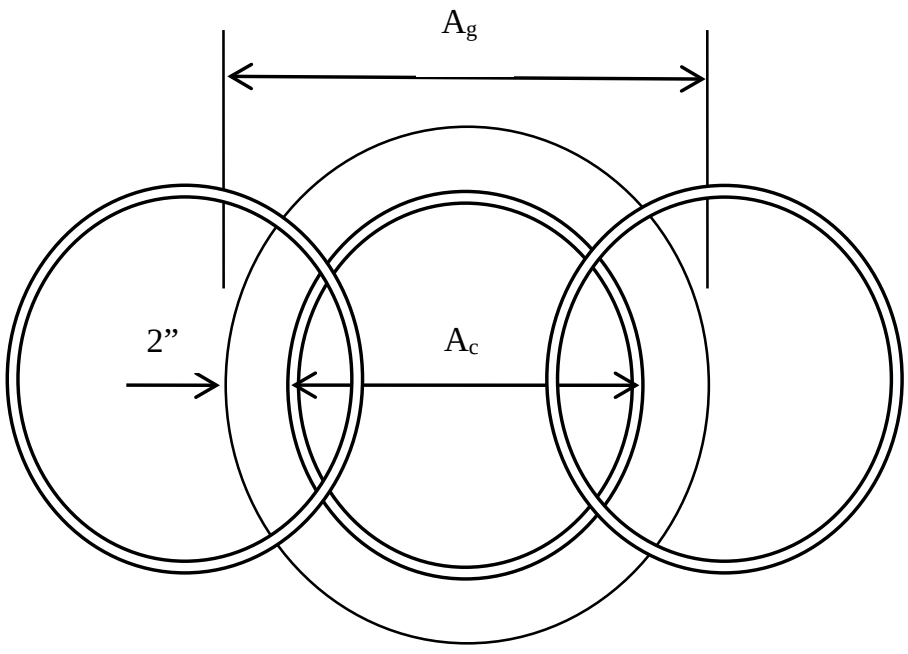
The cracking moment, Mcr, is defined in Article 5.6.3.3. The gross moment of inertia, Ig, is defined in Article 5.3.

Revisions:

Oct 2017	Renumbered article from 5.7.3.3.2 to 5.6.3.3 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.6.4.6 SPIRALS, HOOPS, AND TIES

For calculation of the ratio of spiral reinforcement required by Equation 5.6.4.6-1 for a single column with interlocking spirals, the core area, Ac, shall be based on the out to out core area for one single spiral of the interlocking spirals. The gross area, Ag, shall be based on a theoretical round column having the core area as previously defined and having a theoretical cover of 2" all around the core.



Commentary: From Oregon DOT Bridge Engineering Section Office Practice Manual 2003, Section 5.1.7.5

Revisions:

Oct 2017 Renumbered article from 5.7.4.6 to 5.6.4.6 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.6.7 CONTROL OF CRACKING BY DISTRIBUTION OF REINFORCEMENT

The exposure factor, $\gamma_{e,}$ shall be defined as follows:

Class 1 Exposure $\gamma_e = 1.0$ kips/inch

Components exposed only to the effects of weather such as pier caps and columns.

Class 2 Exposure $\gamma_e = 0.75$ kips/inch

Components exposed to earth fill or submerged in water such as abutments, wings, and footings. Also Deck slabs not designed in accordance with Article 9.7.2.

Revisions:

June 2006 Article revised to comply with the AASHTO 2005 Interims.

Oct 2017 Renumbered article from 5.7.3.4 to 5.6.7 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.7.3.5 LONGITUDINAL REINFORCEMENT

In equation 5.7.3.5-2 for the required tensile reinforcement at the inside edge of the bearing area of simple end supports to the section of critical shear, the values of V_u, V_s, V_p, and θ calculated at the section of critical shear shall be used. Where there is an embedded steel bearing plate in the girder, the inside edge of the bearing area shall be taken as the inside edge of the embedded steel plate and the theoretical crack is assumed to propagate from the inside edge of the embedded steel plate at an angle of θ, where θ is calculated at the section of critical shear. Refer to Figure C5.7.3.5-1.

For prestressed girders, if the prestressing strands alone are not sufficient to resist the required tensile force, then the embedded steel plate can be lengthened slightly, mild steel can be utilized, or a combination of the two. Any lack of full development in either prestressing strands or the mild reinforcing shall be accounted for. Check development of mild reinforcing from the end of the girder to the point where the reinforcing bars cross the theoretical crack.

At other sections (critical section, 0.1L, 0.2L, etc.), the tensile capacity of the tensile reinforcement on the flexural tension side of the member shall be calculated using equation 5.7.3.5-1. The values of M_u, N_u, V_u, V_s, V_p, and θ shall be the values that are calculated for the section under consideration.

Commentary: At sections other than at the end, the values of M_u, N_u, V_u, V_s, V_p, and θ are assumed to apply over a bandwidth that is centered on the section under consideration. At the end, the bandwidth is taken as the distance from the inside edge of the bearing area to the section of critical shear. The code is not clear regarding what values of M_u, N_u, V_u, V_s, V_p, and θ apply over the bandwidth at the end. The commentary allows using V_u, V_s, V_p, and θ calculated at the section of critical shear over this bandwidth (Refer to C5.7.3.5.). M_u is taken as 0.0 ft-kips over this bandwidth. For uniformity within the Bridge Section, we have chosen to use the method in the commentary.

Revisions:

Oct 2017	Renumbered article from 5.8.3.5 to 5.7.3.5 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.7.3.5.2 DEFLECTION and CAMBER

The ultimate purpose in computing deflections due to prestressing and dead load is to produce a structure which will conform with the profile grade after the effects of immediate dead load deflection and prestressing and subsequent deflection due to creep have taken place.

In prestressed, precast girders the pretensioned steel strands induce upward deflection or camber. This camber is lessened by the weight of the girder, but not negated. Since concrete is subject to creep, the camber increases with time.

The camber strip is the relatively thin layer of concrete between the underside of the bridge deck and the top of the girder. The purpose of the camber strip is to compensate for the difference between the profile of the underside of the deck along the girder line and the girder itself. The camber strip shall be of sufficient thickness so that the top of the girder does not protrude into the slab.

The thickness of the deck at centerline of bearing shall be shown on the plans. The thickness shall include the following:

- Basic deck thickness
- Camber strip thickness
- Superelevation allowance
- Vertical curve effects
- Horizontal curve effects
- Fabrication/Construction tolerances

Deflections and camber are assumed to be parabolic curves and shall be computed according to ITD Research Report 98-16-01, Camber Growth In Prestressed Concrete Bridge Girders. The design procedure is outlined in Appendix A, Article A5.6.

Deck Forms

At the time of setting deck forms, the primary concern is that the tops of the girders not extend into the deck and interfere with the reinforcing steel.

After the girders are set, the tops of the girders are profiled. Finish grades for the top of the deck are generated by adding the correction for the slab dead load deflection. The bottom of deck form elevation is computed by subtracting the deck thickness. The top of girder profile should be lower than the bottom of deck form elevation. If not, the profile grade may require adjustment.

Revisions:

Oct 2017	Renumbered article from 5.7.3.6.2 to 5.7.3.5.2 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.8.2.6 CRACK CONTROL REINFORCEMENT

An integral abutment need not be designed by the strut and tie model if the longitudinal reinforcement is determined by conventional beam analysis in BDM Article 11.6.1.3 and a minimum orthogonal grid of reinforcing bars is provided in accordance with the following table.

Strut and Tie - Minimum Crack Control Reinforcement (5.8.2.6)

		Minimum Rebar Spacing on each face to Meet S&T (in)					
Cap Width (ft)	As.req S&T in^2/ft **(each face)**	#4 0.20	#5 0.31	#6 0.44	#7 0.60	#8 0.79	#9 1.00
3.00	0.648	3.7	5.7	8.1	11.1	14.6	18.5
3.25	**0.702**	**3.4**	**5.3**	**7.5**	**10.3**	**13.5**	**17.1**
3.50	0.756	3.2	4.9	7.0	9.5	12.5	15.9
3.75	**0.810**	**3.0**	**4.6**	**6.5**	**8.9**	**11.7**	**14.8**
4.00	0.864	2.8	4.3	6.1	8.3	11.0	13.9
4.25	**0.918**	**2.6**	**4.1**	**5.8**	**7.8**	**10.3**	**13.1**
4.50	0.972	2.5	3.8	5.4	7.4	9.8	12.3
4.75	**1.026**	**2.3**	**3.6**	**5.1**	**7.0**	**9.2**	**11.7**
5.00	1.080	2.2	3.4	4.9	6.7	8.8	11.1
5.25	**1.134**	**2.1**	**3.3**	**4.7**	**6.3**	**8.4**	**10.6**
5.50	1.188	2.0	3.1	4.4	6.1	8.0	10.1
5.75	**1.242**	**1.9**	**3.0**	**4.3**	**5.8**	**7.6**	**9.7**
6.00	1.296	1.9	2.9	4.1	5.6	7.3	9.3
6.25	**1.350**	**1.8**	**2.8**	**3.9**	**5.3**	**7.0**	**8.9**
6.50	1.404	1.7	2.6	3.8	5.1	6.8	8.5
6.75	**1.458**	**1.6**	**2.6**	**3.6**	**4.9**	**6.5**	**8.2**
7.00	1.512	1.6	2.5	3.5	4.8	6.3	7.9

*Multiple layers of rebar can be used to meet strut and tie crack control requirements. This spreadsheet provides spacing for one layer on each face of the cap.

Revisions:
Oct 2023 Added new article.

5.9.2.3.1b TENSION STRESSES

Temporary tensile stresses in prestress concrete before losses in all areas shall be limited to:

$$0.0948\sqrt{f'ci} \leq 0.2ksi$$

Reinforcing bars should not be used to resist the tensile force in the concrete.

Revisions:

Oct 2017 Renumbered article from 5.9.4.1.2 to 5.9.2.3.1b to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

Specified reinforcing bars could be used to resist tensile forces.

5.9.2.3.2b TENSION STRESSES

Tensile stresses in the top slab of post-tension box girders in all areas shall be limited to 0 ksi tension.
Tensile stresses in the bottom slab of post-tension box girders in all areas shall be limited to $0.0948\sqrt{f'c}$.

Revisions:

April 2008	Added allowable tension in bottom slab of box girders.
Oct 2017	Renumbered article from 5.9.4.2.2 to 5.9.2.3.2b to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.9.3 PRESTRESS LOSSES

Elastic Losses or Gains, Δf_{pES}
Δf_{pES} is the sum of all the losses or gains to the strand stress due to elastic shortening or extension caused by either internal (prestressing) or external (gravity) loads applied to the concrete section.

Δf_{pES} should be calculated using either the iteration of Equation 5.9.3.2.3a-1 or directly solving with Equation C5.9.3.2.3a-1.

Long–Term Losses, Δf_{pLT}
Δf_{pLT} is the sum of losses due to long-term shrinkage and creep of the concrete, and relaxation of the prestressing steel.

There are 2 methods listed in the AASHTO LRFD code for computation of long-term losses:

1. The approximate estimate according to the provisions of Article 5.9.3.3 and Equation 5.9.3.3-1.

2. The refined estimates according to the provisions of Article 5.9.3.4.

Method 1 is an approximate method that gives reasonably good results (as compared to Method 2) for conventional prestressed girders with a composite cast-in-place deck; however this method can be unconservative for girders without a cast-in-place deck.

Method 2, the refined method, presumably results in the most accurate estimate of long-term losses for all prestressed girder types with or without a cast-in-place deck, however it requires significantly more effort than Method 1. For typical bridge construction with a conventional prestressed girder and a cast-in-place deck, Method 2 will not yield significantly different or better results as compared to Method 1. It is the Bridge Section's opinion that for conventional prestressed girders with cast-in-place deck the presumed level of accuracy achieved by using Method 2 is seldom warranted or even possible because the material properties that effect creep and shrinkage and the times for various load application are either unknown or beyond the control of the bridge designer.

In general, Method 1 may be used for typical ITD bridge construction that involves precast, pretensioned members with a composite cast-in-place slab. Method 2 may be used for all prestressed girder types but must be used for precast, pretensioned members without a composite slab (such as deck bulb tees, side-by-side voided slab sections, etc) the use of Method 1 in this case would be unconservative.

The term "construction staging" as used in C5.9.3.3 is understood to refer to a member that is constructed in stages rather than a bridge that is constructed in stages. Examples of members that are constructed in stages are segmental construction and post-tensioned spliced precast girders.

Design Assumptions for Method 2 (refined estimate of losses)
It is ITD policy to use 55% humidity for all locations in Idaho.

When using the refined estimate of losses (Method 2) there are some assumptions that need to be made concerning the age of the girder concrete (ageing starts at the end of the cure period) at transfer, at deck placement and at final time. Also the age of the deck concrete is also required for the determination of losses or gains due to loads applied to the composite section (such as rail loads and wearing surfaces). Because these ages are not usually known during the design process some conservative assumptions should be made.

The sooner a cast-in-place deck can be placed on prestressed girders the lower the long term prestress loss will be. Consequently the design should be based on the deck being placed at the latest practical time; this will result in the greatest long term losses and thereby produce a more conservative design. Therefore, if no better information is known, it is ITD policy to assume the following:

For Prestressed Girders with Composite cast-in-place Decks,

Age of girder at transfer = 0.75 days (a smaller number will result in greater prestress loss)
Age of girder at deck placement = 270 days (a larger number will result in greater prestress loss)
Age of deck at composite loading = 1 day (a smaller number will result in greater prestress loss)

Final time = 3650 days (a smaller number will result in less prestress loss, a larger number has little effect)

For Prestressed Girders without cast-in-place Decks,

Age of girder at transfer = 0.75 days (a smaller number will result in greater prestress loss)
Age of girder at installation = 15 days (a smaller number will result in greater prestress loss)
Final time = 3650 days (a smaller number will result in less prestress loss, a larger number has little effect)

The assumed values above were chosen to be conservative in most cases. If the designer has information to more accurately predict the number of days for the various conditions listed above different design values may be used in consultation with the Group Leaders.

Commentary:

The total loss of prestress, Δf_{pT}, is defined as the difference in the stress in prestressing strands immediately before transfer (the jacking stress) and the effective stress in the prestressing strands after all losses, f_{pe}. The total loss of prestress, Δf_{pT}, is further defined as the sum of elastic losses and long-term (also called time-dependent) losses. For typical pretensioned, precast members with low-relaxation strand, the above definitions can be re-stated as the following equations:

$f_{pe} = (0.75 * 270 \text{ ksi}) - \Delta f_{pT}$ Where 0.75 * 270 ksi is the jacking stress.

$\Delta f_{pT} = \Delta f_{pES} + \Delta f_{pLT}$ (Eqn. 5.9.3.1-1) Where Δf_{pES} is the elastic loss and Δf_{pLT} is the long-term loss.

Δf_{pES} , elastic losses or gains, occur instantaneously at the time of load application. While Δf_{pES} consists of many different components, one for each load, there are two general categories. The first category is the elastic loss that occurs immediately after transfer of the prestress force to the girder (loss due to prestress combined with gain due to the member self weight). The second category is the loss or gain due to additional loads, such as non-composite dead loads, composite dead loads and live loads that are applied after transfer. It is ITD's policy to ignore the effects of this second category for simplicity and the fact that it is conservative to due so because in most cases this effect would result in a gain or increase in prestressing force.

Δf_{pLT} , long term losses, occur due to long-term shrinkage and creep of concrete, and relaxation of the prestressing steel.

Sign Convention

When loads or prestressing forces cause a member to shorten or the strands are allowed to "relax", the tension stress in the strands decreases and the strands undergo a loss. A loss is considered to be a positive quantity. When loads cause the strands to elongate, the tension stress in the strand increases and the strands undergo a gain. A gain is considered to be a negative quantity. For typical construction, the losses will be greater than the gains, and the sum of losses and gains will result in an overall loss. Δf_{pT} will typically be a positive quantity that is subtracted from the jacking stress.

Section Properties

The AASHTO LRFD code allows the bridge designer to use either gross or transformed section properties when designing prestressed girders. Gross section properties are the properties of the girder section based only on the gross concrete area without regard to the area of prestressing steel or other reinforcement. The advantages of gross section properties are that they are simple to compute and they do not vary along the girder length with the eccentricity of harped strands.

Transformed section properties are those properties that take into account the effective area of the prestressing steel as well as any other longitudinal reinforcement in the girder based on the steel-to-concrete modular ratio. The use of transformed section properties does have the advantage of implicitly accounting for all elastic losses or gains due to applied loads including prestress, dead load and live load. The use of transformed section properties is technically more correct and should yield a more accurate estimate of stresses in both the prestressing steel and the concrete.

When gross section properties are used to analyze prestressed girders the typical analysis assumes that the prestressing force in the girder remains constant during all loading conditions. However this is not actually true since the prestressing strands are bonded to the concrete and if plane sections remain plane the stress in the strands (and therefore the prestressing force)

varies with girder loading. Gross section analysis does not account for this change in prestress force directly. Therefore, to account for this effect the prestressing force has to be adjusted by calculating the elastic losses or gains and subtracting or adding them to the initial force.

It should be noted that if transformed section properties are used for the structural analysis of the girder there is no need to consider elastic losses or gains in the prestressing strands, the change in the strand stress is already accounted for implicitly because of the adjusted section properties. This effect can be understood with the simple case of a 10" by 10" rectangular concrete section with 1.5 square inches of prestressing steel located at the center of the section with a steel-to-concrete modular ratio (Es/Ec) of 7.0. Assuming the force at transfer is 0.75*270 ksi the initial prestress force on the section is 0.75*270*1.5 = 303.75 kips. If transformed properties are used the section area becomes 10*10 + 1.5(7.0 – 1) = 109 sq. in., dividing the total initial force by this area results in a compressive stress over the total transformed area of 303.75/109 = 2.787 ksi. Since the transformed area of the steel is part of the total area that the force is applied to then subtracting this compressive stress times the modular ratio from the original tension stress in the steel gives the net stress in the steel, 0.75*270 – 2.787*7.0 = 182.99 ksi. Now if gross section properties had been used for the analysis then to find the effective stress in the steel the elastic losses must be calculated with Equation C5.9.3.2.3a-1, the result for this example is a loss of 19.24 ksi. The effective stress in the steel is then, 0.75*270 – 19.24 = 183.26 ksi. The effective stress from the gross section analysis is essentially the same, well within the level of accuracy of the design material properties.

ITD has historically used gross section properties for prestressed girder design, ignoring all gains in the prestressing force due to added dead load and live load. As a result we have a good history of crack free prestressed girder performance in Idaho. It is ITD policy to continue to use gross section properties ignoring added dead load and live load elastic gains.

Since transformed section properties implicitly account for gains and ITD's policy is to ignore the use of gains, transformed section properties should not be used.

Humidity
The average annual humidity in Idaho can vary from 70% in the far north to as low as 55% in the southwest part of the state. Since concrete shrinks more in a low humidity environment resulting in greater prestress loss it is conservative to assume a low humidity in designing prestressed girders, therefore it is ITD policy to use 55% humidity in design unless the designer has better information for a particular bridge location.

Revisions:

April 2008	Added new article.
Feb 2012	Deleted the approximate method of calculating losses by use of the table. The table has been deleted from the AASHTO LRFD Specifications.
Sept 2012	Corrected references to Method 3 to Method 2.
Oct 2017	Renumbered article from 5.9.5 to 5.9.3 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.
Dec 2024	Added statement to the Commentary that transformed section properties should not be used.

5.9.4.4.1 FACTORED SPLITTING RESISTANCE - PRETENSIONED ANCHORAGE ZONES

In this section, the prestressing force at transfer is to be taken as the prestressing force *just after* transfer. This means that the loss due to elastic shortening should be subtracted out.

For example, for low-lax strands the stress in the strand equals $0.75*fpu - \Delta f_{pES}$ where Δf_{pES} is computed per section 5.9.3.2.3.

Revisions:

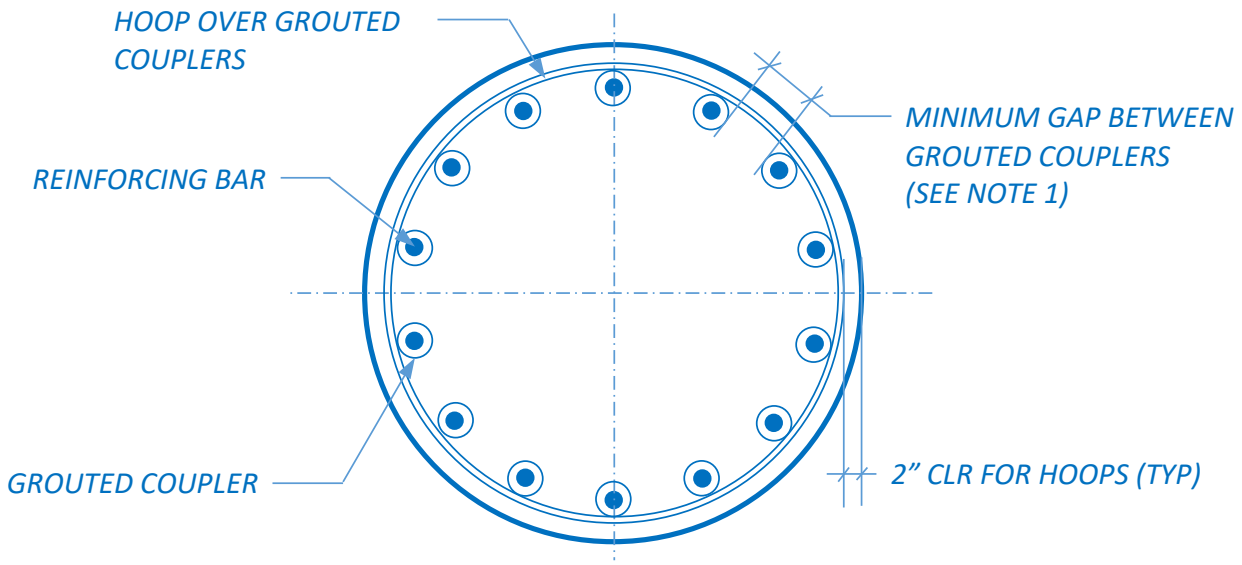
Oct 2017	Renumbered article from 5.10.10.1 to 5.9.4.4.1 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.10.8.4.2b MECHANICAL CONNECTIONS

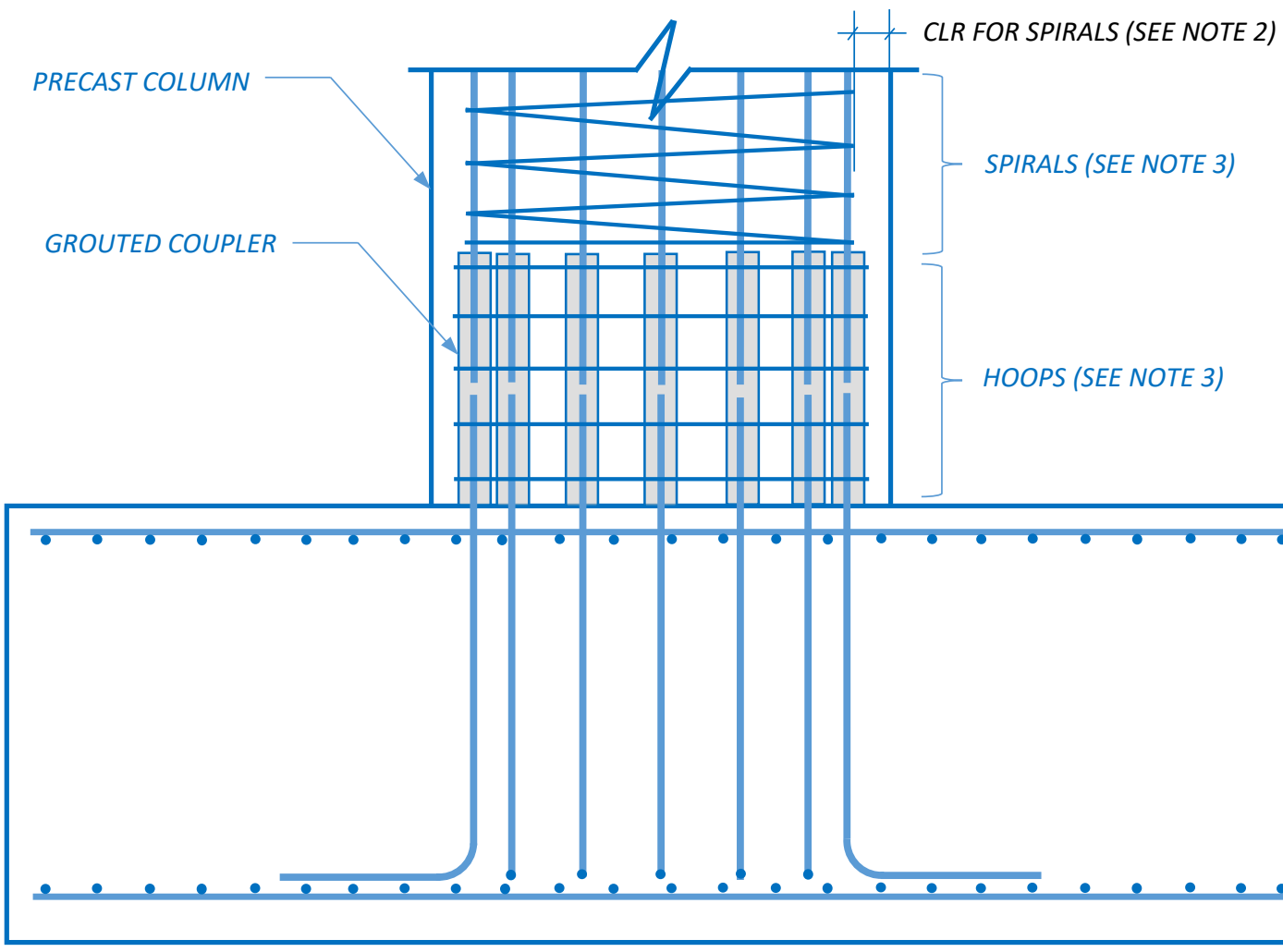
- Grouted splice couplers may be used to connect precast columns to footings or cap beams for columns with less than 4% drift. (Drift is determined by dividing the maximum displacement at the top of a column by its height. Column displacements under seismic loads may be obtained by non-linear analysis or linear-elastic analysis using cracked column section moment of inertia and displacement magnification factors as per AASHTO Art. 4.7.4.5)
- The total length of grouted splice couplers shall not exceed $15d_b$, where d_b is the longitudinal bar diameter.
- Type 1 mechanical connections shall develop min 125% of the specified yield strength of the connected reinforcing bar. Type 2 mechanical connections shall develop min 150% of the specified yield strength of the connected reinforcing bar.
- Grouted couplers in plastic hinge zones must develop 150% of the specified yield strength of the connected reinforcing bar (only Type 2 couplers are permitted). See Table 1 for a list of approved grouted couplers.
- NMB Splice Sleeve: Splice Sleeve North America, Inc. NMB Splice Sleeve grouted couplers for Grade 60 bar with sizes of No. 6, 8, 11 and 14 met at least 150% of specified bar tensile yield strength. Assuming a specified 90 ksi ultimate strength for Grade 60 bars, these couplers meet the ACI Type 2 and AASHTO Full Mechanical Connection (FMC) coupler strength requirements (i.e., 1.0 f_u and 1.50 f_y, respectively).
- Erico Lenton Interlok: All Lenton Interlok grouted couplers listed in Table 1 meet ACI Type 1 requirement in tension and compression and the ACI Type 2 requirement in tension. They also meet AASHTO FMC strength requirement.
- Minimum clear distance between grouted splice couplers is recommended to be the same as those specified for reinforcing bars. See typical detail drawings in Figure 1.
- The clear cover for the shear reinforcement over grouted couplers in the precast column shall be 2”.
- Grout for grouted couplers shall be provided by the manufacturer of the coupler.

Table 1. List of Approved Grouted Couplers

ASTM A706 or ASTM A615 Grade 60 Bar Size	NMB Splice Sleeve	Erico Lenton Interlok
#5	5U-X	LK5
#6	6U-X	LK6
#7	7U-X	LK7
#8	8U-X	LK8
#9	9U-X	LK9
#10	10U-X	LK10
#11	11U-X, SNX11	LK11
#14	14U-X	LK14
#18	--	LK18



COLUMN SECTION
NTS



COLUMN/FOOTING ELEVATION
NTS

NOTES:

1. *LARGER OF (1) 1 IN., (2) 1.33 TIMES MAX. COARSE AGGREGATE SIZE, AND (3) NOMINAL DIAMETER OF CONNECTED REINFORCING.*
2. *CLEAR COVER FOR SPIRALS = 2" + (DIAM. OF COUPLER – DIAMETER OF BAR)/2*
3. *FOLLOW THE REQUIREMENTS OF AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 5.10.6.*

Figure 1. Typical Precast Column with Grouted Couplers to Footing Connection Details.

1. Background Information on Grouted Coupler Dimensions and Comparison of Grouted Coupler Lengths:

Figure 2 shows the connector configuration for the NMB Type U-X and A11W splice-sleeves. Figure 3 shows connector configuration for the NMB SNX11 splice-sleeve.
Tables 2 and 3 show the dimensions and the required rebar embedment lengths corresponding to Figures 2 and 3, respectively.

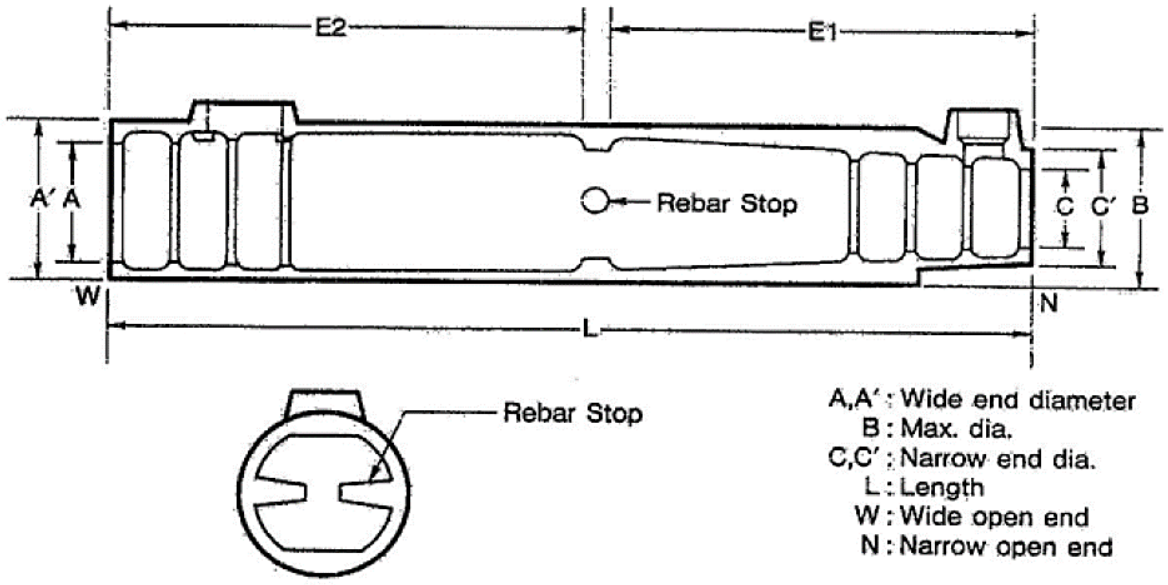


Figure 2. NMB Type U-X and A11W Splice Sleeves.
(ICC-ES Report ESR-3433, Splice Sleeve North America, Inc., 2016).

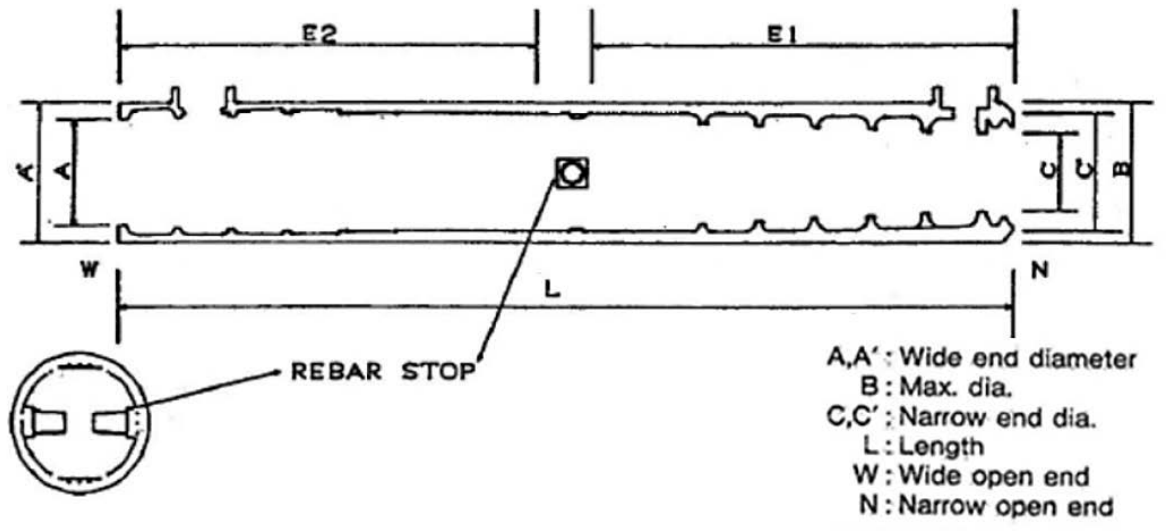


Figure 3. NMB SNX11 Splice Sleeve.
(ICC-ES Report ESR-3433, Splice Sleeve North America, Inc., 2016).

Table 2. Dimensions of NMB Type U-X and A11W Splice-Sleeves (ICC-ES Report ESR-3433, Splice Sleeve North America, Inc., 2016).

DIMENSIONS OF NMB U-X SLEEVES											REQUIRED REBAR EMBEDMENT LENGTH			
Sleeve No.	Bar Diameter (in.) [mm]	Bar Size		Sleeve Length (in.) [mm]	Narrow End Diameter (in.) [mm]		Maximum Diameter (B) (in.) [mm]	Wide End Diameter (in.) [mm]			Dowel (E1) (in.) [mm]		Dowel (E2) (in.) [mm]	
		ASTM	JIS		I.D. (C)	O.D. (C')		I.D. (A)	Total Tolerance [1]	O.D (A')	Min.	Max.	Min.	Max.
5U-X	0.625 [16]	#5	D16	9.65 [245]	0.87 [22]	1.50 [38]	1.89 [48.0]	1.26 [32.0]	0.63 [16.0]	1.89 [48.0]	4.13 [105]	4.33 [110]	4.13 [105]	4.92 [125]
6U-X	0.750 [19]	#6	D19	11.22 [285]	1.02 [26]	1.65 [42]	2.05 [52.0]	1.42 [36.0]	0.67 [17.0]	2.05 [52.0]	4.92 [125]	5.12 [130]	4.92 [125]	5.71 [145]
7U-X	0.875 [22]	#7	D22	12.80 [325]	1.14 [29]	1.77 [45]	2.36 [60.0]	1.73 [44.0]	0.86 [21.8]	2.36 [60.0]	5.71 [145]	5.91 [150]	5.71 [145]	6.50 [165]
8U-X	1.000 [25]	#8	D25	14.57 [370]	1.30 [33]	1.93 [49]	2.52 [64.0]	1.89 [48.0]	0.89 [22.6]	2.52 [64.0]	6.50 [165]	6.69 [170]	6.50 [165]	7.48 [190]
9U-X	1.128 [29]	#9	D29	16.34 [415]	1.42 [36]	2.06 [52.4]	2.67 [67.9]	2.01 [51.0]	0.89 [22.6]	2.67 [67.9]	7.40 [188]	7.56 [192]	7.40 [188]	8.35 [212]
10U-X	1.270 [32]	#10	D32	17.91 [455]	1.57 [40]	2.28 [58]	2.87 [73.0]	2.17 [55.0]	0.89 [22.6]	2.87 [73.0]	8.19 [208]	8.35 [212]	8.19 [208]	9.13 [232]
11U-X	1.410 [36]	#11	D36	19.49 [495]	1.73 [44]	2.40 [61]	3.03 [77.0]	2.32 [59.0]	0.91 [23.1]	3.03 [77.0]	8.98 [228]	9.13 [232]	8.98 [228]	9.92 [252]
14U-X	1.693 [43]	#14	D43	24.41 [620]	2.01 [51]	2.80 [71]	3.46 [88.0]	2.60 [66.0]	0.91 [23.1]	3.46 [88.0]	11.42 [290]	11.61 [295]	11.42 [290]	12.40 [315]
A11W	1.410 [36]	#11	D36	19.49 [495]	1.73 [44]	3.31 [84]	3.31 [84.0]	2.60 [66.0]	1.19 [30.2]	3.31 [84.0]	8.86 [225]	9.69 [246]	8.27 [210]	9.50 [241]

[1]Total tolerance is determined by subtracting bar diameter from the wide end inside diameter (A).

Table 3. Dimensions of NMB SNX11 Splice-Sleeve (ICC-ES Report ESR-3433, Splice Sleeve North America, Inc., 2016).

DIMENSIONS OF NMB SNX SLEEVE											REQUIRED REBAR EMBEDMENT LENGTH			
Sleeve No.	Bar Diameter (in.) [mm]	Bar Size		Sleeve Length (in.) [mm]	Narrow End Diameter (in.) [mm]		Maximum Diameter (B) (in.) [mm]	Wide End Diameter (in.) [mm]			Dowel (E1) (in.) [mm]		Dowel (E2) (in.) [mm]	
		ASTM	JIS		I.D. (C)	O.D. (C')		I.D. (A)	Total Tolerance[1]	O.D (A')	Min.	Max.	Min.	Max.
SNX11	1.410 [36]	#11	D36	19.09 [485]	1.69 [43]	3.03 [77]	3.03 [77.0]	2.32 [59]	0.91 [23.1]	3.03 [77]	8.86 [225]	9.25 [235]	8.27 [210]	9.45 [240]

[1]Total tolerance is determined by subtracting bar diameter from the wide end inside diameter (A).

Figure 4 shows the connector configuration for Erico's Lenton Interlok couplers and Table 4 shows the dimensions and cut length for reinforcing steel.

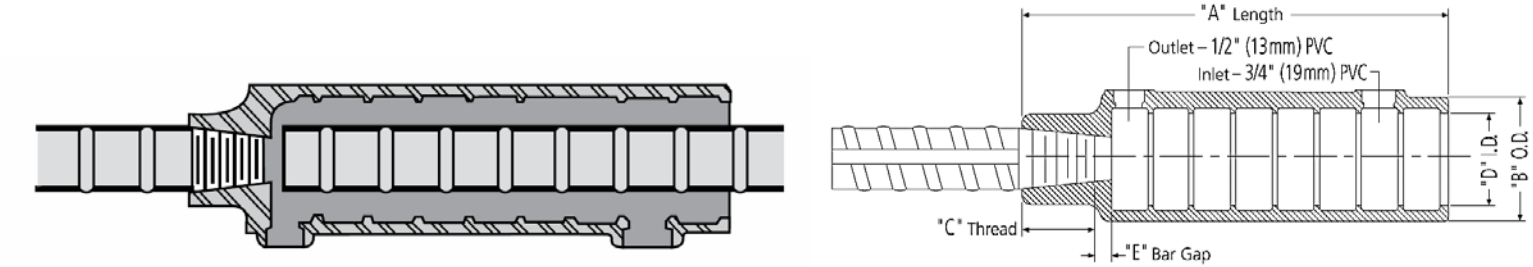


Figure 4. Erico's Lenton Interlok Rebar Splicing System. (Erico, 2013).

Table 4. Coupler Dimensions and Cut Length for Reinforcing Steel for Lenton Interlok Rebar Splicing System. (Erico, 2013).

Rebar Size		Coupler Part No.	"A"	"B"	"C"	"D"	"E" Reference	"X" Max.	"X" Min. Type 1*	"X" Min. Type 2**
in-lb	Canadian									
#5	15M	LK5	7-13/16"	2-9/16"	7/8"	1-7/8"	13/16"	6-1/8"	5-1/4"	5-1/2"
#6	20M	LK6	7-13/16"	2-9/16"	1-1/8"	1-7/8"	9/16"	6-1/8"	5-1/4"	5-3/8"
#7	---	LK7	7-13/16"	2-9/16"	1-1/4"	1-7/8"	7/16"	6-1/8"	5-1/4"	
#8	25M	LK8	8-5/8"	2-11/16"	1-3/8"	2"	1/4"	7"	6"	
#9	30M	LK9	9-3/4"	2-13/16"	1-1/2"	2-1/8"	1/4"	8"	6-7/8"	
#10	---	LK10	10-13/16"	3"	1-9/16"	2-5/16"	1/4"	9"	7-3/4"	
#11	35M	LK11	11-15/16"	3-1/8"	1-11/16"	2-7/16"	3/8"	9-7/8"	8-1/2"	
#14	45M	LKT14	15-3/16"	3-11/16"	2-1/8"	2-3/4"	5/16"	12-3/4"	11"	
#18	55M	LKT18	20-5/16"	4-1/2"	2-3/4"	3-1/4"	9/16"	17"	14-3/4"	

* "X" Min. Type 1 will develop 125% of the specified yield strength of the rebar in tension and compression (125% f_y).
** "X" Min. Type 2 meets Type 1 and will develop the specified tensile strength of the rebar in tension (f_u).

Reference: Idaho Transportation Department Research Report, Report No. FHWA-ID-16-246: *"Seismic Performance of Columns with Grouted Couplers in Idaho Accelerated Bridge Construction Applications"* (Authors: Arya Ebrahimpour, Barbara E. Earles, Supreme Maskey, Maria Tangarife, Andrew D. Sorensen, Idaho State University Department of Civil and Environmental Engineering)

Revisions:

Oct 2017	New article prepared by Leonard Ruminski

5.11.3.2.1 PILE ANCHORAGE INTO PILE CAP

Concrete-Filled Shell Piles

Structures with concrete-filled shell piles in Seismic Zone 2 shall be anchored with steel dowels as specified in Article 5.12.9.1, with a minimum steel ratio of 0.01. Dowel embedment length shall not be less than the development length required for the reinforcement specified in Article 5.10.8.2.

Steel Piles

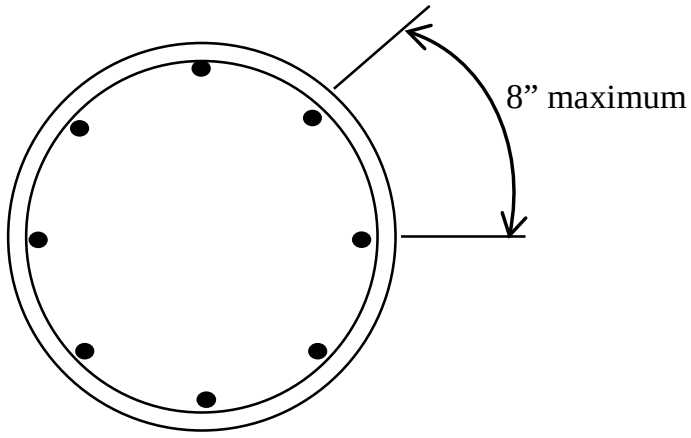
Structures with steel piles in Seismic Zone 2 shall be provided with anchoring devices to develop any uplift forces. The uplift force shall not be less than 10 percent of the factored axial compressive resistance of the pile.

Revisions:

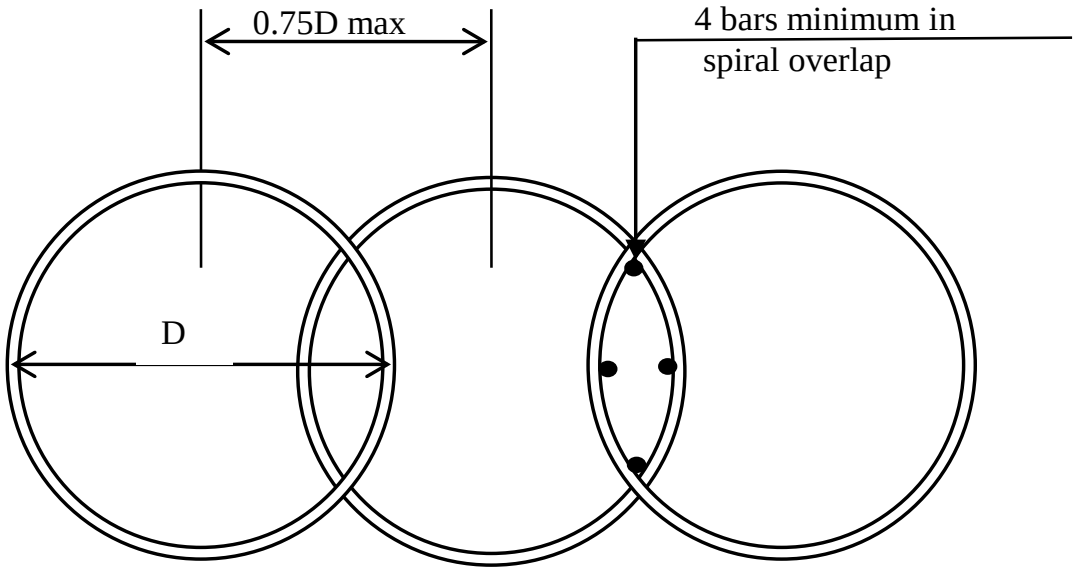
Oct 2023 New article.

5.11.4.1.4 TRANSVERSE REINFORCEMENT FOR CONFINEMENT AT PLASTIC HINGES

The commentary for this article specifies a maximum spacing of 8” center-center of longitudinal bars.



Interlocking spirals shall be used for non-circular columns. Reinforcement details are shown in the following sketch.



Revisions:

Oct 2017	Renumbered article from 5.10.11.4.1d to 5.11.4.1.4 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.12.3.2.5 CONCRETE STRENGTH

This provision of the code shall not be used without the prior approval of the Bridge Engineer and Materials Engineer.

Commentary

Since most of the precast elements that are used are steam cured and the mix designs given in the ITD Standard Construction Specifications has replaced cement with fly-ash at a greater rate than one to one, the values as listed in this specification will not be correct.

Revisions:

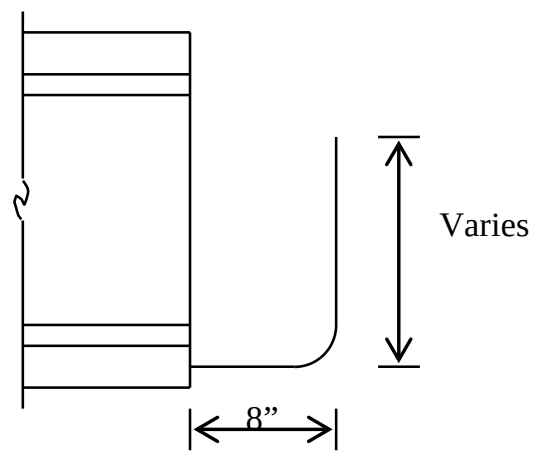
Oct 2017	Renumbered article from 5.14.1.2.5 to 5.12.3.2.5 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.12.3.3 SIMPLE SPAN PRESTRESSED GIRDERS MADE CONTINUOUS

The following design criteria shall apply for the design of simple span prestressed girder bridges constructed with a continuous concrete deck (no expansion joints at the piers).

Case 1 Girders Designed As Simple Spans & Top Deck Reinforcement Added To Control Cracking.
(This is the typical design case for new bridges)

- The top longitudinal deck reinforcement over the piers, in addition to the standard empirical design reinforcement, shall be #6 bars at 12" spaced between the standard top deck bars. The full area of the additional reinforcement shall extend either direction from the bearing centerlines a distance of at least 10 feet or 15% of the longer span whichever is greater. At least half the area of the additional reinforcement shall extend to a distance from the pier of at least 15 ft or 20% of the longer span whichever is greater.
- The bottom longitudinal deck reinforcement shall be per the empirical design method, Article 9.7.2.
- A positive moment connection at the piers shall be provided. This shall entail extending the required number of prestressing strand beyond the end of each girder 8" horizontally then bent vertical and anchored in the pier diaphragm. See details on standard drawing for Prestressed AASHTO Girder Details B5.2D or Prestressed Bulb Tee Girder Details B5.3O.



Case 2 Girders Designed Fully Continuous For Live Load
(This case may be used for new bridges where Case 1 is not feasible and approved by the Bridge Engineer)

- The weight of the parapet may be distributed evenly to all the girders.
- The negative moment reinforcement shall be determined based on the maximum negative moment taken at the face of the support.
- Longitudinal reinforcement shall be anchored in accordance with Article 5.12.3.3.8.
- The section shall meet Strength 1 limit state requirements as follows:
  $1.25*DC_{noncomposite}$, acting as simply supported and
  $1.25*DC_{composite} + 1.5*DW + 1.75*LL$, acting as a continuous beam.
- Both layers of steel in the deck may be used in resisting the negative moments.
- Only structures with fully effective construction joints at the piers, per Article 5.12.3.4, shall be designed as continuous for the Service III limit state. The requirements of Article 5.12.3.4, may be considered satisfied if the girder age is at least 90 days at the time the continuity diaphragm is placed.
- A positive moment connection at the piers shall be provided with a minimum capacity, Mn, of $1.2M_{cr}$ in accordance with NCHRP Report 519.

Case 3 Girders Designed As Simple Spans And The Deck Is Replaced To Eliminate Joints.
(This case is used for existing bridges that are retrofitted)

- No design is required. Use #5 bars in the top mat at approximately 12" spacing over the piers and carry them at least a development length beyond the centerline of bearing of the girders but not beyond the 1/4 pt. of the span.

Commentary

Case 1 – The additional reinforcement in the top of the deck is based on providing enough steel over the piers to meet the requirements for control of cracking in the deck per Article 5.6.7 assuming the total Service 1 live load is distributed equally to all girders. This additional deck steel may not supply enough negative moment capacity to resist the full negative moments that would be required in a continuous girder design for Strength 1 loading, however it will provide enough reinforcement to limit the steel stress requirements for crack control for spans up to 130' and girder depths up to 73.5". Girders not specifically designed for continuous action should still be provided with a positive moment connection in order to prevent possible cracking in the diaphragm and also to securely anchor the girders in the diaphragm. The number of prestressing strands that are extended into the pier diaphragm is based on the area of steel required to provide a moment capacity, M_n, sufficient to resist $0.6M_{cr}$ for the composite girder section in positive bending based on $M_{cr} = Sf_r$ where S is the composite section modulus and f_r is the modulus of rupture equal to $0.24\sqrt{f`_c}$ where $f`_c$ is the strength of the diaphragm concrete. ITD's maximum slab thickness and the maximum effective composite slab width per Article 4.6.2.6.1 were used to establish the number of strands required for the various girder depths as well as development length. However, the number of strand and the development length shown on the standard drawing may be considered adequate.

Case 2 – Since the effects due to creep and shrinkage are highly dependent on conditions beyond the control or knowledge of the designer, it is more practical to allow the girders to age for 90 days before continuity is established in order to negate the effects of creep and shrinkage rather than attempting to calculate these effects based on assumed conditions and material properties that can vary significantly.

Revisions:

June 2006	Revised Article to conform to approved 2006 Ballot Item #13.
Oct 2017	Renumbered article from 5.14.1.4 to 5.12.3.3 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.12.4 DIAPHRAGMS

Intermediate concrete diaphragms shall be placed as follows:

Span Length	Diaphragm Location
< 40’	None
40’ – 79’	Midspan
80’ – 119’	⅓ points
> 120’	¼ points

When the skew is >20°, intermediate diaphragms should be staggered and placed perpendicular to the centerline of girder.

Shallow Girders with cast-in-place deck
AASHTO, Bulb Tee, and WF girders less than 66” in depth shall have permanent concrete diaphragms or end beams at the ends of each span. Intermediate diaphragms shall be spaced as noted above.

Deep Girders with cast-in-place deck
AASHTO, Bulb Tee, and WF girders ≥ 66” in depth shall have temporary diaphragms installed between the exterior and first interior girder. These diaphragms shall be placed midway between all permanent intermediate diaphragms as well as the end beams and the girders restrained at the ends before pouring the permanent intermediate diaphragms and end beams. Temporary diaphragms shall be removed after the deck overhang brackets have been removed. Intermediate diaphragms shall be spaced as noted above.

DeckTee Girders connected with weld ties
DeckTee girders with non-structural overlay and connected with weld ties shall have permanent concrete diaphragms or end beams at the ends of each span. Intermediate diaphragms shall be spaced as noted above.

DeckTee girders with a minimum 5”cast-in-place concrete deck slab and connected with weld ties shall have permanent concrete diaphragms or end beams at the ends of each span. No intermediate concrete diaphragms are required for spans less than 120’. Intermediate diaphragms for spans greater than 120’ shall be spaced at ¼ points.

DeckTee girders connected with a cast-in-place closure pour
DeckTee girders connected with a cast-in-place closure pour shall have permanent concrete diaphragms or end beams at the ends of each span. No intermediate concrete diaphragms are required for spans less than 120’. Intermediate diaphragms for spans greater than 120’ shall be spaced at ¼ points.

Expansion Ends
To facilitate jacking for future repairs at simply-supported ends of precast, prestressed girder bridges, the end diaphragms shall be designed for a minimum clearance of 10 inches above the level of the beam seats on piers and abutments. No extra reinforcement is required beyond that provided for normal dead, live and impact loads.

Continuous Ends
The end of girders in bridges designed without expansion joints shall be cast into full-depth end diaphragms.

Revisions:

July 2010	Added note for skewed intermediate diaphragm orientation.
Mar 2015	Added requirements for DeckTee girders.
Oct 2017	Renumbered article from 5.13.2.2 to 5.12.4 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.
Oct 2023	Clarified that the girder ends need to be restrained with temporary diaphragms.

5.14 DURABILITY

General
All State and Locally sponsored projects shall be required to provide a deck protection system in the design and construction on all new concrete bridge decks, regardless of the winter roadway maintenance salt policy. Both mats of reinforcing steel should be considered for epoxy coating in deck slabs that will be carrying high volumes of traffic and will be subjected to frequent winter salting applications. Since both high traffic and frequent salting will occur primarily in urban areas, all structures located in urban areas shall be evaluated for a dual protection system.

A Single Deck Protection System is the minimum acceptable deck protection for decks exposed to traffic on all interstate, state, or county highways unless additional deck protection is required. The single deck protection system shall meet the requirements listed below. Details for the type of deck protection system shall be shown or noted on the deck typical section as part of the Situation and Layout submittal.

EXPOSED DECK SLAB
The deck slab is considered exposed to traffic when the distance between the finished grade and the top of the concrete deck is less than 4 inches between the paved roadway shoulders.

SINGLE DECK PROTECTION SYSTEM
- The concrete deck shall have an 8-inch minimum thickness of Class 40AF concrete, which includes a ½ inch expendable wearing surface that is considered as added dead load and not having structural capabilities.
- The top mat of reinforcement shall have 2½ inches of cover.
- All reinforcement within 4 inches of surfaces exposed to traffic shall be epoxy coated, including concrete parapets.

DUAL DECK PROTECTION SYSTEM
A dual deck protection system shall be utilized for all structures requiring special construction techniques or that have been classified as major or unusual bridges as defined in the BDM Article 0.05. Any structure that will require shoring for removal and repair of the deck (e.g. CIP box girders, CIP tee beams, CIP slab bridges) shall have a dual protection system. Deck slabs on box girder bridges are difficult and costly to repair unless the deck is designed so a portion of the deck can be removed without requiring shoring, such as the Type 1 dual deck protection system.

The dual deck protection system shall meet the requirements listed for one of the 3 following types. The type selected will require the approval of the Bridge Design Engineer prior to incorporating that system in the design.
TYPE 1
- The concrete deck shall have a 7½ inch minimum thickness of Class 40AF concrete, which does not include the 1½ inch of replaceable wearing surface that is considered as added dead load and not having structural capabilities.
- The top mat of reinforcement shall have 1¾ inches initial cover (before scarification of ¼ inches).
- The deck shall be designed so that the top 1½ inches can be removed without requiring shoring while maintaining traffic on a portion of the deck. The replaceable wearing surface of 1½ inches shall be latex modified concrete or micro silica modified concrete.
- All reinforcement within 4 inches of surfaces exposed to traffic shall be epoxy coated, including concrete parapets.

TYPE 2
- The concrete deck shall have an 8½-inch minimum thickness of Class 40AF concrete, which includes a 1-inch expendable wearing surface that is considered as added dead load and not having structural capabilities.
- The top mat of reinforcement shall have 3 inches of cover.
- All reinforcement within 4 inches of surfaces exposed to traffic shall be epoxy coated, including concrete parapets.

TYPE 3
- Bridges using precast prestressed boxes or slabs as the deck to support traffic shall use the Type 3 Dual Deck Protection System. The concrete class and member sizes for precast, prestressed deck members shall be determined by design.
- The top mat of reinforcement shall have 2½ inches of cover.

- The top surface of precast beams that act as the bridge deck shall have an asphalt overlay of 0.2’ with an interlayer spray-applied waterproofing membrane or a PPC overlay. All reinforcement within 4 inches of surfaces exposed to traffic shall be epoxy coated, including concrete parapets.

BURIED DECK SLABS

The deck slab is considered buried when the distance between the finished grade and the top of the concrete deck is greater than 4 inches between the paved roadway shoulders. This generally applies to box culverts and stifflegs where roadway ballast is carried over the top slab.

UNDER ROADWAY WITH LESS THAN 2 FEET FILL

- The deck slab shall be Class 40A concrete with a waterproof membrane applied as specified in Section 511 of the Standard Specifications.
- The top mat of reinforcement shall have 2½ inches of cover.
- Both mats of reinforcement in the deck slab shall be non-epoxy coated bars.

OUTSIDE ROADWAY OR FILL EXCEEDS 2 FEET

- The deck slab shall be Class 40A concrete.
- The top mat of reinforcement shall have 2 inches of cover.
- Both mats of reinforcement in the deck slab shall be non-epoxy coated bars.

REHABILITATION

The following guidelines for deck protection should be considered when the bridge requires rehabilitation work.

CONCRETE OVERLAY

A silica fume or latex concrete overlay should be used when:

The deck thickness is less than 8”
The top mat of reinforcement is not epoxy coated
The cover for the top mat of reinforcement is less than 2½”.

The existing deck concrete should be removed to the top of the top mat of reinforcement or to a depth where the chloride concentration is ≤ 3 lb/cy. The concrete overlay thickness should provide 2½” cover for the top mat of reinforcement. Refer to article 16.4 for concrete overlay details.

EPOXY OVERLAY

An epoxy overlay should be considered when the deck has minimal cracks/delamination and the deck meets the criteria for new exposed decks. The overlay completely covers the deck and provides waterproofing and skid resistance. Epoxy overlays should be avoided on curved alignments due to polished aggregate with low skid resistance that can cause sliding. For a new construction deck, the overlay is normally applied 2-3 years after construction. The profile grade across the bridge is increased ⅜” for an epoxy overlay.

Recent research provided to ITD, and completed in partnership with the FHWA, has shown that there are no aggregates that perform as well as calcined bauxite for friction and polish resistance. The research showed that calcined bauxite is hands down the best aggregate while a handful of other aggregates lie in a second tier, for polish resistance and friction.

It is the Bridge Section’s intent to specify two separate aggregates. For high volume roads and bridges carrying the interstate we would specify calcined bauxite. For all other bridges we would specify an aggregate that meets material properties from the second tier. For Bridge preservation projects that have multiple bridges that require an epoxy overlay, specify only one type of aggregate for the entire project. Designate the type of aggregate and the table corresponding to that aggregate on the plans since Section 553 includes both types of aggregate (e.g. Calcined Bauxite Aggregate – Table 553.02-2).

POLYMER CONCRETE OVERLAY

A polyester polymer concrete (PPC) overlay should be considered when the deck has minimal cracks/delamination and the deck meets the criteria for new exposed decks. The overlay completely covers the deck and provides waterproofing and skid resistance. Due to the cost of PPC overlays, they should only be considered for bridges with high traffic volumes or where life cycle costs would be less than an epoxy overlay. PPC overlays are not applied to decks that have a concrete overlay. The profile grade across the bridge is increased for a polyester polymer concrete (PPC) overlay.
The minimum thickness of a PPC overlay is ¾”. If a minimum ¾” PPC overlay is applied during original construction, there is no ½” sacrificial wearing surface. The structural thickness of the concrete deck shall be a minimum of 8” with 2½” cover from the top of the concrete deck (not top of PPC overlay) to the top mat of epoxy reinforcement.

DECK SEALER

A high weight methacrylate (HMWM) or a low modulus polymer deck sealer should be considered when the deck has minimal cracks/delaminations and the deck meets the criteria for new exposed decks. The sealer only fills the cracks. Consult with the Bridge Engineer to determine if a deck sealer or epoxy overlay should be used.

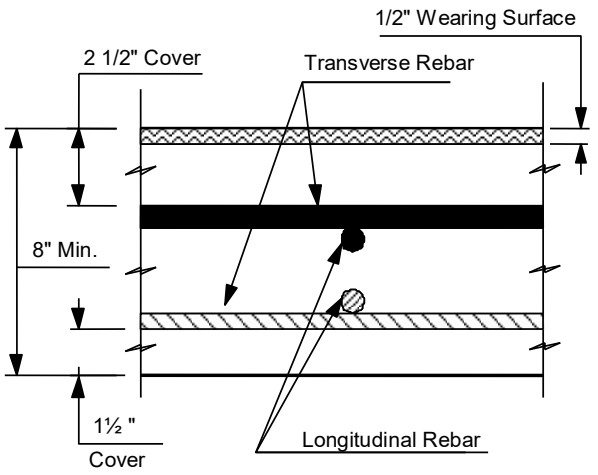
CONCRETE WATERPROOFING SYSTEM TYPE C

Apply type C (silane) concrete waterproofing to parapets/curbs and beam seats under joints during new construction after the concrete surface is fully cured. Re-apply 2-3 years after new construction and consider applying during rehab projects to bridges that have not been protected.

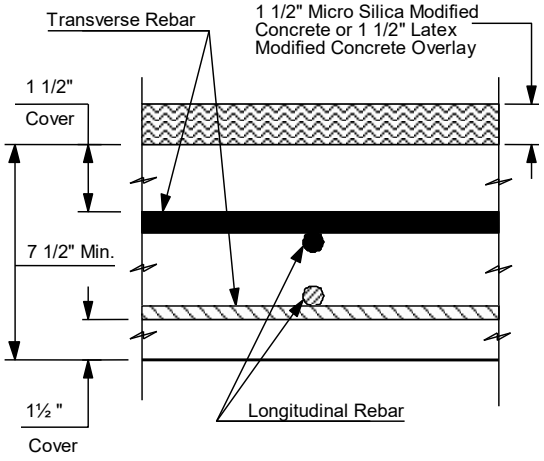
Revisions:

June 2006	Added paragraph for Electrical Connections to Bridge Decks that was in the ITD Bridge Metric/English Manuals.
Feb 2012	Added paragraph for Rehabilitation of bridge decks.
June 2013	Added reference to A5.7 in Concrete Overlay paragraph.
Oct 2014	Revised Type 3 Protection System to use 0.2' asphalt overlay with a spray-applied waterproofing membrane. Corrected reference to B5.8 for electrical connection details.
August 2016	Increased the cover to the bottom mat of reinforcement from 1" to 1½". This change provides 1" cover to the reinforcement over the ½" v-drip groove.
October 2017	Changed reference to "polymer overlay" to "polyester polymer concrete (PPC) overlay". Added thickness of epoxy and polyester polymer concrete (PPC) overlays. Renumbered article from 5.12 to 5.14 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.
March 2018	Enhanced the description/use of Epoxy and PPC overlays.
June 2018	Added the requirements for use of two different aggregates for epoxy overlays.
Nov 2019	Deleted requirement for electrical connection.
Sept 2021	Corrected class of concrete in Buried deck Slabs outside roadway from Class 40B to Class 40A. Deleted the note to not use the 2018 Standard Specification for epoxy overlay. The 2020 Supplemental Specifications corrected the Epoxy Overlay specification.
Jan 2022	Added clarification that PPC overlay is a Type 3 Protection System that does not require a ½" wearing surface.
June 2022	Referenced Section 553 for Epoxy Overlays and revised the table designation for calcined bauxite aggregate.
Oct 2023	Added weight of an initial PPC overlay and weight of a future overlay.
Dec 2024	Clarified that epoxy overlays should be avoided on curved alignments. Deleted weight of PPC overlay for design. Added directions on when/where to apply concrete waterproofing membrane type C. Clarified that the details for the type of deck protection be shown on the deck typical section on the S&L submittal. Clarified that unusual bridges defined in BDM Article 0.05.

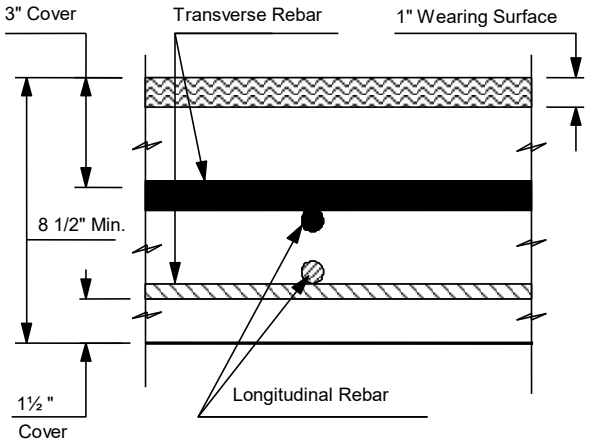
DECK PROTECTION SYSTEM DETAILS
FOR NEW CONCRETE BRIDGE DECKS



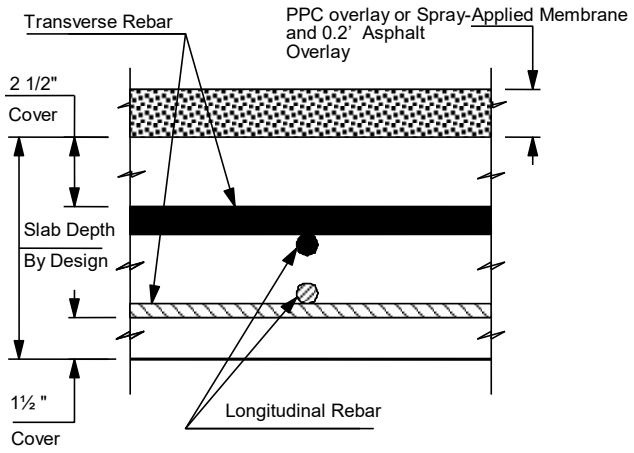
SINGLE PROTECTION SYSTEM



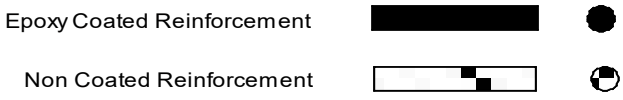
TYPE I
DUAL PROTECTION SYSTEM



TYPE 2
DUAL PROTECTION SYSTEM



TYPE 3
DUAL PROTECTION SYSTEM



REBAR AREAS AND SPACING

SPACING	#3	#4	#5	#6	#7	#8	#9	#10	#11
4	0.33	0.60	0.93	1.32	1.80	2.37	3.00	3.81	4.68
4.5	0.29	0.53	0.83	1.17	1.60	2.11	2.67	3.39	4.16
5	0.26	0.48	0.74	1.06	1.44	1.90	2.40	3.05	3.74
5.5	0.24	0.44	0.68	0.96	1.31	1.72	2.18	2.77	3.40
6	0.22	0.40	0.62	0.88	1.20	1.58	2.00	2.54	3.12
6.5	0.20	0.37	0.57	0.81	1.11	1.46	1.85	2.34	2.88
7	0.19	0.34	0.53	0.75	1.03	1.35	1.71	2.18	2.67
7.5	0.18	0.32	0.50	0.70	0.96	1.26	1.60	2.03	2.50
8	0.17	0.30	0.47	0.66	0.90	1.19	1.50	1.91	2.34
8.5	0.16	0.28	0.44	0.62	0.85	1.12	1.41	1.79	2.20
9	0.15	0.27	0.41	0.59	0.80	1.05	1.33	1.69	2.08
9.5	0.14	0.25	0.39	0.56	0.76	1.00	1.26	1.60	1.97
10	0.13	0.24	0.37	0.53	0.72	0.95	1.20	1.52	1.87
10.5	0.13	0.23	0.35	0.50	0.69	0.90	1.14	1.45	1.78
11	0.12	0.22	0.34	0.48	0.65	0.86	1.09	1.39	1.70
11.5		0.21	0.32	0.46	0.63	0.82	1.04	1.33	1.63
12		0.20	0.31	0.44	0.60	0.79	1.00	1.27	1.56
13		0.18	0.29	0.41	0.55	0.73	0.92	1.17	1.44
14		0.17	0.27	0.38	0.51	0.68	0.86	1.09	1.34
15		0.16	0.25	0.35	0.48	0.63	0.80	1.02	1.25
16		0.15	0.23	0.33	0.45	0.59	0.75	0.95	1.17
17		0.14	0.22	0.31	0.42	0.56	0.71	0.90	1.10
18		0.13	0.21	0.29	0.40	0.53	0.67	0.85	1.04

5.10.8.2.1a TENSION DEVELOPMENT LENGTH

Grade 60 reinforcement; 4000 psi concrete

	3	4	5	6	7	8	9	10	11	14	18
	Development Length - inches										
Basic Ld_b	27	36	45	54	63	72	82	92	102	122	163

MODIFICATION FACTORS

Increase l_d - Refer to Article 5.10.8.2.1b

Decrease l_d - Refer to Article 5.10.8.2.1c

Commentary

The 2015 Interims revised the tension development length calculations. Modification factors that increase or decrease the basic development length shall be used in accordance with Articles 5.11.2.1.2 and 5.11.2.1.3.

Revisions

Mar 2015 Revised to conform to the 2015 Interims.

Oct-17 Renumbered article from 5.11.2.1.1 to 5.10.8.2.1a to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.10.8.2.2a COMPRESSION DEVELOPMENT LENGTH

MODIFICATION FACTORS

(1)	Basic development length	1.00
(2)	Enclosed by spiral with diam > 0.25" & pitch <= 4"	0.75

Grade 60 reinforcement; 4000 psi concrete

	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**14**	**18**
	Development Length - inches										
(1)	8	10	12	15	17	19	22	25	27	32	43
(2)	8	8	9	11	13	15	16	19	20	24	32

Revisions

Oct 2017 Renumbered article from 5.11.2.2.1 to 5.10.8.2.2a to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.10.8.2.4 STANDARD HOOKS IN TENSION

Grade 60 reinforcement; 4000 psi concrete

MODIFICATION FACTORS FOR PLAIN BARS

(1)	Basic hooked development length	1.00
(2)	For #11 bar and smaller, hooks with side cover normal to plane of hook not less than 2.5", and for 90° hook with cover on the bar extension beyond hook not less than 2.0"	0.80
(3)	For 90° hooks of #11 and smaller bars that are either enclosed within ties or stirrups perpendicular to the bar being developed, spaced not greater than $3d_b$ along the development length of the hook; or enclosed within ties or stirrups parallel to the bar being developed spaced not greater than $3d_b$ along the length of the tail extension of the hook plus bend, and in both cases the first tie or stirrup enclosing the bent portion of the hook is within $2d_b$ of the outside of the bend	0.80
(4)	For 180° hooks of #11 and smaller bars that are enclosed within ties or stirrups perpendicular to the bar being developed, spaced not greater than $3d_b$ along the development length of the hook, and the first tie or stirrup enclosing the bent portion of the hook is within $2d_b$ of the outside of the bend	0.80

PLAIN BARS

	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**14**	**18**
3*Db	1.125	1.5	1.875	2.25	2.625	3	3.384	3.81	4.23	5.079	6.771
2*Db	0.75	1	1.25	1.5	1.75	2	2.256	2.54	2.82	3.386	4.514
	Development Length - inches										
(1)	8	10	12	15	17	19	22	25	27	33	43
(2)	6	8	10	12	14	16	18	20	22		
(3)	6	8	10	12	14	16	18	20	22		
(4)	6	8	10	12	14	16	18	20	22		
(2) & (3)	6	7	8	10	11	13	14	16	18		
(2) & (4)	6	7	8	10	11	13	14	16	18		

MODIFICATION FACTORS FOR EPOXY BARS

(1)	Basic hooked development length	1.00
(2)	For #11 bar and smaller, hooks with side cover normal to plane of hook not less than 2.5", and for 90° hook with cover on the bar extension beyond hook not less than 2.0"	0.80
(3)	For 90° hooks of #11 and smaller bars that are either enclosed within ties or stirrups perpendicular to the bar being developed, spaced not greater than $3d_b$ along the development length of the hook; or enclosed within ties or stirrups parallel to the bar being developed spaced not greater than $3d_b$ along the length of the tail extension of the hook plus bend, and in both cases the first tie or stirrup enclosing the bent portion of the hook is within $2d_b$ of the outside of the bend	0.80
(4)	For 180° hooks of #11 and smaller bars that are enclosed within ties or stirrups perpendicular to the bar being developed, spaced not greater than $3d_b$ along the development length of the hook, and the first tie or stirrup enclosing the bent portion of the hook is within $2d_b$ of the outside of the bend	0.80
	Epoxy Bar	1.20

EPOXY BARS

	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**14**	**18**
$3*d_b$	1.125	1.500	1.875	2.250	2.625	3.000	3.384	3.810	4.230	5.079	6.771
2*Db	0.75	1	1.25	1.5	1.75	2	2.256	2.54	2.82	3.386	4.514
	Development Length - inches										
(1)	9	12	15	18	20	23	26	29	33	39	52
(2)	7	10	12	14	16	19	21	24	26		
(3)	7	10	12	14	16	19	21	24	26		
(4)	7	10	12	14	16	19	21	24	26		
(2) & (3)	6	8	10	11	13	15	17	19	21		
(2) & (4)	6	8	10	11	13	15	17	19	21		

Revisions

Oct 2017 Renumbered article from 5.11.2.4 to 5.10.8.2.4 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.10.8.4.3 LAP SPLICES IN TENSION

The tension development length for the specified yield strength shall be taken in accordance with Article 5.10.8.2.1a. The minimum lap length shall be as required for a Class A or B lap splice, but not less than 12.0" where:

Class A lap splice = 1.0*ld

Class B lap splice = 1.3*ld

Except as specified, lap splices in tension shall be Class B splices.

Class A lap splices may be used where:

(a) the area of reinforcement provided is at least twice that required by analysis over the entire length of the lap splice; and

(b) one-half or less of the total reinforcement is spliced within the required lap splice length.

Revisions

Oct 2017 Renumbered article from 5.11.5.3.4 to 5.10.8.4.3 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

5.10.8.4.5 LAP SPLICIES IN COMPRESSION

MODIFICATION FACTORS

(1)	Basic development length	1.00
(2)	Ties along splice with effective area >= 15% of (compression component thickness)*(tie spacing)	0.83
(3)	With spirals	0.75

Grade 60 reinforcement; 4000 psi concrete

	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**14**	**18**
	Lap Splice Length - inches										
(1)	12	15	19	23	27	30	34	39	43	51	68
(2)	12	13	16	19	22	25	29	32	36	43	57
(3)	12	12	15	17	20	23	26	29	32	39	51

Revisions

Oct 2017	Renumbered article from 5.11.5.5.1 to 5.10.8.4.5 to conform to the 8th Edition of the AASHTO LRFD Bridge Design Specifications.

Notes to Designers for Prestressed Girders

CONTACT INFORMATION

Contech Engineered Solutions, LLC

20059 Simplot Blvd
Caldwell, ID 83607
208 859-2187

6087 West 5400 South
Salt Lake City, UT 84118
801 859-2187

Knife River Prestress

922 N. Carnahan Road
Spokane Valley, WA 99212
509 536-3300

Teton Prestress Concrete

5984 S Heritage Lane
Idaho Falls, ID 83402
208 552-6606

MAXIMUM GIRDER FORM LENGTH - FEET

	Teton Prestress	Knife River Prestress	Contech @ Caldwell	Contech @ Salt Lake
AASHTO Type 2,3,4		150	220	220
Bulb Tee		170	220	220
WF Girder		180	220	220
Deck Bulb Tee		170	220	220
Max Deck BulbTee top flange	7	8	8	8

BED CAPACITY

Teton Prestress in Idaho Falls

1,900 kips @ 30" cgs from bottom of girder
Maximum number of strand
AASHTO & BulbTee Girders: 42 – 0.6"Ø 60 – 0.5" Ø
WF Girders: forms not available

Knife River Prestress in Spokane

1,900 kips for AASHTO & BulbTee Girders
Maximum number of strand: 42 – 0.6"Ø 60 – 0.5" Ø

3,076 kips for WF Girders
Maximum number of strand: 70 – 0.6"Ø 98 – 0.5" Ø

Contech Engineered Solutions in Caldwell

3,500 kips @ 32" cgs from bottom of girder
Maximum number of strand
AASHTO, BulbTee, & WF Girders: 74 – 0.6"Ø (50 straight & 24 harp) 80 – 0.5" Ø

MAXIMUM NUMBER OF STRAND
The controlling values for the maximum span length curves are based on the following to allow all fabricators the capability of furnishing the girders.

AASHTO & Bulb Tee Girders:	42 – 0.6"Ø	60 – 0.5" Ø
WF Girders:	56 – 0.6"Ø	80 – 0.5" Ø

The maximum number of 0.6"Ø strand for each girder is:

AASHTO Type 2	16 straight
AASHTO Type 3	34 straight
AASHTO Type 4	48 straight
Bulb Tee Girder	24 straight
WF Girders	44 straight

LATERAL STABILITY
Lateral stability of the girder should be checked at release using the procedure in Article 5.5.4.3 of the Bridge Design Manual. The centerline of the lifting loop should be a minimum of 4' from the end of the girder. The need for adding debonded strand in the top flange for handling should be considered.

CRANE CAPACITY
Contech Engineered Solutions in Caldwell

Straddle Cranes: 75k (maximum girder weight of 150k)
Heavy Straddle Crane and outside boom crane: 85k (maximum girder weight of 170k)
Two outside boom cranes for girder weight greater than 170k.
Outside boom cranes cost approximately $1000/day.

Knife River Prestress in Spokane

Single Crane: 108k
Two Cranes: 200k
Girder weight more than 200k would require renting cranes at an additional cost.

DESIGN CRITERIA
The maximum girder concrete strength shall 6.5 ksi initial and 8.5 ksi final. Higher strengths may be used with Group Leader approval and with confirmation from the fabricator.

Deck Bulb Tee Girders and Deck WF Girders

- The use of deck bulb tee girders and deck WF girders should be limited to single span bridges with a maximum 10º skew and should not be used on bridges carrying interstate traffic.
- To ensure the entrained air requirement is met, limit the compressive strength to 8500 psi. Contact the fabricator to verify a mix design is available.

Do not debond strand.
Harp strand at the 0.4 & 0.6 center-center bearing span length using a 2" vertical and horizontal spacing.

Commentary
If the girder weight exceeds the crane capacity listed above, the designer should consider the extra costs for lifting and transporting the girder to determine the most economical cost. Each project should be evaluated based upon the parameters of the site to determine the best solution.

The time to obtain concrete strength is taking longer due to the new Type 1L cement being produced. To offset this, maximum girder concrete strengths have been reduced.

PRESTRESSED GIRDER PRELIMINARY DESIGN CURVES

GIRDER W/CAST-IN-PLACE DECK

Section Properties and maximum span length curves for the AASHTO, Bulb Tee, and WF girders are included in this Article. The maximum span length curves should only be used as an aid in preliminary design. The curves on based on the following design parameters:

- AASHTO LRFD Design Specifications using HL93 live load
- Simple Span lengths are centerline-centerline bearing
- 42'-0" out-out bridge width
- Girder spacing is for:
  - 4 girders @ 12'-0"
  - 5 girders @ 9'-3"
  - 6 girders @ 7'-3"
  - 7 girders @ 6'-0"
- 42" single slope Concrete parapet
- Slab f'c = 4.0 ksi Girder f'c = 8.0 ksi Girder f'ci = 6.0 ksi
- 0.6"Ø 270 ksi strand with straight & harp strand on 2" centers. Harp points at 0.4 & 0.6 points
- No permanent strand debonded. No temporary strand added for handling.
- Future wearing surface = 28 psf
- Minimum 8" nominal deck slab thickness. Structural deck thickness is 0.5" less than the nominal thickness
- Meets lateral stability criteria at release.

DECK TEE GIRDER W/PPC OVERLAY

Section Properties and maximum span length curves for the Bulb Tee girders and WF girders with an 8" thick top flange are included in this Article.

The maximum span length curves should only be used as an aid in preliminary design. The curves on based on the following design parameters:

- AASHTO LRFD Design Specifications using HL93 live load
- Live load distribution calculated using Table 4.6.2.2.1-1 Cross –Section J sufficiently connected to act as a unit.
- Simple Span lengths are centerline-centerline bearing
- 42'-0" out-out bridge width
- Girder spacing for deck bulb tee girders is for:
  - 6 girders @ 84" top flange width
  - 7 girders @ 72" top flange width
  - 8 girders @ 63" top flange width
- Girder spacing for WF deck bulb tee girders is for:
  - 7 girders @ 72" top flange width
  - 8 girders @ 63" top flange width
  - 9 girders @ 56" top flange width
- Girder f'c = 8.0 ksi Girder f'ci = 6.0 ksi
- 0.6"Ø 270 ksi strand with straight & harp strand on 2" centers. Harp points at 0.4 & 0.6 points.
- No permanent strand debonded. No temporary strand added for handling.
- 42" 3-Tube Curb Mounted Rail
- Total wearing surface = 9 psf (¾" PPC overlay)

Revisions:

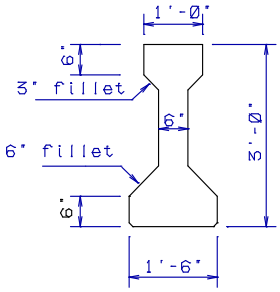
July 2009	Added design parameters on page 1 Added WSDOT WF girder data Added Deck Bulb Tee Girder maximum span curves
Feb 2012	Revised maximum span graphs for refined losses Changed from 7.5 ksi concrete to 10 ksi concrete
June 2013	Added Bed Capacity and Maximum Number of strand data Revised maximum span graphs for maximum number of strand
Mar 2015	Maximum span curves checked for lateral stability during handling without adding additional strand using the procedure in Article 5.5.4.3 of the Bridge Design Manual. All maximum span curves based on F'c=8 ksi and 0.6"Ø strand. BT37x84 girder deleted from the standards due to lateral stability during handling BT48 Series girders deleted. The BT37 Series girders provide a narrower top flange that can better accommodate superelevation. DeckTee girders with asphalt overlay designed for a total of 0.4' asphalt to protect spray-applied membrane seal. DeckTee girders with asphalt overlay designed for a 2-tube curb mounted rail with 9½" curb height. DeckTee girder with 5" c-i-p deck preliminary design curves deleted.
Aug 2016	Changed name of Hanson Prestress to Forterra Structural Precast. Changed name of Central premix to Oldcastle Precast. Added Crane Capacity data for handling girders in the prestress yard.
Nov 2019	Harp strand at 2" centers.. 42" single slope concrete parapet used for girders with c-i-p deck. 42" 2-Tube Rail used for voided slabs and deck tee girders. AASHTO, Bulb Tee, and WF girders checked for lateral stability at release using PCI procedure. PPC overlay (9 psf) used for voided slabs and deck tee girders.
Sep 2020	Added contact information. Changed name of Oldcastle Precast to Knife River Prestress Added table for Maximum Girder Form Length Updated maximum prestress force and number of 0.6" Ø strand for Forterra's new bed in Caldwell. Revised format of maximum span graphs for Deck Bulb Tee girders & WF Bulb Tee girders.
May 2021	Corrected contact information for Teton Prestress Added "Feet" to the form length table title.
Oct 2023	Changed name of Forterra Precast to Contech Engineered Solutions. Changed format to portrait orientation. Added restrictions for use of deck tee girders and limited the compressive strength to 8500 psi to meet entrained air requirements.
Dec 2024	Revised Deck Bulb Tee girder & WF Deck Tee girder maximum span graphs using live load distribution factor based on AASHTO Table 4.6.2.2.1-1 cross-section J sufficiently connected to act as a unit. Added "*Weight based on 150 pcf. Adjust weight in accordance with AASHTO Table 3.5.1-1 and C3.5.1" to Section Properties Tables. Revised all girder maximum span graphs for f`c = 8.0 ksi and f`ci = 6.0 ksi. Added section on Design Criteria. Added 2" vertical spacing for harp strand. Added reason for reducing maximum girder concrete strength due to new cement to commentary.

AASHTO GIRDER SECTION PROPERTIES

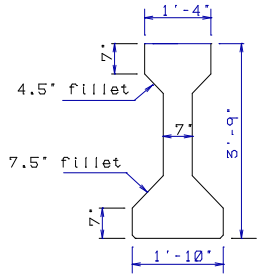
		CENTER OF GRAVITY			SECTION MODULUS		*WEIGHT
DEPTH	AREA	TOP	BOTTOM	MOMENT OF INERTIA	TOP	BOTTOM	LB/FT
36"	368.44	20.147	15.853	50,842	2524	3207	384
45"	558.94	24.706	20.294	125,165	5066	6168	582
54"	788.44	29.249	24.751	260,403	8903	10,521	821

*Weight based on 150 pcf. Adjust weight in accordance with AASHTO Table 3.5.1-1 and C3.5.1

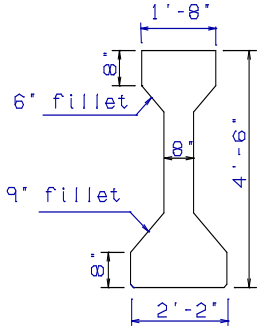
ALL UNITS IN INCHES EXCEPT WEIGHT



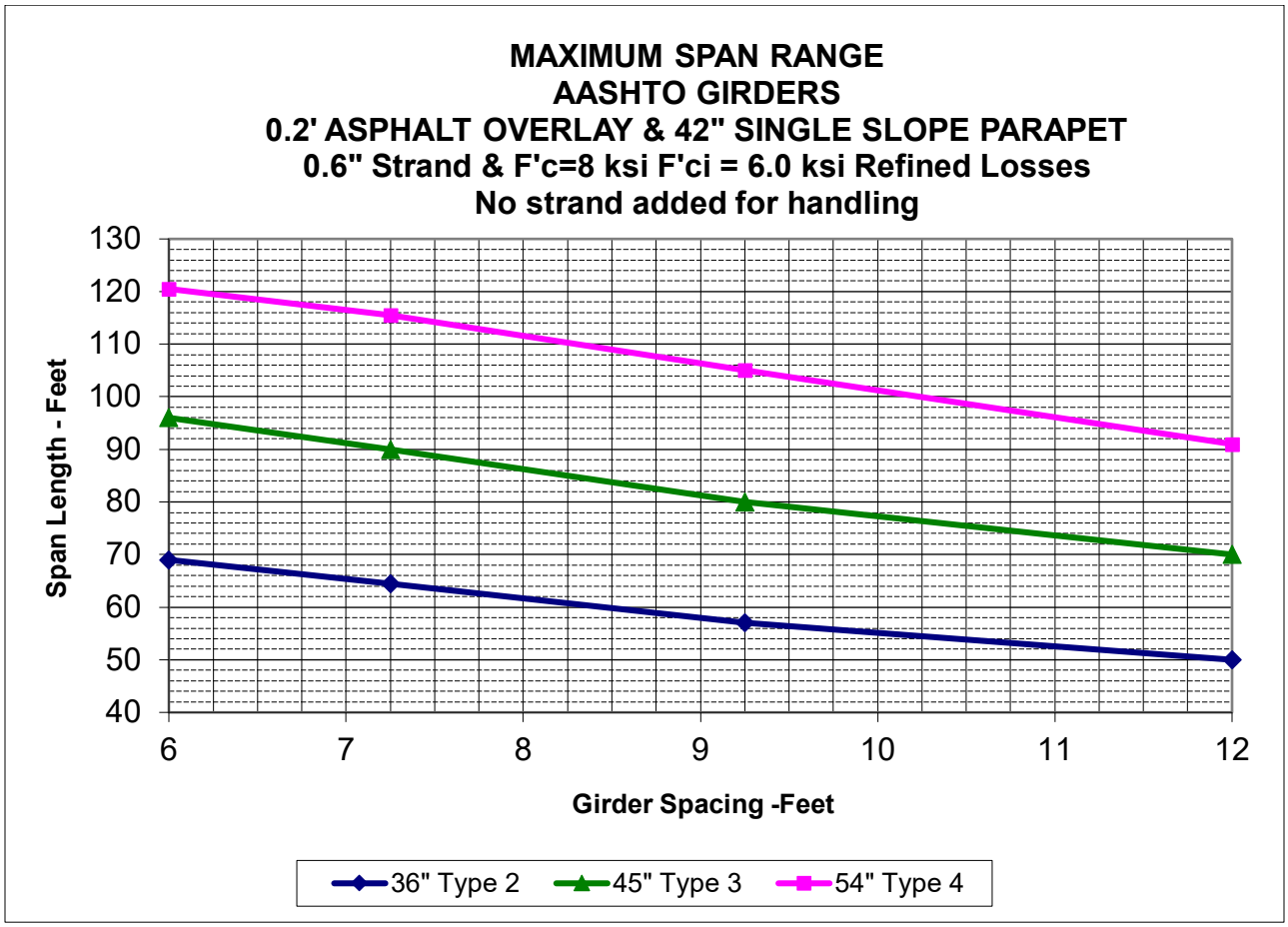
TYPE 2 GIRDER



TYPE 3 GIRDER



TYPE 4 GIRDER

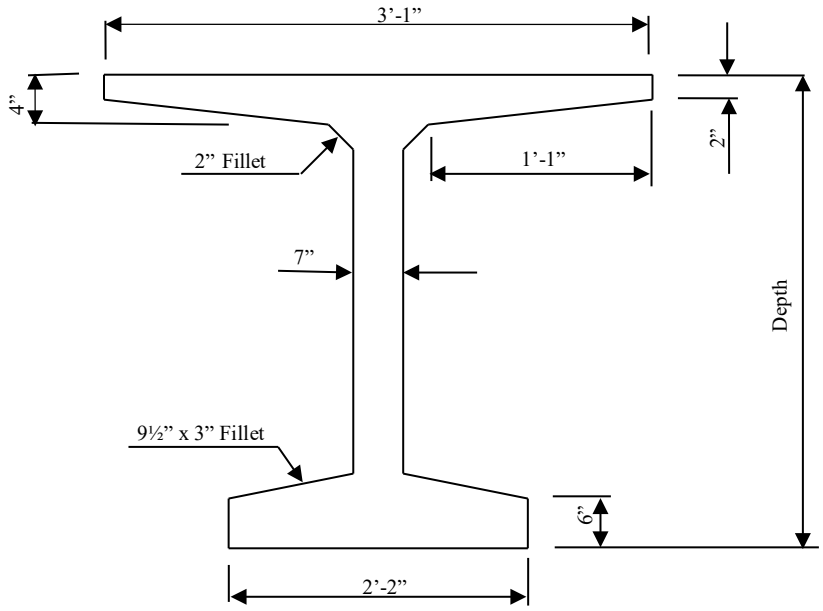

MAXIMUM SPAN RANGE
AASHTO GIRDERS
0.2' ASPHALT OVERLAY & 42" SINGLE SLOPE PARAPET
0.6" Strand & F'c=8 ksi F'ci = 6.0 ksi Refined Losses
No strand added for handling
Span Length - Feet
130
120
110
100
90
80
70
60
50
40
6
7
8
9
10
11
12
Girder Spacing -Feet
36" Type 2
45" Type 3
54" Type 4

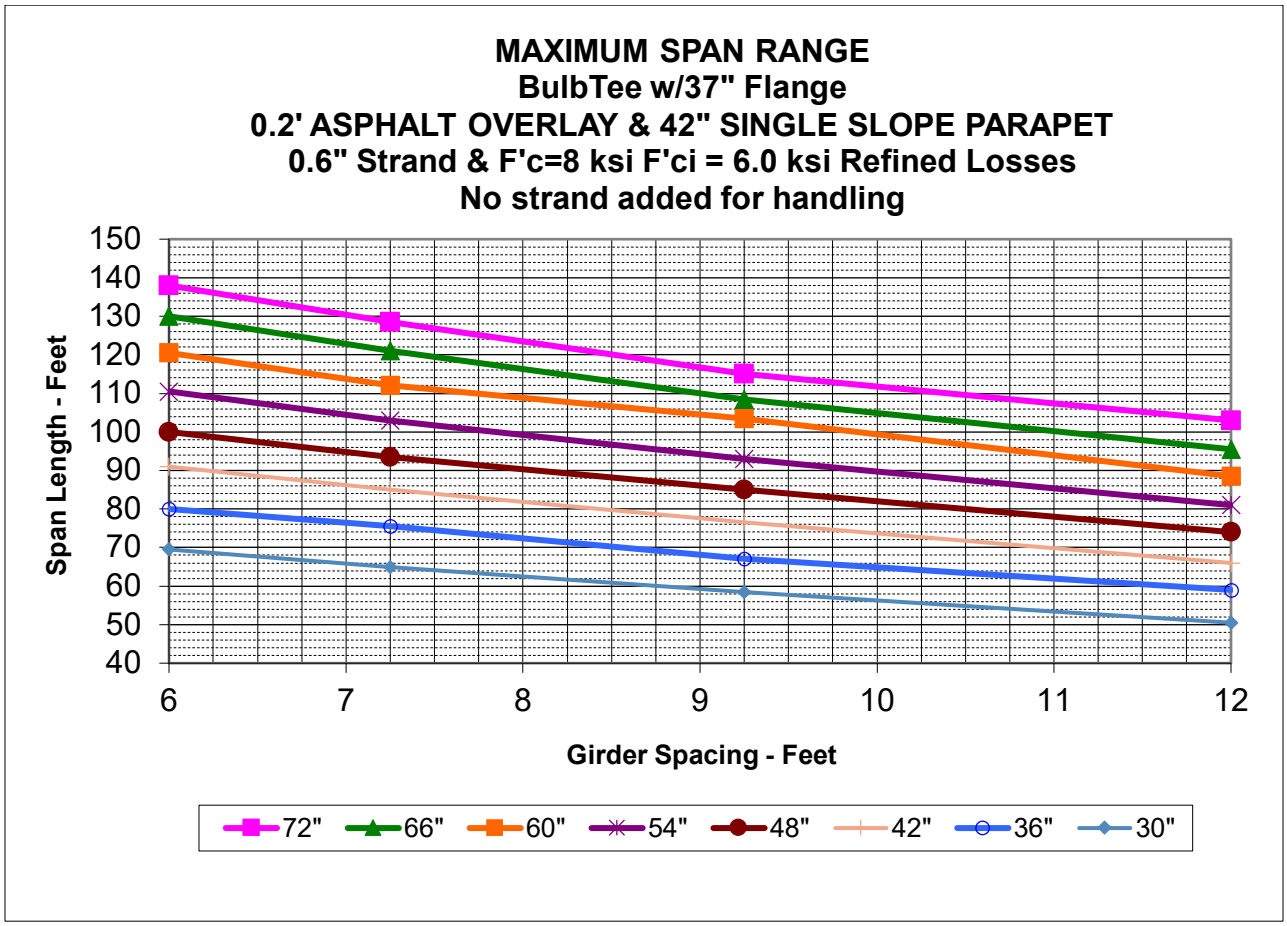
37” TOP FLANGE BULB TEE GIRDER SECTION PROPERTIES

		CENTER OF GRAVITY			SECTION MODULUS		*WEIGHT LB/FT
DEPTH	AREA	TOP	BOTTOM	MOMENT OF INERTIA	TOP	BOTTOM	
30"	449.9375	15.644	14.356	51,361	3,283	3,578	469
36"	491.9375	18.857	17.143	82,126	4,355	4,791	512
42"	533.9375	22.036	19.964	121,708	5,523	6,096	556
48"	575.9375	25.190	22.810	170,872	6,783	7,491	600
54"	617.9375	28.322	25.678	230,379	8,134	8,972	644
60"	659.9375	31.438	28.562	300,990	9,574	10,538	687
66"	701.9375	34.539	31.461	383,465	11,102	12,189	731
72"	743.9375	37.630	34.370	478,562	12,718	13,924	775

*Weight based on 150 pcf. Adjust weight in accordance with AASHTO Table 3.5.1-1 and C3.5.1

ALL UNITS IN INCHES EXCEPT WEIGHT



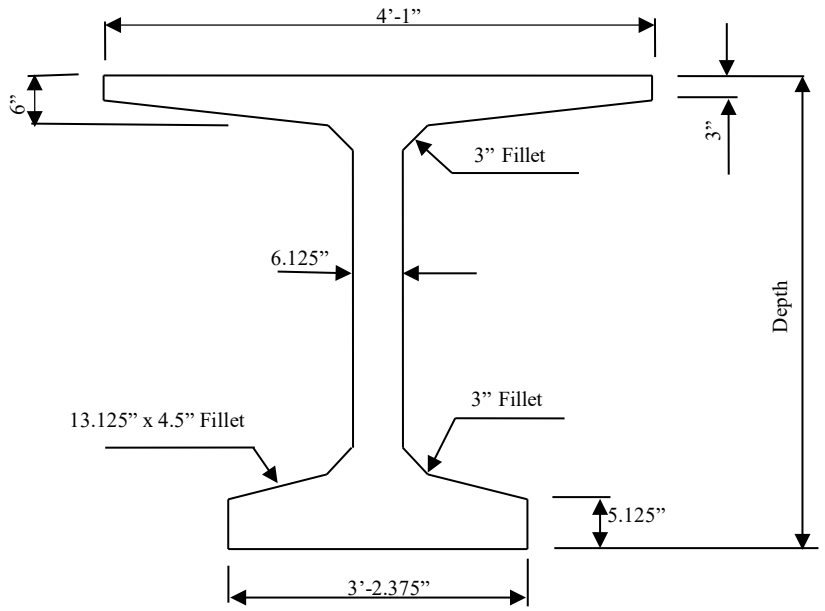

MAXIMUM SPAN RANGE
BulbTee w/37" Flange
0.2' ASPHALT OVERLAY & 42" SINGLE SLOPE PARAPET
0.6" Strand & F'c=8 ksi F'ci = 6.0 ksi Refined Losses
No strand added for handling
Span Length - Feet
150
140
130
120
110
100
90
80
70
60
50
40
6
7
8
9
10
11
12
Girder Spacing - Feet
72"
66"
60"
54"
48"
42"
36"
30"

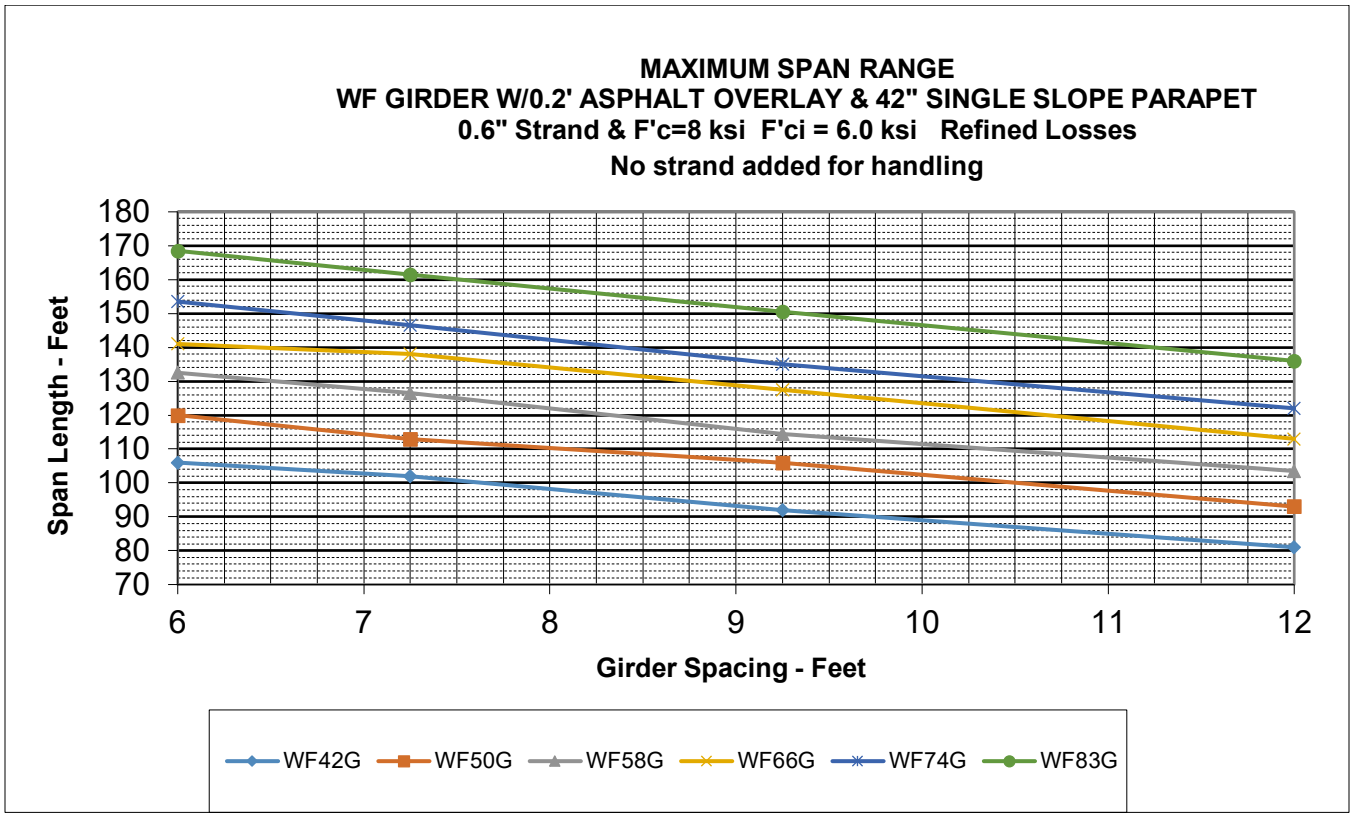
WF GIRDER SECTION PROPERTIES

		CENTER OF GRAVITY			SECTION MODULUS		*WEIGHT LB/FT
DEPTH	AREA	TOP	BOTTOM	MOMENT OF INERTIA	TOP	BOTTOM	
42"	727.531	21.640	20.360	183,642	8,486	9,020	758
50"	776.531	25.849	24.151	282,559	10,931	11,700	809
58"	825.531	30.033	27.967	406,266	13,527	14,527	860
66"	874.531	34.196	31.804	556,339	16,269	17,493	911
74"	923.531	38.343	35.657	734,356	19,152	20,595	962
82.625"	976.359	42.796	39.829	959,393	22,418	24,088	1017

*Weight based on 150 pcf. Adjust weight in accordance with AASHTO Table 3.5.1-1 and C3.5.1

ALL UNITS IN INCHES EXCEPT WEIGHT

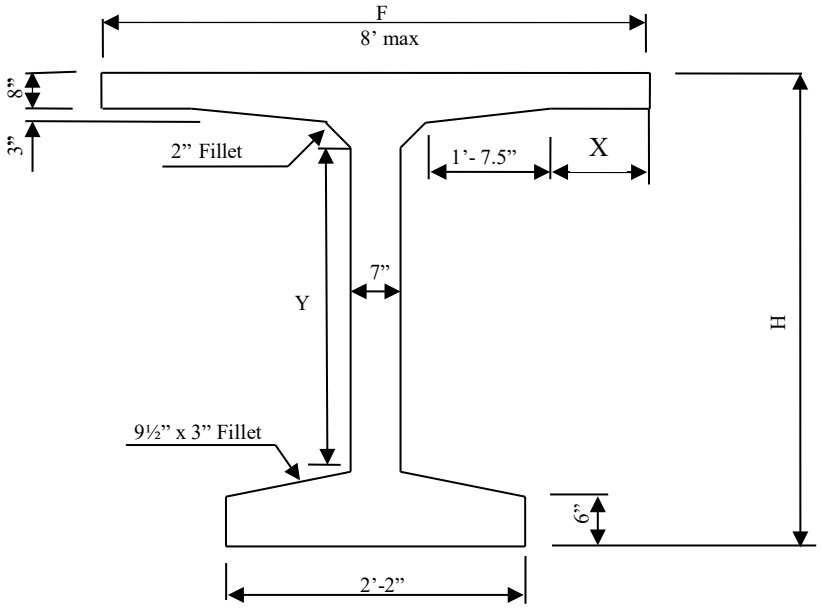


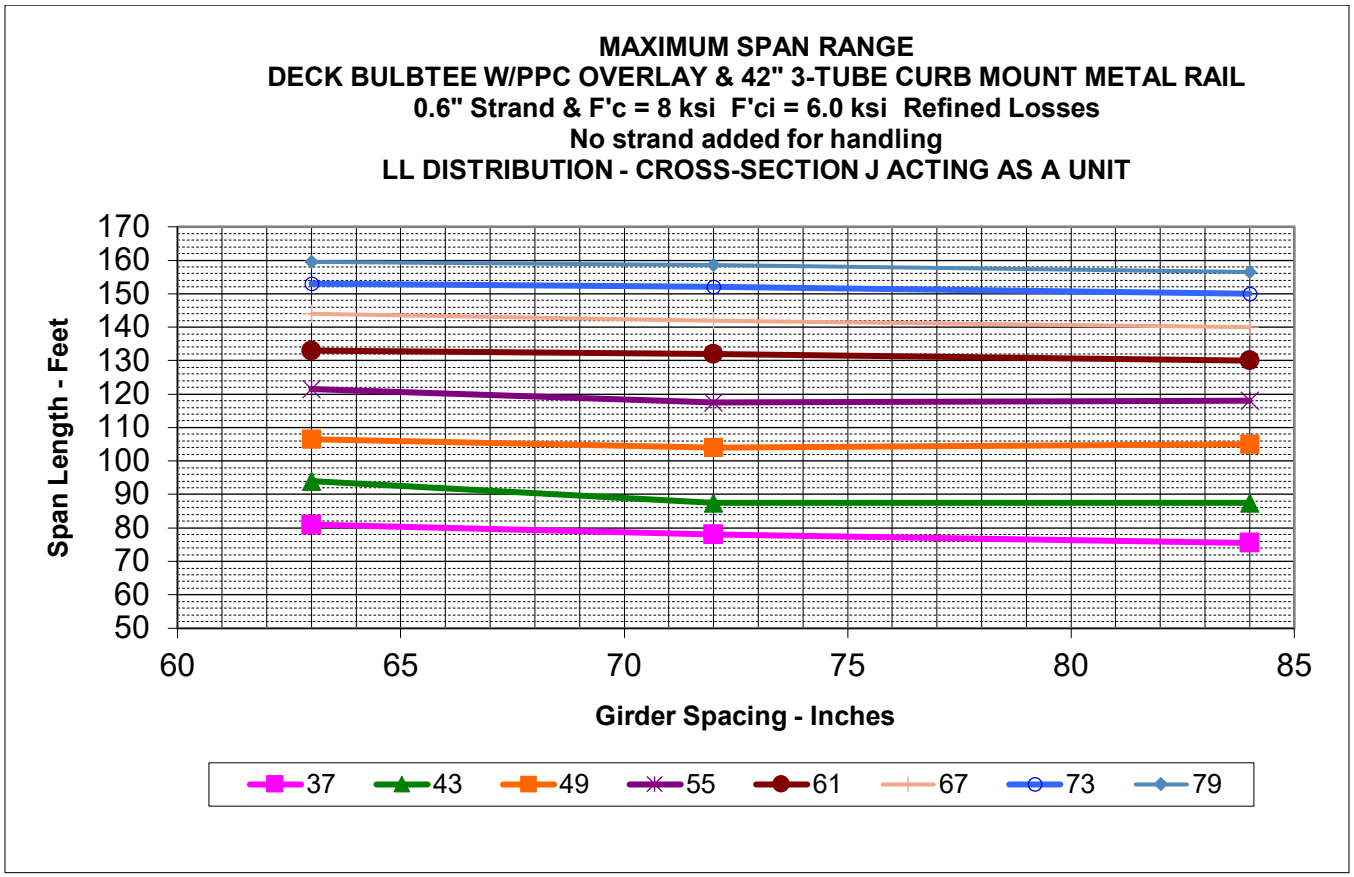

MAXIMUM SPAN RANGE
WF GIRDER W/0.2' ASPHALT OVERLAY & 42" SINGLE SLOPE PARAPET
0.6" Strand & F'c=8 ksi F'ci = 6.0 ksi Refined Losses
No strand added for handling
Span Length - Feet
180
170
160
150
140
130
120
110
100
90
80
70
6
7
8
9
10
11
12
Girder Spacing - Feet
WF42G
WF50G
WF58G
WF66G
WF74G
WF83G

DECK BULB TEE GIRDER W/PPC OVERLAY

BASE GIRDER	H	Y= (H-22)
30" BT	37	15
36" BT	43	21
42" BT	49	27
48" BT	55	33
54" BT	61	39
60" BT	67	45
66" BT	73	51
72" BT	79	57

X = (F-50)/2

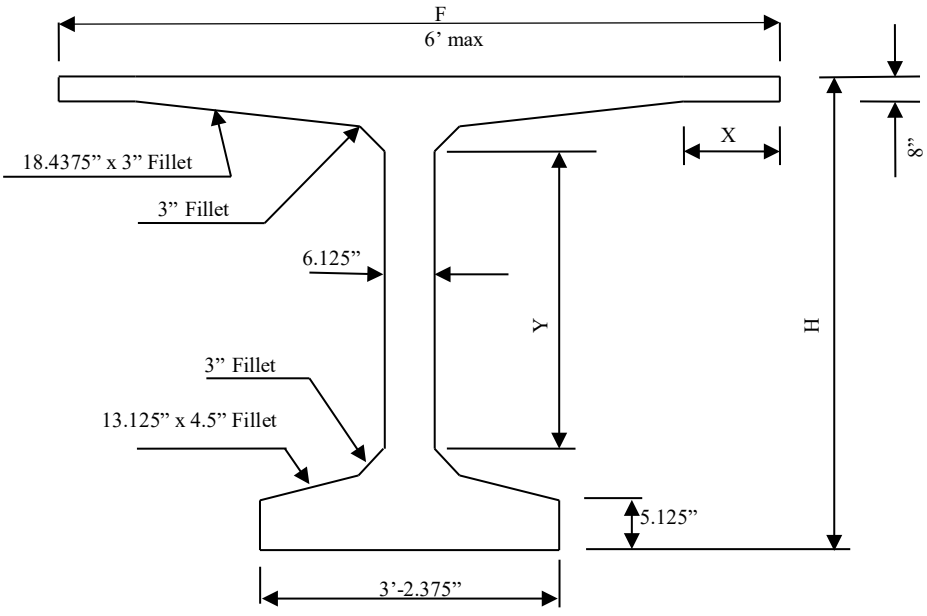


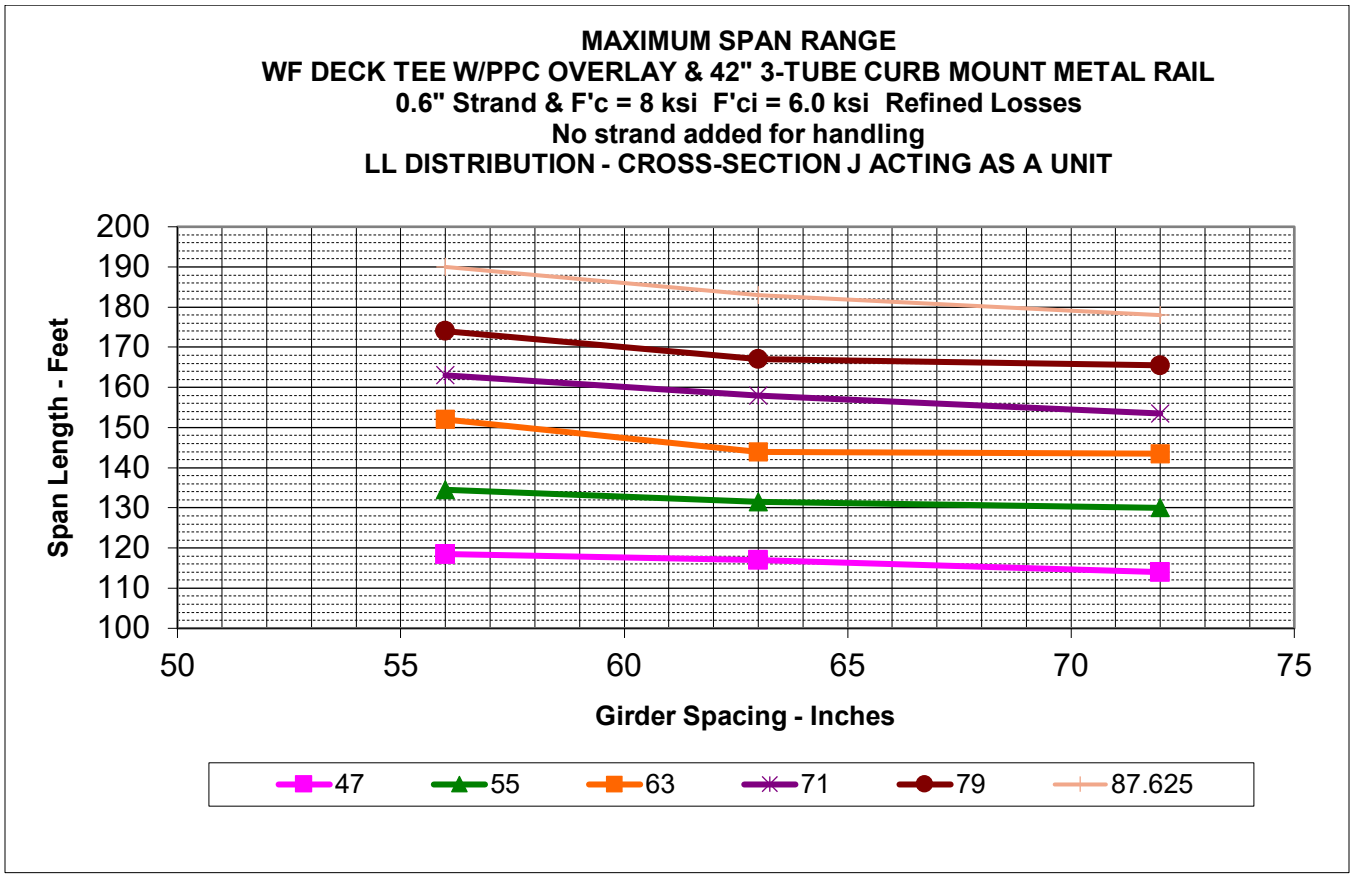

MAXIMUM SPAN RANGE
DECK BULBTEE W/PPC OVERLAY & 42" 3-TUBE CURB MOUNT METAL RAIL
0.6" Strand & F'c = 8 ksi F'ci = 6.0 ksi Refined Losses
No strand added for handling
LL DISTRIBUTION - CROSS-SECTION J ACTING AS A UNIT
Span Length - Feet
170
160
150
140
130
120
110
100
90
80
70
60
50
60
65
70
75
80
85
Girder Spacing - Inches
37
43
49
55
61
67
73
79

WF DECK TEE GIRDER W/PPC OVERLAY

BASE GIRDER	H	Y = (H-26.625)
42" WF	47	20.375
50" WF	55	28.375
58" WF	63	36.375
66" WF	71	44.375
74" WF	79	52.375
83" WF	87.625	61

X = (F-49)/2




MAXIMUM SPAN RANGE
WF DECK TEE W/PPC OVERLAY & 42" 3-TUBE CURB MOUNT METAL RAIL
0.6" Strand & F'c = 8 ksi F'ci = 6.0 ksi Refined Losses
No strand added for handling
LL DISTRIBUTION - CROSS-SECTION J ACTING AS A UNIT
Span Length - Feet
200
190
180
170
160
150
140
130
120
110
100
50
55
60
65
70
75
Girder Spacing - Inches
47
55
63
71
79
87.625

NOTES TO DESIGNER FOR PRECAST PRESTRESSED SLAB

The Standard Drawings for precast prestressed slabs are shown in Appendix B for Section 5.

The following criteria shall be used in developing details for projects utilizing precast prestressed slabs:

PRESTRESSING STEEL
Prestressing steel shall be designed as straight strand. Strand shall not be debonded.

Maximum number of strand:

	VOIDED SLAB DEPTH					
Y_b	12”	15” SOLID	15”	18”	21”	26”
2”	16	16	16	16	16	16
4”	16	12	12	12	16	16
6”				6	6	4
7.5”	16					
9.5”		12	16			
11.5”		16	16			
13.5”				16		
15.5”					8	
17.5”					16	
19.5”						4
21.5”						16

TIE RODS
Tie rods spacing shall be as follows:
SPAN ≤ 40' at centerline span
SPAN > 40' at 1/3 points
Tie rods shall be oriented as follows:
skew angle < 20° parallel to centerline bearing
skew angle > 20° perpendicular to slab centerline

When tie rod lengths greater than 20' are required, specify heavy-duty sleeve nuts to obtain the required length.

BEARING PADS
Bearing pads should be designed in accordance with Article 14.7.5 of the Bridge Design Manual.

The beam seat shall be parallel to the bottom of the beams.

MEMBRANE SEAL
A waterproof membrane seal shall be applied to the top surface of the slabs when an asphalt wearing surface is used. The membrane seal shall be a spray-applied waterproofing membrane that conforms to Section 511. A 0.2’ asphalt wearing surface should be used at initial construction. The height of the 42” single slope concrete parapet does not needs to be increased for the 0.2’ overlay at initial construction.

When a PPC overlay is used, no asphalt future wearing surface is used.

Revisions:

July 2009	Corrected references on page 3 to Section 511 and System Type D.
Feb 2012	Added maximum span chart based upon refined losses.
Mar 2015	Revised maximum span curves for using 0.4’ total asphalt pavement.
Jan 2016	Revised maximum span curves for using 0.2’ total asphalt pavement and 2014 live load distribution factors and resistance factors.
Oct 2017	Revised maximum span curves for using 0.4’ total asphalt pavement.
Nov 2019	Revised 18” Voided Slab section properties due to changing the center of the voids from 8½” to 9” to meet the requirements of AASHTO Article 5.12.3.2.2. Revised 15” Voided Slab section properties due to changing the center of the voids from 7” to 7½” to meet the requirements of AASHTO Article 5.12.3.2.2. Clarified design assumptions for total asphalt wearing surface to be 0.2’ initial and nothing in the future. Revised Maximum Span Range curves for 9 psf PPC overlay and 42: single slope parapet.
Dec 2024	Reformatted article to portrait orientation. Moved “Notes to Designer” to front of the article. Added Table of location of maximum strand. Added f’ci = 6.0 ksi to title of maximum span graph. Added Torsional Constant J to Section Properties Table. Added “*Weight based on 150 pcf. Adjust weight in accordance with AASHTO Table 3.5.1-1 and C3.5.1” to Section Properties Tables.

PRECAST PRESTRESSED SLAB
PRELIMINARY DESIGN CURVES

PRECAST PRESTRESSED SLAB W/ASPHALT OVERLAY

Section Properties and maximum span length curves for the precast prestressed slabs are included in this Article.
The maximum span length curves should only be used as an aid in preliminary design. The curves on based on the following design parameters:

- AASHTO LRFD Design Specifications using refined losses
- Simple Span lengths are centerline-centerline bearing
- All beams are parallel
- 44'-0" out-out bridge width
- 42" Single Slope Concrete parapet
- Girder f'c = 8 ksi Girder f'ci = 6.0 ksi
- 0.6"Ø 270 ksi strand
- Total wearing surface = 9 psf (PPC Overlay)
- HL93 live load

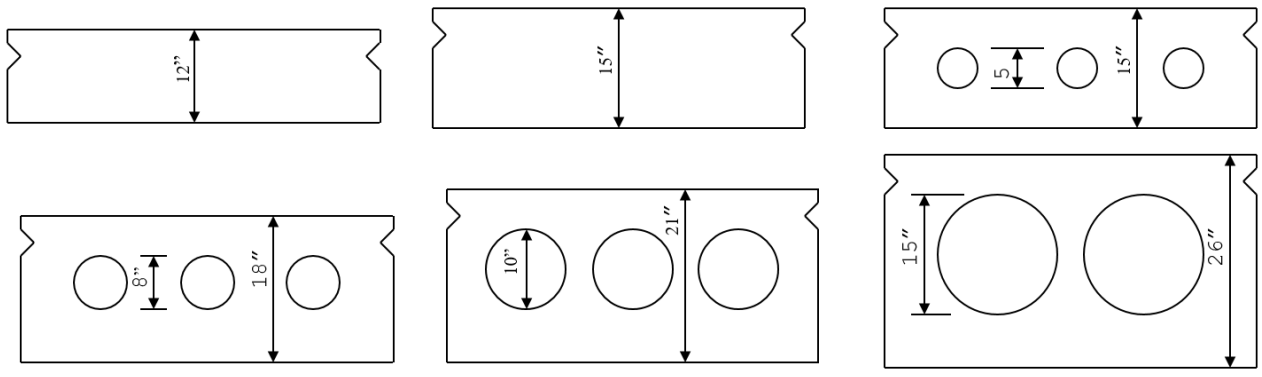
PRECAST PRESTRESSED SLAB SECTION PROPERTIES

		CENTER OF GRAVITY			SECTION MODULUS		*WEIGHT	TORSIONAL CONSTANT J
DEPTH	AREA	TOP	BOTTOM	MOMENT OF INERTIA	TOP	BOTTOM	LB/FT	IN4
12" SOLID	561.188	6.055	5.945	6782	1120	1141	585	21,867
15" SOLID	705.188	7.573	7.427	13223	1746	1780	735	41,282
15" VOID	646.283	7.579	7.421	13131	1733	1770	673	40,982
18" VOID	698.391	9.103	8.897	22233	2442	2499	728	65,448
21" VOID	757.568	10.622	10.378	34798	3276	3353	789	96,038
26" VOID	879.758	13.144	12.856	63943	4865	4974	917	156,550

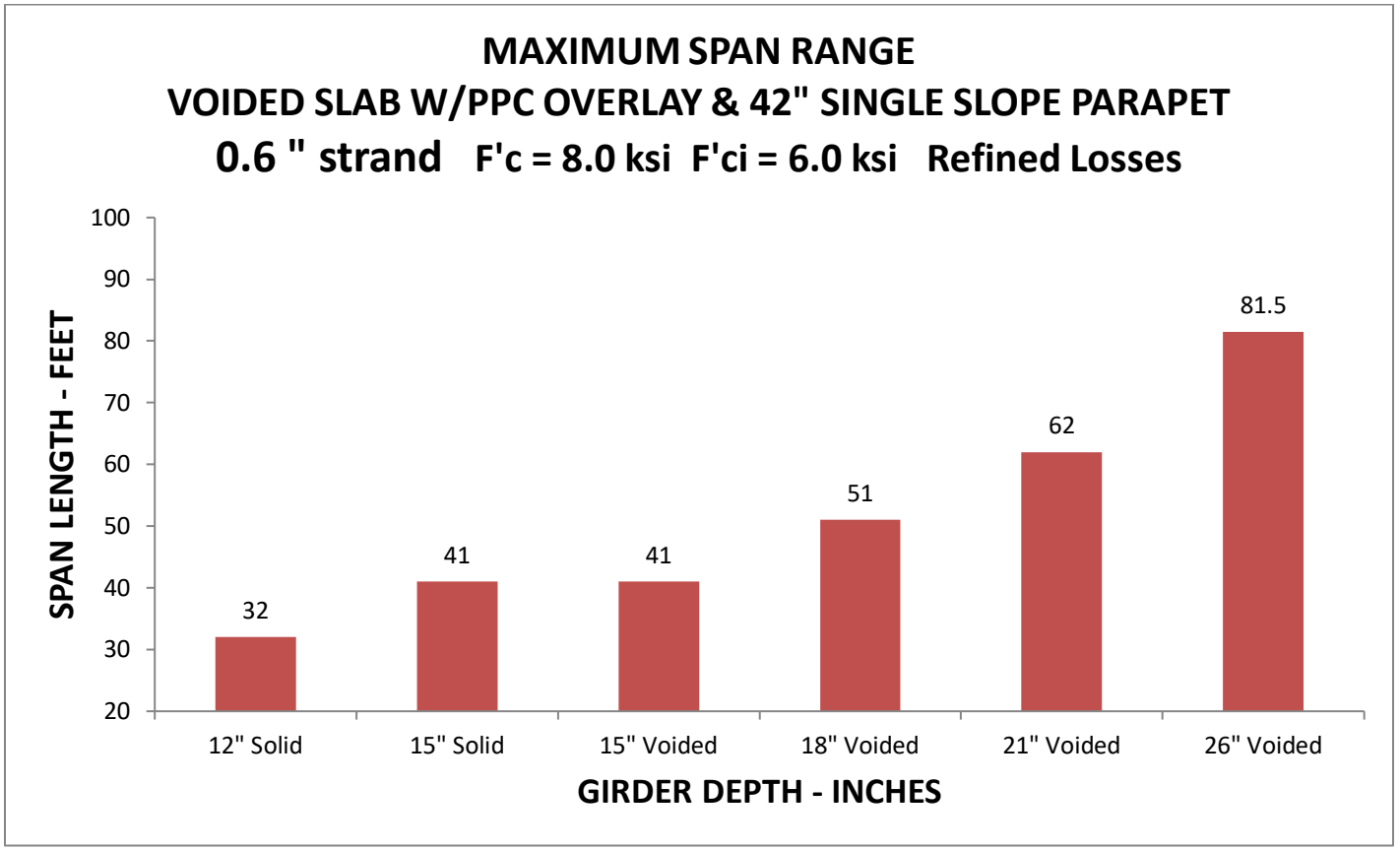
**Weight based on 150 pcf. Adjust weight in accordance with AASHTO Table 3.5.1-1 and C3.5.1*

ALL UNITS IN INCHES EXCEPT WEIGHT

All slabs are 48" wide



All slabs are 48" wide


MAXIMUM SPAN RANGE
VOIDED SLAB W/PPC OVERLAY & 42" SINGLE SLOPE PARAPET
0.6 " strand F'c = 8.0 ksi F'ci = 6.0 ksi Refined Losses
SPAN LENGTH - FEET
100
90
80
70
60
50
40
30
20
32
41
41
51
62
81.5
12" Solid
15" Solid
15" Voided
18" Voided
21" Voided
26" Voided
GIRDER DEPTH - INCHES

DEFLECTION

Beam self weight

$$\Delta_g = \frac{5 * w_{beam} * L^4 * 1728}{384 * E_{ci} * I_g}$$

$$E_{ci} = 57.619\sqrt{f'_{ci}} \text{ (ksi)}$$

f'$_{ci}$ = girder concrete strength at release (psi)
I_g = Moment of Inertia of girder (in^4)
L = span length (ft)
W_{beam} = beam dead load (kips/ft)

Non-composite Dead Loads

$$\Delta_{SDL} = \frac{5 * w_{SDL} * L^4 * 1728}{384 * E_c * I_g} \qquad E_c = \frac{E_{ci}}{0.85}$$

Composite Dead Loads

$$\Delta_{CDL} = \frac{5 * w_{CDL} * L^4 * 1728}{384 * E_c * I_c}$$

I_c = Composite Moment of Inertia (in^4)

Prestressing Force at Transfer

For 2 point harping; $\Delta_p = \frac{P_i}{E_{ci} * I_g}\left(\frac{e_{mid} * L^2 * 144}{8} - \frac{e_{mid} * a^2 * 144}{6} + \frac{e_{end} * a^2 * 144}{6}\right)$

For straight strand; $\Delta_p = \frac{P_i * e * L^2 * 144}{8 * E * I_g}$

$P_i = P_0 - f_{ES} * A_{ps}$

f_u = strand ultimate strength (ksi)
A_{ps} = total area of strand (in^2)
$P_0 = 0.75 * f_u * A_{ps}$

a = distance from end of girder to harp point (ft)

$e_{end} = Y_b - cg_{end}$ $\quad$ Y_b = centroid of girder from bottom (in)

$e_{mid} = Y_b - cg_{mid}$ $\quad$ cg = strand center of gravity (in)

$$f_{ES} = \frac{\frac{P_0}{A_g} + \frac{P_0 * e_{mid}^2}{I_g} - \frac{M_{girderDL} * e_{mid} * 12}{I_g}}{\frac{E_{ci}}{E_{ps}} + \frac{A_{ps}}{A_g} + \frac{A_{ps} * e_{mid}^2}{I_g}}$$

At Release:

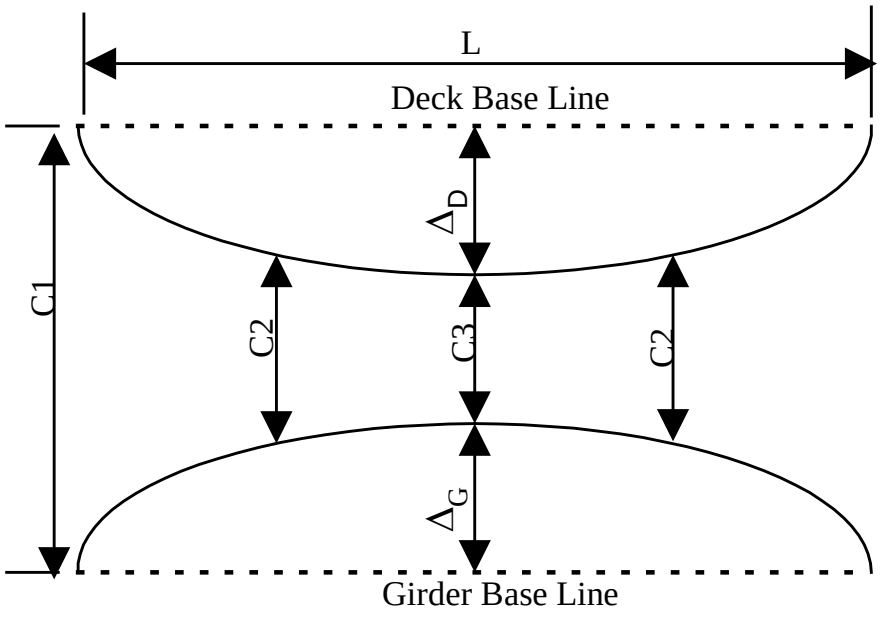
$$\Delta_{release} = \Delta_g + \Delta_p$$

At Slab Placement:

$$\Delta_{erection} = 1.65 * \Delta_g + 1.55 * \Delta_p$$

CAMBER STRIP

Both the deck and girder profiles can be assumed to be parabolic curves, either above or below a base line. The base line for the deck is a straight line between the point at the beginning of the span to the point at the end of the span on the underside of the deck. The base line for the girder is the straight line between the point at the beginning of the span to the point at the end of the span on the top of the girder.



C1 = Camber strip thickness at ends of girder
C2 = Camber strip thickness at ¼ point of girder
C3 = Camber strip thickness at mid-span of girder

Δ_D and Δ_G must be first calculated to determine C1, C2, and C3. A positive value for Δ_D or Δ_G indicates the profile is above its respective base line.

$$\Delta_D = \Delta_{VC} - \Delta_{HC}$$

Δ_{VC} = Vertical curve effect (inches)
Δ_{HC} = Horizontal curve effect (inches)

$$\Delta_{VC} = \frac{1.5 * G * L^2}{VC}$$

G = algebraic difference in profile tangent grades (ft/ft)
+ for crest vertical curve
- for sag vertical curve
VC = vertical curve length (ft)
L = girder span length (ft)

$$\Delta_{HC} = \frac{1.5 * s * L^2}{R}$$

S = super-elevation rate (ft/ft)
R = radius of horizontal curve (ft)
L = girder span length (ft)

$$\Delta_G = 1.55\,\Delta_p - 1.65\,\Delta_g - \Delta_{SDL} - \Delta_{CDL}$$ (All values are absolute values)

If $\Delta_D > \Delta_G$; camber strip thickest at mid-span (Δ_D and Δ_G are algebraic values)

$$C_1 = F + s * \frac{W_f}{2}$$

F = minimum fabrication/construction tolerance value; ½" for spans up 80' & 1" for spans over 80'.
S = super-elevation rate (ft/ft)
W_f = girder top flange width (inches)

$$C_2 = C_3 - \frac{C_3 - C_1}{4}$$

$$C_3 = C_1 + \Delta_D - \Delta_G$$

If $\Delta_G > \Delta_D$; camber strip thickest at ends (Δ_D and Δ_G are algebraic values)

$$C_3 = F + s * \frac{W_f}{2}$$

$$C_1 = C_3 + \Delta_G - \Delta_D$$

$$C_2 = C_3 + \frac{C_1 - C_3}{4}$$

If $\Delta_G = \Delta_D$;

$$C_1 = C_2 = C_3 = F + \frac{s * W_f}{2}$$

Girder Stirrups

The 4" standard projection of the girder stirrup into the deck slab should be checked. The variable depth of the camber strip may require the stirrup projection to be increased so the hook is above the bottom mat of slab reinforcement or decreased so the hook is below the top mat of slab reinforcement.

Revisions:

April 2008	Revised f'_{ci} to psi
July 2009	Added ksi units to definition of E_{ci} Added 144 units conversion to straight strand Δ_p equation. Added paragraph on girder stirrups.

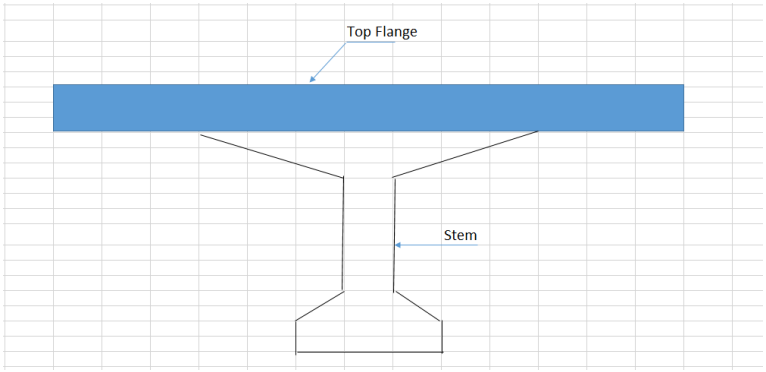
LIVE LOAD DISTRIBUTION FACTOR FOR DECK TEE GIRDERS

Deck Tee girders connecting the top flanges using UHPC & HESC concrete meet Section (J) of Table 4.6.2.2.1-1.

The live load distribution factors (LLDF) for moment are calculated using the criteria in Table 4.6.2.2.2b-1 for Section (J) sufficiently connected to act as a unit for interior girders and using Table 4.6.2.2.2d-1 for exterior girders.

The live load distribution factors (LLDF) for shear are calculated using the criteria in Table 4.6.2.2.3a-1 for Section (J) sufficiently connected to act as a unit for interior girders and using Table 4.6.2.2.3b-1 for exterior girders.

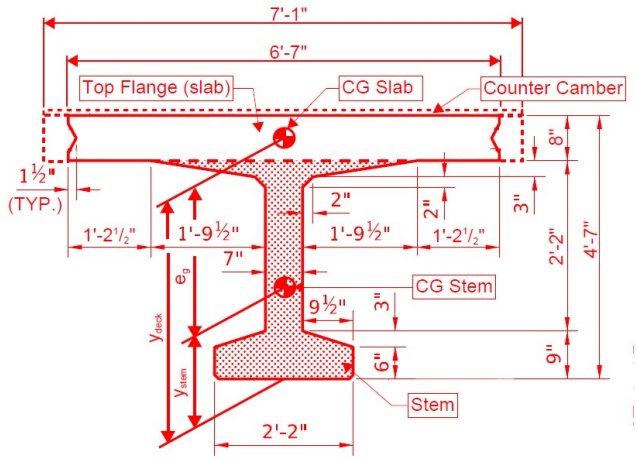
The analysis is based on the top flange acting as the slab and the remaining portion of the girder below the top flange acting as the stem.



To evaluate the distribution factor, the following terms are defined:

t_s = thickness of the top flange
$Kg = n(I_{stem} + A_{stem} * e_g^2)$
e_g = distance between stem and top flange centroids

Design Example for Moment LLDF with no skew



$N_b = 6$ number of beams
Skew = 0º
L = 109.75' span length (center to center of bearing)
S = 7'-1" girder spacing
t_s = 8.00" top flange thickness
I_{stem} = 151213 in^4 moment of inertia of the stem
A_{stem} = 546 in^2 area of stem
y_{stem} = 21.4" centroid of stem measured from bottom flange
y_{flange} = 51" centroid of the flange measured from the bottom flange
e_g = 29.6" distance between centroids of stem and flange
n = 1.0 flange and stem same strength
Kg = 629,657

Interior Girder

Check S: $3.5 \le 7.08 \le 16$ OK
Check t_s: $4.5 \le 8 \le 12$ OK
Check L: $20 \le 109.75 \le 240$ OK
Check N_b: $6 \ge 4$ OK
Check K_g: $10{,}000 \le 629{,}657 \le 7{,}000{,}000$ OK

One Lane Loaded

Moment LLDF = $0.06 + \left(\frac{S}{14}\right)^{0.4}\left(\frac{S}{L}\right)^{0.3}\left(\frac{K_g}{12.0Lt_s^3}\right)^{0.1}$ lanes

$$0.06 + (7.08/14)^{0.4}(7.08/109.75)^{0.3}\left(\frac{629{,}657}{12.0(109.75)(8)^3}\right)^{0.1} = 0.392$$

Two or more Lanes Loaded

Moment LLDF = $0.075 + \left(\frac{S}{9.5}\right)^{0.6}\left(\frac{S}{L}\right)^{0.2}\left(\frac{K_g}{12.0Lt_s^3}\right)^{0.1}$ lanes

$$0.075 + (7.08/9.5)^{0.6}(7.08/109.75)^{0.2}\left(\frac{629{,}657}{12.0(109.75)(8)^3}\right)^{0.1} = 0.556$$

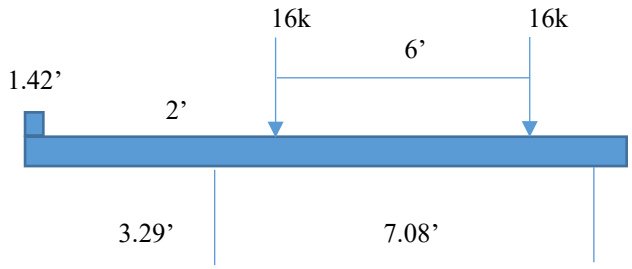
Exterior Girder

Overhang = 3.29’ distance from centerline exterior girder to edge deck
Barrier = 1.42’ width of barrier
d_e = 1.87’ centerline exterior girder to traffic face of barrier

One Lane Loaded

Check d_e: $-1.0 \le 1.87 \le 5.5$ OK

X = 3.29 + 7.08 – 1.42 – 2.0 = 6.96



Moment Distribution factor = lever rule = $\frac{16}{32}\left(\frac{6.96}{7.08} + \frac{6.96-6}{7.08}\right) = 0.559$

(1.2 multiple presence factor)*0.559 = 0.671

Two Lanes Loaded

Check d_e: $-1.0 \le 1.87 \le 5.5$ OK

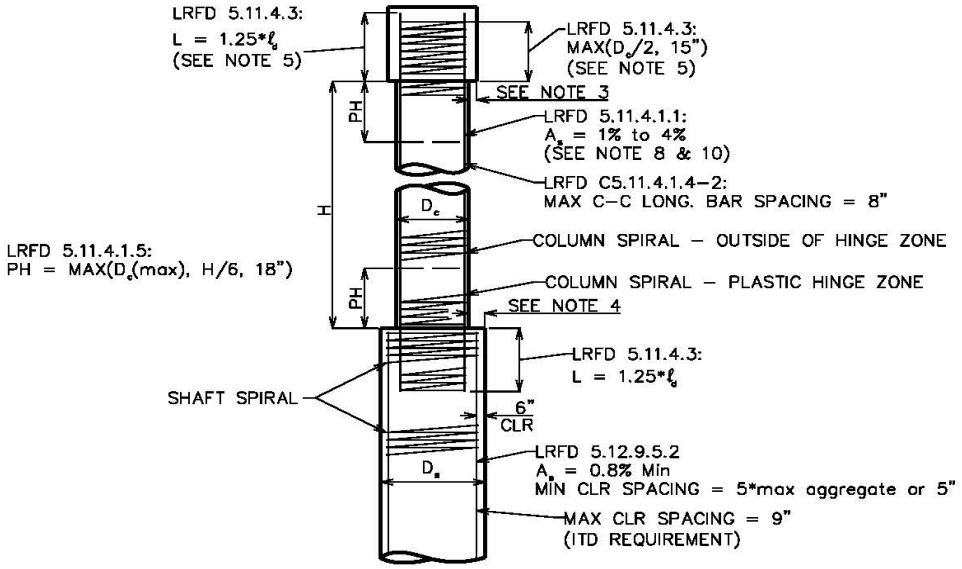
$e = 0.77 + d_e/9.1 = 0.976$

Moment Distribution factor = e*interior distribution factor = 0.976*0.556 = 0.543

Commentary:
NCHRP 999 “Design & Construction of Deck Bulb Tee Girder Bridges with UHPC Connections”
(ISBN 978-0-309-68703-4) shows that decked girders connected with UHPC longitudinal joints act as a unit.

Revisions:
Dec 2024 Added new article

COLUMN/DRILLED SHAFT DETAILING REQUIREMENTS



NOTES:

1. All columns to be detailed in accordance with Seismic Zone 3/4 (LRFD 5.11.4) requirements regardless of Seismic Zone.

2. No splices of longitudinal or spiral rebar in PH Zones are allowed. (LRFD 5.11.4.1.6)

3. Cap width should be a minimum of 6" wider than the column (D_c) on each side. Cap height should be D_c or larger.

4. Diameter of drilled shaft shall be large enough to allow for drilled shaft installation tolerance between column and shaft rebar cages.
Rule of thumb: Provide a shaft diameter 2 ft. larger than the column.

5. Extend rebar into cap as far as practical near top mat of longitudinal rebar in cap.

6. Spiral is only discontinuous at bottom mat of pier cap longitudinal rebar.

7. Use a spiral for rebar sizes #6 and smaller, use welded hoops for rebar sizes #7 and above. (Confirm with rebar fabricator otherwise)

8. Detail column and cap beam longitudinal rebar to ensure construction feasibility. Specify the column cage orientation with respect to the cap centerline on the plans.

9. Provide CSL tubes in the drilled shaft in accordance with the Geotechnical Engineering Report. Rule of Thumb: One CSL tube per foot diameter of shaft.

10. Recommend keeping longitudinal column rebar as close to 1% of column area as possible.

COLUMN SPIRAL - OUTSIDE OF HINGE ZONE

LRFD 5.6.4.6:
$\rho_s \geq 0.45(A_g/A_c - 1)*(f'_c/f_{yh})$

LRFD 5.7.2.5:
$A_v \geq 0.0316*\text{sqrt}(f'_c)*(b_v*s/f_{yh})$

LRFD 5.7.2.6:
$s_{max} = \min(0.8d_v, 24")$ if $v_u < 0.125f'_c$
$s_{max} = \min(0.4d_v, 12")$ if $v_u \geq 0.125f'_c$

LRFD 5.10.4.2:
Max Spiral Pitch = 6 * Dia. Long d_b or 6"
Min Clear Spacing = max(1", 1.33 * max aggregate)

COLUMN SPIRAL - PLASTIC HINGE ZONES

Include all requirements from outside hinge zone

LRFD 5.11.4.1.4:
$f_{yh} \leq 75$ ksi $\leq f_y$ (Longitudinal)
Circular:
$\rho_s \geq 0.12*(f'_c/f_{yh})$
Rectangular (both principal axes):
$A_{sh} \geq 0.30*s*h_c*(f'_c/f_{yh})(A_g/A_c - 1)$
$A_{sh} \geq 0.12*s*h_c*(f'_c/f_{yh})$

LRFD 5.11.4.1.5:
Max Pitch = D_c(min)/4 or 4"

Extend spiral meeting requirements of PH into top and bottom component connections

SHAFT SPIRAL

ITD considers shafts capacity protected or elastic under seismic loads in accordance with BDM Article 3.10.9.3, therefore, PH confinement steel per 5.11.4.5.2 need not be applied

LRFD 5.6.4.6:
$\rho_s \geq 0.45(A_g/A_c - 1)*(f'_c/f_{yh})$
(A_g may be calculated using 2" of cover for ps calculations)

LRFD 5.7.2.5:
$A_v \geq 0.0316*\text{sqrt}(f'_c)*(b_v*s/f_y)$

LRFD 5.7.2.6:
$s_{max} = \min(0.8d_v, 24")$ if $v_u < 0.125f'_c$
$s_{max} = \min(0.4d_v, 12")$ if $v_u \geq 0.125f'_c$

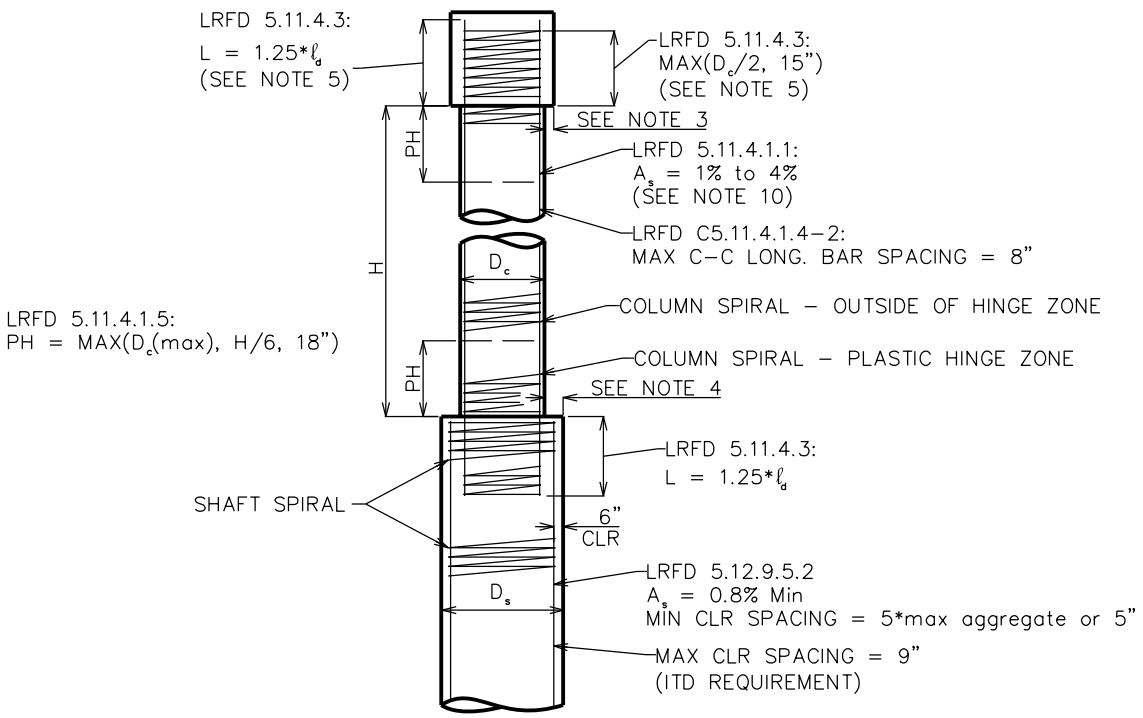
LRFD 5.10.8.4.2a (non-contact lap splice):

$s_{max} = 2*\pi*A_{sp}*f_{ytr}*\ell_s/k*A_t*F_{ut}$
(in the splice zone)

DEFINITIONS:

LRFD = AASHTO LRFD Bridge Design Specifications
PH = Plastic Hinge Zone
ρ_s = ratio of spiral reinforcement to total volume of column core = $4*A_{sp}/d_c*s$
D_c = Diameter of Column
D_s = Diameter of Shaft
H = Column Height

COLUMN/DRILLED SHAFT DETAILING REQUIREMENTS



NOTES:

1. All columns to be detailed in accordance with Seismic Zone 3/4 (LRFD 5.11.4) requirements regardless of Seismic Zone.

2. No splices of longitudinal or spiral rebar in PH Zones are allowed. (LRFD 5.11.4.1.6)

3. Cap width should be a minimum of 6" wider than the column (D_c) on each side. Cap height should be D_c or larger.

4. Diameter of drilled shaft shall be large enough to allow for drilled shaft installation tolerance between column and shaft rebar cages. Rule of thumb: Provide a shaft diameter 2 ft. larger than the column.

5. Extend rebar into cap as far as practical near top mat of longitudinal rebar in cap.

6. Spiral is only discontinuous at pier cap longitudinal rebar.

7. Use a spiral for rebar sizes #6 and smaller, use welded hoops for rebar sizes #7 and above. (Confirm with rebar fabricator otherwise)

8. Detail column and cap beam longitudinal rebar to ensure construction feasibility. Specify the column cage orientation with respect to the cap centerline on the plans.

9. Provide CSL tubes in the drilled shaft in accordance with the Geotechnical Engineering Report. Rule of Thumb: one CSL tube per foot diameter of shaft.

10. Recommend keeping longitudinal column rebar as close to 1% of column area as possible.

COLUMN SPIRAL – OUTSIDE OF HINGE ZONE

LRFD 5.6.4.6:
$\rho_s \geq 0.45(A_g/A_c - 1)*(f'_c/f_y)$

LRFD 5.7.2.5:
$A_v \geq 0.0316*\text{sqrt}(f'_c)*(b_v*s/f_y)$

LRFD 5.7.2.6:
$s_{max} = \min(0.8d_v, 24")$ if $v_u < 0.125f'_c$
$s_{max} = \min(0.4d_v, 12")$ if $v_u \geq 0.125f'_c$

LRFD 5.10.4.2:
Max Spiral Pitch = 6 * Dia. Long d_b or 6"
Min Clear Spacing = max(1", 1.33 * max aggregate)

COLUMN SPIRAL – PLASTIC HINGE ZONES

Include all requirements from outside hinge zone

LRFD 5.11.4.1.4:
$f_{yh} \leq 75$ ksi $\leq f_y$ (Longitudinal)
Circular:
$\rho_s \geq 0.12*(f'_c/f_{yh})$
Rectangular (both principal axes):
$A_{sh} \geq 0.30*s*h_c*(f'_c/f_{yh})(A_g/A_c - 1)$
$A_{sh} \geq 0.12*s*h_c*(f'_c/f_{yh})$

LRFD 5.11.4.1.5:
Max Pitch = D_c(min)/4 or 4"

Extend spiral meeting requirements of PH into top and bottom component connections

SHAFT SPIRAL

ITD considers shafts capacity protected or elastic under seismic loads in accordance with BDM Article 3.10.9.3, therefore, PH confinement steel per 5.11.4.5.2 need not be applied

LRFD 5.6.4.6:
$\rho_s \geq 0.45(A_g/A_c - 1)*(f'_c/f_{yh})$
(Agross may be calculated using 2" of cover for ps calculations)

LRFD 5.7.2.5:
$A_v \geq 0.0316*\text{sqrt}(f'_c)*(b_v*s/f_y)$

LRFD 5.7.2.6:
$s_{max} = \min(0.8d_v, 24")$ if $v_u < 0.125f'_c$
$s_{max} = \min(0.4d_v, 12")$ if $v_u \geq 0.125f'_c$

LRFD 5.10.8.4.2a:
$s_{max} = 2*\pi*A_{sp}*f_{ytr}*\ell_s/k*A_\ell*F_{u\ell}$
(in the splice zone)

DEFINITIONS:

LRFD = AASHTO LRFD Bridge Design Specifications
PH = Plastic Hinge Zone
ρ_s = ratio of spiral reinforcement to total value of column core = $4*A_{sp}/d_c*s$
D_c = Diameter of Column
D_s = Diameter of Shaft
H = Column Height

CHAPTER 5
STANDARD DRAWING REVISION LOG

B5.1 Metal Reinforcement

Oct 2017	Revised note 6 to include GFRP designation.
	Changed column name in Table to "Coat".
	Added GFRP Bar Length Table.
Nov 2019	Revised format of notes to active voice, imperative mood.
Sep 2020	Changed "GFRP" to "G" in note 6B.
May 2021	Changed format of dimensions in the hook dimensions table to "feet & inches".
	Changed definition of 90 degree bend detail length "B".
Jan 2022	Converted to ORD format.
Oct 2023	Revised GFRP Bar Length summary table.
	Added Type S to rebar reference in note 5.
	Deleted note 8 that is included in Section 503
Dec 2024	Created B5.1A for substructure reinforcement and B5.1B for superstructure reinforcement.

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B5.1A Metal Reinforcement – Sheet 1

Dec 2024	New sheet for substructure reinforcement
	Added Bar Type S or W to Table and changed "Bar Type" to "Bend Type".

B5.1B Metal Reinforcement – Sheet 2

Dec 2024	New sheet for superstructure reinforcement
	Added Bar Type S or W to Table and changed "Bar Type" to "Bend Type".
	Added note 6c "Provide bar type S or W in accordance with Bridge Design Manual Article 5.4.3".

B5.2A AASHTO Type 2 Prestressed Girder

July 2009	Modified the end block reinforcement to comply with AASHTO Article 5.10.10.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed.
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.
	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.
	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9A from 2'-11" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram.
	Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.2B AASHTO Type 3 Prestressed Girder

June 2006	Extended the 6" stirrup spacing in the end block to comply with AASHTO Article 5.10.10.2.
July 2009	Modified the end block reinforcement to comply with AASHTO Article 5.10.10.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed.
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.
	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.
	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9A from 2'-11" to 2'-0".

CHAPTER 5
STANDARD DRAWING REVISION LOG

Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram. Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.2C AASHTO Type 4 Prestressed Girder

June 2006	Extended the 6" stirrup spacing in the end block to comply with AASHTO Article 5.10.10.2.
July 2009	Modified the end block reinforcement to comply with AASHTO Article 5.10.10.
July 2010	Corrected dimension of G1 & G2 bars from 12.5" to 15".
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed.
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region. Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule. Dimensions of bars G4 & G4A to be specified by the designer. Deleted length of all standard hooks. Revised length of G9A from 2'-11" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram. Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.2D Prestressed AASHTO Girder Details

June 2006	Extended strand for the positive moment connection in the Type C Diaphragm to comply with Article 5.14.1.4 of the LRFD Manual. Changed "Abutment Diaphragm Dowel Details" to "Girder End Details" and labeled Type C "Positive Moment Connection".
July 2009	Added Note 9 for size of strand used in the design. Revised Note 5 for lateral restraint until deck is cured.
Sept 2012	Changed "cut strand" to "extend strand" in Positive Moment Connection Detail.
March 2015	Added new note 5 for electronic shop drawings.
Oct	2017 Specified 0.6" diameter strand. Added note for Girder Shipping.
Nov 2019	Revised format of notes to active voice, imperative mood.
Sep 2020	Revised wording of note 7. Revised note 11 to "Fabricate in accordance with Section 506". Added note 12: "Design based upon 0.6" dia. AASHTO M203 low relaxation strand". Renumbered note 12 to note 13 and deleted the 7 day requirement. Added note 14: Basis of Payment.
Jan 2022	Deleted sheet; see B5.3O sheets.

B5.2E Pier Diaphragm for AASHTO Girders

June 2006	Extended strand for the positive moment connection and widened the gap between girder ends to 10".
Jan 2022	Deleted sheet; see B5.3Q sheets.

B5.3A 30" Bulb Tee Prestressed Girder

March 2015	Added new sheet
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region. Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.

CHAPTER 5
STANDARD DRAWING REVISION LOG

	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9 from 3'-5" to 4'-0".
	Revised length of G9A from 1'-8.5" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram.
.	Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.3B 36" Bulb Tee Prestressed Girder

July 2009	Modified the end block reinforcement to comply with AASHTO Article 5.10.10.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed.
March 2015	Changed page number
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.
	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.
	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9 from 3'-5" to 4'-0".
	Revised length of G9A from 1'-8.5" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram.
	Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.3C 42" Bulb Tee Prestressed Girder

July 2009	Modified the end block reinforcement to comply with AASHTO Article 5.10.10.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed.
March 2015	Changed page number
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.
	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.
	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9 from 3'-5" to 4'-0".
	Revised length of G9A from 1'-8.5" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram.
	Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.3D 48" Bulb Tee Prestressed Girder

June 2006	Extended the 6" stirrup spacing in the end block to comply with AASHTO Article 5.10.10.2.
July 2009	Modified the end block reinforcement to comply with AASHTO Article 5.10.10.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed.
March 2015	Changed page number
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.

CHAPTER 5
STANDARD DRAWING REVISION LOG

	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.
	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9 from 3'-5" to 4'-0".
	Revised length of G9A from 1'-8.5" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram.
	Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.3E 54" Bulb Tee Prestressed Girder

June 2006	Extended the 6" stirrup spacing in the end block to comply with AASHTO Article 5.10.10.2.
July 2009	Modified the end block reinforcement to comply with AASHTO Article 5.10.10.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed.
March 2015	Changed page number
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.
	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.
	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9 from 3'-5" to 4'-0".
	Revised length of G9A from 1'-8.5" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram.
	Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.3F 60" Bulb Tee Prestressed Girder

June 2006	Extended the 6" stirrup spacing in the end block to comply with AASHTO Article 5.10.10.2.
July 2009	Modified the end block reinforcement to comply with AASHTO Article 5.10.10.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed.
March 2015	Changed page number
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.
	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.
	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9 from 3'-5" to 4'-0".
	Revised length of G9A from 1'-8.5" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram.
	Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.3G 66" Bulb Tee Prestressed Girder

June 2006	Extended the 6" stirrup spacing in the end block to comply with AASHTO Article 5.10.10.2.
July 2009	Modified the end block reinforcement to comply with AASHTO Article 5.10.10.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed.

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March 2015	Changed page number
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.
	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.
	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9 from 3'-5" to 4'-0".
	Revised length of G9A from 1'-8.5" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram.
	Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.3H 72" Bulb Tee Prestressed Girder

June 2006	Extended the 6" stirrup spacing in the end block to comply with AASHTO Article 5.10.10.2.
July 2009	Modified the end block reinforcement to comply with AASHTO Article 5.10.10.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed.
March 2015	Changed page number
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.
	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.
	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9 from 3'-5" to 4'-0".
	Revised length of G9A from 1'-8.5" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram.
	Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.3I WF42G Prestressed Girder

July 2009	Added new standard drawing.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed.
	Revised bearing plate to 36" square to accommodate difference in bottom flange chamfers.
March 2015	Changed page number
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.
	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.
	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9 from 3'-5" to 4'-0".
	Revised length of G9A from 1'-8.5" to 2'-0".

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Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram. Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail". Corrected overhang dimension from 1'-9.5" to 1'-9.4375".

B5.3J WF50G Prestressed Girder

July 2009	Added new standard drawing.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed. Revised bearing plate to 36" square to accommodate difference in bottom flange chamfers.
March 2015	Changed page number
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region. Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule. Corrected web depth in Section at Centerline Span. Dimensions of bars G4 & G4A to be specified by the designer. Deleted length of all standard hooks. Revised length of G9 from 3'-5" to 4'-0". Revised length of G9A from 1'-8.5" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram. Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.3K WF58G Prestressed Girder

July 2009	Added new standard drawing.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed. Corrected top flange cantilever dimension. Revised bearing plate to 36" square to accommodate difference in bottom flange chamfers.
March 2015	Changed page number
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region. Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule. . Corrected web depth in Section at Centerline Span. Dimensions of bars G4 & G4A to be specified by the designer. Deleted length of all standard hooks. Revised length of G9 from 3'-5" to 4'-0". Revised length of G9A from 1'-8.5" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram. Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.3L WF66G Prestressed Girder

July 2009	Added new standard drawing.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed. Corrected top flange cantilever dimension. Revised bearing plate to 36" square to accommodate difference in bottom flange chamfers.
March 2015	Changed page number
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.

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June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.
	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.
	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9 from 3'-5" to 4'-0".
	Revised length of G9A from 1'-8.5" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram.
	Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.3M WF74G Prestressed Girder

July 2009	Added new standard drawing.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed.
	Corrected top flange cantilever dimension.
	Revised bearing plate to 36" square to accommodate difference in bottom flange chamfers.
March 2015	Changed page number
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.
	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.
	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9 from 3'-5" to 4'-0".
	Revised length of G9A from 1'-8.5" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram.
	Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

B5.3N WF83G Prestressed Girder

July 2009	Added new standard drawing.
June 2013	Revised end block reinforcement details to indicate reinforcement must be designed.
	Corrected top flange cantilever dimension.
	Revised bearing plate to 36" square to accommodate difference in bottom flange chamfers.
March 2015	Changed page number
May 2021	Changed CG of strand from centerline bearing to end of girder.
Jan 2022	Converted to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.
	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Girder General Details sheet to Prestressed Girder Schedule.
	Dimensions of bars G4 & G4A to be specified by the designer.
	Deleted length of all standard hooks.
	Revised length of G9 from 3'-5" to 4'-0".
	Revised length of G9A from 1'-8.5" to 2'-0".
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram.
	Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".

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B5.3O-1 Prestressed General Girder Details

June 2006	Renumbered the sheet and extended strand for the positive moment connection in the Type C Diaphragm to comply with Article 5.14.1.4 of the LRFD Manual.
	Changed "Abutment Diaphragm Dowel Details" to "Girder End Details" and labeled Type C "Positive Moment Connection".
July 2008	Added Note 12 for size of strand used in the design.
July 2009	Renumbered the sheet from B5.3O to B5.3U.
	Added Note 9 for size of strand used in the design.
	Revised Note 5 for lateral restraint until deck is cured.
Sept 2012	Changed "cut strand" to "extend strand" in Positive Moment Connection Detail.
	Changed "BT37 & BT48" to "Bulb Tee Series" and "WF" to "WF Series" in Positive Moment Connection Detail.
March 2015	Changed page number to B5.3O.
	Added lift loop location.
	Added new note 5 for electronic shop drawings.
	Revised note 6 for adding temporary strands in the top flange for handling.
Aug 2016	Deleted reference to note 11 in ** note.
Oct 2017	Specified 0.6" diameter strand.
	Added note for Girder Shipping.
Nov 2019	Deleted "&" from Lift Loop Location Table.
	Revised format of notes to active voice, imperative mood.
	Deleted reference to contour sheet in Screed Adjustment diagram.
Sep 2020	Deleted "All" from the last sentence in note 7.
	Revised wording of note 8.
	Added note 14 "fabricate in accordance with Section 506".
	Renumbered notes 14 & 15 to 15 & 16.
	Deleted 7 day requirement from note 16.
	Added note 17 "Basis of Payment".
	Replaced AASHTO girder with Bulb Tee girder in Camber Strip Detail.
May 2021	Clarified spacing of bars in Girder End Details.
	Changed page number to B5.3O-1.
Jan 2022	Changed sheet title to "Prestressed Girder General details".
	Moved "Girder End Details" and "Intermediate Diaphragm Dowel Details" to another sheet.
	Added Hat Bar Details.
	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Deleted note 1 and moved immediate and final losses to prestressed girder schedule on girder detail sheets.
	Deleted cast-in-place dowel bar option from note 1.
	Renumbered notes.
	Revised format of notes to active voice, imperative mood and Writer's Style Guide.
	Added arrows showing direction of deflection in Deflection Table.
Dec 2024	Modified dimension line showing screed adjustment dimension.
	Changed rebar designations S4 & S5 to G12 & G13.

B5.3O-2 Prestressed AASHTO Girder Details

May 2021	Added new sheet for WF girder details.
Jan 2022	Changed title of sheet to "AASHTO Girder Details" and added Girder End details, Intermediate Diaphragm Dowel Details for AASHTO Girders.
	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Revised Girder End Details Type B for "FIXED" and deleted "Pinned". Extended strand to provide better anchorage into the abutment cap.
	Added "Type B & Type C" to End Details Table.
Dec 2024	Changed name of "Detail A" to "Detail 1".

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B5.3O-3 Prestressed Bulb Tee Girder Details

Sept 2021	Added new sheet for Girder End details, Intermediate Diaphragm Dowel Details for Bulb Tee Girders. Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Revised Girder End Details Type B for "FIXED" and deleted "Pinned". Extended strand to provide better anchorage into the abutment cap.
Dec 2024	Changed name of "Detail A" to "Detail 1".

B5.3O-4 Prestressed WF Girder Details

Sept 2021	Added new sheet for Girder End details, Intermediate Diaphragm Dowel Details for WF Girders. Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Revised Girder End Details Type B for "FIXED" and deleted "Pinned". Extended strand to provide better anchorage into the abutment cap.
Dec 2024	Changed name of "Detail A" to "Detail 1".

B5.3P Temporary Diaphragm Details

June 2006	Renumbered the sheet.
July 2009	Renumbered the sheet from B5.3P to B5.3V.
May 2014	Lowered the hole for the top brace from 9" to 12" to get the assembly below the fillet for the WF Series girders. Added the WF data to the Lower Connection Plate Detail. Added a G13-#4 bar for the WF girder.
March 2015	Changed page number
Nov 2019	Revised format of notes to active voice, imperative mood.
May 2021	Revised sheet to make temporary diaphragms a contractor design.
Jan 2022	Deleted details and only show Concept Detail. Temporary diaphragm details submitted on shop drawings for approval. Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Revised format of notes to active voice, imperative mood and Writer's Style Guide.

B5.3Q-1 Pier Diaphragm for AASHTO Girders

June 2006	Renumbered the sheet, extended the strand for the positive moment connection, and widened the gap between girder ends to 10".
July 2009	Renumbered the sheet from B5.3Q to B5.3W.
March 2015	Changed page number
Jan 2022	Changed sheet to AASHTO girder details. Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Dec 2024	Changed rebar designation "E" to "PD".

B5.3Q-2 Pier Diaphragm for Bulb Tee & WF Girders

Jan 2022	Added new sheet for Bulb Tee and WF girder details. Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Dec 2024	Changed rebar designation "E" to "PD".

B5.3R Optional Prestressed Girder WWR Details

Oct 2023	Added new sheet.

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B5.4A Typical Deck Bulb Tee Section & Details (Off-System and Local Roads)

June 2006	Added new standard drawing.
July 2009	Corrected spelling of Bulb Tee in title block
	Corrected wording in Note 6("one" to "when")
	Added Note 14 placing girders perpendicular to the cross-slope.
	Changed intermediate diaphragm reinforcement G9, G9A, D1, &D2 to #4
	Specified G9 & G9A bars @ maximum 12" spacing
June 2013	Revised reference in Note 8 to subsection 705.02 for 2012 Standard Specifications.
March 2015	Revised note 10 for spray-applied concrete waterproof membrane.
Aug 2016	Designated drawing for Off System and Local Roads bridges using weld tabs.
Nov 2019	Revised format of notes to active voice, imperative mood.
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Revised format of notes to active voice, imperative mood and Writer's Style Guide.
	Revised railing from 2-tube curb mount rail to 3-tube curb mount rail in the Typical Section.
Dec 2024	Denoted G9 & G9A bars as epoxy coated.

B5.4B Prestressed Deck Bulb Tee Girder (Off-System and Local Roads)

June 2006	Added new standard drawing.
April 2008	Defined "W"
	Changed G14 to #4
	Computed max. spacing for G11 & G12 flange reinforcement
	Modified Reinforcement Diagram Sketch for G1, G5, G5A, G11, G13, & G14.
July 2009	Modified Reinforcement Diagram Sketch for G6 & G8
	Added G9 & G9A bars to Reinforcement Diagram
	Added spacing of intermediate diaphragm bars in the Elevation view
	Added confinement length "Y" and Bursting Reinforcement length "Z" to End Reinforcement Detail
July 2010	Standardized G12 bar to #6@6½" and added G12A for exterior girder.
	Added note for bundling #4 bar with G12 within 8' of joint/discontinuity of parapet.
Aug 2016	Designated drawing for Off System and Local Roads bridges.
	Changed all reinforcement to epoxy coated bars.
	Revised concrete parapet to 2-tube curb mounted rail.
	Changed G12A to 180° hook.
	Updated names of fabricators.
Sep 2020	Changed name of Oldcastle Precast to Knife River Prestress.
May 2021	Changed CG of strand from centerline bearing to end of girder
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region.
	Changed Concrete Strength from PSI to KSI.
	Changed strand symbol from solid circle to open circle.
	Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram.
	Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail".
	Denoted epoxy bars in details as (E).

B5.4C Prestressed Deck Bulb Tee Girder Details (Off-System and Local Roads)

June 2006	Added new standard drawing.
July 2009	Added Note 11 for size of strand used in the design.
	Added Notes 12 & 13 for deflection data
	Modified Deflection Data Table for ΔD
July 2010	Deleted the 5' dimension for length of splayed bar area and made it a variable.
March 2015	Added new note 5 for electronic shop drawings.

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Aug 2016	Designated drawing for Off System and Local Roads bridges using weld tabs.
Oct 2017	Specified 0.6" diameter strand. Added note for Girder Shipping.
Nov 2019	Corrected size and spacing of G11 & G12 bars in the Girder Plan. Revised format of notes to active voice, imperative mood.
Sep 2020	Revised wording of notes 2, 4, 5 & 7. Added note 11 "Fabricate in accordance with Section 506". Renumbered notes 11, 12, 13, 14, & 15. Deleted 7 day requirement from note16. Added note 17 "Basis of Payment".
May 2021	Clarified spacing of bars in Girder End Details.
Jan 2022	Converted sheet to ORD format.
June 2022	Removed inch symbol from weld symbol and angle designation. Revised format of leader lines.
Oct 2023	Deleted note 1 and moved immediate and final losses to prestressed girder schedule on girder detail sheets. Deleted cast-in-place dowel bar option from note 1. Renumbered notes. Added arrows showing direction of deflection in Deflection Table. Revised format of notes to active voice, imperative mood and Writer's Style Guide
Dec 2024	Changed name of "Detail A" to "Detail 1". Denoted epoxy bars with (E) designation.

B5.4D Typical Deck Bulb Tee Section & Details (State System)

Aug 2016	Added new standard drawing for State System Bridges using UHPC longitudinal shear key.
Oct 2017	Revised note 5 temporary bracing removal to agree with construction sequence. Revised note 7 to agree with the Special Provision. Revised note 9 to agree with the Special Provision.
Nov 2019	Revised format of notes to active voice, imperative mood. Added note 9A for HESC. Added note 13 for PPC overlay.
Jan 2022	Changed railing to 3-Tube Curb Mounted rail. Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Revised format of notes to active voice, imperative mood and Writer's Style Guide Revised railing from 2-tube curb mount rail to 3-tube curb mount rail in the Typical Section.
Dec 2024	Denoted epoxy bars in details as (E).

B5.4E Prestressed Deck Bulb Tee Girder (State System)

Aug 2016	Added new standard drawing for State System Bridges using UHPC longitudinal shear key.
Oct 2017	Changed stirrup spacing at the end of the girder in the Elevation view from 3" to 4" to agree with the End Reinforcement Detail.
Nov 2019	Defined extension length of G11 & G12 bars into UHPC and HESC closure pour.
May 2021	Changed CG of strand from centerline bearing to end of girder
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Bundled stirrups in h/4 end region. Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Added "AASHTO M31 Grade 60 Type S" to Reinforcement Diagram. Changed name of "Detail A" to "Detail 1" and "Detail B" to "Strand Detail". Changed G5 bar from plain to epoxy.

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B5.4F Prestressed Deck Bulb Tee Girder Details (State System)

Oct 2016	Added new standard drawing for State System Bridges using UHPC longitudinal shear key.
Oct 2017	Specified 0.6" diameter strand. Added note for Girder Shipping.
Nov 2019	Added HESC closure pour and forming details. Labeled closure pour and forming details for UHPC. Revised format of notes to active voice, imperative mood.
Sep 2020	Revised wording of notes 2, 7, & 13. Added note 14 "Fabricate in accordance with Section 506". Renumbered notes 14 to 19. Deleted 7 day requirement from note 20. Added note 21 "Basis of Payment". Added "min" to plywood strip thickness in UHPC Closure Pour Forming Details and deleted reference to Ductal Jointing Procedure.
May 2021	Clarified spacing of bars in Girder End Details.
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Deleted note 1 and moved immediate and final losses to prestressed girder schedule on girder detail sheets. Deleted cast-in-place dowel bar option from note 1. Added arrows showing direction of deflection in Deflection Table. Renumbered notes. Revised format of notes to active voice, imperative mood and Writer's Style Guide.
Dec 2024	Changed name of "Detail A" to "Detail 1" Denoted G5 end diaphragm bar as epoxy coated.

B5.5A 1'-0" Prestressed Solid Slab (Off-System and Local Roads)

June 2013	Changed top mat reinforcement cover to 2½". Added 4-G2#4 bars at top of section. Added Note 5 for design of end block reinforcement Revised location of top row of prestress reinforcement.
Aug 2016	Designated drawing for Off System and Local Roads bridges using weld ties and tie rods. Corrected the float finish note reference in the Elevation.
Oct 2017	Moved note from Typical Prestressed Slab Details sheet B5.5G to create note 5.
Nov 2019	Corrected reference in PLAN from "note 5" to "note 4".
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Deleted Reinforcement Diagram and moved it to B5.5G. Changed name of "Detail A" to "Detail 1" and "Detail B" to "Detail 2". Denoted epoxy bars with (E) designation

B5.5B 1'-3" Prestressed Voided Slab (Off-System and Local Roads)

June 2013	Changed top mat reinforcement cover to 2½". Added 4-G2#4 bars at top of section. Added Note 5 for design of end block reinforcement Revised location of top row of prestress reinforcement.
Aug 2016	Designated drawing for Off System and Local Roads bridges using weld ties and tie rods. Corrected the float finish note reference in the Elevation.
Oct 2017	Moved note from Typical Prestressed Slab Details sheet B5.5G to create note 5.
Nov 2019	Corrected reference in PLAN from "note 5" to "note 4".
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.

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Oct 2023	Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Deleted Reinforcement Diagram and moved it to B5.5G. Changed name of "Detail A" to "Detail 1" and "Detail B" to "Detail 2". Denoted epoxy bars with (E) designation

B5.5C 1'-3" Prestressed Solid Slab (Off-System and Local Roads)

Feb 2012	Deleted void and vent hole details shown on the drawings.
June 2013	Changed top mat reinforcement cover to 2½". Added 4-G2#4 bars at top of section. Added Note 5 for design of end block reinforcement Revised location of top row of prestress reinforcement.
Aug 2016	Designated drawing for Off System and Local Roads bridges using weld ties and tie rods. Corrected the float finish note reference in the Elevation.
Oct 2017	Moved note from Typical Prestressed Slab Details sheet B5.5G to create note 5.
Nov 2019	Corrected reference in PLAN from "note 5" to "note 4".
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Deleted Reinforcement Diagram and moved it to B5.5G. Changed name of "Detail A" to "Detail 1" and "Detail B" to "Detail 2". Denoted epoxy bars with (E) designation

B5.5D 1'-6" Prestressed Solid Slab (Off-System and Local Roads)

Feb 2012	Deleted void and vent hole details shown on the drawings.
June 2013	Changed top mat reinforcement cover to 2½". Added 4-G2#4 bars at top of section. Added Note 5 for design of end block reinforcement Revised location of top row of prestress reinforcement.
Aug 2016	Designated drawing for Off System and Local Roads bridges using weld ties and tie rods. Corrected the float finish note reference in the Elevation.
Oct 2017	Moved note from Typical Prestressed Slab Details sheet B5.5G to create note 5.
Nov 2019	Changed center of 8" voids from 8½" to 9" to meet the requirements of AASTO Article 5.12.3.2.2. Corrected reference in PLAN from "note 5" to "note 4".
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Deleted Reinforcement Diagram and moved it to B5.5G. Changed name of "Detail A" to "Detail 1" and "Detail B" to "Detail 2". Denoted epoxy bars with (E) designation

B5.5E 1'-9" Prestressed Solid Slab (Off-System and Local Roads)

Feb 2012	Deleted void and vent hole details shown on the drawings.
June 2013	Changed top mat reinforcement cover to 2½". Added 4-G2#4 bars at top of section. Added Note 5 for design of end block reinforcement Revised location of top row of prestress reinforcement.

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Aug 2016	Designated drawing for Off System and Local Roads bridges using weld ties and tie rods. Corrected the float finish note reference in the Elevation.
Oct 2017	Moved note from Typical Prestressed Slab Details sheet B5.5G to create note 5.
Nov 2019	Corrected reference in PLAN from "note 5" to "note 4".
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Deleted Reinforcement Diagram and moved it to B5.5G. Changed name of "Detail A" to "Detail 1" and "Detail B" to "Detail 2". Denoted epoxy bars with (E) designation

B5.5F 2'-2" Prestressed Voided Slab (Off-System and Local Roads)

June 2006	Extended the 6" stirrup spacing in the end block to comply with AASHTO Article 5.10.10.2.
June 2013	Changed top mat reinforcement cover to 2½". Added 4-G2#4 bars at top of section. Added Note 5 for design of end block reinforcement Revised location of top row of prestress reinforcement.
Aug 2016	Designated drawing for Off System and Local Roads bridges using weld ties and tie rods. Corrected the float finish note reference in the Elevation.
Oct 2017	Moved note from Typical Prestressed Slab Details sheet B5.5G to create note 5.
Nov 2019	Corrected reference in PLAN from "note 5" to "note 4".
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Deleted Reinforcement Diagram and moved it to B5.5G. Changed name of "Detail A" to "Detail 1" and "Detail B" to "Detail 2". Denoted epoxy bars with (E) designation

B5.5G Typical Prestressed Slab Details (Off-System and Local Roads)

June 2006	Corrected the reference in Note 10 to paragraph H to conform to the 2004 Standard Specifications.
July 2009	Added Note 19 for size of strand used in the design.
June 2013	Corrected Detail A. Added Self Consolidating Concrete note to Note 9.
March 2015	Added new note 14 for electronic shop drawings.
Aug 2016	Designated drawing for Off System and Local Roads bridges using weld ties and tie rods. Deleted composite dead load from deflection data table.
Oct 2017	Specified 0.6" diameter strand. Added note for Girder Shipping.
Nov 2019	Revised Note 9 to replace reference to Contractor's Note for Self-Consolidating Concrete with "Section 502" to comply with the 2018 Standard Specifications. Revised format of notes to active voice, imperative mood.
Sep 2020	Changed "Girders" to "Slab" in notes 1, 15, 16, 19, & Construction Sequence note 1. Deleted "All" in note 16. Changed "Subsection 506.03" to "Section 506" in note 16. Deleted "7 days after placement" requirement in note 21. Added note 22 "Basis of Payment". Added Δ before "P" in $\Delta P + \Delta G$ equation in Deflection Table. Changed title from "Tie Rods" to "Tie Rods and Bearing Plates" in Notes.
Jan 2022	Converted sheet to ORD format.

CHAPTER 5
STANDARD DRAWING REVISION LOG

June 2022	Removed inch symbol from weld symbol. Used diameter symbol in Steel Plate Washer Detail. Revised format of leader lines.
Oct 2023	Deleted note 1 and moved immediate and final losses to prestressed girder schedule on girder detail sheets. Renumbered notes. Added arrows showing direction of deflection in Deflection Table. Revised format of notes to active voice, imperative mood and Writer's Style Guide.
Dec 2024	Added Reinforcement Diagram. Changed name of "Detail A" to "Detail 1" and "Detail B" to "Detail 2".

B5.6A 12" Prestressed Slab (State System)

Aug 2016	Added new standard drawing for State System Bridges using UHPC longitudinal shear key.
Oct 2017	In note 2, replaced sheet number with "Typical Prestressed Slab Details sheet". In note 5, changed note reference to 21 to agree with new numbering on Typical Prestressed Slab Details sheet. Moved note from Typical Prestressed Slab Details sheet B5.6G to create note 7. In the Elevation, changed note reference to 18 to agree with new numbering on Typical Prestressed Slab Details sheet and replaced sheet number with "Typical Prestressed Slab Details sheet".
Nov 2019	Increased depth of shear key from 6" to 7".
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Denoted epoxy bars with (E) designation

B5.6B 1'-3" Prestressed Voided Slab (State System)

Aug 2016	Added new standard drawing for State System Bridges using UHPC longitudinal shear key.
Oct 2017	In note 2, replaced sheet number with "Typical Prestressed Slab Details sheet". In note 5, changed note reference to 21 to agree with new numbering on Typical Prestressed Slab Details sheet. Moved note from Typical Prestressed Slab Details sheet B5.6G to create note 7. In the Elevation, changed note reference to 18 to agree with new numbering on Typical Prestressed Slab Details sheet and replaced sheet number with "Typical Prestressed Slab Details sheet".
Nov 2019	Deleted 4" dia. PVC for future utilities note from Section at Mid-Span. 4" PVC will not fit inside 5" void. Increased depth of shear key from 6" to 7".
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Denoted epoxy bars with (E) designation

B5.6C 1'-3" Prestressed Slab (State System) (State System)

Aug 2016	Added new standard drawing for State System Bridges using UHPC longitudinal shear key.
Oct 2017	In note 2, replaced sheet number with "Typical Prestressed Slab Details sheet". In note 5, changed note reference to 21 to agree with new numbering on Typical Prestressed Slab Details sheet. Moved note from Typical Prestressed Slab Details sheet B5.6G to create note 7. In the Elevation, changed note reference to 18 to agree with new numbering on Typical Prestressed Slab Details sheet and replaced sheet number with "Typical Prestressed Slab Details sheet".
Nov 2019	Increased depth of shear key from 6" to 7".
Jan 2022	Converted sheet to ORD format.

CHAPTER 5
STANDARD DRAWING REVISION LOG

June 2022	Revised format of leader lines.
Oct 2023	Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Denoted epoxy bars with (E) designation

B5.6D 1'-6" Prestressed Voided Slab (State System)

Aug 2016	Added new standard drawing for State System Bridges using UHPC longitudinal shear key.
Oct 2017	In note 2, replaced sheet number with "Typical Prestressed Slab Details sheet". In note 5, changed note reference to 18 to agree with new numbering on Typical Prestressed Slab Details sheet. Moved note from Typical Prestressed Slab Details sheet B5.6G to create note 7. In the Elevation, changed note reference to 21to agree with new numbering on Typical Prestressed Slab Details sheet and replaced sheet number with "Typical Prestressed Slab Details sheet".
Nov 2019	Changed center of 8" voids from 8½" to 9" to meet the requirements of AASTO Article 5.12.3.2.2. Corrected note 5 reference from "note 21" to "note 20". Increased depth of shear key from 6" to 7".
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Denoted epoxy bars with (E) designation

B5.6E 1'-9" Prestressed Voided Slab (State System)

Aug 2016	Added new standard drawing for State System Bridges using UHPC longitudinal shear key.
Oct 2017	In note 2, replaced sheet number with "Typical Prestressed Slab Details sheet". In note 5, changed note reference to 21 to agree with new numbering on Typical Prestressed Slab Details sheet. Moved note from Typical Prestressed Slab Details sheet B5.6G to create note 7. In the Elevation, changed note reference to 18 to agree with new numbering on Typical Prestressed Slab Details sheet and replaced sheet number with "Typical Prestressed Slab Details sheet".
Nov 2019	Increased depth of shear key from 6" to 7".
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Denoted epoxy bars with (E) designation

B5.6F 2'-2" Prestressed Voided Slab (State System)

Aug 2016	Added new standard drawing for State System Bridges using UHPC longitudinal shear key.
Oct 2017	In note 2, replaced sheet number with "Typical Prestressed Slab Details sheet". In note 5, changed note reference to 21 to agree with new numbering on Typical Prestressed Slab Details sheet. Moved note from Typical Prestressed Slab Details sheet B5.6G to create note 7. In the Elevation, changed note reference to 18 to agree with new numbering on Typical Prestressed Slab Details sheet and replaced sheet number with "Typical Prestressed Slab Details sheet".
Nov 2019	Increased depth of shear key from 6" to 7".
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.

CHAPTER 5
STANDARD DRAWING REVISION LOG

Oct 2023	Changed Concrete Strength from PSI to KSI. Changed strand symbol from solid circle to open circle. Moved Immediate and final losses from Prestressed Deck Girder Details sheet to Prestressed Girder Schedule.
Dec 2024	Denoted epoxy bars with (E) designation

B5.6G Typical Prestressed Slab Details (State System)

Aug 2016	Added new standard drawing for State System Bridges using UHPC longitudinal shear key.
Oct 2017	Reformatted Notes. Specified 0.6" diameter strand. Added note for Girder Shipping. Changed "mill" to "diamond grind" in new note 21.
March 2018	Changed "mill" to "diamond grind" in Construction Sequence note 5.
Nov 2019	Revised Note 3 to replace reference to Contractor's Note for Self-Consolidating Concrete with "Section 502" to comply with the 2018 Standard Specifications. Corrected reference to "note 21" to "note 20" in Camber Detail. Revised format of notes to active voice, imperative mood. Deleted note 20 for future utility conduits. Renumbered note 21 to note 20. Changed thickness of strip form from ¼±⅛ to ⅜" and plywood cover form thickness from ⅜" to ⅜" to agree with deck bulb tee girder details. Increased depth of shear key from 6" to 7". Corrected location of G6 bar in Shear Key Detail to show 2½" clear and increased length of G6 & G7 bars.
Sep 2020	Deleted "All" from notes 6 & 16. Revised wording of notes 8 &.11. Changed "Subsection 506.03" to "Section 506" in note 17. Deleted "7 days after placement" requirement in note 22. Added note 23 "Basis of Payment". Added Δ before "P" in ΔP + ΔG equation in Deflection Table. Added "min" to plywood strip thickness in Shear Key Forming Details and deleted reference to Ductal Jointing Procedure. Added "Hot dip galvanize after fabrication" to Slab Bearing Plate detail.
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Deleted note 1 and moved immediate and final losses to prestressed girder schedule on girder detail sheets. Renumbered notes. Revised format of notes to active voice, imperative mood and Writer's Style Guide. Added arrows showing direction of deflection in Deflection Table.
Dec 2024	Added title "Reinforcement Diagram" & AASHTO M31 Grade 60 Type S to reinforcement table.

B5.7A Box Girder Details

June 2006	Renumbered the sheet.
Nov 2019	Revised format of notes to active voice, imperative mood.
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Revised format of notes to active voice, imperative mood and Writer's Style Guide.

B5.7B Post-tensioning Standard Details

June 2006	Renumbered the sheet.
Nov 2019	Revised format of notes to active voice, imperative mood.
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.

CHAPTER 5
STANDARD DRAWING REVISION LOG

Oct 2023	Revised format of notes to active voice, imperative mood and Writer's Style Guide.

B5.8 Electrical Connection to Top Reinforcing Steel

June 2006	Added new standard drawing.
Nov 2019	Deleted sheet.

B5.8 Concrete Repair Details

Nov 2019	Added new sheet.
May 2021	Added "Section" to "582" references. Added preformed joint filler around bearing pad in Section B-B. Increased depth of spall removal in Section D-D to be ¾" below reinforcement to engage rebar to hold patch in place.
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Revised format of notes to active voice, imperative mood and Writer's Style Guide.
Dec 2024	Deleted Note 1 and renumbered notes. Added extra lines in Table. Revised note for "Field Verify" to "Field verify clear cover and adjust sawcut depth to avoid rebar damage".

SUBSTRUCTURE

MARK	LOCATION	BAR SIZE	COAT	NO. OF BARS	BAR TYPE	BEND TYPE	BARS/ SET	LENGTH a	LENGTH b	LENGTH c	LENGTH d	LENGTH e	ANGLE θ	ANGLE Φ	TOTAL LENGTH

SUPERSTRUCTURE

MARK	LOCATION	BAR SIZE	COAT	NO. OF BARS	BAR TYPE	BEND TYPE	BARS/ SET	LENGTH a	LENGTH b	LENGTH c	LENGTH d	LENGTH e	ANGLE θ	ANGLE Φ	TOTAL LENGTH

SUPERSTRUCTURE BAR WEIGHT

BAR SIZE	LINEAR FEET	POUNDS PER FOOT	TOTAL WEIGHT
#4		0.668	
#5		1.043	
#6		1.502	
#7		2.044	
	TOTAL WEIGHT		

EPOXY COATED BAR WEIGHT

BAR SIZE	LINEAR FEET	POUNDS PER FOOT	TOTAL WEIGHT
#4		0.668	
#5		1.043	
#6		1.502	
#7		2.044	
	TOTAL WEIGHT		

GFRP BAR LENGTH

BAR SIZE	LINEAR FEET PER BAR	NUMBER OF BARS	TOTAL LENGTH
#4			

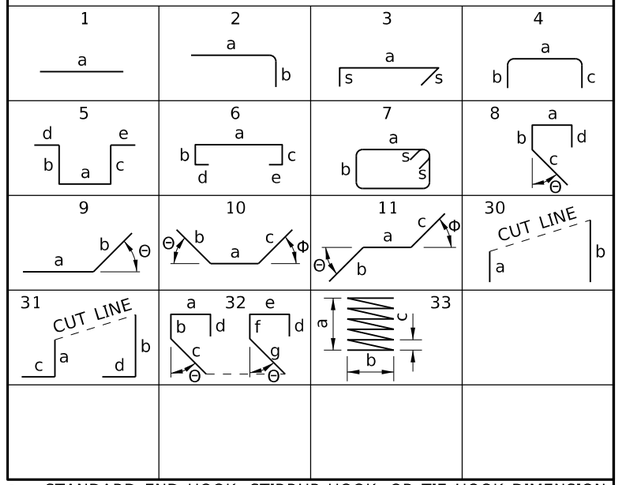
REINFORCEMENT NOTES

1. PROVIDE BEND DETAILS IN ACCORDANCE WITH THE LATEST ACI STANDARD PRACTICE AND AASHTO SPECIFICATIONS.
2. DIMENSIONS SHOWN IN THE "BAR BEND DIAGRAMS" ARE OUT TO OUT OF BEND POINTS, HOOKS, OR BAR ENDS, UNLESS NOTED OTHERWISE. PIN DIAMETER "D" IS THE SAME FOR BENDS AND HOOK ON A BAR.
3. NO DEDUCTIONS FOR CURVATURE AT BENDS ARE MADE EXCEPT FOR THE ADJUSTMENTS INCLUDED IN THE ABOVE "ADD LENGTH" DIMENSIONS.
4. * INDICATES STIRRUP OR TIE BAR.
5. PROVIDE BARS THAT CONFORM TO AASHTO M31, GRADE 60.
6. A. PROVIDE EPOXY COATED BARS DESIGNATED "E" IN THE "COAT" COLUMN.
   B. PROVIDE GLASS FIBER REINFORCED POLYMER COATED BARS DESIGNATED "G" IN THE "COAT" COLUMN.
   C. PROVIDE BAR TYPE S OR W DESIGNATED IN THE "BAR TYPE" COLUMN.
7. BAR WEIGHTS ONLY INCLUDE REINFORCING STEEL PAID FOR UNDER THE PAY ITEMS 503-005A, 503-010A, 503-015A & 503-020A. OTHER REINFORCING STEEL NOT LISTED IS INCIDENTAL TO OTHER PAY ITEMS.

DESIGNER NOTES

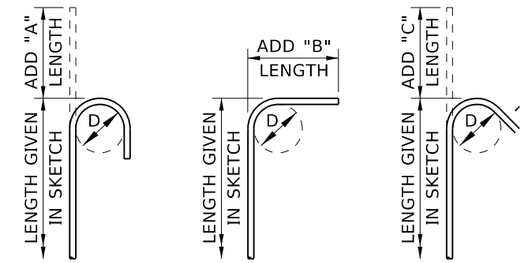
PROVIDE BAR TYPE S OR W IN ACCORDANCE WITH BRIDGE DESIGN MANUAL ARTICLE 5.4.3.

BAR BEND DIAGRAMS



s = STANDARD END HOOK, STIRRUP HOOK, OR TIE HOOK DIMENSION

BEND DETAILS



"L" = LENGTH GIVEN IN SKETCH

STANDARD END HOOK DIMENSIONS

BAR SIZE	ALL GRADES D	A	B
#3	2¼"	5"	6"
#4	3"	6"	8"
#5	3¾"	7"	10"
#6	4½"	8"	1'-0"
#7	5¼"	10"	1'-2"
#8	6"	11"	1'-4"
#9	9½"	1'-3"	1'-7"
#10	10¾"	1'-5"	1'-10"
#11	1'-0"	1'-7"	2'-0"
#14	1'-6¼"	2'-3"	2'-7"
#18	2'-0"	3'-0"	3'-5"

STIRRUP AND TIE HOOK DIMENSIONS

ALL GRADES D	B	C
1½"	4"	4"
2"	4½"	4½"
2½"	6"	5½"
4½"	1'-0"	8"
5¼"	1'-2"	9"
6"	1'-4"	10½"

REVISIONS NO.	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			

DESIGNED
DESIGN CHECKED
DETAILED
DWG. CHECKED
CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY

CADD FILE NAME
Standards/Bridge Standard Drawings/ B05.18.DGN

DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT
YOUR Safety→YOUR Mobility→YOUR Economic Opportunity

APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE: _____

ENGLISH

PROJECT NO.

METAL REINFORCEMENT - SHEET 2

BRIDGE LRFD DESIGN MANUAL B5.1B

BRIDGE PLANS

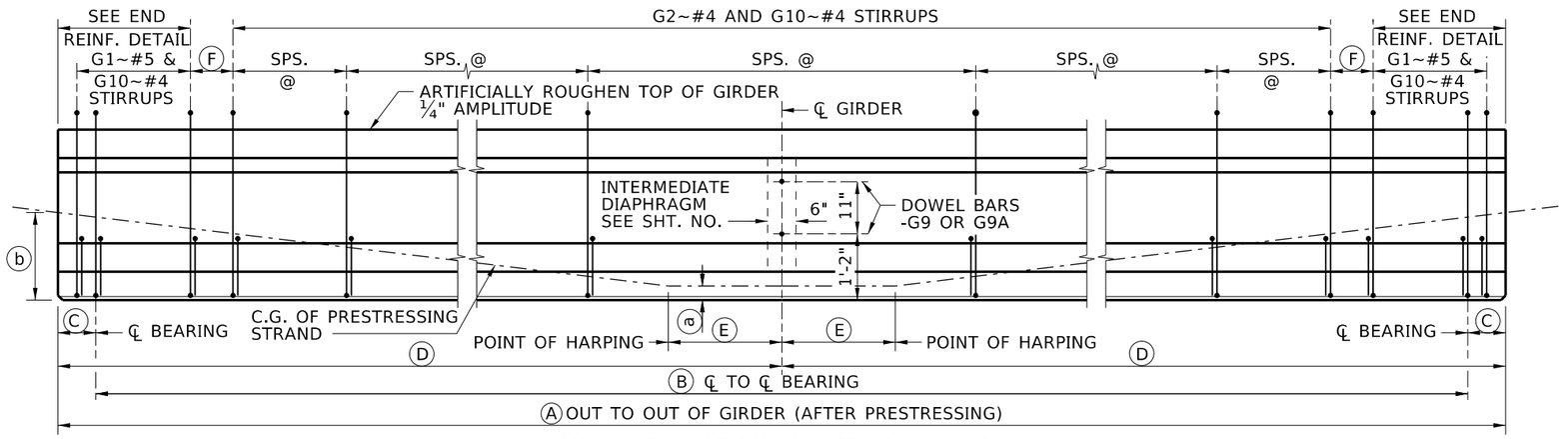
BRIDGE KEY NO.

COUNTY | KEY NO.

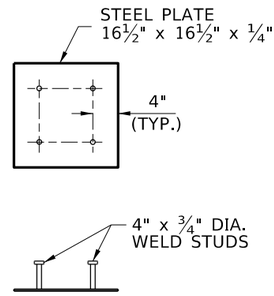
BRIDGE DWG. NO. | SHEET OF

PRESTRESSED GIRDER SCHEDULE

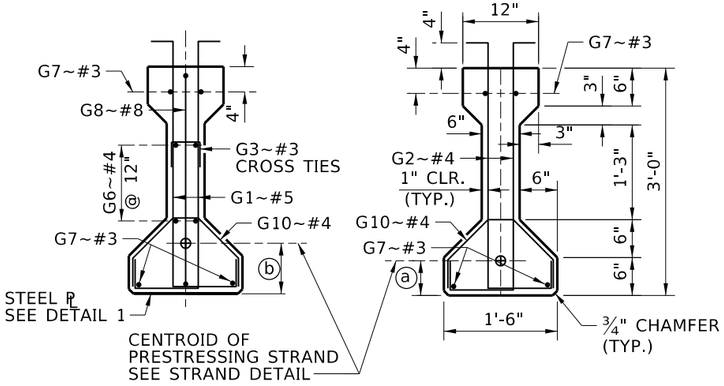
GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



GIRDER ELEVATION AND STIRRUP LAYOUT
NTS

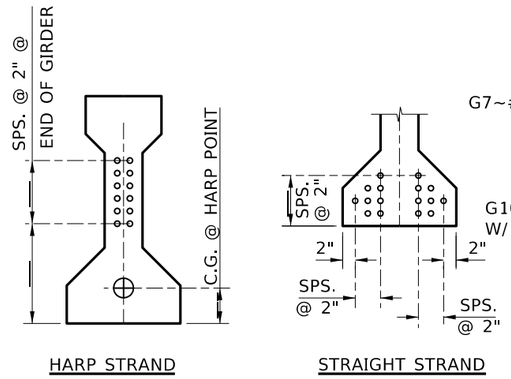


DETAIL 1
½"=1'-0"



SECTION AT END OF GIRDER
½"=1'-0"

SECTION AT ℄ SPAN
½"=1'-0"



HARP STRAND

STRAIGHT STRAND

STRAND DETAIL
½"=1'-0"

END REINFORCEMENT DETAIL
½"=1'-0"

REINFORCEMENT DIAGRAM
AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	3'-3", 10", 4½"
G2*	#4	60	
G3*	#3	60	4"
G4	#5	60	
G4A	#5	60	
G5	#6	60	
G5A	#6	60	
G6	#4	60	
G7	#3	60	(A) - 4"
G8	#8	60	2'-9", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	4", 9", 45°, 4½"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED AASHTO GIRDER GENERAL DETAILS AND PRESTRESSED AASHTO GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

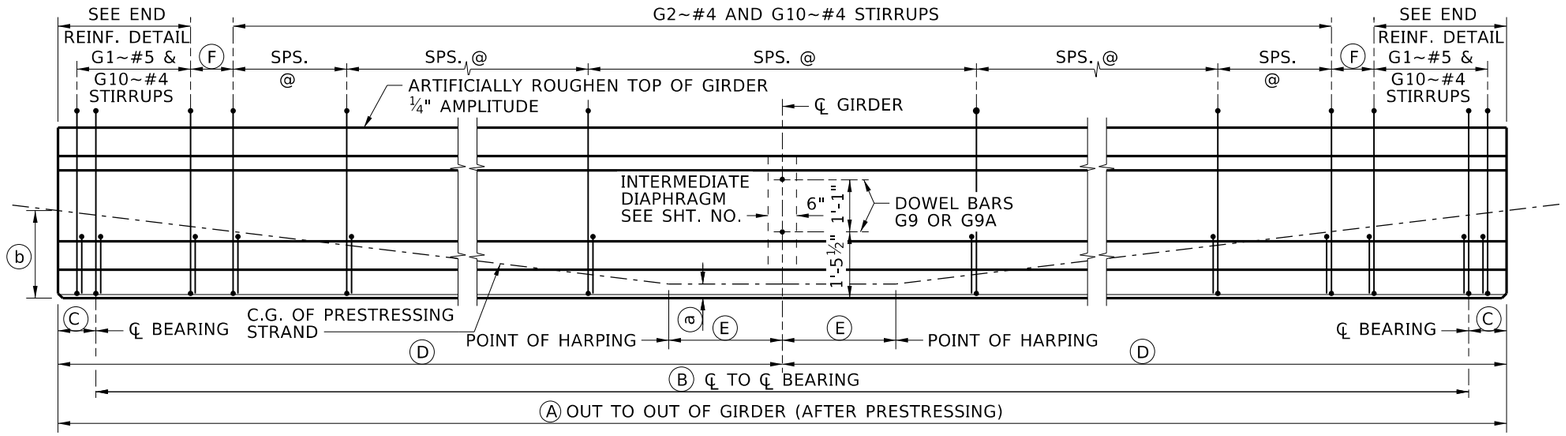
* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT ..... 384 LB/FT

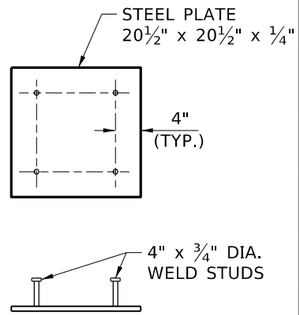
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	AASHTO TYPE II PRESTRESSED GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED		YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	CADD FILE NAME Standards/Bridge Standard Drawings/ B05_2A.DGN				COUNTY / KEY NO.
				DWG. CHECKED				BRIDGE LRFD DESIGN MANUAL B5.2A	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			

PRESTRESSED GIRDER SCHEDULE

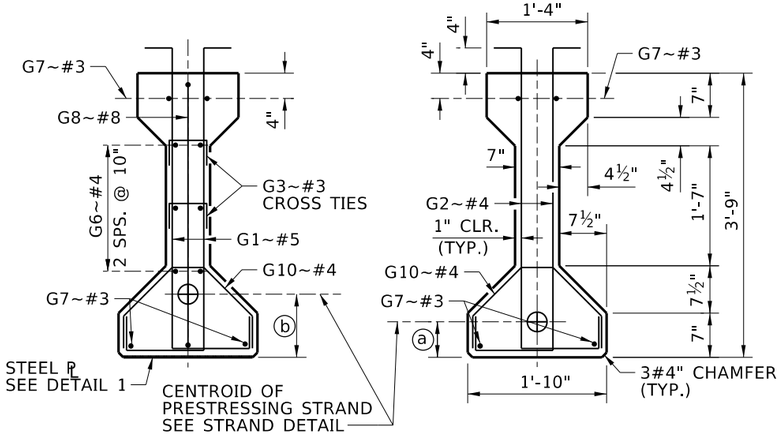
GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



GIRDER ELEVATION AND STIRRUP LAYOUT
⅜"=1'-0"

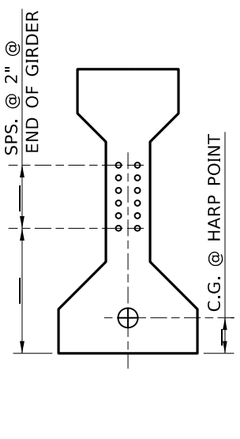


DETAIL 1
½"=1'-0"

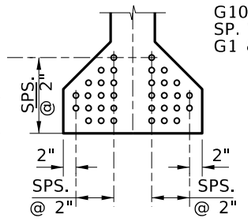


SECTION AT END OF GIRDER
½"=1'-0"

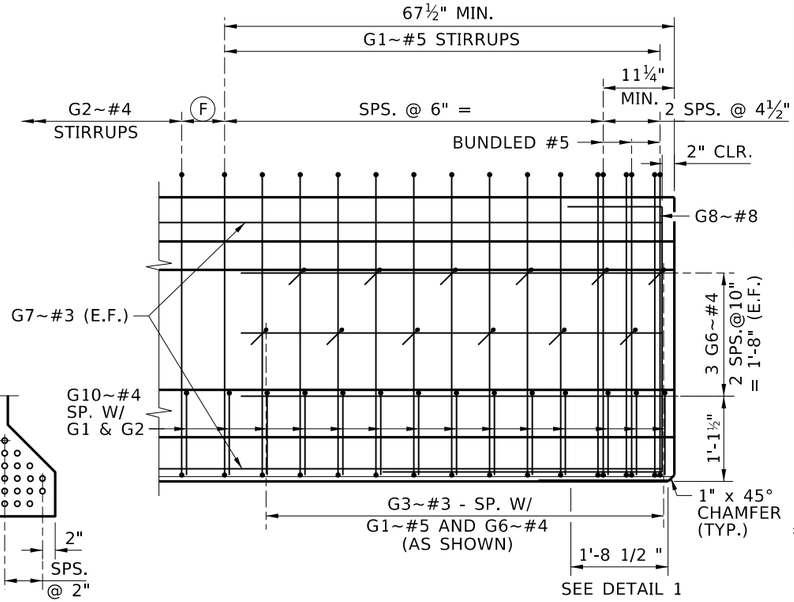
SECTION AT ℄ SPAN
½"=1'-0"



HARP STRAND



STRAND DETAIL
½"=1'-0"



END REINFORCEMENT DETAIL
½"=1'-0"

REINFORCEMENT DIAGRAM
AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	4'-0", 1'-10½", 5½"
G2*	#4	60	
G3*	#3	60	5"
G4	#5	60	
G4A	#5	60	
G5	#6	60	
G5A	#6	60	
G6	#4	60	
G7	#3	60	(A) - 4"
G8	#8	60	3'-6", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	4", 10", 45°, 5½"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED AASHTO GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

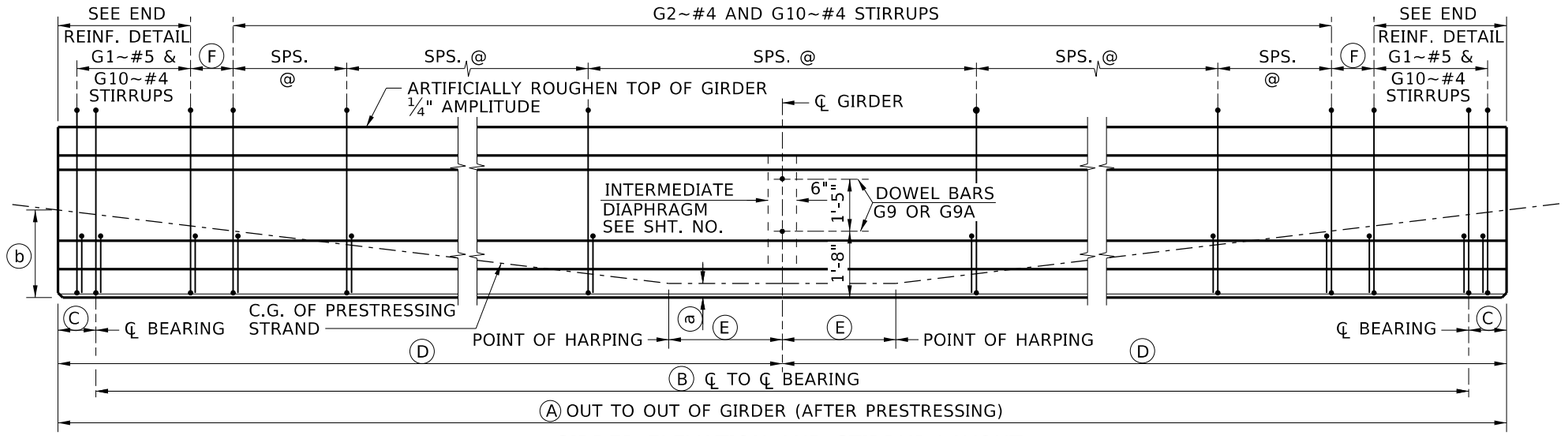
* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT..... 583 LB/FT

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	AASHTO TYPE III PRESTRESSED GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_2B.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL B5.2B	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

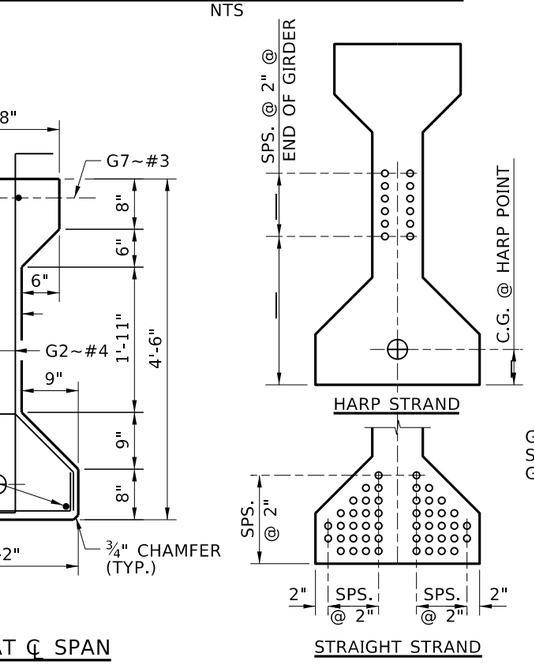
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



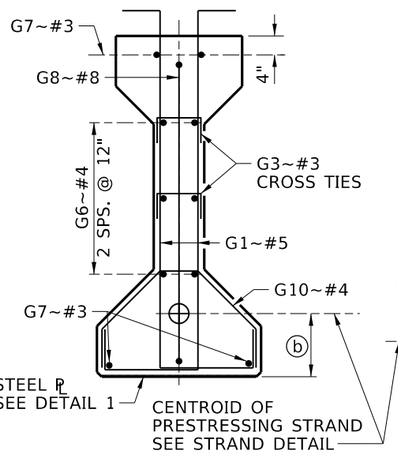
GIRDER ELEVATION AND STIRRUP LAYOUT

NTS



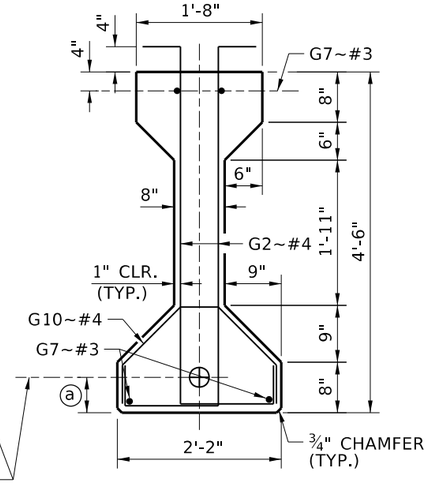
STRAND DETAIL

½"=1'-0"



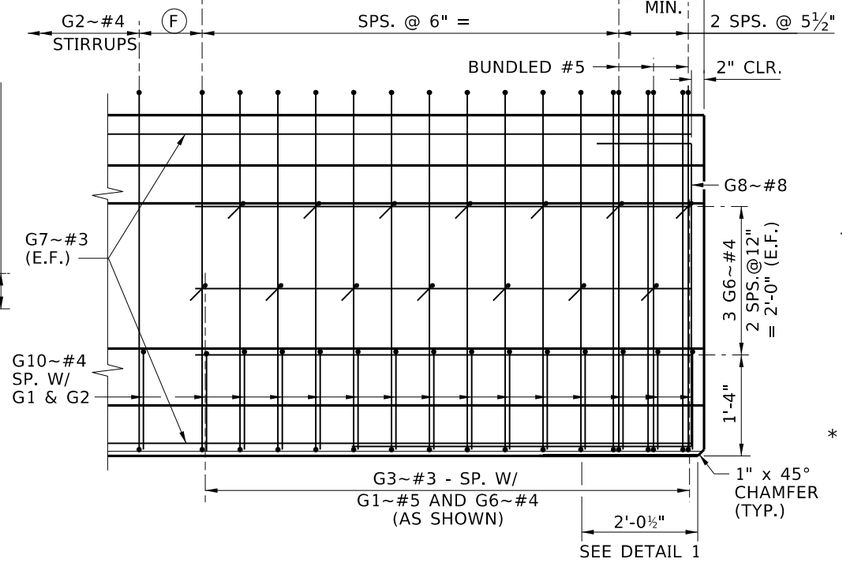
SECTION AT END OF GIRDER

½"=1'-0"



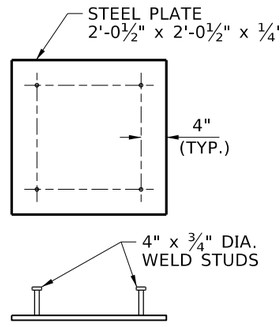
SECTION AT ℄ SPAN

½"=1'-0"



END REINFORCEMENT DETAIL

½"=1'-0"



DETAIL 1

½"=1'-0"

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	4'-9", 1'-3", 6½"
G2*	#4	60	
G3*	#3	60	6"
G4	#5	60	
G4A	#5	60	
G5	#6	60	
G5A	#6	60	
G6	#4	60	
G7	#3	60	(A) - 4"
G8	#8	60	4'-0", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	6", 1'-0½", 45°, 6½"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED AASHTO GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT ..... 822 LB/FT

REVISIONS			
NO.	DATE	BY	DESCRIPTION
△			
△			
△			
△			
△			

DESIGNED
DESIGN CHECKED
DETAILED
DWG. CHECKED
CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY

CADD FILE NAME
Standards/Bridge Standard Drawings/B05_2C.DGN

DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT
YOUR Safety→YOUR Mobility→YOUR Economic Opportunity

APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:

ENGLISH

PROJECT NO.

AASHTO TYPE IV PRESTRESSED GIRDER

BRIDGE LRFD DESIGN MANUAL B5.2C

BRIDGE PLANS

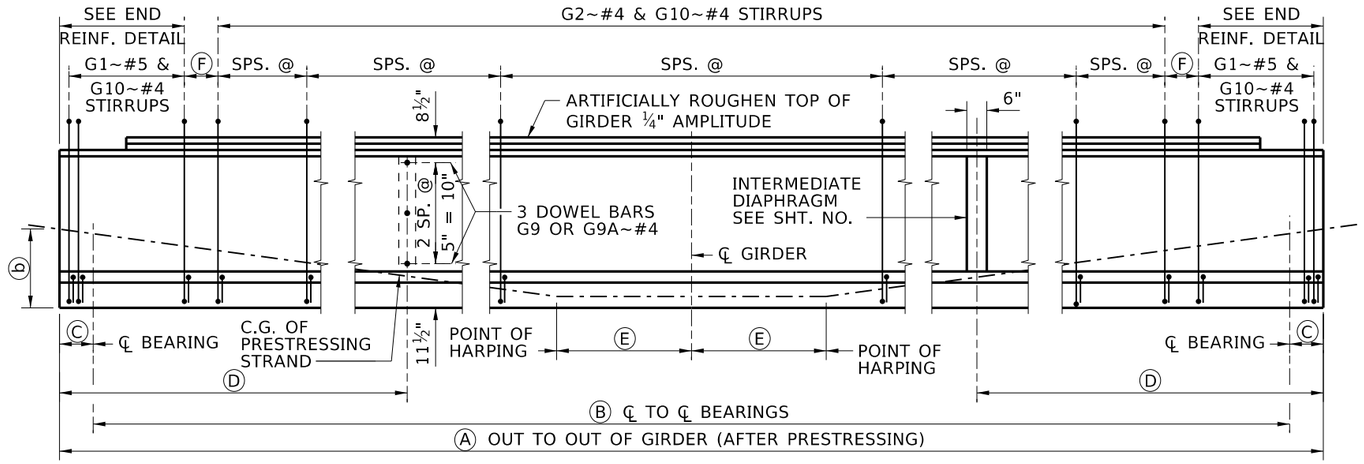
BRIDGE KEY NO.

COUNTY | KEY NO.

BRIDGE DWG. NO. | SHEET OF

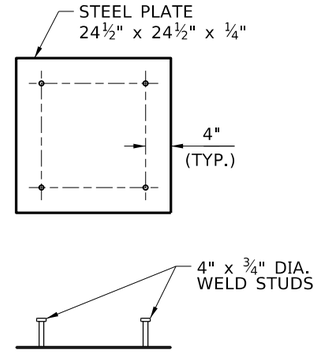
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



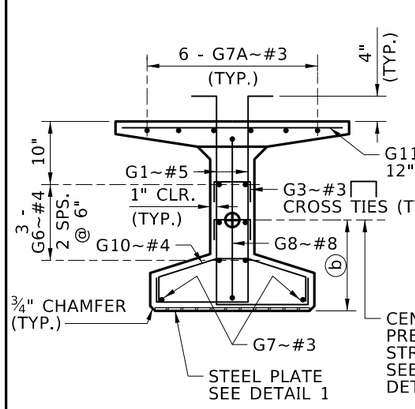
GIRDER ELEVATION AND STIRRUP LAYOUT

½"=1'-0"



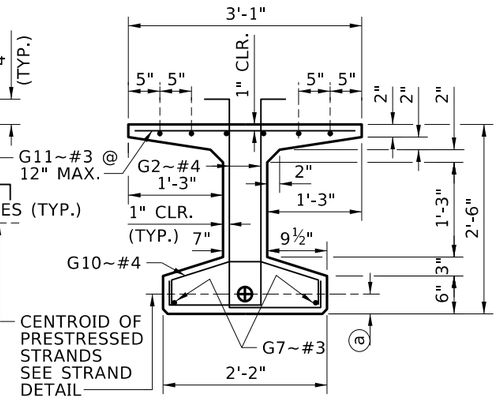
DETAIL 1

½"=1'-0"



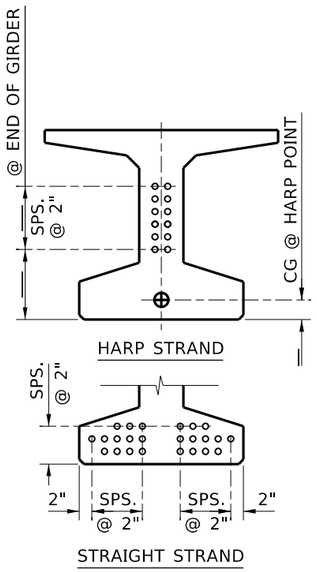
SECTION AT END OF GIRDER

½"=1'-0"



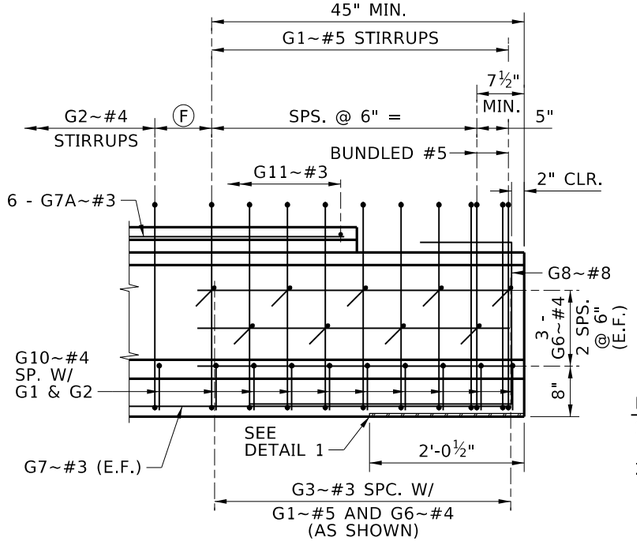
SECTION AT ℄ SPAN

½"=1'-0"



STRAND DETAIL

½"=1'-0"



END REINFORCEMENT DETAIL

½"=1'-0"

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	1'-2½" 2'-9" 4¼"
G2*	#4	60	
G3*	#3	60	5"
G4	#5	60	
G4A	#5	60	
G5	#6	60	
G5A	#6	60	
G6	#4	60	
G7	#3	60	(A) - 4"
G7A	#3	60	(A) - 2 (BLOCKOUT + 2")
G8	#8	60	2'-2" 3'-6" 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	10" 5" 3 4½" 9½
G11	#3	60	2'-11"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED BULB TEE GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

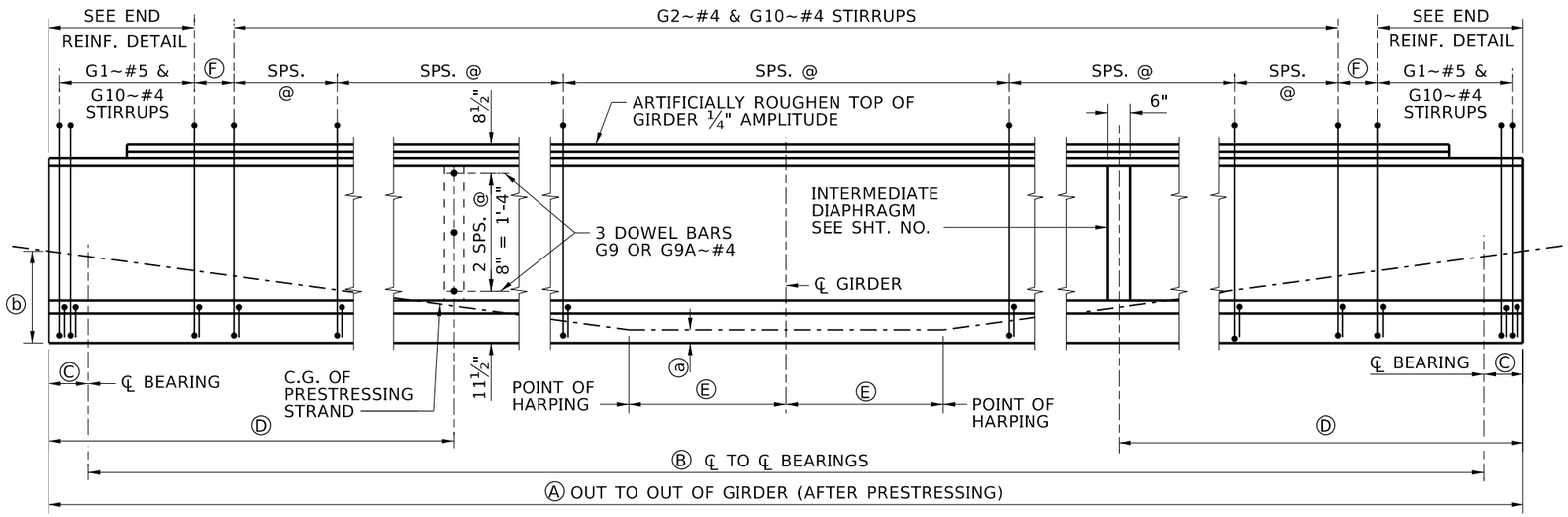
∗ STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT .....469 LB/FT

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	30" BULB TEE PRESTRESSED GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_3A.dgn				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL B5.3A	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

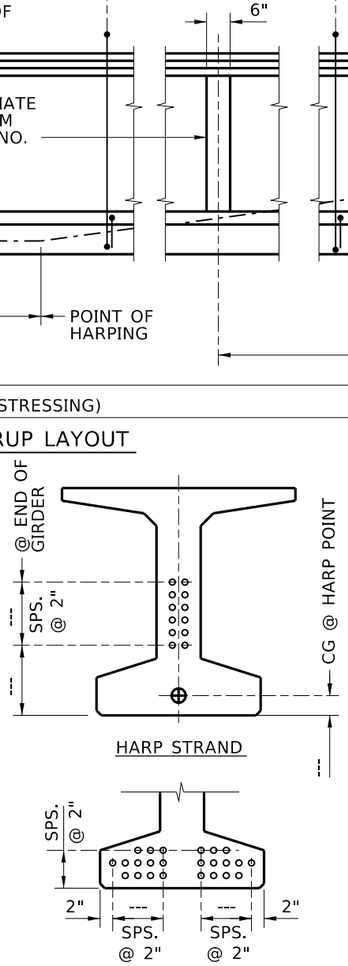
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



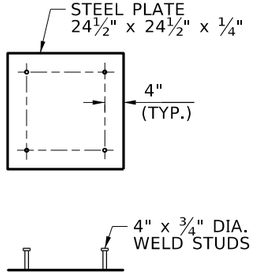
GIRDER ELEVATION AND STIRRUP LAYOUT

NTS



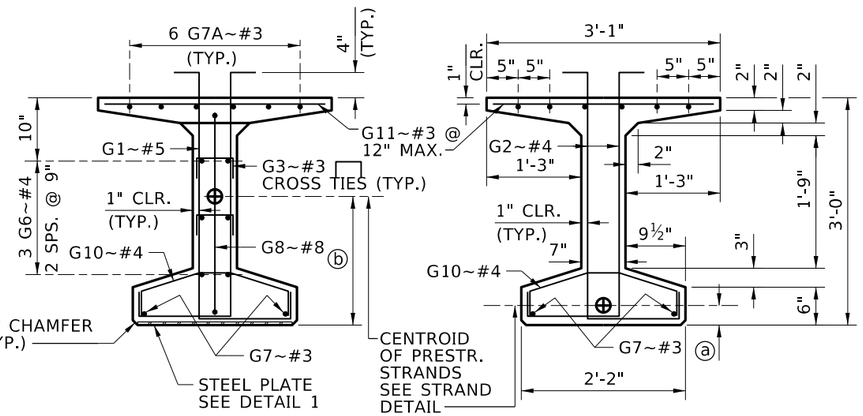
STRAND DETAIL

½"=1'-0"



DETAIL 1

⅜"=1'-0"

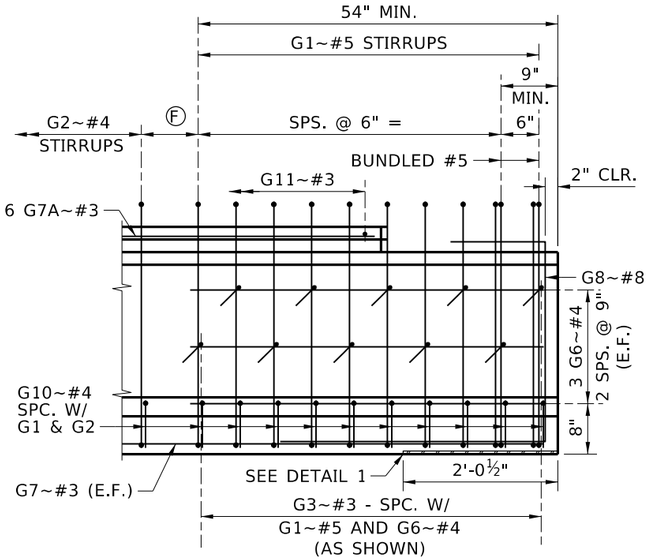


SECTION AT END OF GIRDER

½"=1'-0"

SECTION AT ℄ SPAN

½"=1'-0"



END REINFORCEMENT DETAIL

½"=1'-0"

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	3'-3", 1'-2½", 4¼"
G2*	#4	60	
G3*	#3	60	5"
G4	#5	60	
G4A	#5	60	
G5	#6	60	
G5A	#6	60	
G6	#4	60	
G7	#3	60	Ⓐ - 4"
G7A	#3	60	Ⓐ - 2 (BLOCKOUT + 2")
G8	#8	60	2'-8", 1'-3", 3'-6"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	4½", 10", 5", 3, 9½"
G11	#3	60	2'-11"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED BULB TEE GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

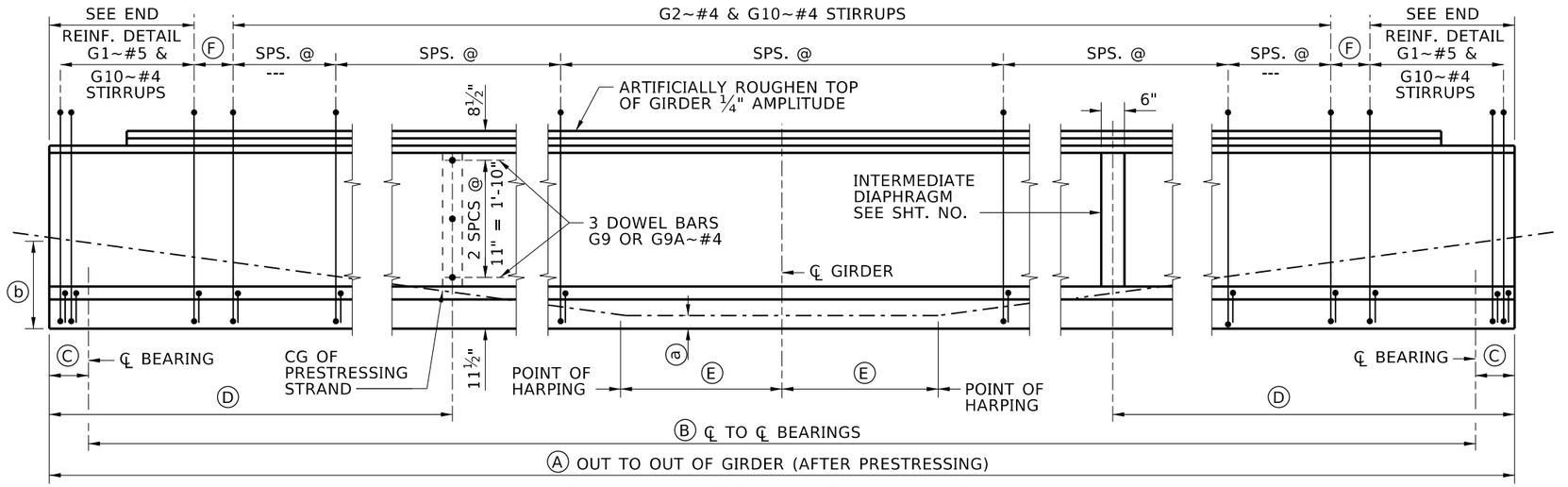
* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT ..... 512 LB/FT

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	36" BULB TEE PRESTRESSED GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_3B.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL B5.3B	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

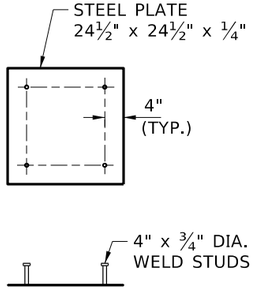
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



GIRDER ELEVATION AND STIRRUP LAYOUT

NTS



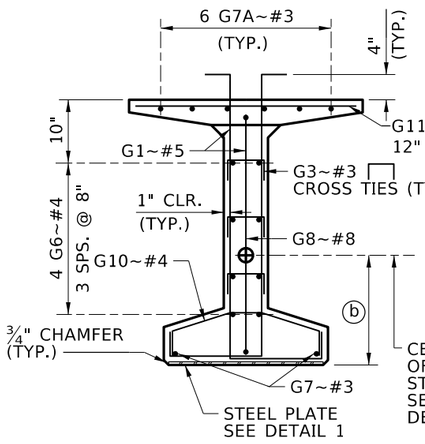
DETAIL 1

⅜"=1'-0"

REINFORCEMENT DIAGRAM

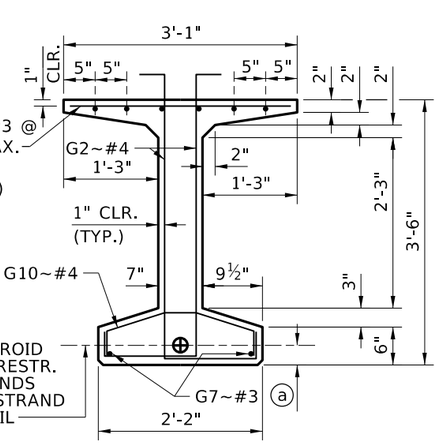
AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	3'-9", 1'-2½", 4¼"
G2*	#4	60	
G3*	#3	60	5"
G4	#5	60	
G4A	#5	60	
G5	#6	60	---
G5A	#6	60	---
G6	#4	60	---
G7	#3	60	(A) - 4"
G7A	#3	60	(A) - 2 (BLOCKOUT + 2")
G8	#8	60	3'-2", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	4½", 10", 5", 3, 9½
G11	#3	60	2'-11"



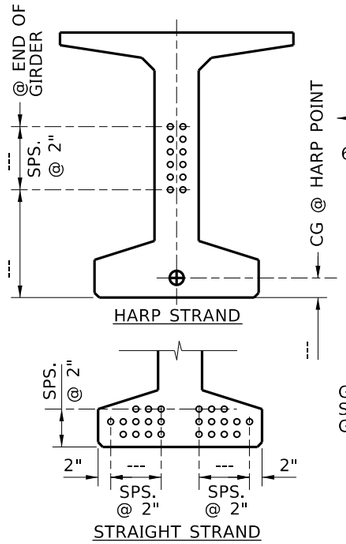
SECTION AT END OF GIRDER

½"=1'-0"



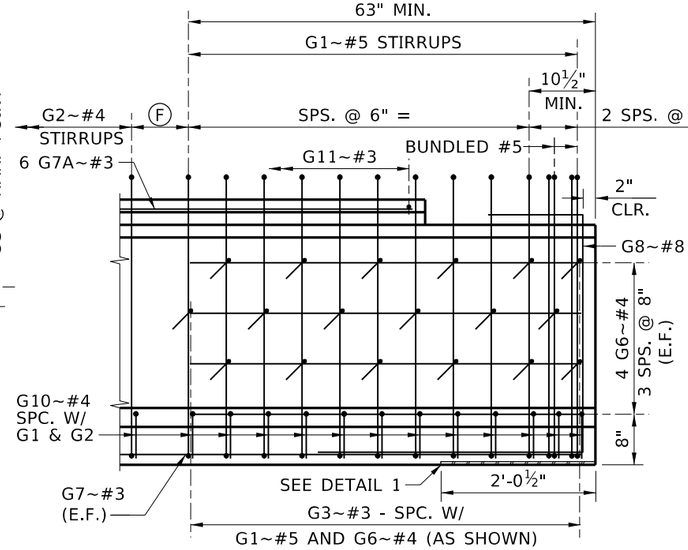
SECTION AT ℄ SPAN

½"=1'-0"



STRAND DETAIL

½"=1'-0"



END REINFORCEMENT DETAIL

½"=1'-0"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED BULB TEE GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

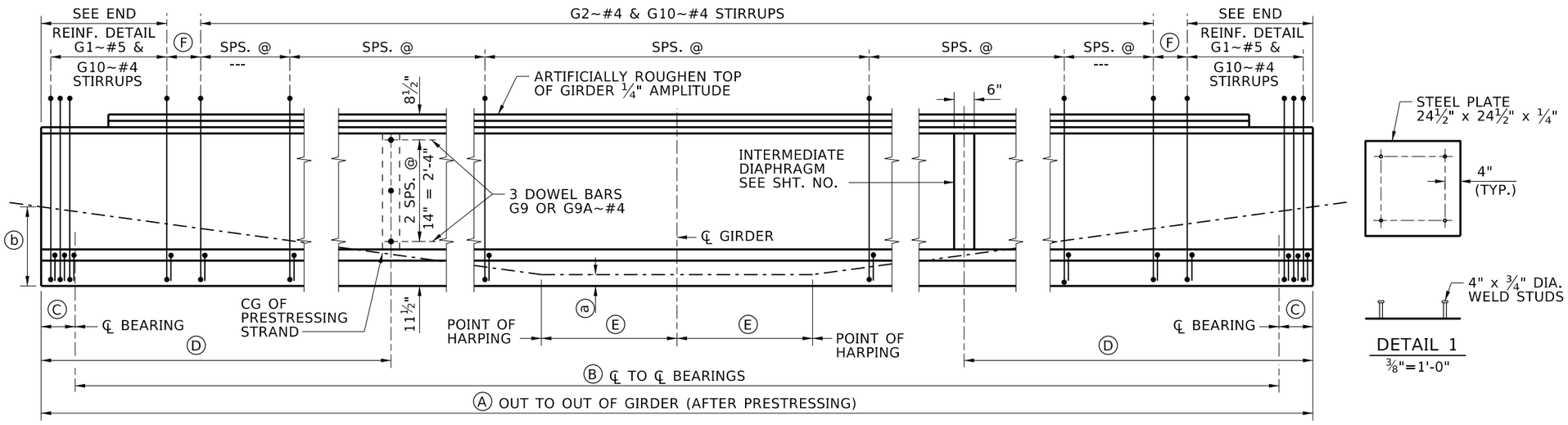
* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT ..... 556 LB/FT

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	42" BULB TEE PRESTRESSED GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_3C.DGN	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL B5.3C	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024				BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



GIRDER ELEVATION AND STIRRUP LAYOUT

NTS

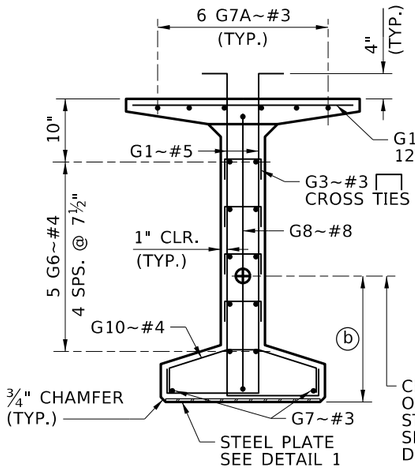
DETAIL 1

⅜"=1'-0"

REINFORCEMENT DIAGRAM

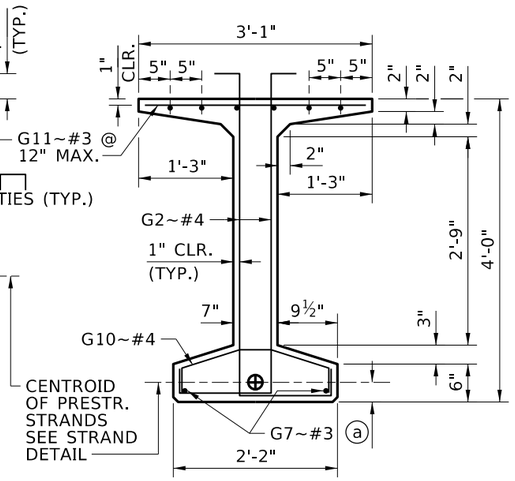
AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	4'-3", 1'-2½", 4¼"
G2*	#4	60	
G3*	#3	60	5"
G4	#5	60	
G4A	#5	60	
G5	#6	60	---
G5A	#6	60	---
G6	#4	60	---
G7	#3	60	(A) - 4"
G7A	#3	60	(A) - 2 (BLOCKOUT + 2")
G8	#8	60	3'-8", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	4½", 10", 5", 3, 9½"
G11	#3	60	2'-11"



SECTION AT END OF GIRDER

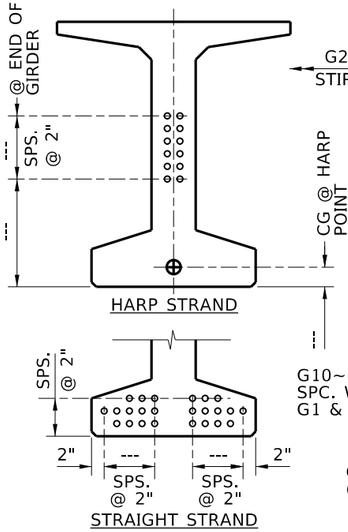
½"=1'-0"



CENTROID OF PRESTR. STRANDS SEE STRAND DETAIL

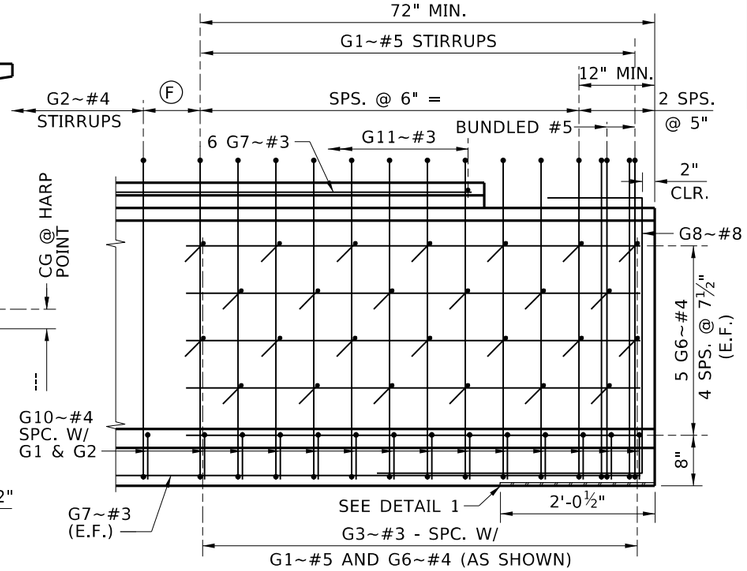
SECTION AT ℄ SPAN

½"=1'-0"



STRAND DETAIL

½"=1'-0"



END REINFORCEMENT DETAIL

½"=1'-0"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED BULB TEE GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT ..... 600 LB/FT

REVISIONS			
NO.	DATE	BY	DESCRIPTION
△			
△			
△			
△			
△			

DESIGNED

DESIGN CHECKED

DETAILED

DWG. CHECKED

CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY

CADD FILE NAME Standards/Bridge Standard Drawings/B05_3D.DGN

DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT

YOUR Safety→YOUR Mobility→YOUR Economic Opportunity

APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:

ENGLISH

PROJECT NO.

48" BULB TEE PRESTRESSED GIRDER

BRIDGE LRFD DESIGN MANUAL B5.3D

BRIDGE PLANS

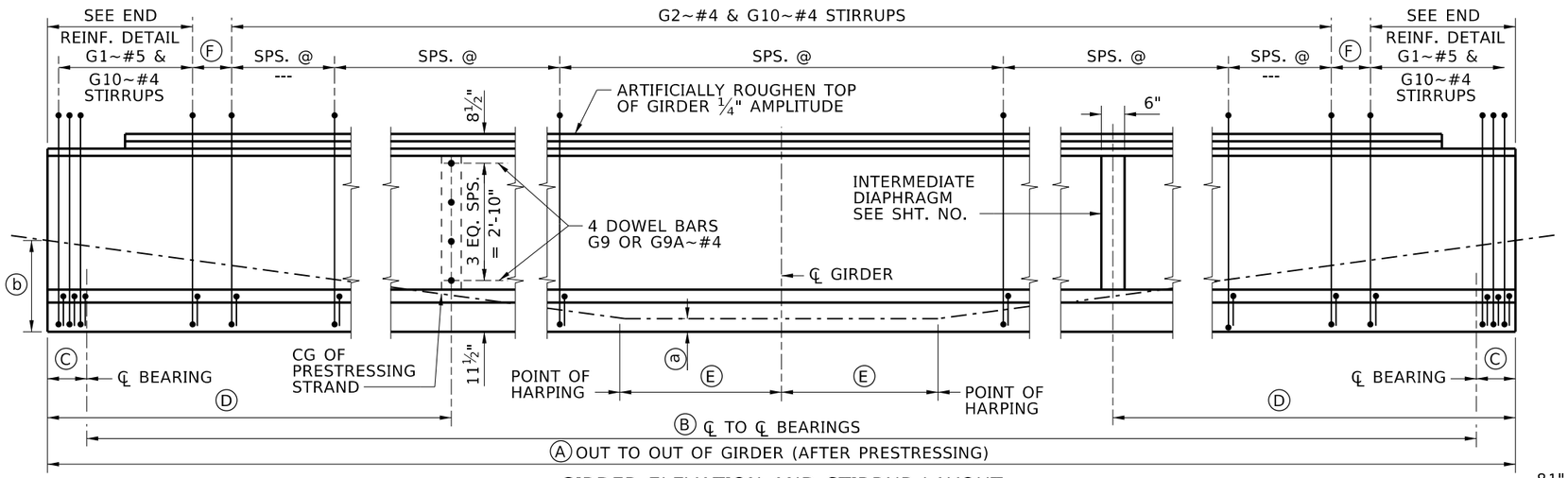
BRIDGE KEY NO.

COUNTY | KEY NO.

BRIDGE DWG. NO. | SHEET OF

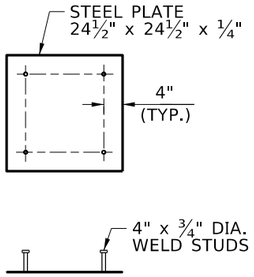
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



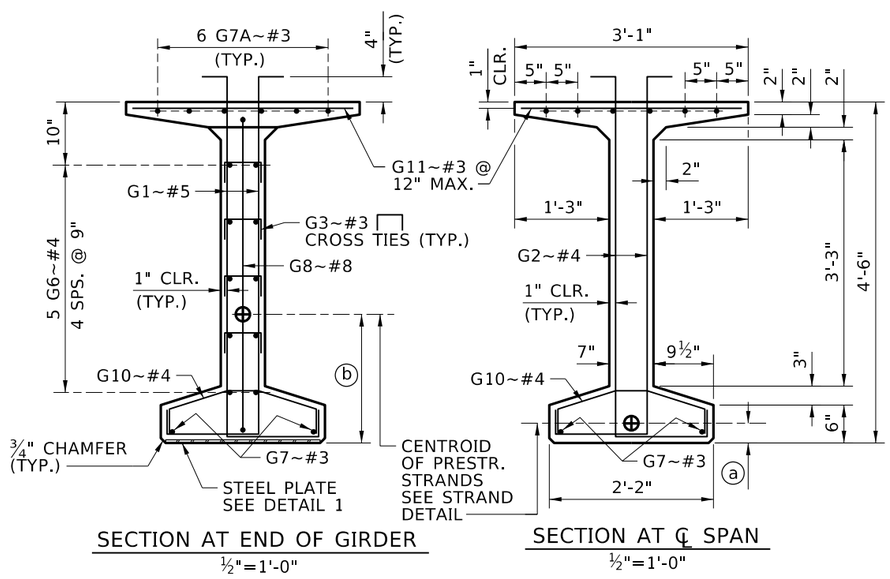
GIRDER ELEVATION AND STIRRUP LAYOUT

NTS



DETAIL 1

⅜"=1'-0"

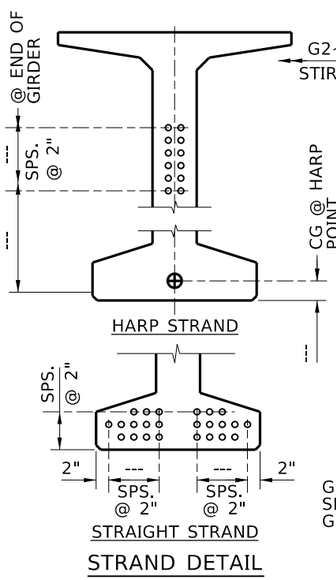


SECTION AT END OF GIRDER

½"=1'-0"

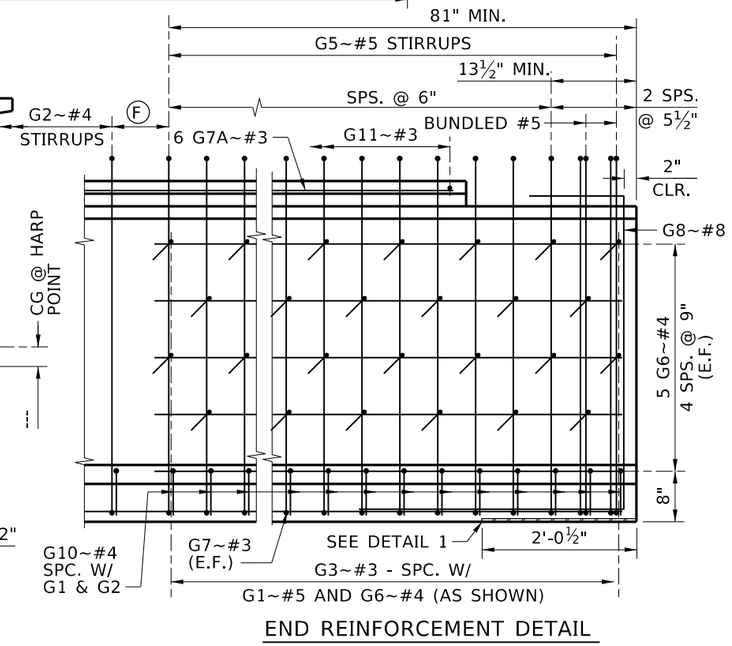
SECTION AT ℄ SPAN

½"=1'-0"



STRAND DETAIL

½"=1'-0"



END REINFORCEMENT DETAIL

½"=1'-0"

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	4'-9", 1'-2½", 4¼"
G2*	#4	60	
G3*	#3	60	5"
G4	#5	60	—
G4A	#5	60	—
G5	#6	60	---
G5A	#6	60	---
G6	#4	60	---
G7	#3	60	A - 4"
G7A	#3	60	A - 2 (BLOCKOUT + 2")
G8	#8	60	4'-2", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	4½", 10", 5", 3, 9½
G11	#3	60	2'-11"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDERS GENERAL DETAILS AND PRESTRESSED BULB TEE GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

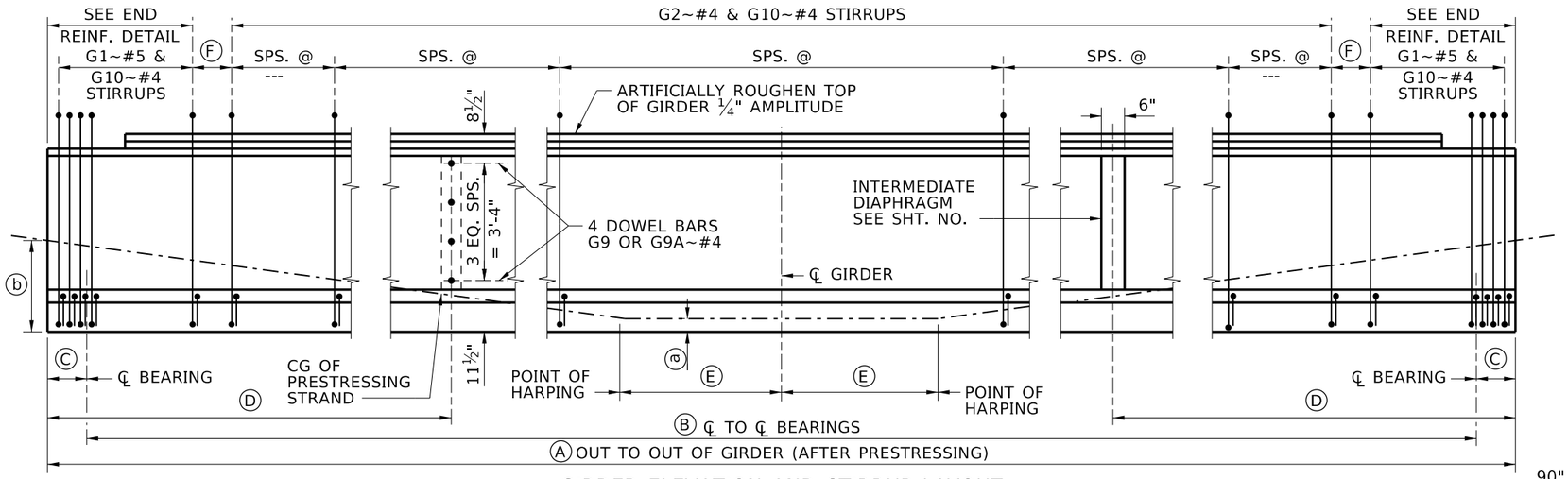
* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT.....644 LBS/FT

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	54" BULB TEE PRESTRESSED GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standard/Bridge Standard Drawings/ B05_3E.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL B5.3E	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

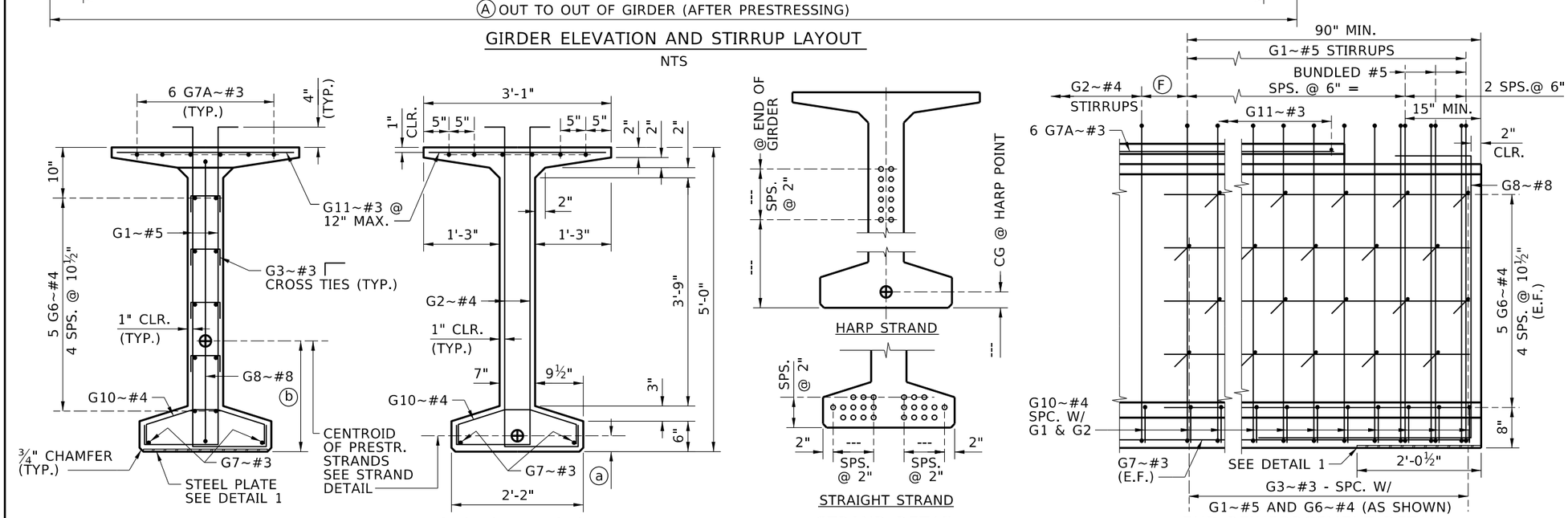
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



GIRDER ELEVATION AND STIRRUP LAYOUT

NTS



DETAIL 1

⅜"=1'-0"

SECTION AT END OF GIRDER

½"=1'-0"

SECTION AT ℄ SPAN

½"=1'-0"

STRAND DETAIL

½"=1'-0"

END REINFORCEMENT DETAIL

½"=1'-0"

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	5'-3", 1'-2½", 4¼"
G2*	#4	60	
G3*	#3	60	5"
G4	#5	60	
G4A	#5	60	
G5	#6	60	---
G5A	#6	60	---
G6	#4	60	---
G7	#3	60	(A) - 4"
G7A	#3	60	(A) - 2 (BLOCKOUT + 2")
G8	#8	60	4'-8", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	4½", 10", 5", 3, 9½"
G11	#3	60	2'-11"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED BULB TEE GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

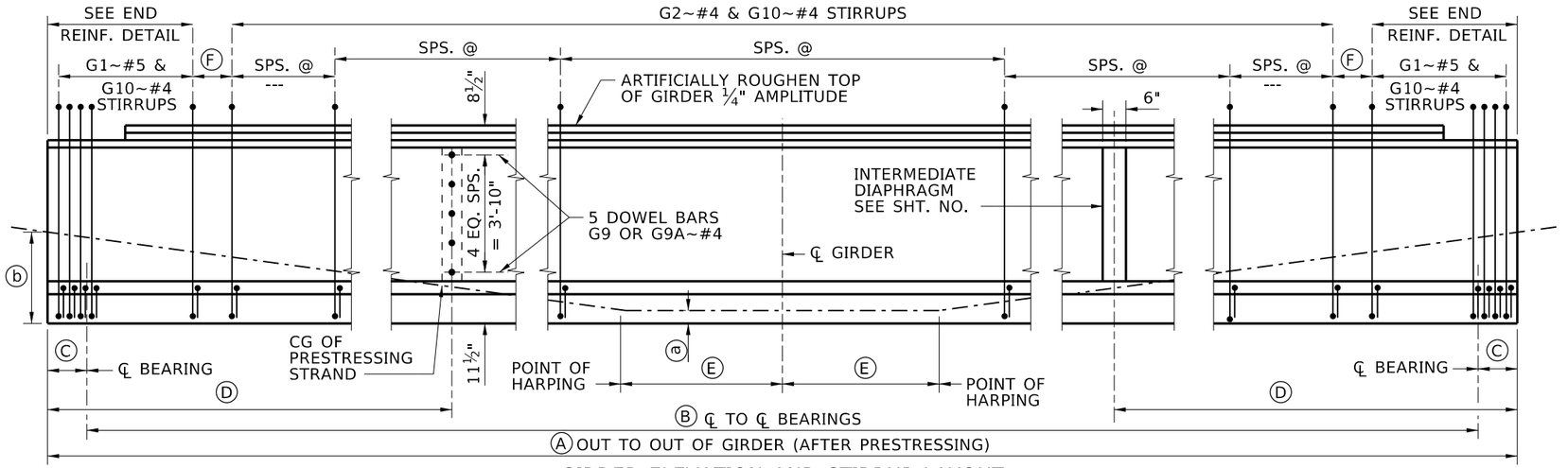
* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT..... 687 LB/FT

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	60" BULB TEE PRESTRESSED GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME Standards/Bridge Standard Drawings/ B05_3F.DGN	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
△				DETAILED					COUNTY / KEY NO.
△				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL B5.3F	BRIDGE DWG. NO. / SHEET OF
△				CORRECTIONS					

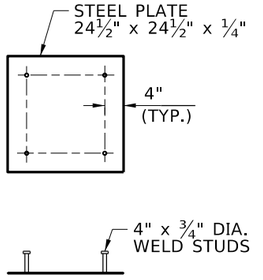
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



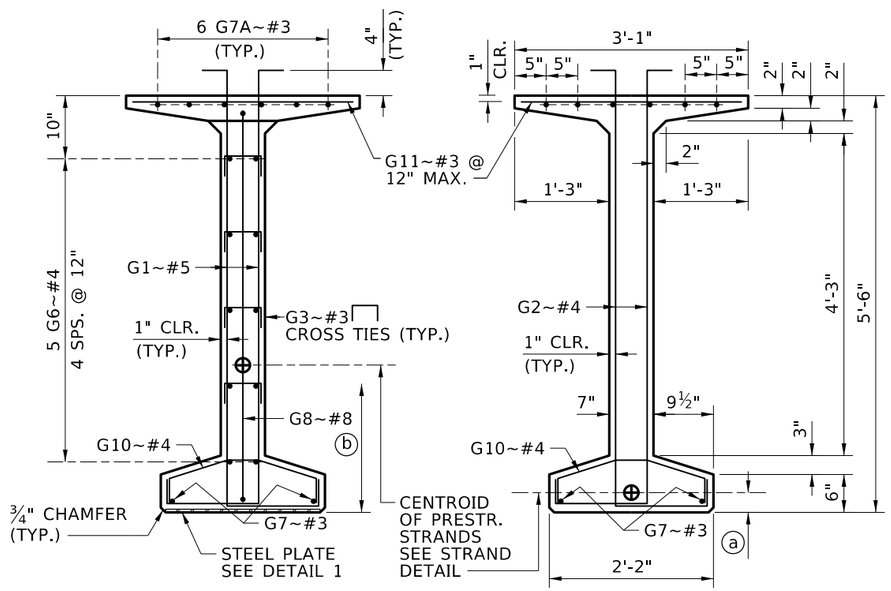
GIRDER ELEVATION AND STIRRUP LAYOUT

NTS



DETAIL 1

⅜"=1'-0"

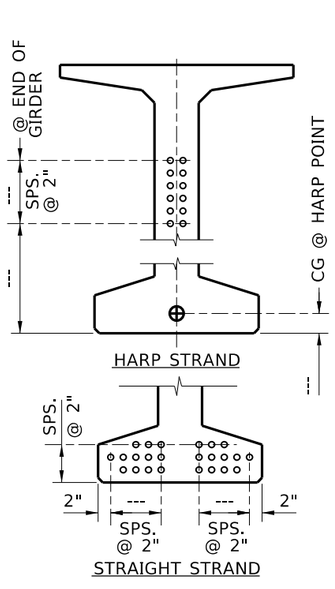


SECTION AT END OF GIRDER

½"=1'-0"

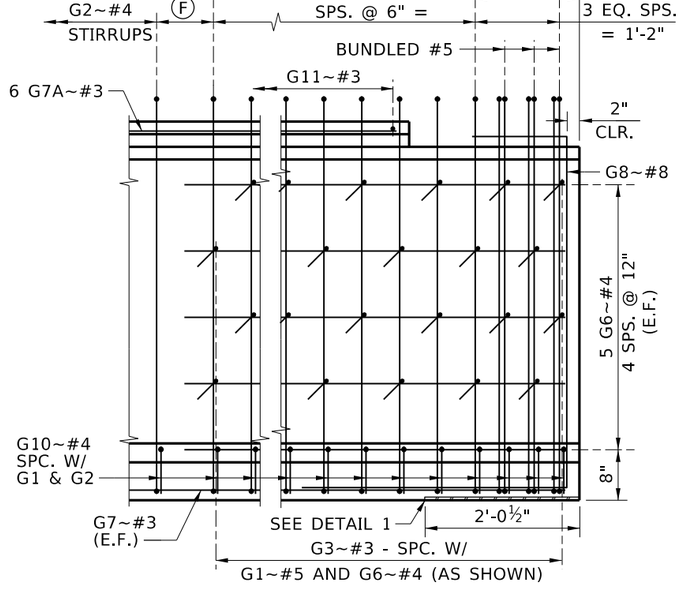
SECTION AT ℄ SPAN

½"=1'-0"



STRAND DETAIL

½"=1'-0"



END REINFORCEMENT DETAIL

½"=1'-0"

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	5'-9", 1'-2½", 4¼"
G2*	#4	60	
G3*	#3	60	5"
G4	#5	60	—
G4A	#5	60	—
G5	#6	60	---
G5A	#6	60	---
G6	#4	60	---
G7	#3	60	(A) - 4"
G7A	#3	60	(A) - 2 (BLOCKOUT + 2")
G8	#8	60	5'-2", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	4½", 10", 5", 3, 9½"
G11	#3	60	2'-11"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED BULB TEE GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

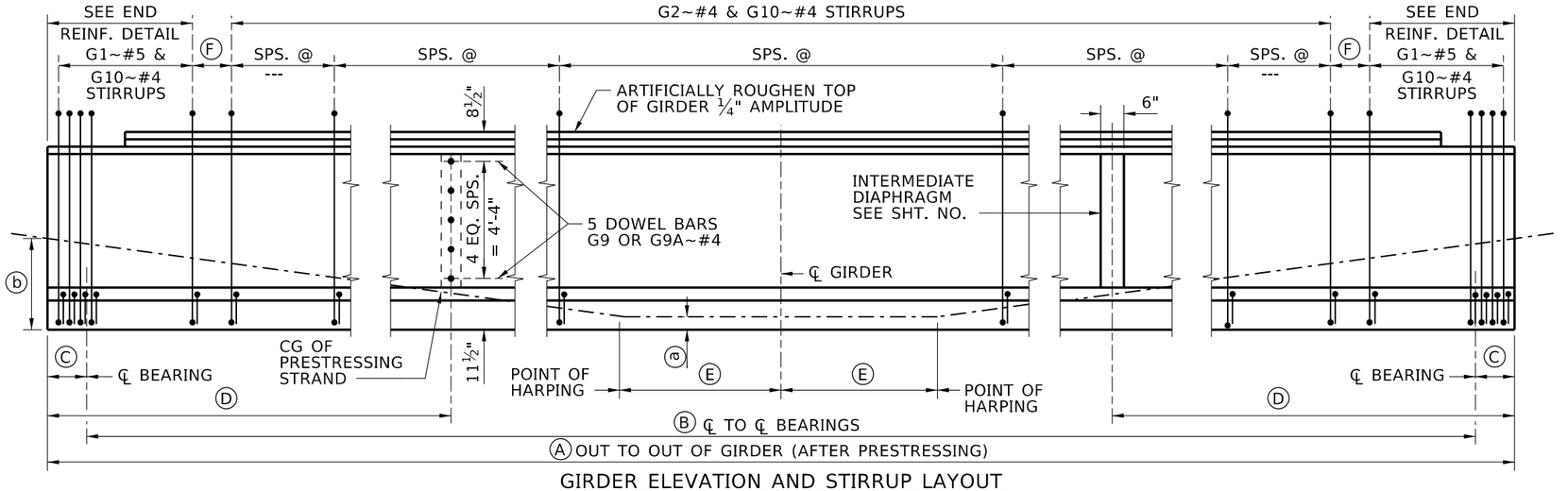
* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT..... 731 LB/FT

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	66" BULB TEE PRESTRESSED GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_3G.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL B5.3G	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

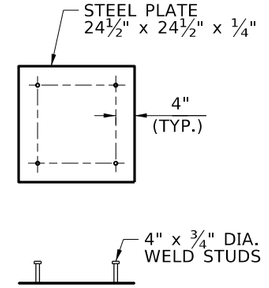
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



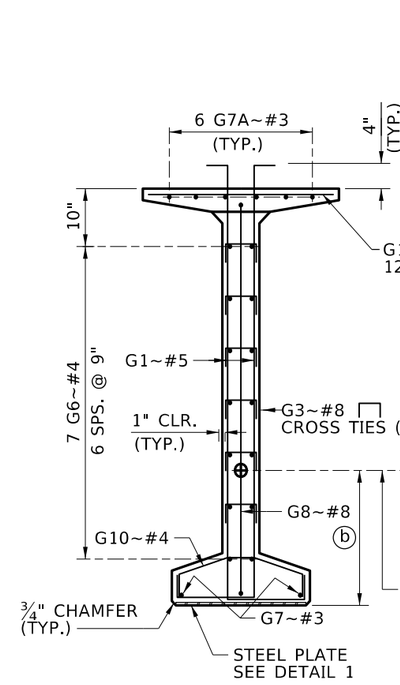
GIRDER ELEVATION AND STIRRUP LAYOUT

NTS



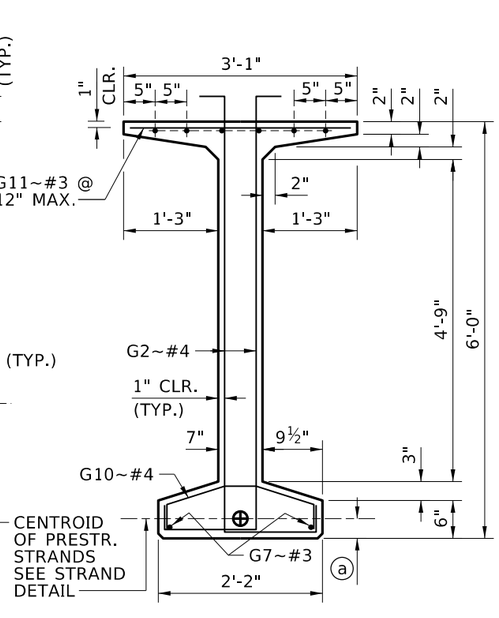
DETAIL 1

⅜"=1'-0"



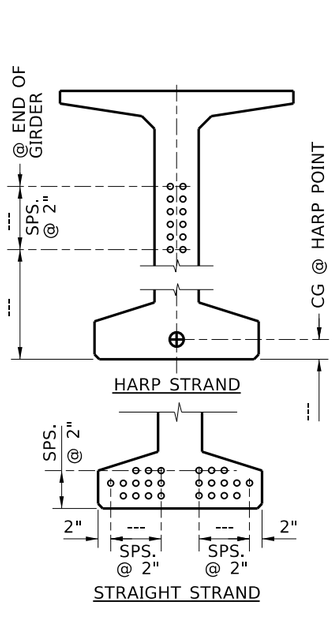
SECTION AT END OF GIRDER

½"=1'-0"



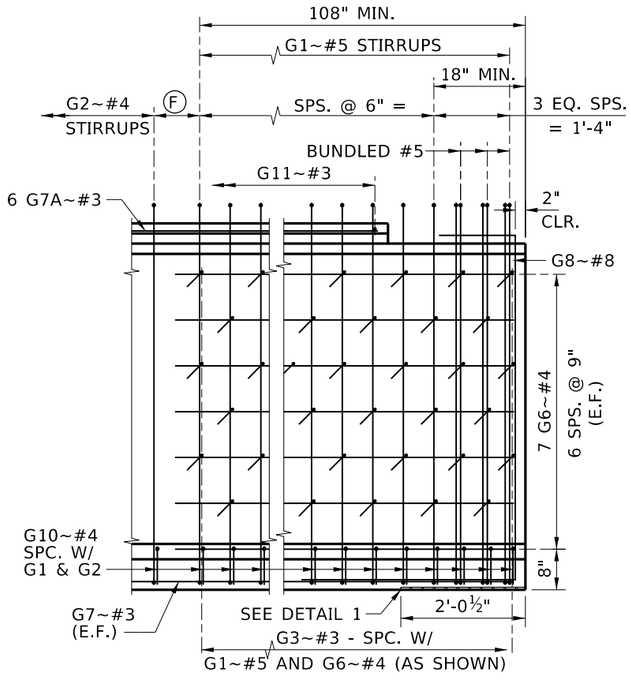
SECTION AT ℄ SPAN

½"=1'-0"



STRAND DETAIL

½"=1'-0"



END REINFORCEMENT DETAIL

NTS

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	6'-3", 1'-2½", 4¼"
G2*	#4	60	
G3*	#3	60	5"
G4	#5	60	
G4A	#5	60	
G5	#6	60	
G5A	#6	60	
G6	#4	60	
G7	#3	60	A - 4"
G7A	#3	60	A - 2 (BLOCKOUT + 2")
G8	#8	60	5'-8", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	4½", 10", 5", 3, 9½"
G11	#3	60	2'-11"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED BULB TEE GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

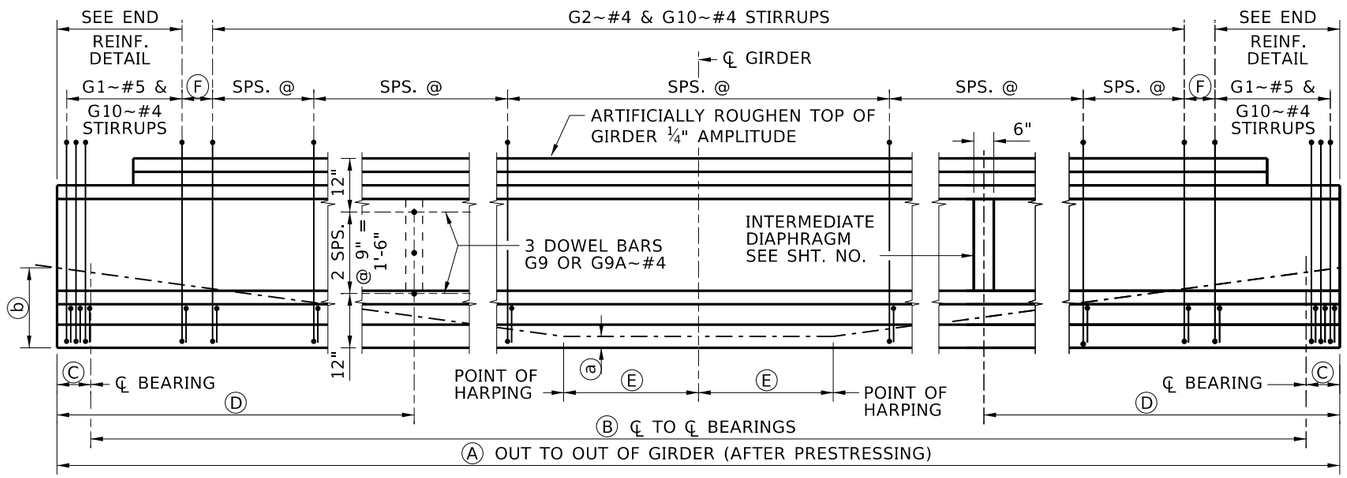
* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT..... 775 LB/FT

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	72" BULB TEE PRESTRESSED GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_3H.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL B5.3H	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

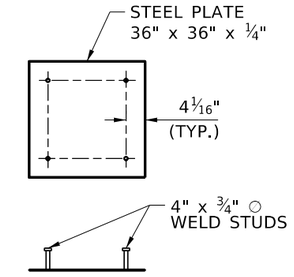
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



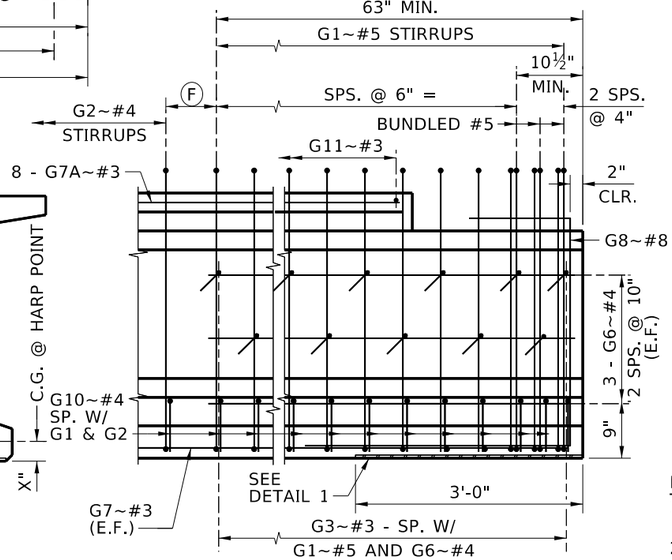
GIRDER ELEVATION AND STIRRUP LAYOUT

NTS



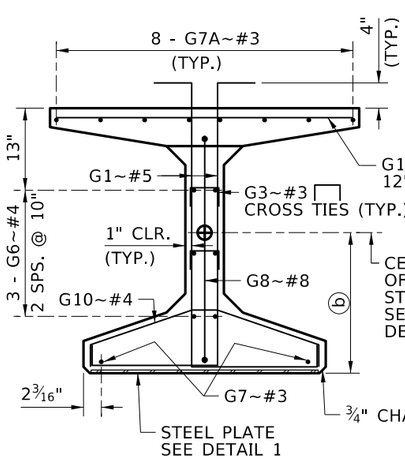
DETAIL 1

NTS



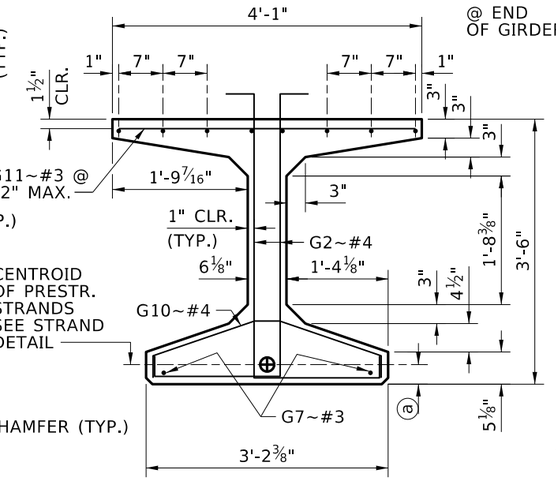
END REINFORCEMENT DETAIL

½" = 1'-0"



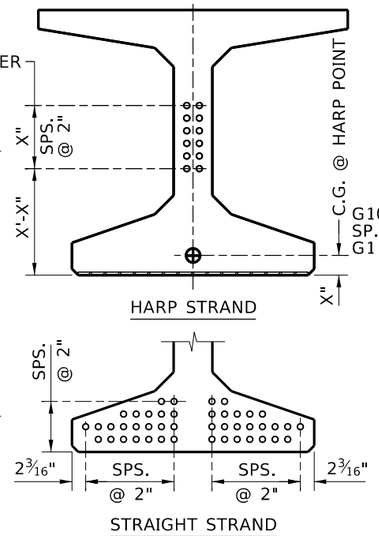
SECTION AT END OF GIRDER

½" = 1'-0"



SECTION AT ℄ SPAN

½" = 1'-0"



STRAIGHT STRAND

STRAND DETAIL

½"=1'-0"

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	3'-9", 1'-8¼", 3½"
G2*	#4	60	
G3*	#3	60	4⅛"
G4	#5	60	
G4A	#5	60	
G5	#6	60	
G5A	#6	60	
G6	#4	60	
G7	#3	60	A - 4"
G7A	#3	60	A - 2 (BLOCKOUT + 2")
G8	#8	60	3'-0", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	
G10*	#4	60	3½", 17", 4", 4½", 13⅛"
G11	#3	60	3'-11"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED WF GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

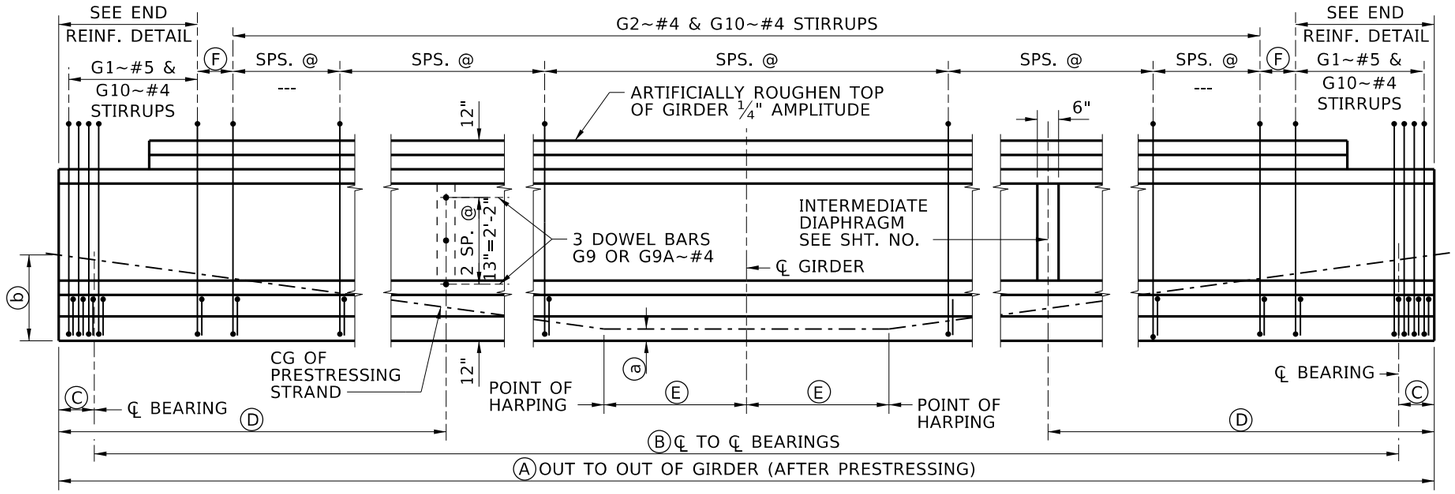
* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT..... 758 LB/FT

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	WF42G PRESTRESSED GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME Standards/Bridge Standard Drawings/B05_3I.dgn	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED					COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL B5.3I	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

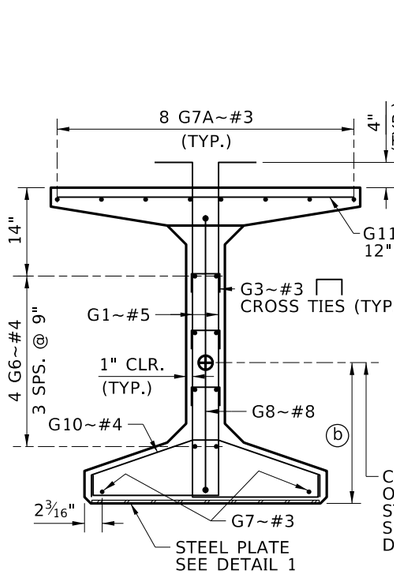
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



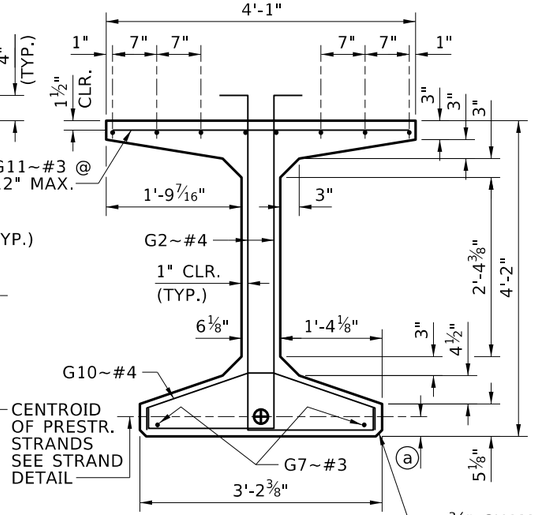
GIRDER ELEVATION AND STIRRUP LAYOUT

NTS



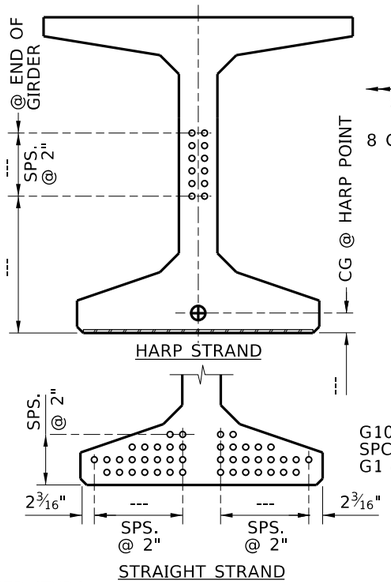
SECTION AT END OF GIRDER

½"=1'-0"



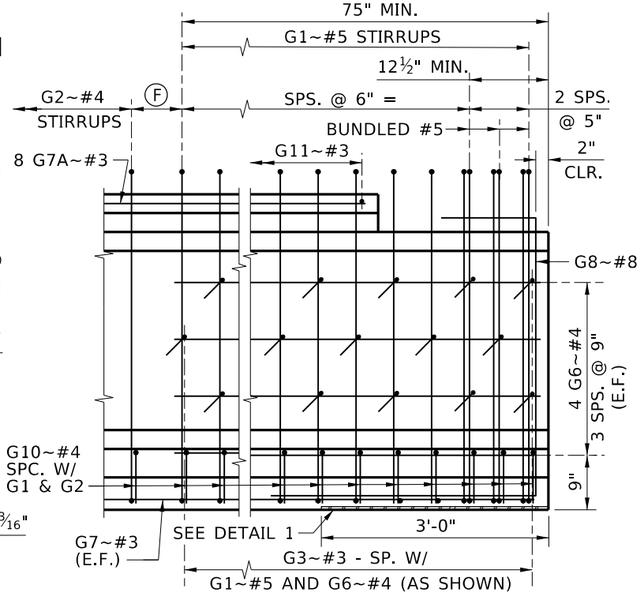
SECTION AT ℄ SPAN

½"=1'-0"



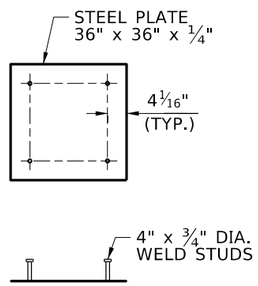
STRAND DETAIL

½"=1'-0"



END REINFORCEMENT DETAIL

½"=1'-0"



DETAIL 1

⅜"=1'-0"

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	4'-5", 1'-8¼", 3½"
G2*	#4	60	
G3*	#3	60	4⅛"
G4	#5	60	
G4A	#5	60	
G5	#6	60	
G5A	#6	60	
G6	#4	60	
G7	#3	60	(A) - 4"
G7A	#3	60	(A) - 2 (BLOCKOUT + 2")
G8	#8	60	3'-8", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	3½", 17", 4", 4½", 13⅛"
G11	#3	60	3'-11"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDERS GENERAL DETAILS AND PRESTRESSED WF GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

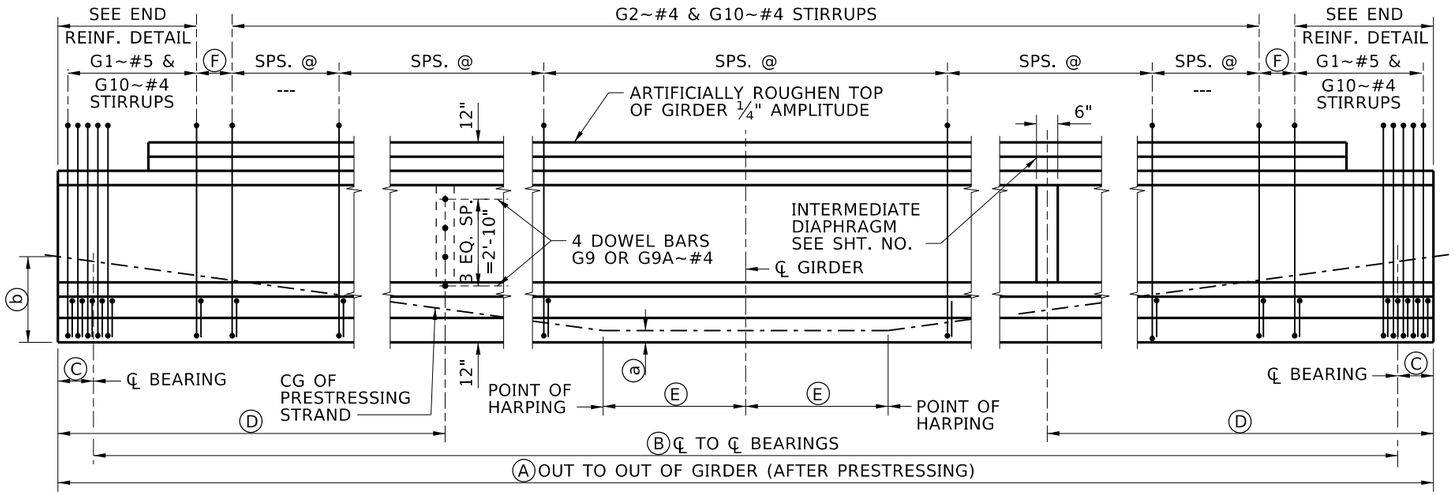
* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT.....809 LB/FT

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	WF50G PRESTRESSED GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_3J.DGN	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL B5.3J	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024				BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

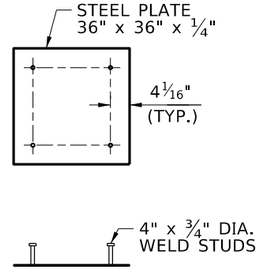
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



GIRDER ELEVATION AND STIRRUP LAYOUT

NTS



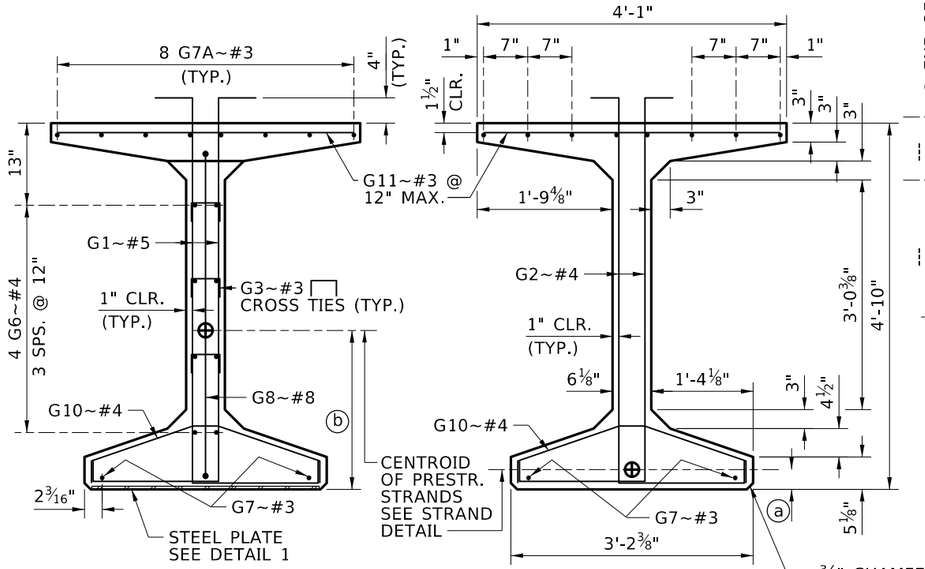
DETAIL 1

⅜"=1'-0"

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	5'-1", 1'-8¼", 3½"
G2*	#4	60	
G3*	#3	60	4⅛"
G4	#5	60	
G4A	#5	60	
G5	#6	60	---
G5A	#6	60	---
G6	#4	60	---
G7	#3	60	(A) - 4"
G7A	#3	60	(A) - 2 (BLOCKOUT + 2")
G8	#8	60	4'-4", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	3½", 17", 4", 4½", 13⅛"
G11	#3	60	3'-11"

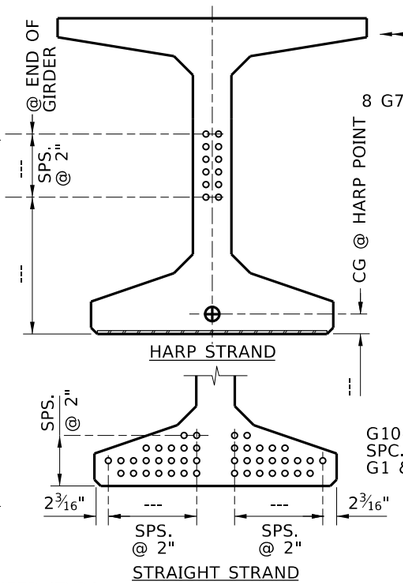


SECTION AT END OF GIRDER

½"=1'-0"

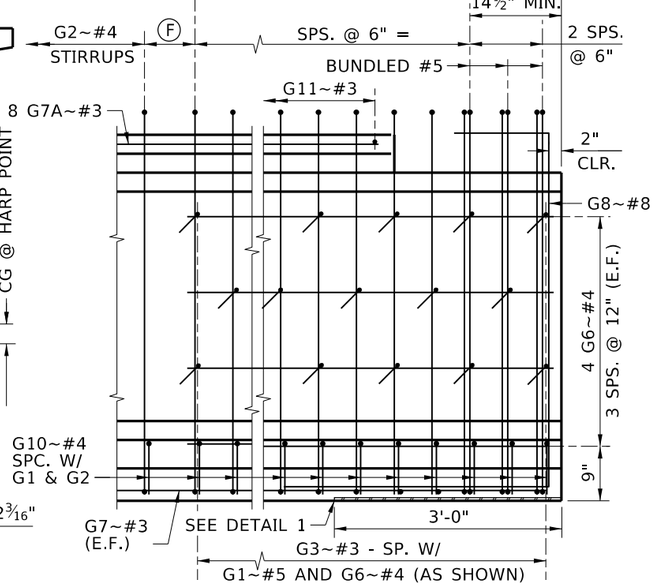
SECTION AT ℄ SPAN

½"=1'-0"



STRAND DETAIL

½"=1'-0"



END REINFORCEMENT DETAIL

½"=1'-0"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED WF GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

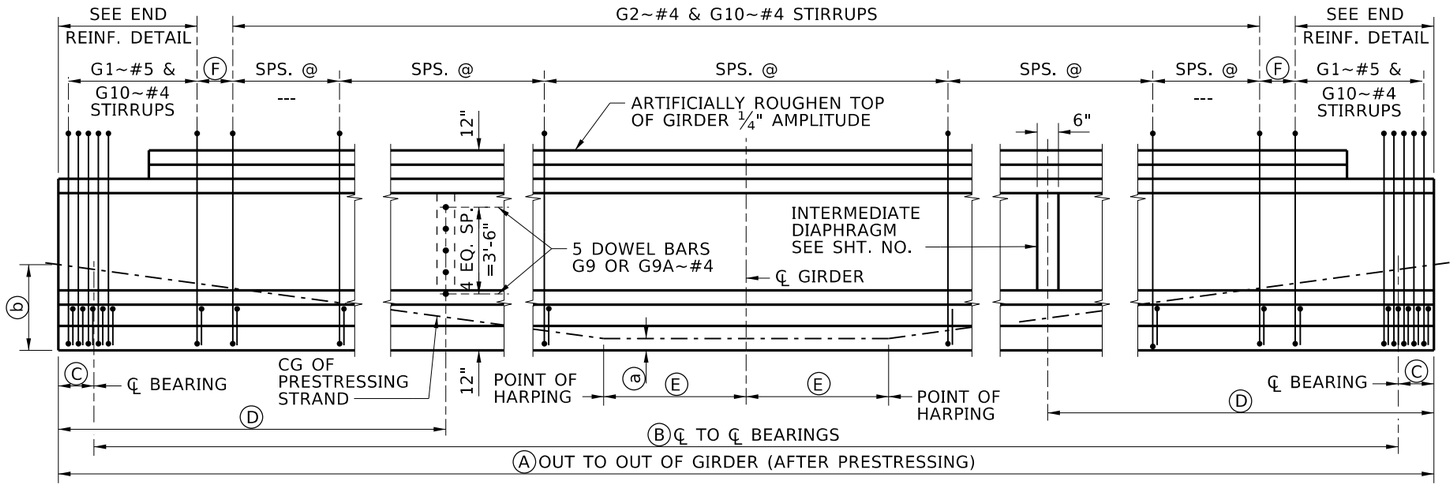
* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT..... 860 LB/FT

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	WF58G PRESTRESSED GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_3K.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL B5.3K	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN

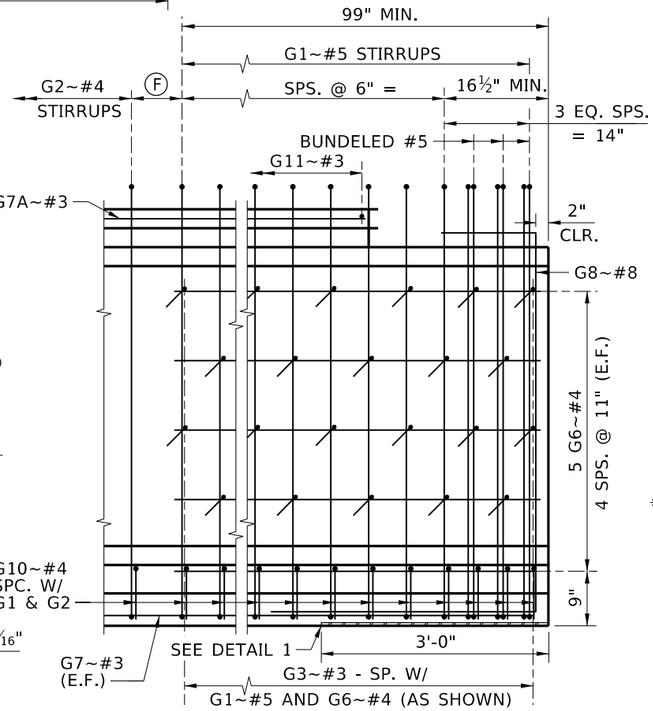


GIRDER ELEVATION AND STIRRUP LAYOUT

NTS

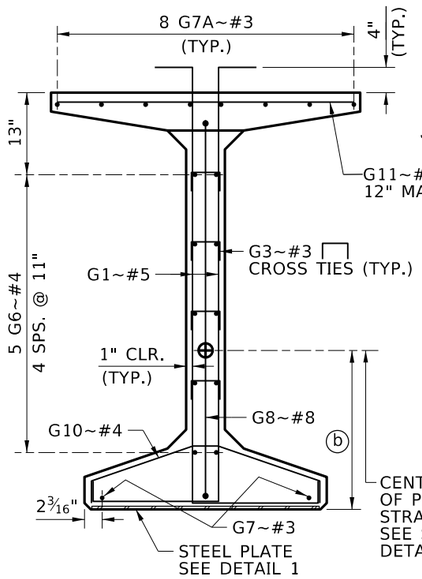
DETAIL 1

⅜"=1'-0"



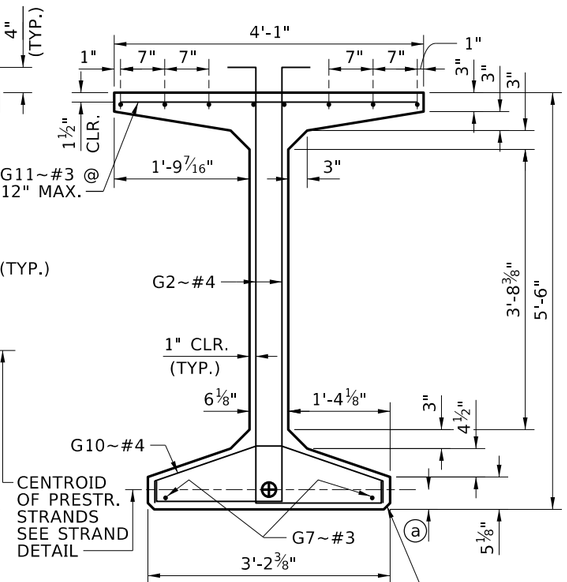
END REINFORCEMENT DETAIL

½"=1'-0"



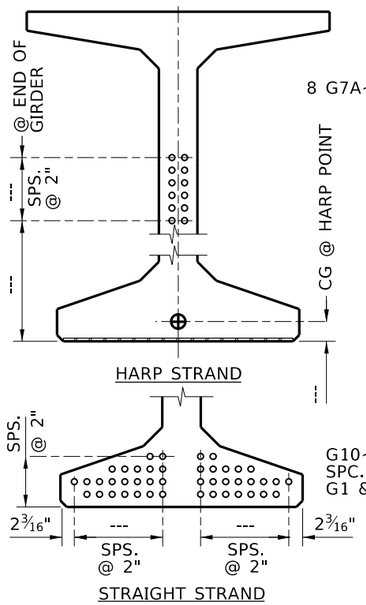
SECTION AT END OF GIRDER

½"=1'-0"



SECTION AT ℄ SPAN

½"=1'-0"



STRAND DETAIL

½"=1'-0"

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	5'-9", 1'-8¼", 3½"
G2*	#4	60	
G3*	#3	60	4⅛"
G4	#5	60	
G4A	#5	60	
G5	#6	60	
G5A	#6	60	
G6	#4	60	
G7	#3	60	A - 4"
G7A	#3	60	A - 2 (BLOCKOUT + 2")
G8	#8	60	5'-0", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	3½", 17", 4", 4½", 13⅛"
G11	#3	60	3'-11"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED WF GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT..... 911 LB/FT

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGNED
DESIGN CHECKED
DETAILED
DWG. CHECKED
CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY

CADD FILE NAME
Standards/Bridge Standard Drawings/B05_3L.DGN

DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT
YOUR Safety→YOUR Mobility→YOUR Economic Opportunity

APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:

ENGLISH

PROJECT NO.

WF66G PRESTRESSED GIRDER

BRIDGE LRFD DESIGN MANUAL B5.3L

BRIDGE PLANS

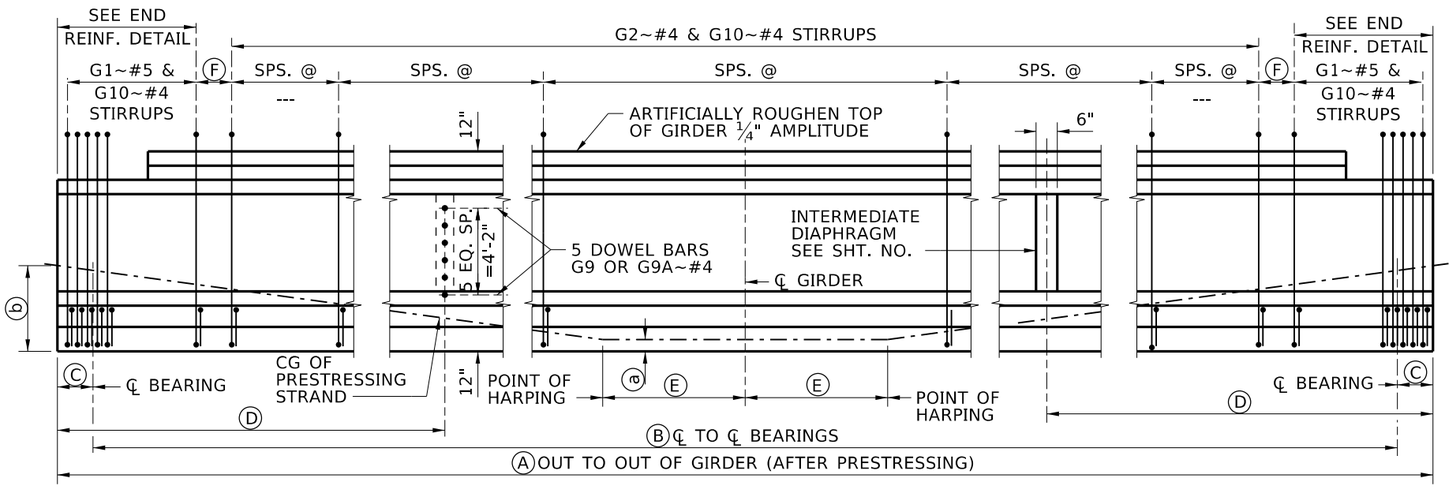
BRIDGE KEY NO.

COUNTY | KEY NO.

BRIDGE DWG. NO. | SHEET OF

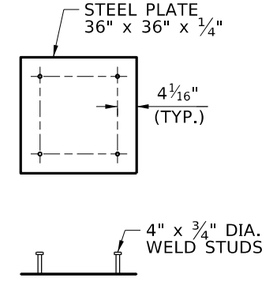
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



GIRDER ELEVATION AND STIRRUP LAYOUT

NTS



DETAIL 1

⅜"=1'-0"

SECTION AT END OF GIRDER

½"=1'-0"

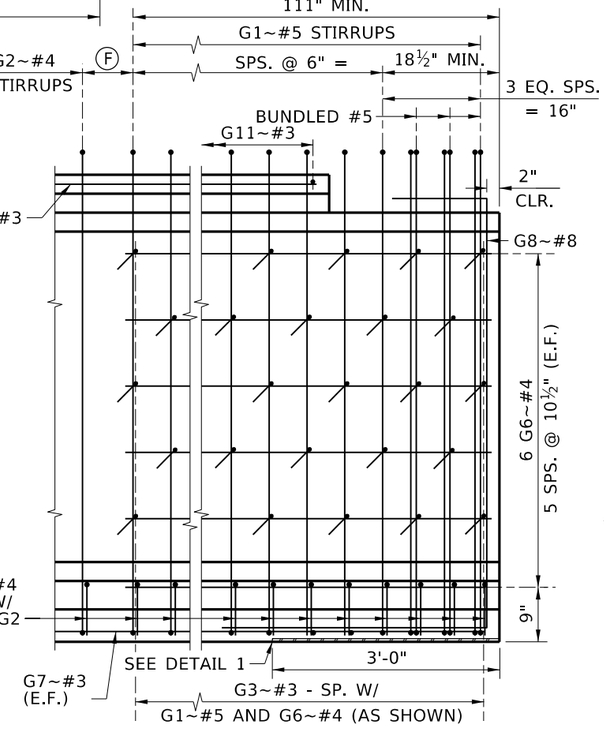
SECTION AT ℄ SPAN

½"=1'-0"

STRAIGHT STRAND

STRAND DETAIL

½"=1'-0"



END REINFORCEMENT DETAIL

½"=1'-0"

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	6'-5", 1'-8¼", 3½"
G2*	#4	60	
G3*	#3	60	4⅛"
G4	#5	60	
G4A	#5	60	
G5	#6	60	
G5A	#6	60	
G6	#4	60	
G7	#3	60	(A) - 4"
G7A	#3	60	(A) - 2 (BLOCKOUT + 2")
G8	#8	60	5'-8", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	3½", 17", 4", 4½", 13⅛"
G11	#3	60	3'-11"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED WF GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT..... 962 LB/FT

REVISIONS			
NO.	DATE	BY	DESCRIPTION
△			
△			
△			
△			
△			

DESIGNED

DESIGN CHECKED

DETAILED

DWG. CHECKED

CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY

CADD FILE NAME

Standards/Bridge Standard Drawings/B05_3M.DGN

DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT

YOUR Safety→YOUR Mobility→YOUR Economic Opportunity

APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:

ENGLISH

PROJECT NO.

WF74G PRESTRESSED GIRDER

BRIDGE LRFD DESIGN MANUAL B5.3M

BRIDGE PLANS

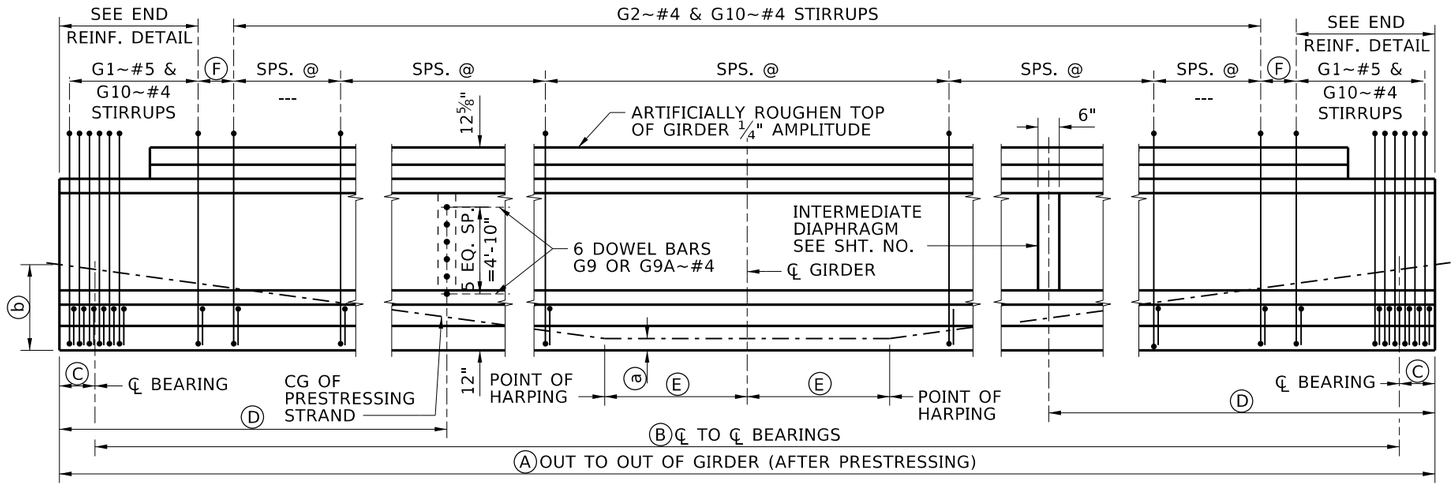
BRIDGE KEY NO.

COUNTY | KEY NO.

BRIDGE DWG. NO. | SHEET OF

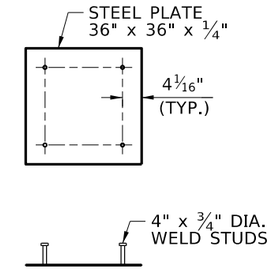
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN

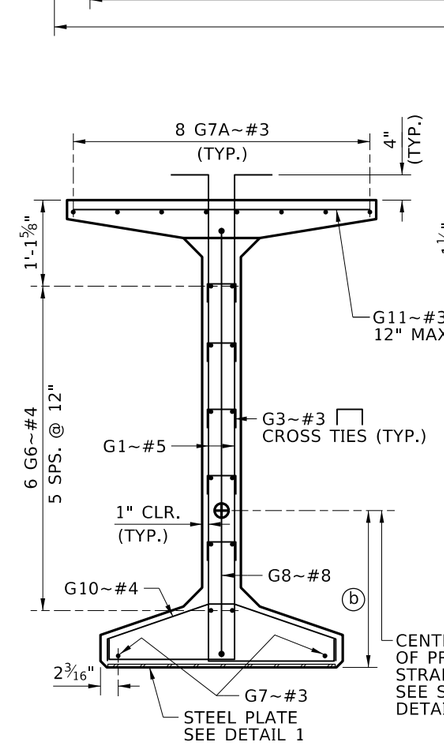


GIRDER ELEVATION AND STIRRUP LAYOUT

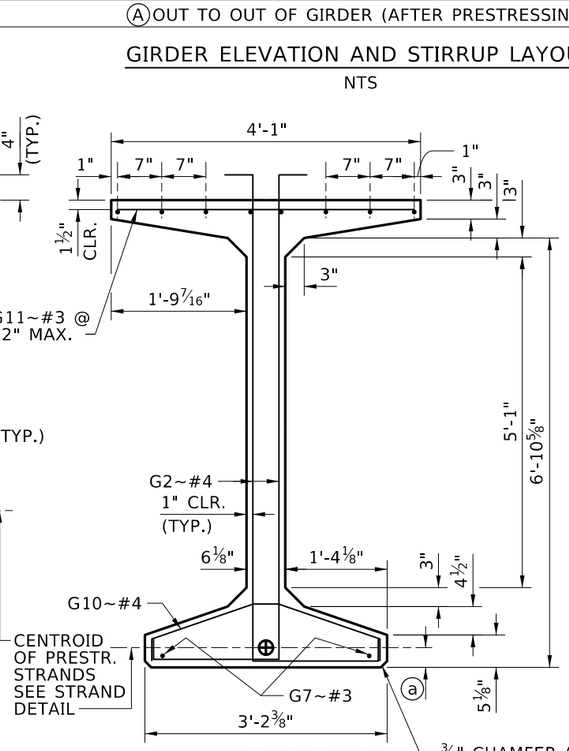
NTS



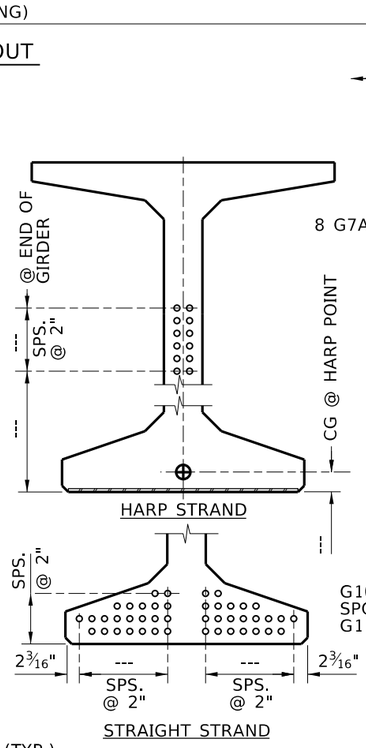
DETAIL 1
⅜"=1'-0"



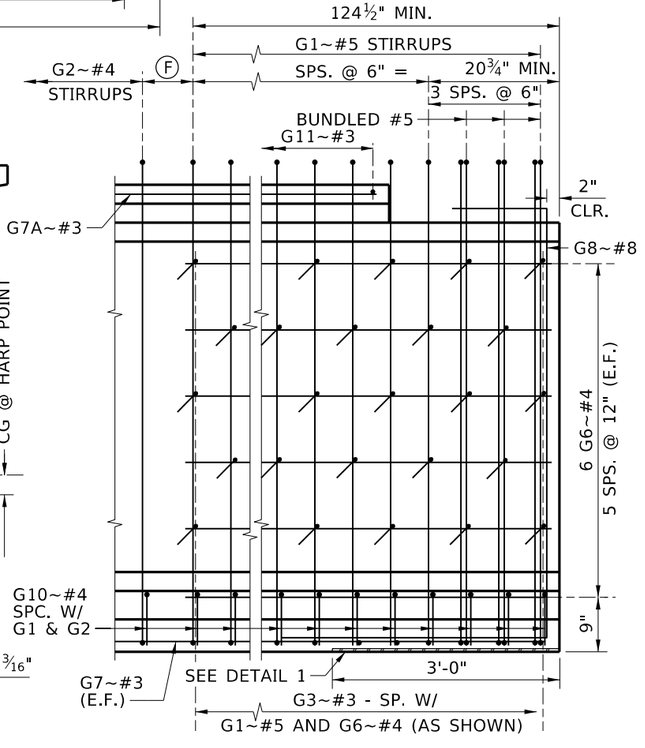
SECTION AT END OF GIRDER
½"=1'-0"



SECTION AT ℄ SPAN
½"=1'-0"



STRAND DETAIL
½"=1'-0"



END REINFORCEMENT DETAIL
½"=1'-0"

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5	60	7'-2", 1'-8¼", 3½"
G2*	#4	60	
G3*	#3	60	4⅛"
G4	#5	60	
G4A	#5	60	
G5	#6	60	---
G5A	#6	60	---
G6	#4	60	---
G7	#3	60	(A) - 4"
G7A	#3	60	(A) - 2 (BLOCKOUT + 2")
G8	#8	60	6'-4½", 3'-6", 1'-3"
G9	#4	60	4'-0"
G9A	#4	60	2'-0"
G10*	#4	60	3½", 17", 4", 4½", 13⅛"
G11	#3	60	3'-11"

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE PRESTRESSED GIRDER GENERAL DETAILS AND PRESTRESSED WF GIRDER DETAILS SHEETS FOR NOTES, DIAPHRAGM DOWEL DETAILS, END DETAILS AND DEFLECTION DATA.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

GIRDER WEIGHT.....1017 LB/FT

REVISIONS			
NO.	DATE	BY	DESCRIPTION
△			
△			
△			
△			
△			

DESIGNED
DESIGN CHECKED
DETAILED
DWG. CHECKED
CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY

CADD FILE NAME
Standards/Bridge Standard Drawings/B05_3N.DGN

DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT
YOUR Safety→YOUR Mobility→YOUR Economic Opportunity

APPROVED BY:
BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:

ENGLISH

PROJECT NO.

WF83G PRESTRESSED GIRDER

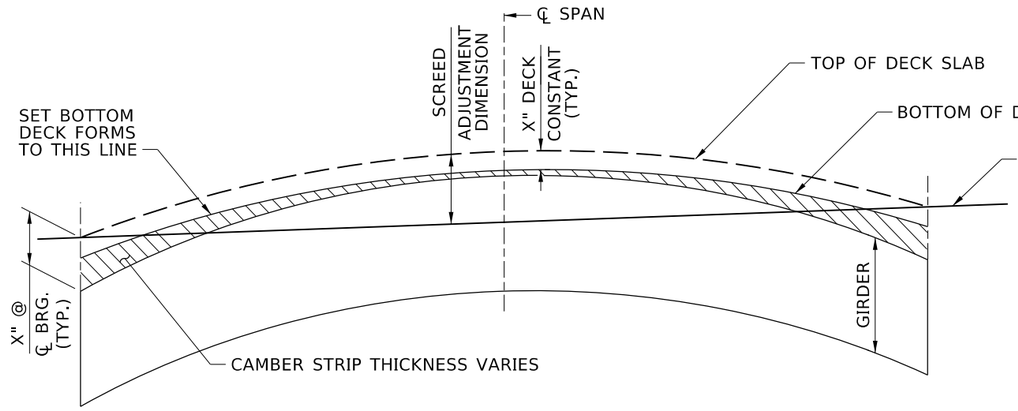
BRIDGE LRFD DESIGN MANUAL B5.3N

BRIDGE PLANS

BRIDGE KEY NO.

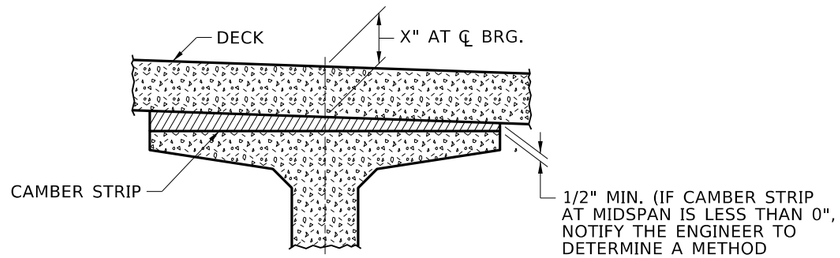
COUNTY | KEY NO.

BRIDGE DWG. NO. | SHEET OF



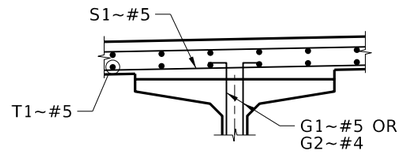
SCREED ADJUSTMENT DIAGRAM

NTS

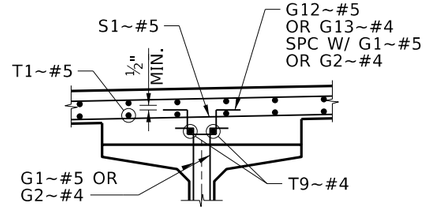


CAMBER STRIP DETAIL

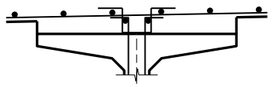
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TYPICAL HAUNCH DETAIL



MODIFIED HAUNCH DETAIL

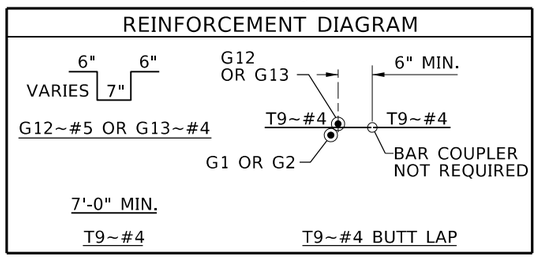


G12 & G13 ADJUSTMENT RANGE

HAT BAR DETAILS

(BULB TEE GIRDERS SHOWN, AASHTO & WF GIRDERS SIMILAR)

¾"=1'-0"



NOTE:

A. ADD HAT BARS G12, G13, AND T9 WHERE THE GIRDER STIRRUPS (G1 AND G2 BARS) DO NOT RISE ABOVE THE BOTTOM MAT OF REINFORCEMENT.

B. ADDITIONAL G12, G13, AND T9 BARS WILL BE PAID FOR AT THE CONTRACT UNIT PRICE FOR METAL REINF. SCH. NO. 2.

NOTES

DOWELS

1. PROVIDE DOWELS BY ANY OF THE FOLLOWING METHODS:
   a. PROVIDE COIL ROD INSERTS AND THREADED DOWELS, IF THE ULTIMATE STRENGTH OF THE INSERT IS IN ACCORDANCE WITH THE FOLLOWING:

BAR SIZE	MINIMUM ULTIMATE TENSION CAPACITY (LBS.)
#4	12,000
#5	18,600
#6	26,400

   b. ON INTERIOR GIRDERS ONLY, 1½"Ø HOLES MAY BE PROVIDED DURING FABRICATION AND DOWELS GROUTED IN PLACE AFTER DELIVERY TO THE JOB SITE.
2. PLACE END DIAPHRAGM DOWELS PARALLEL TO ℄ BEARING.

SHOP DRAWINGS

3. PROVIDE SHOP DRAWING DETAILS THAT CONFORM TO CURRENT AASHTO SPECIFICATIONS. SHOW DETENSIONING SEQUENCE AND GIRDER LIFT POINTS ON SHOP DRAWINGS.
4. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 506.03 AND 105.02.
5. LATERALLY RESTRAIN THE GIRDER DURING TRANSPORTATION AND ERECTION. SHOW THE METHOD OF LATERAL RESTRAINT ON THE SHOP DRAWINGS.
6. PROVIDE DESIGN CALCULATIONS AND SHOW THE DETAILS ON THE SHOP DRAWINGS IF TEMPORARY STRANDS ARE ADDED IN THE TOP FLANGE FOR HANDLING, TRANSPORTATION, OR ERECTION. PROVIDE A REVISED DEFLECTION DATA TABLE AND SCREED ADJUSTMENT TABLE. APPROVED CHANGES AT THE CONTRACTOR'S EXPENSE.

MISCELLANEOUS GIRDER DETAILS

7. WELDED WIRE REINFORCEMENT STIRRUPS MAY BE PROVIDED IN ACCORDANCE WITH THE DETAILS SHOWN ON THE OPTIONAL PRESTRESSED GIRDER WWR DETAILS SHEET.
8. PROVIDE GIRDERS WITH ENDS THAT ARE PLUMB WHEN SET TO GRADE.
9. DIMENSION Ⓐ IN THE PRESTRESSED GIRDER SCHEDULE TABLE IS A HORIZONTAL DIMENSION. CORRECT THE FINISHED GIRDER LENGTH FOR GRADE AND PROVIDE AN ALLOWANCE FOR BEAM SHORTENING.
10. SEE SHEET ___ FOR TEMPORARY DIAPHRAGM DETAILS.
11. BLOCK OUT TOP FLANGE OF BULB TEE AND WF GIRDERS TO ALLOW PLACEMENT OF CONCRETE FOR THE END DIAPHRAGMS.
12. IF THE TOP FLANGE OVERHANG IS USED FOR SUPPORT OF DECK FORMS OR SCREEDS, APPROVAL OF THE METHOD TO BE USED IS REQUIRED BEFORE CASTING OF THE BEAMS. SHOW THE METHOD OF DECK FORM AND SCREED SUPPORT ON SHOP DRAWINGS, AND DESIGN THE REINFORCEMENT ACCORDINGLY.
13. GIRDER ERECTION/DECK PLACEMENT ASSUMED TO OCCUR WITHIN 60-90 DAYS AFTER GIRDER FABRICATION.
14. FABRICATE IN ACCORDANCE WITH 506.

STRAND

15. DESIGN BASED UPON 0.6" DIA. AASHTO M203 LOW RELAXATION STRAND.

GIRDER SHIPPING

16. DO NOT SHIP PRESTRESSED CONCRETE MEMBERS UNTIL TESTS ON CONCRETE CYLINDERS MANUFACTURED FROM THE SAME CONCRETE AND CURED UNDER THE SAME CONDITIONS AS THE GIRDERS INDICATE THAT THE CONCRETE OF THE PARTICULAR MEMBER HAS ATTAINED A COMPRESSIVE STRENGTH EQUAL TO THE SPECIFIED DESIGN 28 DAY COMPRESSIVE STRENGTH.

BASIS OF PAYMENT

17. PRESTRESSING CONCRETE MEMBERS IS INCIDENTAL TO THE PRECAST AND PRESTRESSED PAY ITEMS IN 502.

SCREED ADJUSTMENT DIMENSIONS AT ℄ OF GIRDERS

0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	SPAN (TENTH POINTS)
0										0	SCREED ADJUSTMENT DIMENSION - INCHES

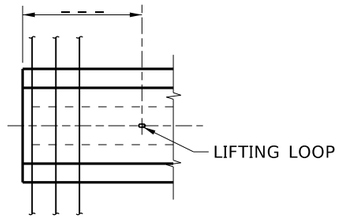
DEFLECTION DATA ~ INCHES

LOCATION	ΔP PRESTRESS	ΔG GIRDER	∑Δ * ΔP + ΔG	Δ1 ** 1.55 ΔP + 1.65 ΔG	ΔS NON COMP. DL	ΔC COMP. DL	Δ2 ΔS + ΔC
	↑	↓	↑	↑	↓	↓	↓
	↑	↓	↑	↑	↓	↓	↓

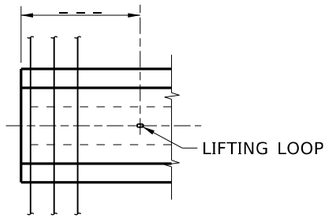
*ESTIMATED DEFLECTION OF PRESTRESSED GIRDER AT RELEASE

**ESTIMATED DEFLECTION OF PRESTRESSED GIRDER AT GIRDER ERECTION/DECK PLACEMENT

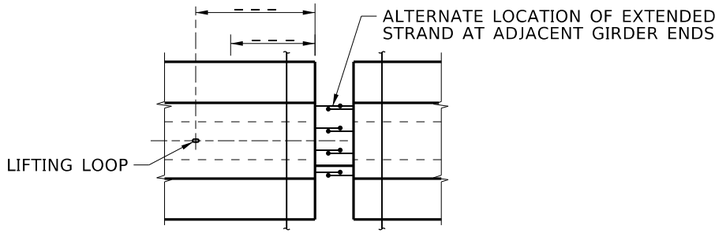
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PRESTRESSED GIRDER GENERAL DETAILS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards\Bridge Standard Drawings\				COUNTY / KEY NO.
				DWG. CHECKED	B05_3O_1.DGN			BRIDGE LRFD DESIGN MANUAL, B5.3O-1	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			



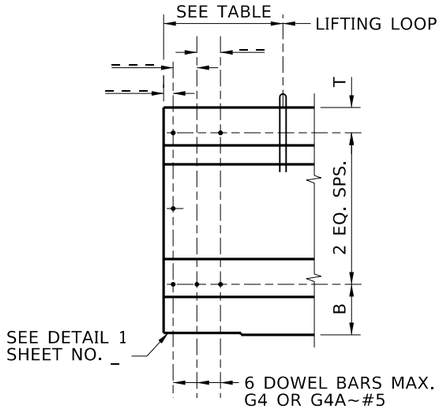
PLAN



PLAN

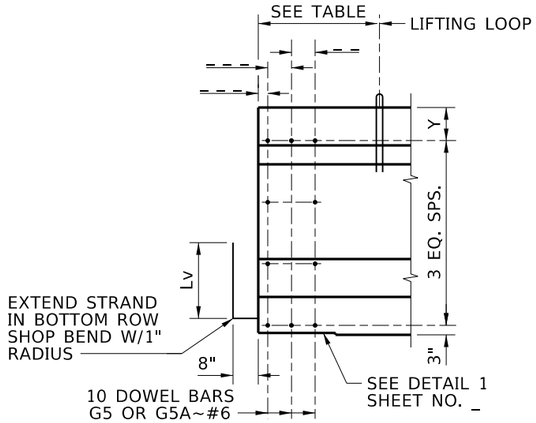


PLAN



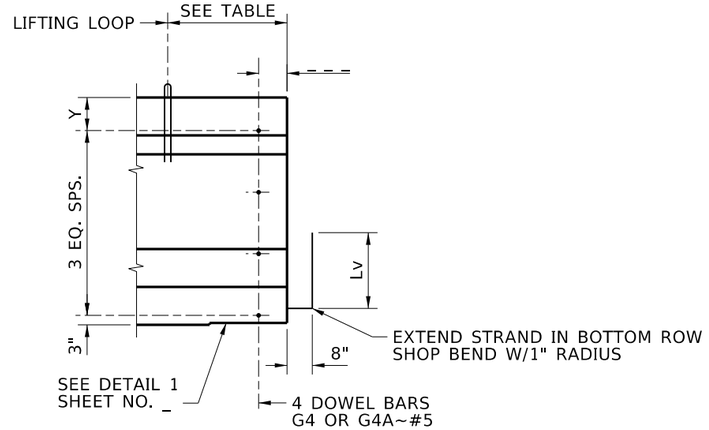
ELEVATION

TYPE A
EXPANSION



ELEVATION

TYPE B
FIXED

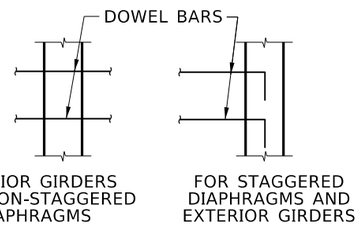


ELEVATION

TYPE C
POSITIVE MOMENT
CONNECTION

GIRDER END DETAILS

1/4"=1'-0"



INTERMEDIATE DIAPHRAGM DOWEL DETAILS

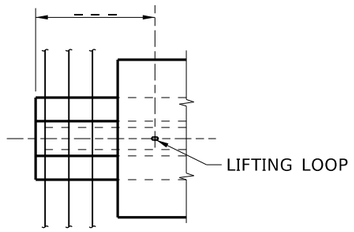
1/4"=1'-0"

	MIN.	MAX.
RELEASE		
ERECTION		

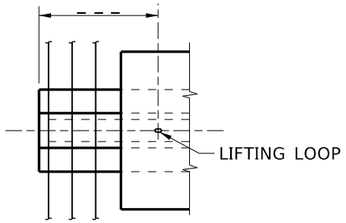
LIFT LOOP LOCATION

END DETAILS				TYPE B & TYPE C	
GIRDER TYPE	B	T	Y	NO. STRANDS	Lv
2	15"	12"	12"	2	35"
3	18"	15"	15"	4	24"
4	20"	17"	17"	4	32"

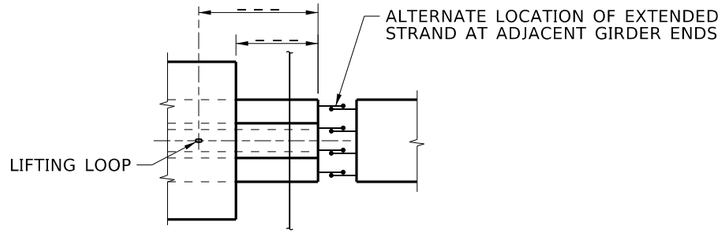
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PRESTRESSED AASHTO GIRDER DETAILS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards\Standard Bridge Drawings\B05_3O_2.DGN.dgn				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B5.3O-2	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



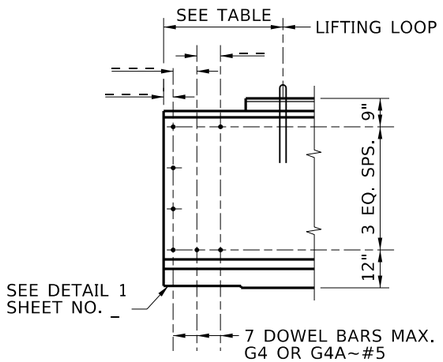
PLAN



PLAN

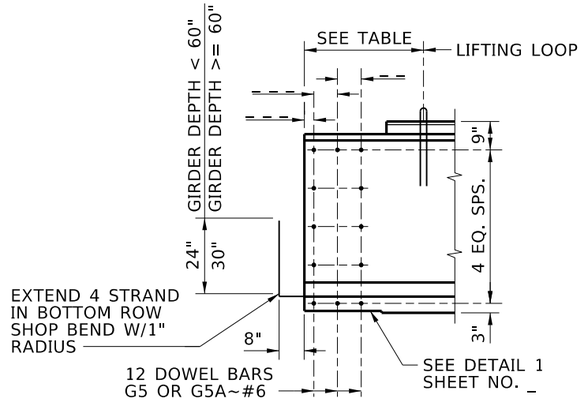


PLAN



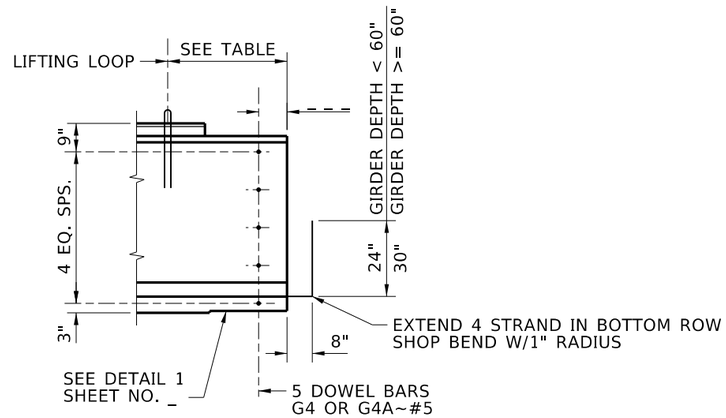
ELEVATION

TYPE A
EXPANSION



ELEVATION

TYPE B
FIXED

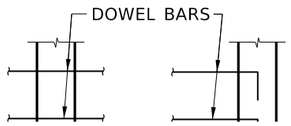


ELEVATION

TYPE C
POSITIVE MOMENT
CONNECTION

GIRDER END DETAILS

¼"=1'-0"



INTERIOR GIRDERS
WITH NON-STAGGERED
DIAPHRAGMS

FOR STAGGERED
DIAPHRAGMS AND
EXTERIOR GIRDERS

INTERMEDIATE DIAPHRAGM DOWEL DETAILS

¼"=1'-0"

	MIN.	MAX.
RELEASE		
ERECTION		

LIFT LOOP LOCATION

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGNED
DESIGN CHECKED
DETAILED
DWG. CHECKED
CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY

CADD FILE NAME
Standards\Standard Bridge Drawings\B05_3O_3.DGN.dgn

DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT
YOUR Safety→YOUR Mobility→YOUR Economic Opportunity

APPROVED BY:
BRIDGE ENGINEER MICHAEL T. JOHNSON DATE: _____

ENGLISH

PROJECT NO.

PRESTRESSED BULB TEE GIRDER DETAILS

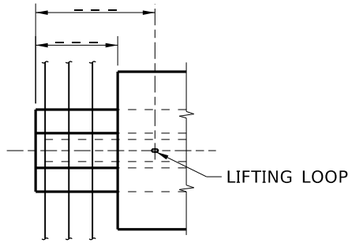
BRIDGE LRFD DESIGN MANUAL, B5.3O-3

BRIDGE PLANS

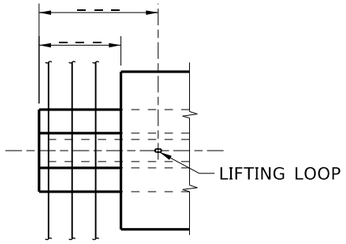
BRIDGE KEY NO.

COUNTY | KEY NO.

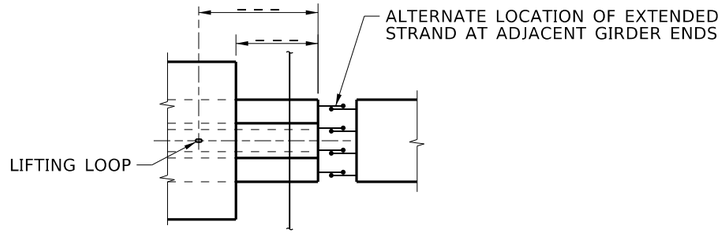
BRIDGE DWG. NO. | SHEET OF



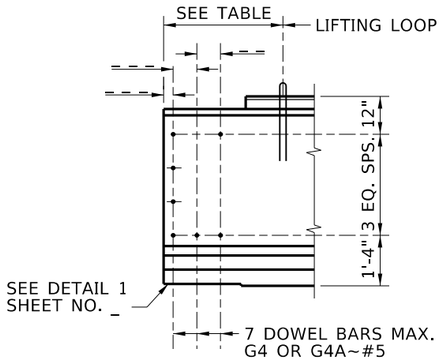
PLAN



PLAN

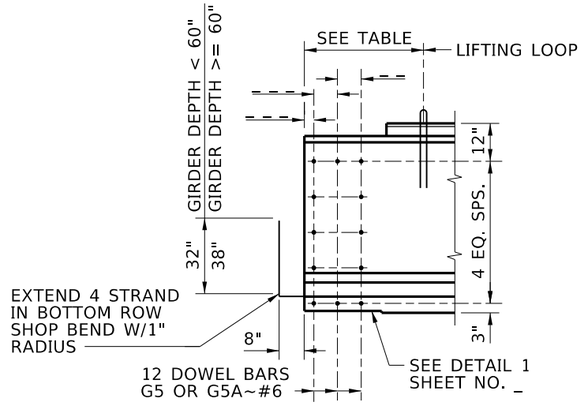


PLAN



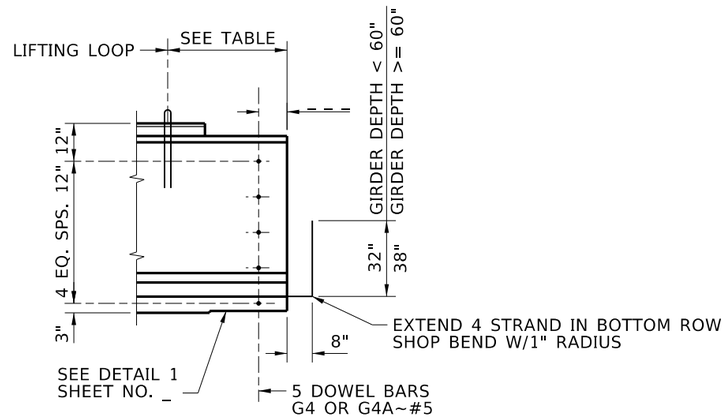
ELEVATION

TYPE A
EXPANSION



ELEVATION

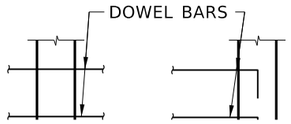
TYPE B
FIXED



ELEVATION

TYPE C
POSITIVE MOMENT
CONNECTION

GIRDER END DETAILS
¼"=1'-0"



INTERIOR GIRDERS
WITH NON-STAGGERED
DIAPHRAGMS

FOR STAGGERED
DIAPHRAGMS AND
EXTERIOR GIRDERS

INTERMEDIATE DIAPHRAGM DOWEL DETAILS
¼"=1'-0"

	MIN.	MAX.
RELEASE		
ERECTION		

LIFT LOOP LOCATION

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGNED
DESIGN CHECKED
DETAILED
DWG. CHECKED
CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY

CADD FILE NAME
Standards\Standard Bridge Drawings\B05_3O_4.DGN.dgn

DRAWING DATE:
DEC 2024

IDAHO TRANSPORTATION DEPARTMENT
YOUR Safety→YOUR Mobility→YOUR Economic Opportunity

APPROVED BY:
BRIDGE ENGINEER MICHAEL T. JOHNSON DATE: _____

ENGLISH

PROJECT NO.

PRESTRESSED WF GIRDER DETAILS

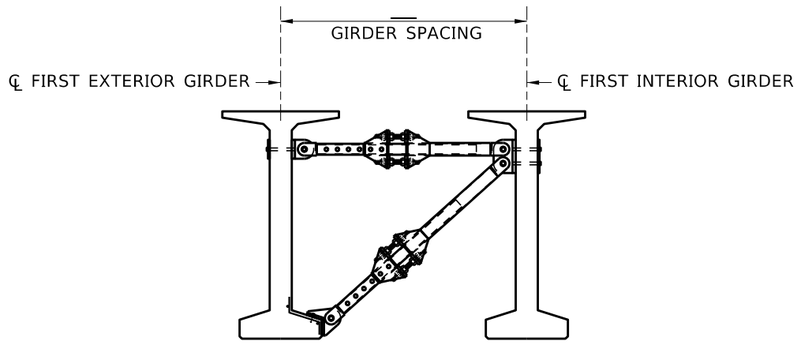
BRIDGE LRFD DESIGN MANUAL, B5.3O-4

BRIDGE PLANS

BRIDGE KEY NO.

COUNTY | KEY NO.

BRIDGE DWG. NO. | SHEET OF



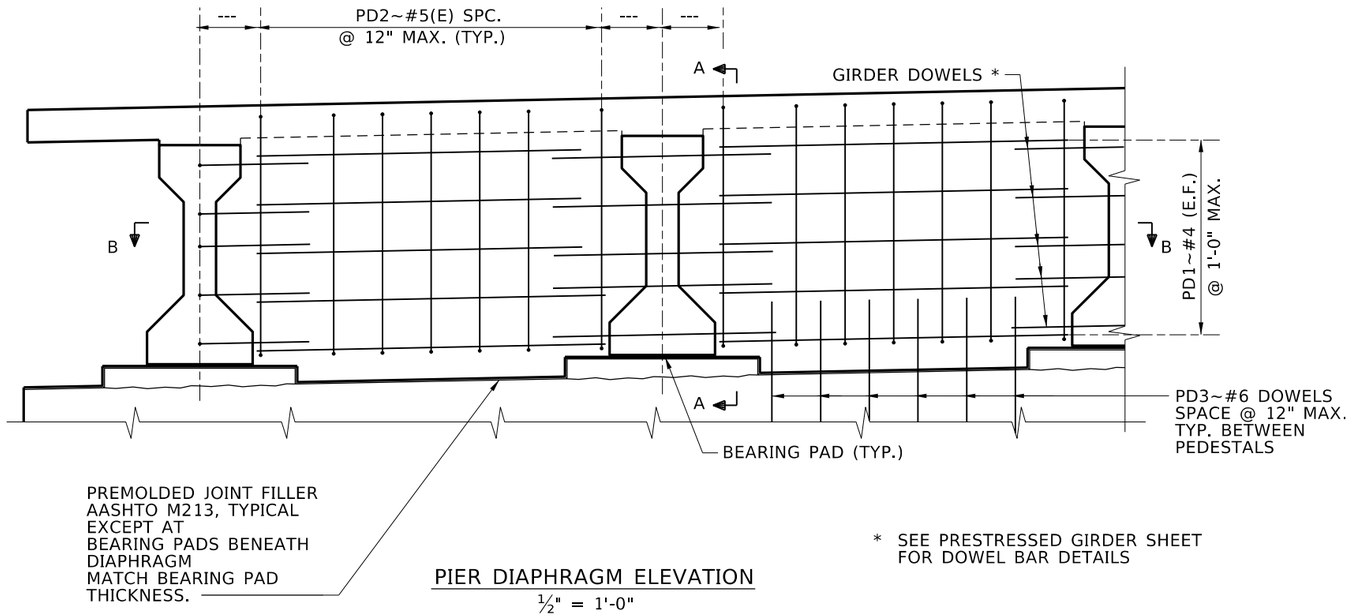
CONCEPT DETAIL
TEMPORARY DIAPHRAGM
SCALE=1'-0"

TEMPORARY DIAPHRAGM NOTES

1. DESIGN TEMPORARY DIAPHRAGMS TO RESIST CONSTRUCTION LOADS. ASSUME THE DECK FINISHING MACHINE CARRIAGE IS AT THE MOST ADVERSE POSITION WHEN COMPUTING CONSTRUCTION LOADS.
2. SUBMIT DESIGN CALCULATIONS AND TEMPORARY DIAPHRAGM DETAILS SIGNED AND SEALED BY AN IDAHO LICENSED PROFESSIONAL ENGINEER. CLEARLY SPECIFY THE MATERIALS BEING USED.
3. PROVIDE AND INSTALL TEMPORARY DIAPHRAGMS BETWEEN THE EXTERIOR GIRDER AND FIRST INTERIOR GIRDER ON AASHTO, BULB TEE, AND WF GIRDERS ≥ 66" IN DEPTH AND AT END DIAPHRAGMS BEFORE POURING THE PERMANENT INTERMEDIATE DIAPHRAGMS AND END DIAPHRAGM.
4. LOCATE TEMPORARY DIAPHRAGMS MIDWAY BETWEEN PERMANENT INTERMEDIATE DIAPHRAGMS AS SHOWN.
5. REMOVE TEMPORARY DIAPHRAGMS AFTER REMOVING DECK OVERHANG BRACKETS.
6. TEMPORARY DIAPHRAGMS INCIDENTAL TO PRESTRESSED GIRDER PAY ITEM.
7. TEMPORARY DIAPHRAGM DETAILS SHOWN ON OREGON DOT STANDARD DRAWING BR350 ARE ACCEPTABLE.

TEMPORARY DIAPHRAGM LAYOUT
SCALE=1'-0"

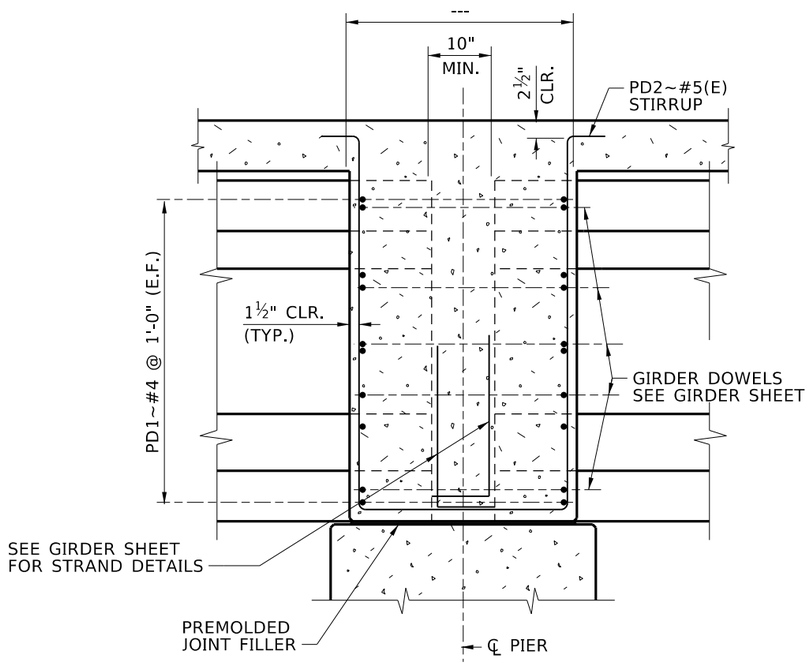
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	TEMPORARY DIAPHRAGM DETAILS	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
1				DETAILED	Standards/Bridge Standard Drawings/B05_3P.DGN.dgn				COUNTY	KEY NO.
2				DWG. CHECKED	DRAWING DATE: OCT 2023	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B5.3P	BRIDGE DWG. NO.	SHEET OF
3				CORRECTIONS						
4										
5										



PIER DIAPHRAGM ELEVATION

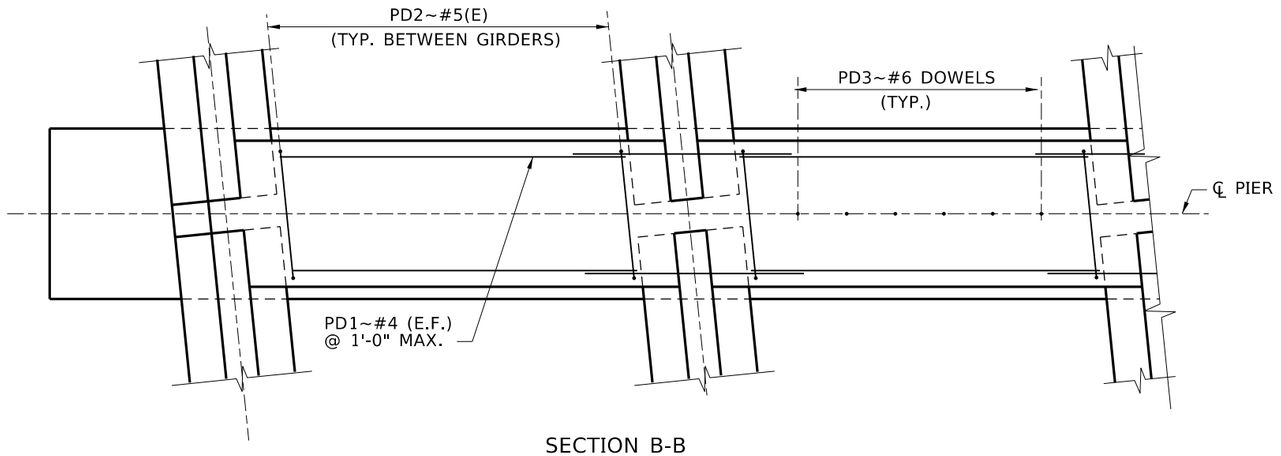
½" = 1'-0"

* SEE PRESTRESSED GIRDER SHEET FOR DOWEL BAR DETAILS



SECTION A-A

½" = 1'-0"



SECTION B-B

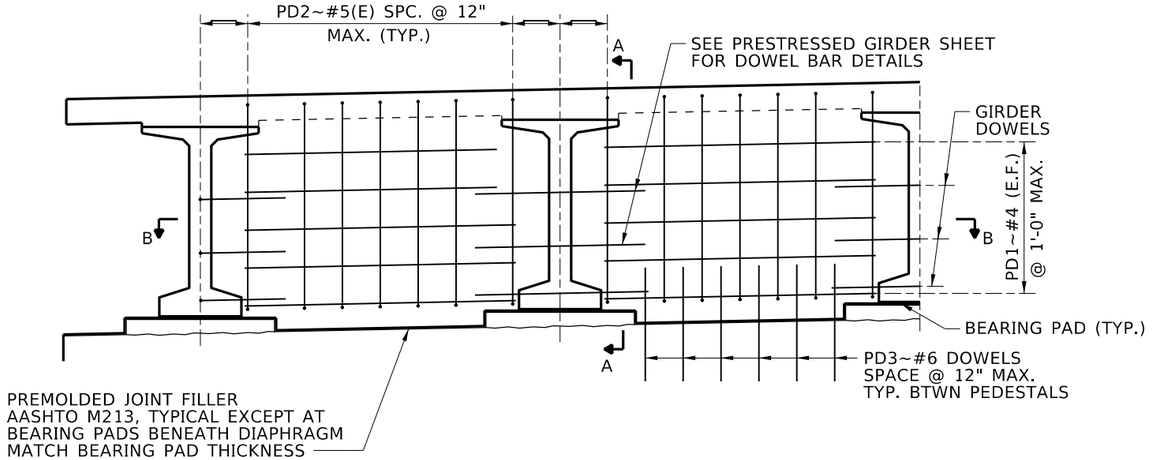
½" = 1'-0"

NOTE:
NO HORIZONTAL CONSTRUCTION JOINTS ALLOWED BETWEEN TOP SLAB AND PIER DIAPHRAGM

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PIER DIAPHRAGM	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED					BRIDGE KEY NO.	
				DETAILED	CADD FILE NAME		PROJECT NO.		COUNTY	KEY NO.
				DWG. CHECKED	Standards\Standard Bridge Drawings\B05_3Q-1.DGN			AASHTO GIRDERS BRIDGE LRFD DESIGN MANUAL, B5.3Q-1		
				CORRECTIONS	DRAWING DATE: DEC 2024				BRIDGE DWG. NO.	SHEET OF

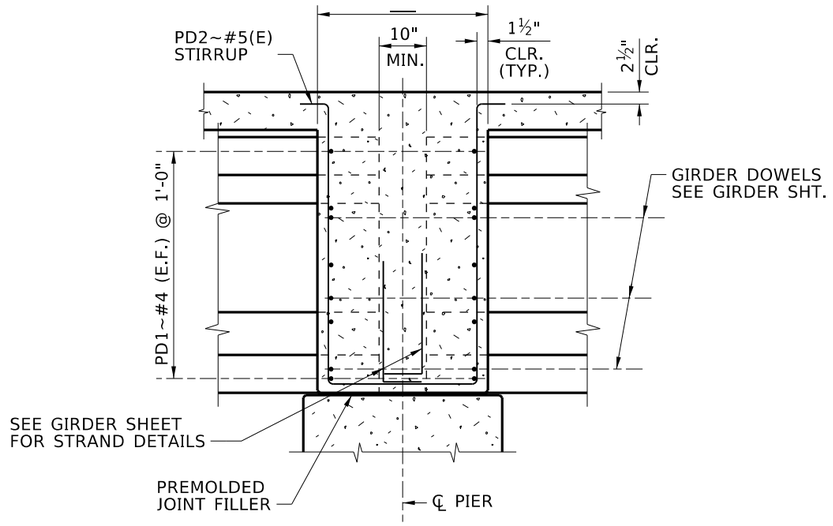
YOUR Safety→YOUR Mobility→YOUR Economic Opportunity

APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:



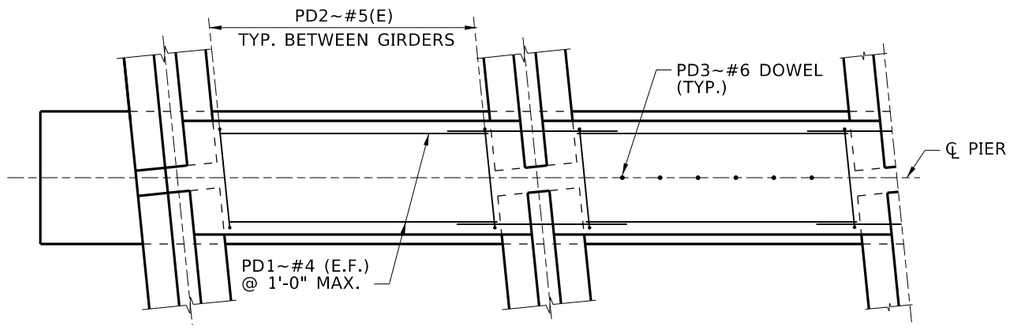
PIER DIAPHRAGM ELEVATION

1/4"=1'-0"



SECTION A-A

3/8"=1'-0"



SECTION B-B

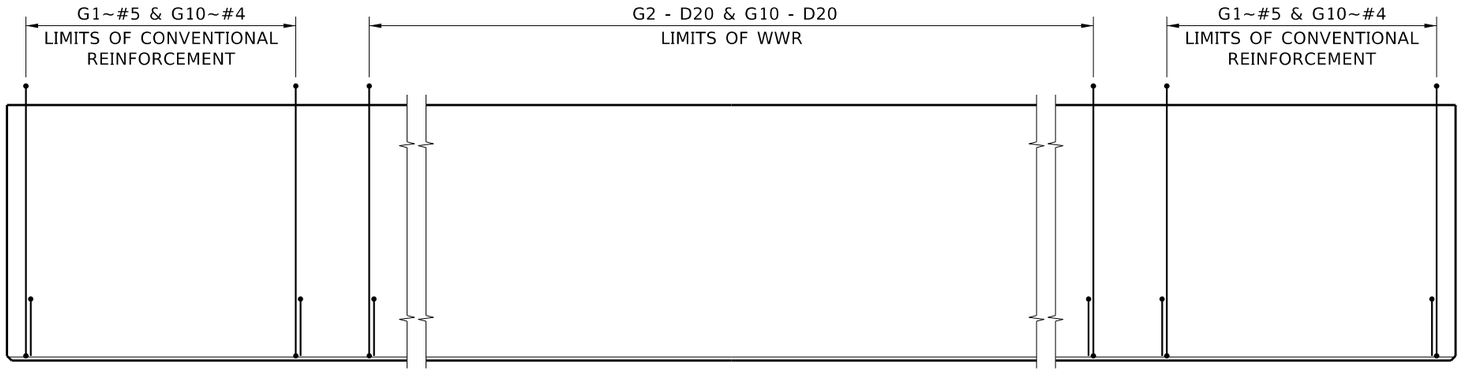
1/4"=1'-0"

NOTE:
NO HORIZONTAL CONSTRUCTION
JOINTS ALLOWED BETWEEN TOP
SLAB AND PIER DIAPHRAGM

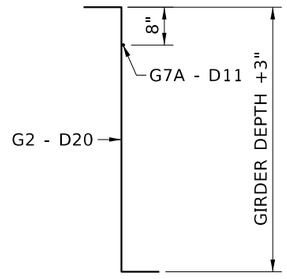
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PIER DIAPHRAGM	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED		YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	CADD FILE NAME			BULB TEE AND WF GIRDER	COUNTY / KEY NO.
				DWG. CHECKED	DX\prj\XXXXX\Proj\Dev\Bridge\Plans B05_3Q-2.dgn			BRIDGE LRFD DESIGN MANUAL, B5.3Q-2	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			

NOTES

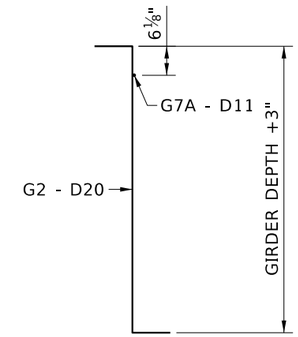
1. PROVIDE DEFORMED WELDED WIRE REINFORCEMENT (WWR) IN ACCORDANCE WITH AASHTO M336.
2. PROVIDE WWR OF THE SAME SIZE AND SPACING FOR G2~#4, G10~#4, G7A~3 AND G11~#3 CONVENTIONAL REINFORCEMENT.



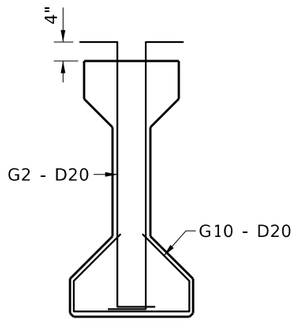
ELEVATION
NTS



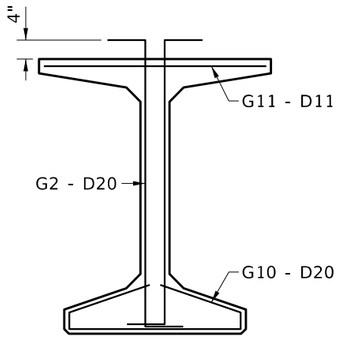
G2 - D20
AASHTO GIRDER



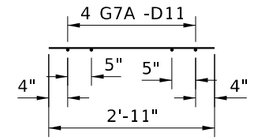
G2 - D20
BULB TEE OR WF GIRDER



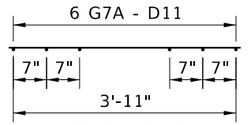
AASHTO GIRDERS
NTS



BULB TEE OR WF GIRDERS
NTS

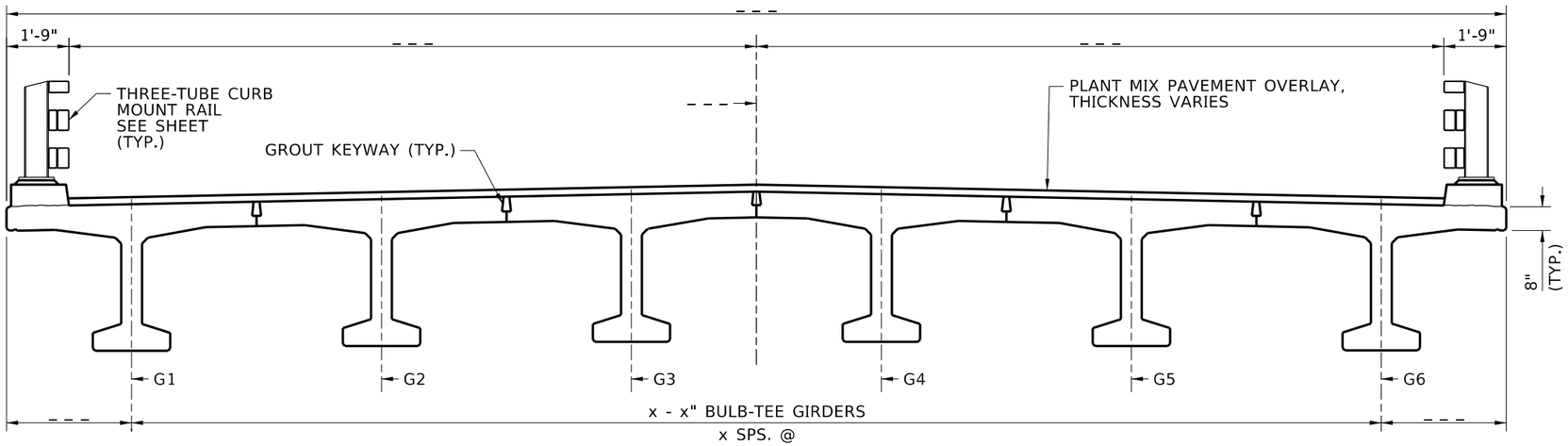


G11 - D11
BULB TEE GIRDER



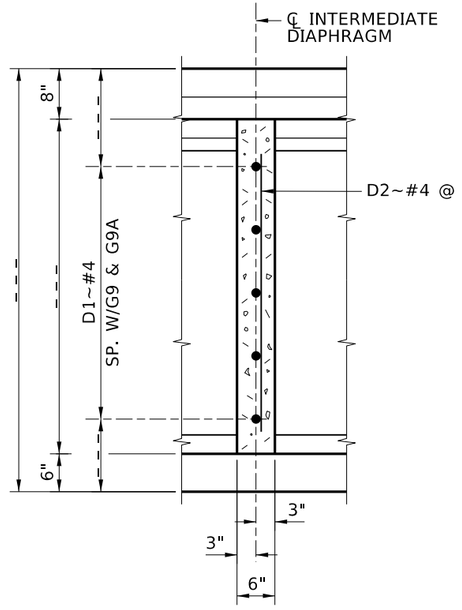
G11 - D11
WF GIRDER

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	OPTIONAL PRESTRESSED GIRDER WWR DETAILS	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED					BRIDGE KEY NO.	
				DETAILED	CADD FILE NAME Standards/Bridge Standard Drawings/ B05_3R.DGN	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		COUNTY	KEY NO.
				DWG. CHECKED				BRIDGE LRFD DESIGN MANUAL, B5.3R	BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS	DRAWING DATE: OCT 2023	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:				



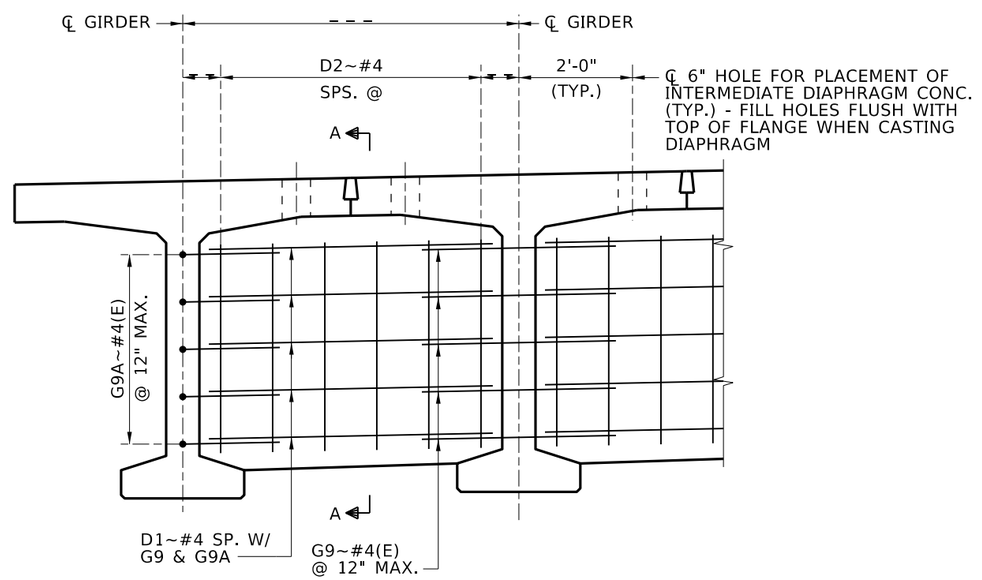
TYPICAL SECTION

¼"=1'-0"



SECTION A-A

½"=1'-0"



ELEVATION - TYPICAL INTERMEDIATE DIAPHRAGM

⅜"=1'-0"

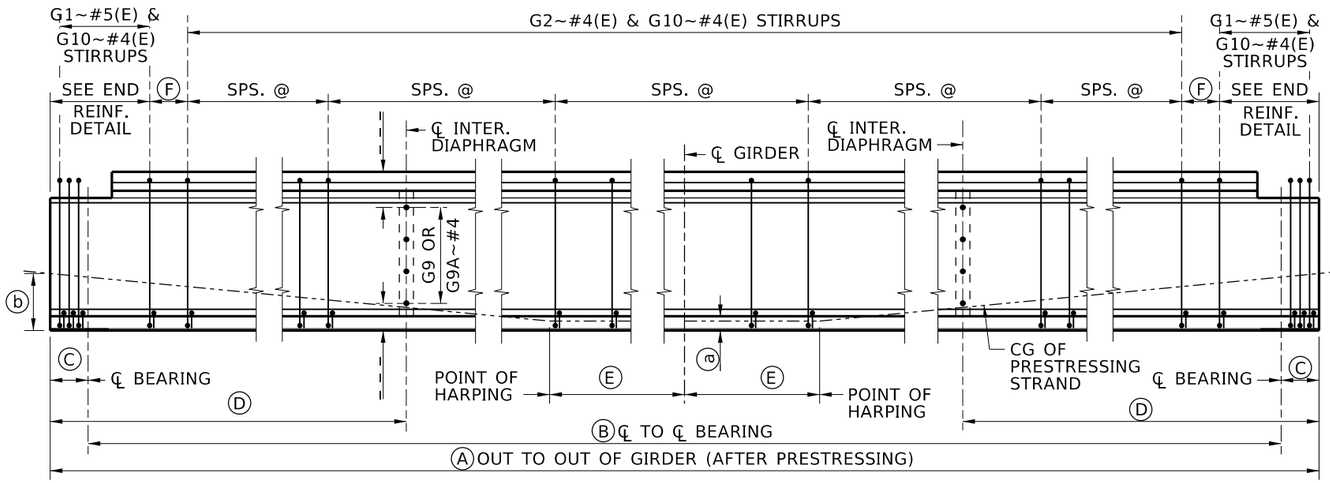
GIRDER NOTES

1. REFER TO SPECIAL PROVISIONS FOR REQUIREMENTS FOR ALTERNATE PRECAST PRESTRESSED GIRDER SECTIONS.
2. THE CURB MAY BE CAST DIRECTLY ONTO THE EXTERIOR GIRDERS IN THE PRECAST YARD BEFORE SHIPPING TO JOB SITE. THE CURB MUST BE A SECONDARY CAST. THIS METHOD REQUIRES APPROVAL BEFORE CASTING THE GIRDERS. SHOW DETAILS ON THE SHOP DRAWINGS.
3. PROVIDE A SCREED OR FLOAT FINISH TO THE TOP SURFACE OF THE GIRDER IN ACCORDANCE WITH 502.03.
4. SHOW THE SIZE AND LOCATION OF CAST-IN HOLES AND ANCHORS ON THE SHOP PLANS. FIELD-DRILLED HOLES ARE NOT PERMITTED.
5. PROVIDE TEMPORARY BRACING AT EACH END OF THE GIRDER TO MAINTAIN GIRDER STABILITY. PLACE TEMPORARY BRACING BEFORE RELEASING THE GIRDER FROM THE ERECTION EQUIPMENT. REMOVE TEMPORARY BRACING AS NOTED IN THE CONSTRUCTION SEQUENCE. SUBMIT TEMPORARY BRACING LOCATIONS, BRACING AND CONNECTION DETAILS AND ANY REQUIRED ADDITIONAL GIRDER REINFORCEMENT ON THE SHOP PLANS. PROVIDE TEMPORARY BRACING DESIGN AND DETAILS THAT ARE SIGNED AND SEALED BY AN IDAHO LICENSED PROFESSIONAL ENGINEER.
6. SUBMIT A METHOD OF EQUALIZING THE DECK BULB TEE GIRDER CAMBERS FOR REVIEW AND APPROVAL. EQUALIZE GIRDER CAMBERS UTILIZING THE APPROVED METHOD WHEN THE DIFFERENCE IN GIRDER CAMBERS BETWEEN ADJACENT GIRDERS MEASURED AT MID-SPAN EXCEEDS ¼ INCH. NOTIFY THE ENGINEER BEFORE GIRDER EQUALIZATION WHEN CAMBERS BETWEEN ADJACENT GIRDERS EXCEEDS 1.5 INCHES. GIRDER CAMBER EQUALIZATION IS A PROGRESSIVE OPERATION THAT REQUIRES STARTING AT THE LOCATION OF MAXIMUM CAMBER DIFFERENCE AND PROGRESSING TO THE LOCATION OF MINIMUM CAMBER DIFFERENCE.
7. SANDBLAST, CLEAN, AND GROUT KEYWAYS LEVEL WITH SURROUNDING GIRDER SURFACES AFTER WELD TIE CONNECTIONS HAVE BEEN NSTALLED.
8. PROVIDE GROUT TYPE "B", CLASS I NON-METALLIC, NON-SHRINK IN ACCORDANCE WITH 705.02.
9. NO VEHICULAR TRAFFIC IS ALLOWED ON THE STRUCTURE UNTIL THE KEYWAY GROUT HAS ATTAINED A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI.
10. APPLY TYPE E SPRAY-APPLIED CONCRETE WATERPROOFING SYSTEM ON TOP FLANGES OF GIRDERS IN ACCORDANCE WITH 511-005A. APPLY CURB TO CURB FROM BEGIN BRIDGE TO END BRIDGE AND ON APPROACH SLABS.
11. PLACE PLANT MIX PAVEMENT OVERLAY CURB TO CURB BEGIN BRIDGE TO END BRIDGE AND APPROACH SLABS. SEE ROADWAY PLANS FOR QUANTITIES.
12. CONSTRUCTION SEQUENCE:
    A. ERECT GIRDERS AND INSTALL TEMPORARY BRACING.
    B. EQUALIZE GIRDER CAMBER, INSTALL WELD TIE CONNECTIONS (MINIMUM OF 3, SEE NOTE 6), RELEASE EQUALIZING EQUIPMENT, MOVE EQUALIZING EQUIPMENT TO NEXT LOCATIONS, AND REPEAT THIS STEP AS NEEDED.
    C. INSTALL REMAINING WELD TIE CONNECTIONS.
    D. GROUT SHEAR KEY, CAST INTERMEDIATE DIAPHRAGMS, AND CAST END DIAPHRAGMS AFTER WELD TIE CONNECTIONS HAVE BEEN INSTALLED.
    E. REMOVE TEMPORARY BRACING.
13. SUBMIT PRECAST GIRDER SHOP DRAWINGS AT THE SAME TIME AS THE CURB MOUNT RAIL SHOP DRAWINGS.
14. PLACE GIRDERS PERPENDICULAR TO THE CROSS-SLOPE WHEN THE CROSS SLOPE IS ≤ 4%.
15. WELDED WIRE REINFORCEMENT STIRRUPS MAY BE PROVIDED IN ACCORDANCE WITH THE DETAILS SHOWN ON THE OPTIONAL PRESTRESSED GIRDER WWR DETAILS SHEET.

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	TYPICAL DECK BULB TEE SECTION AND DETAILS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_4A.DGN			OFF SYSTEM AND LOCAL ROADS BRIDGE LRFD DESIGN MANUAL, B5.4A	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

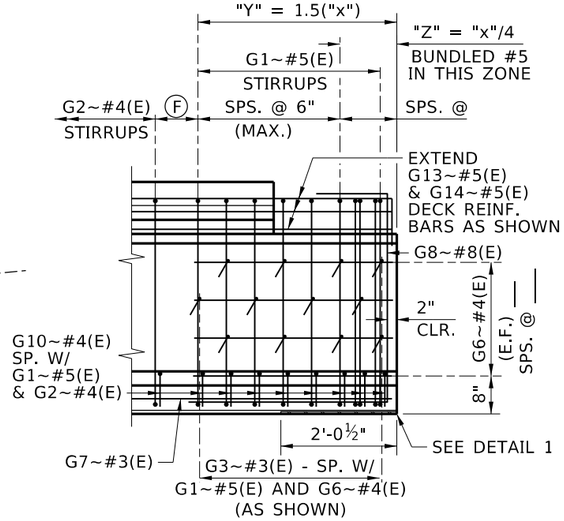
PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



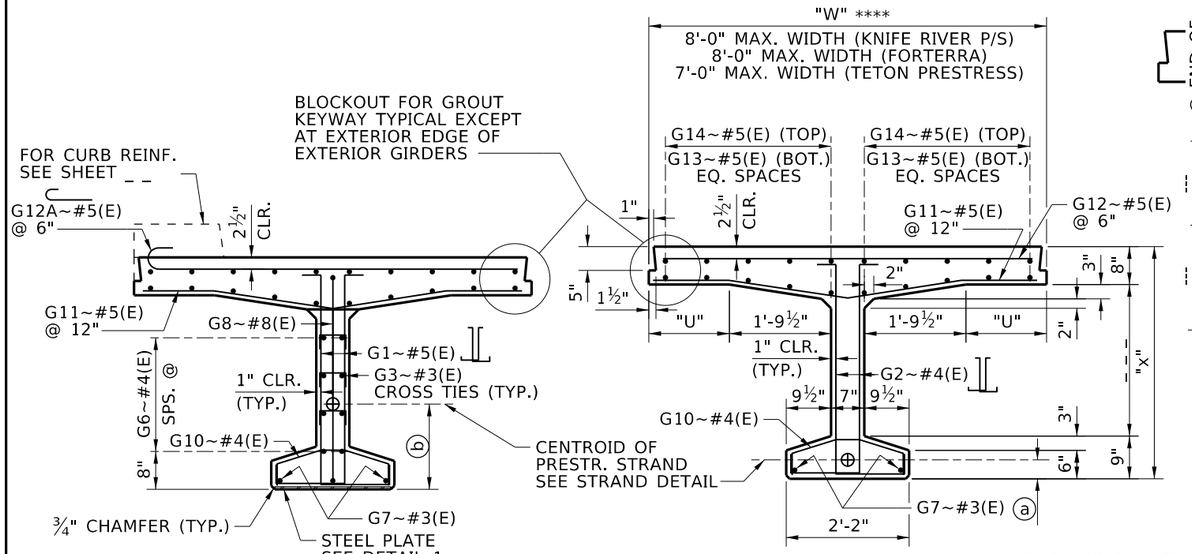
GIRDER ELEVATION AND STIRRUP LAYOUT

3/8"=1'-0"



END REINFORCEMENT DETAIL

3/8"=1'-0"



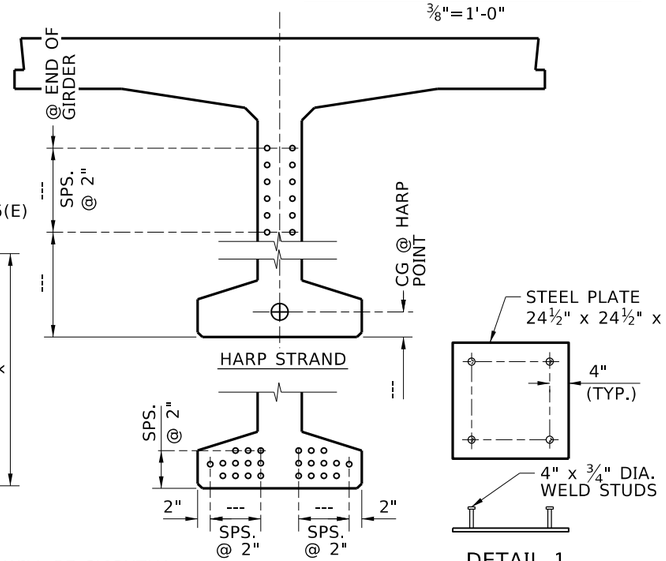
SECTION AT END OF GIRDER

3/8"=1'-0"

SECTION AT ℄ SPAN

3/8"=1'-0"

**** EXACT WIDTH WILL BE SLIGHTLY LESS THAN NOMINAL WIDTH DUE TO GAP BETWEEN TOP FLANGES



STRAND DETAIL

½"=1'-0"

DETAIL 1

3/8"=1'-0"

REINFORCEMENT DIAGRAM

AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1*	#5(E)	60	"x" - 6", 1'-2½", 4¼"
G2*	#4(E)	60	
G3*	#3(E)	60	5"
G5	#6(E)	60	INT GIRDER
G5A	#6(E)	60	EXT GIRDER
G6	#4(E)	60	"Y"
G7	#3(E)	60	Ⓐ - 4" (MINIMUM LAP LENGTH=1'-4")
G8*	#8(E)	60	"X" - 6", 3'-6", 1'-3"
G9	#4(E)	60	
G9A	#4(E)	60	
G10	#4(E)	60	10", 5", 3", 4½", 9½"
G11	#5(E)	60	3¾", "U"-1", 2'-0", 2'-0", "U"-1"
G12	#5(E)	60	"w" - 6"
G12A*	#5(E)	60	"w" - 6", ***
G13	#5(E)	60	Ⓐ - 4" (MINIMUM LAP LENGTH=1'-8")
G14**	#5(E)	60	Ⓐ - 4", 10", 10" (MINIMUM LAP LENGTH=2'-2")

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. SEE TYPICAL BULB TEE SECTION AND DETAILS SHEET FOR ADDITIONAL GIRDER NOTES AND DETAILS.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

** HOOKS AT ABUTMENT ENDS ONLY.

***FOR JOINTS OR DISCONTINUITIES IN THE PARAPET, BUNDLE A #4(E) WITH THE G12A BARS FOR A DISTANCE EQUAL TO 8' FROM THE JOINT/DISCONTINUITY.

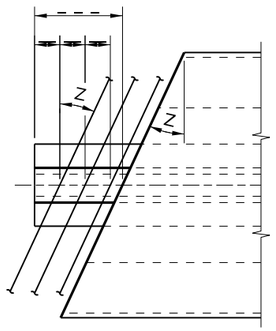
GIRDER WEIGHT.....LB/FT

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PRESTRESSED DECK BULB TEE GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_4B.DGN			OFF SYSTEM AND LOCAL ROADS BRIDGE LRFD DESIGN MANUAL B5.4B	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

DEFLECTION DATA ~ INCHES							
LOCATION	ΔP PRESTRESS	ΔG GIRDER	Σ Δ * ΔP + ΔG	ΔC CURB	Δ1 ** 1.55 ΔP + 1.65(ΔG+ΔC)	ΔD	Δ2 ΔD + ΔWS

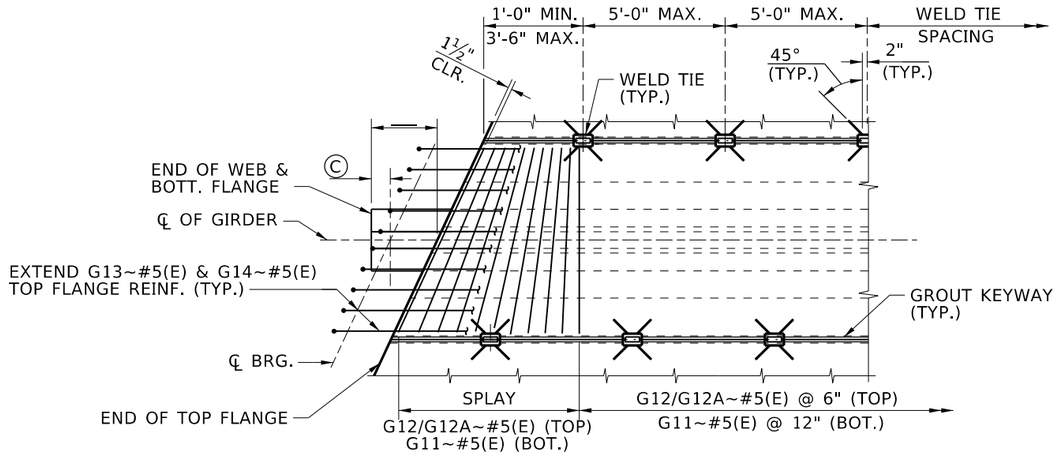
* ESTIMATED DEFLECTION OF PRESTRESSED GIRDER AT RELEASE

** ESTIMATED DEFLECTION OF PRESTRESSED GIRDER AT ERECTION. GIRDER ERECTION ASSUMED TO OCCUR WITHIN 60 TO 90 DAYS AFTER GIRDER FABRICATION



PLAN

3/16"=1'-0"

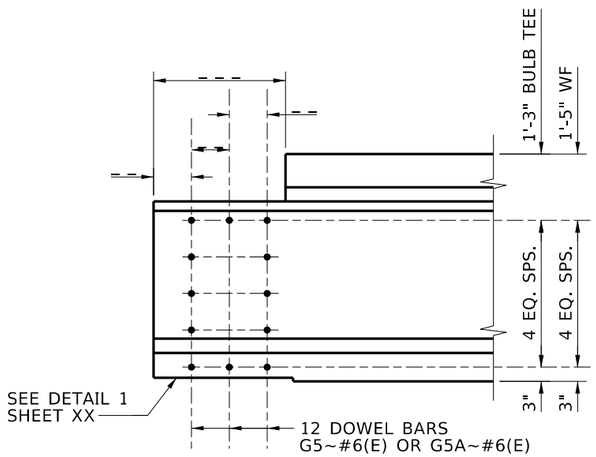


GIRDER PLAN

3/16"=1'-0"

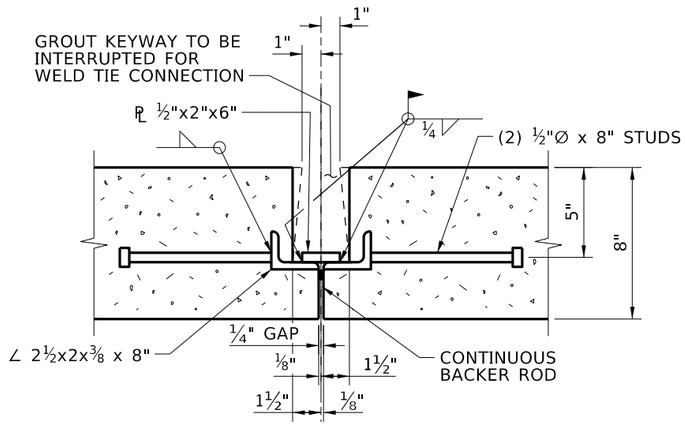
NOTES:

1. OMIT WELD TIES ON EXTERIOR EDGE OF EXTERIOR GIRDER.
2. STRANDS NOT SHOWN.



ELEVATION

TYPE B



GIRDER END DETAILS

⅜"=1'-0"

TYPICAL WELD TIE

1½"=1'-0"

NOTES

DOWELS

1. PROVIDE DOWELS BY ANY OF THE FOLLOWING METHODS:
   a. PROVIDE COIL ROD INSERTS AND THREADED DOWELS, IF THE ULTIMATE STRENGTH OF THE INSERT IS IN ACCORDANCE WITH THE FOLLOWING:

BAR SIZE	MINIMUM ULTIMATE TENSION CAPACITY (LBS.)
#4	12,000
#5	18,600
#6	26,400

   b. 1½"Ø HOLES MAY BE PROVIDED DURING FABRICATION AND DOWELS GROUTED IN PLACE AFTER DELIVERY TO THE JOB SITE.
2. PLACE DOWELS PARALLEL TO ℄ BEARING.

SHOP DRAWINGS

3. PROVIDE SHOP DRAWING DETAILS THAT CONFORM TO CURRENT AASHTO SPECIFICATIONS. SHOW DETENSIONING SEQUENCE AND LIFT POINTS ON THE SHOP DRAWINGS.
4. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 506.03 AND 105.02.
5. LATERALLY RESTRAIN THE GIRDER IN AN UPRIGHT POSITION DURING TRANSPORTATION AND ERECTION. SHOW THE METHOD OF LATERAL RESTRAINT ON THE SHOP DRAWINGS.

MISCELLANEOUS GIRDER DETAILS

6. PROVIDE GIRDERS WITH ENDS THAT ARE PLUMB WHEN SET TO GRADE.
7. DIMENSION Ⓐ IN THE PRESTRESSED GIRDERS SCHEDULE TABLE IS A HORIZONTAL DIMENSION. CORRECT THE FINISHED GIRDER LENGTH FOR GRADE AND PROVIDE AN ALLOWANCE FOR BEAM SHORTENING.
8. BLOCK OUT TOP FLANGE OF BULB TEE AND WF GIRDERS TO ALLOW PLACEMENT OF CONCRETE FOR THE END DIAPHRAGMS.
9. IF THE TOP FLANGE OVERHANG IS USED FOR SUPPORT OF CURB FORMS, APPROVAL OF THE METHOD TO BE USED IS REQUIRED BEFORE CASTING OF THE GIRDERS. SHOW THE METHOD OF CURB FORM SUPPORT ON SHOP DRAWINGS.
10. FABRICATE IN ACCORDANCE WITH 506.

CONCRETE

11. PROVIDE CONCRETE THAT CONFORMS TO 502 EXCEPT THAT ENTRAINED AIR WILL BE 5% ± 1%.

STRAND

12. DESIGN BASED UPON 0.6" DIA. AASHTO M203 LOW RELAXATION STRAND.

DEFLECTION DATA

13. Δ1 INCLUDES THE CURB IF THE CURB IS CAST BEFORE GIRDER ERECTION.
14. ΔD INCLUDES OTHER NON-COMPOSITE LOADS; INTER. DIAPH., METAL RAILING, & PLANT-MIX PAVEMENT.

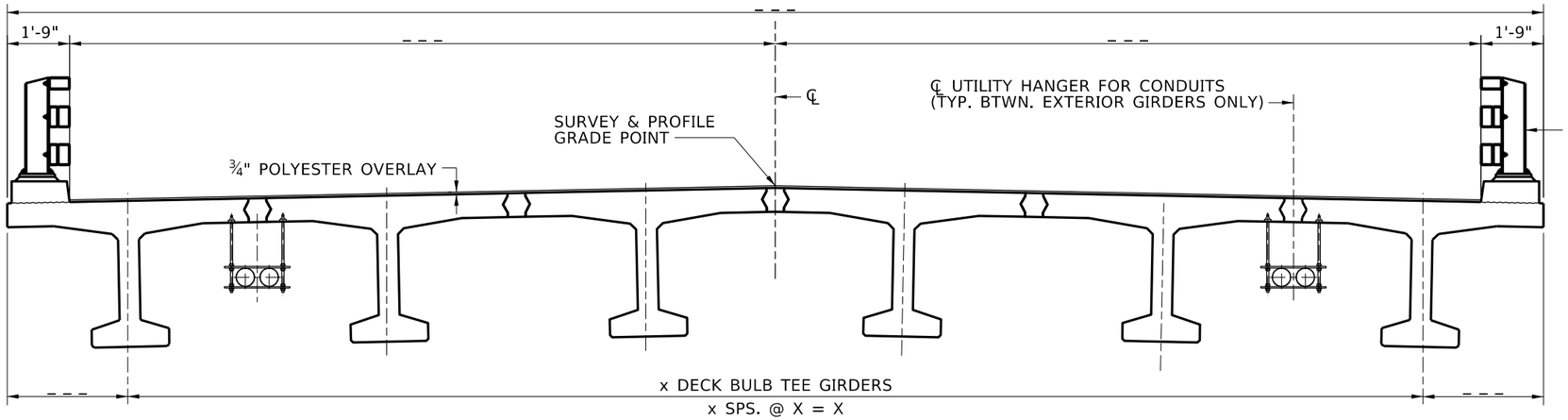
GIRDER SHIPPING

15. DO NOT SHIP PRESTRESSED CONCRETE MEMBERS UNTIL TESTS ON CONCRETE CYLINDERS MANUFACTURED FROM THE SAME CONCRETE AND CURED UNDER THE SAME CONDITIONS AS THE GIRDERS INDICATE THAT THE CONCRETE OF THE PARTICULAR MEMBER HAS ATTAINED A COMPRESSIVE STRENGTH EQUAL TO THE SPECIFIED DESIGN 28 DAY COMPRESSIVE STRENGTH.

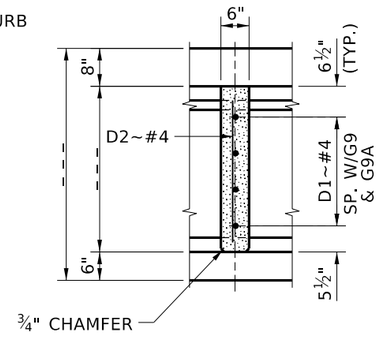
BASIS OF PAYMENT

16. PRESTRESSING CONCRETE MEMBERS IS INCIDENTAL TO THE PRECAST AND PRESTRESSED PAY ITEMS IN 502.

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PRESTRESSED DECK GIRDER DETAILS	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
				DETAILED	Standards/Bridge Standard Drawings/ B05_4C.DGN			OFF SYSTEM AND LOCAL ROADS BRIDGE LRFD DESIGN MANUAL, B5.4C	COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						



TYPICAL SECTION
¼"=1'-0"



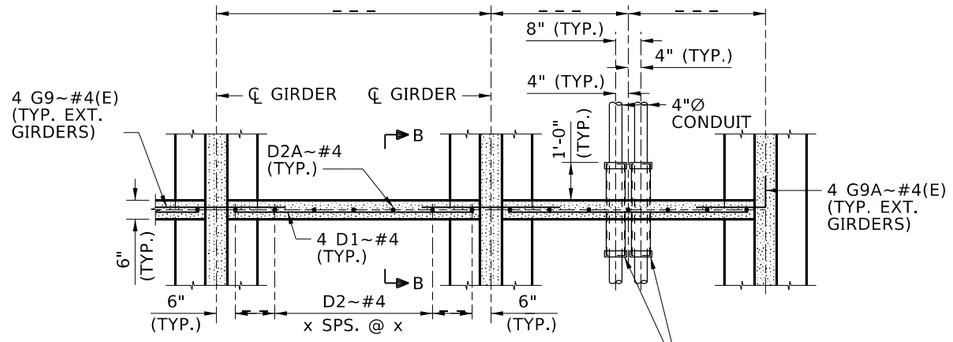
SECTION B-B
⅜"=1'-0"

GIRDER NOTES:

1. REFER TO SPECIAL PROVISIONS FOR REQUIREMENTS FOR ALTERNATE PRECAST PRESTRESSED GIRDER SECTIONS.
2. THE CURB MAY BE CAST DIRECTLY ONTO THE EXTERIOR GIRDERS IN THE PRECAST YARD BEFORE SHIPPING TO THE JOB SITE. THE CURB MUST BE A SECONDARY CAST. THIS METHOD REQUIRES APPROVAL BEFORE CASTING THE GIRDERS. SHOW DETAILS ON THE SHOP DRAWINGS.
3. PROVIDE A SCREED OR FLOAT FINISH TO THE TOP SURFACE OF THE GIRDER IN ACCORDANCE WITH 502.03.
4. SHOW THE SIZE AND LOCATION OF CAST-IN HOLES ON THE SHOP DRAWINGS. FIELD-DRILLED HOLES ARE NOT PERMITTED.
5. PROVIDE TEMPORARY BRACING AT EACH END OF THE GIRDER TO MAINTAIN GIRDER STABILITY. PLACE TEMPORARY BRACING BEFORE RELEASING THE GIRDER FROM ERECTION EQUIPMENT. REMOVE TEMPORARY BRACING AS NOTED IN THE CONSTRUCTION SEQUENCE. SUBMIT TEMPORARY BRACING LOCATIONS, BRACING AND CONNECTION DETAILS AND ANY REQUIRED ADDITIONAL GIRDER REINFORCEMENT IN THE SHOP DRAWINGS. PROVIDE TEMPORARY BRACING DESIGN AND DETAILS THAT ARE SIGNED AND SEALED BY AN IDAHO LICENSED PROFESSIONAL ENGINEER.
6. SUBMIT A METHOD OF EQUALIZING THE DECK BULB TEE GIRDER CAMBERS FOR REVIEW AND APPROVAL. EQUALIZE GIRDER CAMBERS UTILIZING THE APPROVED METHOD WHEN THE DIFFERENCE IN GIRDER CAMBERS BETWEEN ADJACENT GIRDERS MEASURED AT MID-SPAN EXCEEDS ¼ INCH. NOTIFY THE ENGINEER BEFORE GIRDER EQUALIZATION WHEN CAMBERS BETWEEN ADJACENT GIRDERS EXCEEDS 1.5 INCHES. GIRDER CAMBER EQUALIZATION IS A PROGRESSIVE OPERATION THAT REQUIRES STARTING AT THE LOCATION OF MAXIMUM CAMBER DIFFERENCE AND PROGRESSING TO THE LOCATION OF MINIMUM CAMBER DIFFERENCE.
7. CLEAN AND PRESOAK CLOSURE POUR AREAS WITH POTABLE WATER IMMEDIATELY BEFORE PLACING CLOSURE POUR CONCRETE.
8. PROVIDE CLOSURE POUR CONCRETE CONFORM TO THE REQUIREMENTS OF S501-40A.
9. FOR ULTRA HIGH PERFORMANCE CONCRETE, NO VEHICULAR TRAFFIC IS ALLOWED ON THE SURFACE UNTIL THE CLOSURE POUR CONCRETE HAS ATTAINED A MINIMUM COMPRESSIVE STRENGTH OF 14,000 PSI AND HAS CURED FOR 4 DAYS.

9A. FOR HIGH EARLY STRENGTH CONCRETE, ENSURE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI AT DAY 1 AND 5,000 PSI AT 7 DAYS. NO VEHICULAR TRAFFIC IS ALLOWED ON THE STRUCTURE UNTIL THE CLOSURE POUR CONCRETE HAS ATTAINED A MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI.

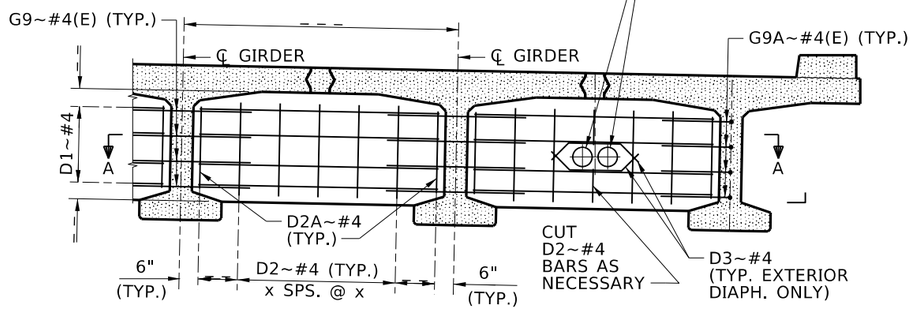
10. CONSTRUCTION SEQUENCE:
    - A. ERECT GIRDERS AND INSTALL TEMPORARY BRACING.
    - B. EQUALIZE GIRDER CAMBER.
    - C. PLACE INTERMEDIATE AND END DIAPHRAGMS.
    - D. WHEN INTERMEDIATE AND END DIAPHRAGMS REACH A COMPRESSIVE STRENGTH OF 3,000 PSI RELEASE EQUALIZING EQUIPMENT AND TEMPORARY BRACING AND PLACE CLOSURE POUR CONCRETE BETWEEN GIRDERS.
    - E. AFTER UHPC CLOSURE POUR HAS ATTAINED A MINIMUM COMPRESSIVE STRENGTH OF 10,000 PSI DIAMOND GRIND THE UHPC FLUSH WITH TOP OF GIRDER. GRINDING INCIDENTAL TO S501-40A.
    - F. SEE SHEET _ FOR STAGE CONSTRUCTION SEQUENCE.
11. SUBMIT PRECAST GIRDER SHOP DRAWINGS AT THE SAME TIME AS THE CURB MOUNT RAIL SHOP DRAWINGS.
12. PLACE GIRDERS PERPENDICULAR TO THE CROSS-SLOPE WHEN THE CROSS-SLOPE IS ≤ 4%.
13. PLACE PPC OVERLAY ON TOP OF DECK AND APPROACH SLABS IN ACCORDANCE WITH 551. PLACE FROM CURB TO CURB AND FROM BEGINNING OF APPROACH SLAB AT ABUTMENT 1 TO END OF APPROACH SLAB AT ABUTMENT 2, EXCEPT AT EXPANSION JOINTS AND SLEEPER BEAMS. ADJUST THE OVERLAY THICKNESS AS REQUIRED TO MATCH FINISH GRADE PROFILE. DETERMINE THE AMOUNT OF ADJUSTMENT BASED ON SURVEYED ELEVATIONS ALONG THE GIRDERS AND SUBMIT FOR APPROVAL.



SECTION A-A
¼"=1'-0"

NOTE:
FIELD CUT BARS AS NECESSARY TO AVOID INTERFERENCE WITH PVC UTILITY CONDUIT SLEEVES.

6"Ø PVC UTILITY CONDUIT SLEEVES, PLACE IN DIAPHRAGMS AT BOTH EXTERIOR GIRDER BAYS ONLY (SEE UTILITY DETAILS)

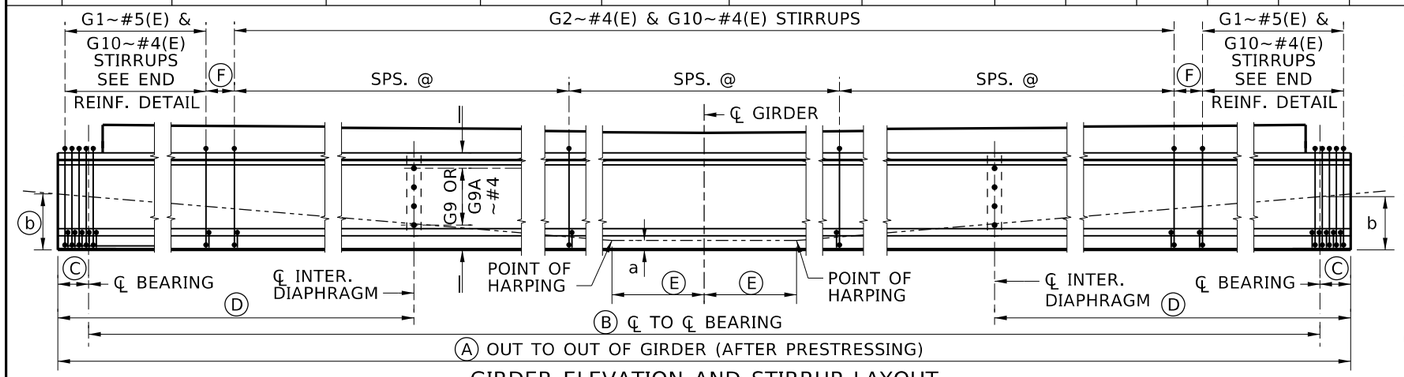


INTERMEDIATE DIAPHRAGM - ELEVATION
¼"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	TYPICAL DECK BULB TEE SECTION AND DETAILS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_4D.DGN			STATE SYSTEM	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B5.4D	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

PRESTRESSED GIRDER SCHEDULE

GIRDERS		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		GIRDER DIMENSIONS								END DETAIL		C.G. OF STRAND	
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	(A)	(B)	(C) LEFT	(C) RIGHT	(D) LEFT	(D) RIGHT	(E)	(F)	LEFT	RIGHT	(b) GIRDER END	(a) MID SPAN



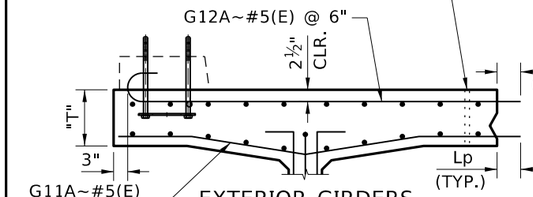
GIRDER ELEVATION AND STIRRUP LAYOUT

NTS

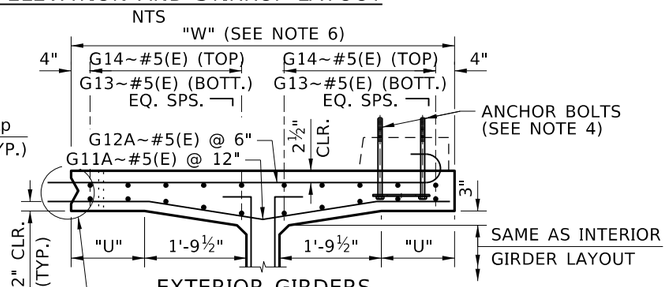
NOTES

1. DIMENSIONS TO STIRRUPS AND DOWEL BARS ARE GIVEN AT ℄ OF GIRDER.
2. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.
3. SEE TYPICAL DECK BULB TEE SECTION AND DETAILS SHEETS FOR ADDITIONAL GIRDER NOTES AND DETAILS.
4. CAST ANCHOR BOLTS INTO EXTERIOR GIRDERS. SUBMIT RAIL SHOP DRAWINGS FOR APPROVAL PRIOR TO PREPARATION OF GIRDER SHOP DRAWINGS.
5. FOR CURB STEEL SEE SHEET ___. SUBMIT FALSE WORK DETAILS FOR GIRDER CLOSURE POUR GROUT KEY BEFORE PREPARATION OF GIRDER SHOP DRAWINGS.
6. EXACT WIDTH OF GIRDER FLANGE WILL BE SLIGHTLY LESS THAN NORMAL WIDTH DUE TO GAP BETWEEN TOP FLANGES.

OPTIONAL SLEEVE/INSERT FOR EQUALIZATION DEVICE AND CLOSURE POUR FORM SUPPORTS, TYPICAL INTERIOR AND EXTERIOR GIRDERS.



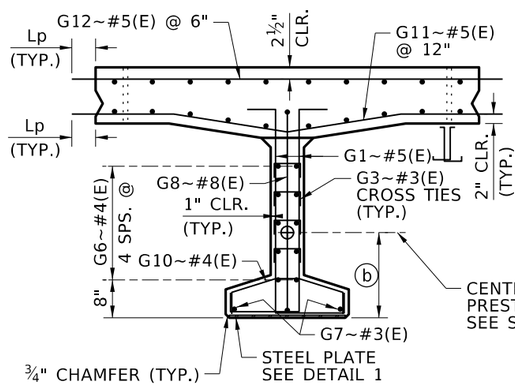
EXTERIOR GIRDERS
SECTION AT END OF GIRDER
⅜"=1'-0"



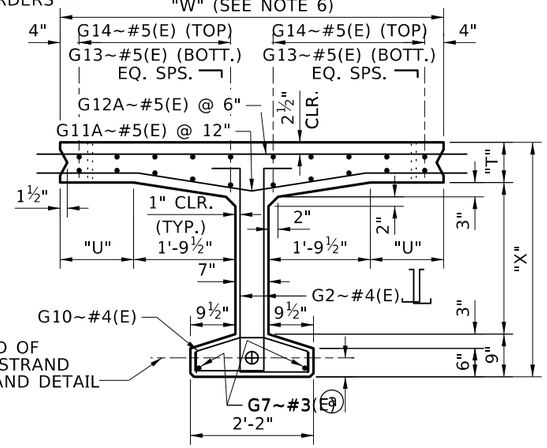
EXTERIOR GIRDERS
SECTION AT MID-SPAN
⅜"=1'-0"

BLOCKOUT FOR KEYWAY TYPICAL EXCEPT AT EXT. EDGE OF EXT. GIRDERS

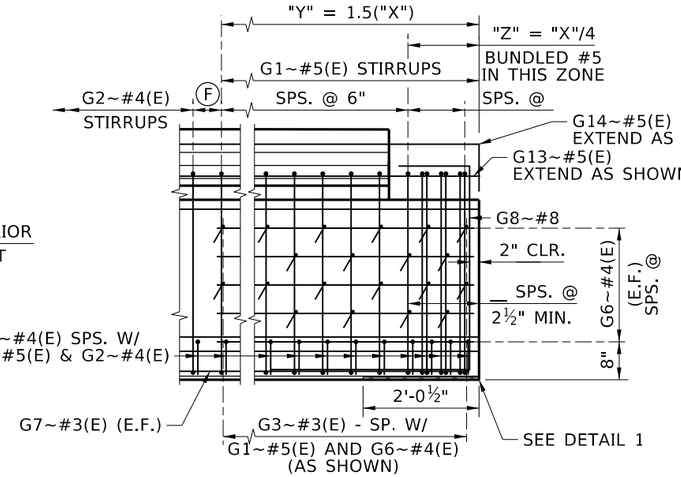
Lp = 5" MIN. FOR UHPC CLOSURE POUR
Lp = 9" MIN. FOR HESC CLOSURE POUR
UHPC = ULTRA HIGH PERFORMANCE CONCRETE
HESC = HIGH EARLY STRENGTH CONCRETE



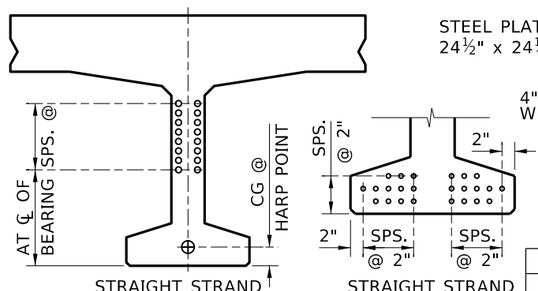
INTERIOR GIRDERS
SECTION AT END OF GIRDER
⅜"=1'-0"



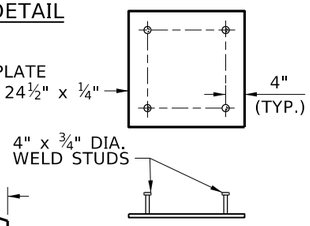
INTERIOR GIRDERS
SECTION AT MID-SPAN
⅜"=1'-0"



END REINFORCEMENT DETAIL
⅜"=1'-0"



STRAND DETAIL



DETAIL 1
⅜"=1'-0"

	"T"		"X"	
	@ MIDSPAN	@ END GRD	@ MIDSPAN	@END GRD
SPAN 1				

GIRDER WEIGHT..... LB/FT

REINFORCEMENT DIAGRAM
AASHTO M31 GRADE 60 TYPE S

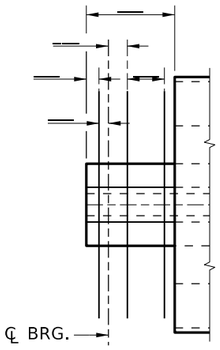
MARK	SIZE	GRADE	SKETCH
G1*	#5(E)	60	D_G - 6", 1'-2½", 4¼"
G2*	#4(E)	60	
G3*	#3(E)	60	5"
G5	#6(E)	60	
G6	#4(E)	60	"Y"
G7	#3(E)	60	(A) - 4" (MINIMUM LAP LENGTH=1'-4")
G8*	#8(E)	60	D_G - 6", 3'-6", 1'-3"
G9	#4(E)	60	
G9A	#4(E)	60	
G10	#4(E)	60	1'-3", 7½", 3, 9½", 4½"
G11	#5(E)	60	3¾", "U" 2'-0" 2'-0" "U"
G11A	#5(E)	60	3¾", "U" 2'-0" 2'-0" "U"
G12	#5(E)	60	
G12A*	#5(E)	60	***
G13	#5(E)	60	(A) - 4" (MINIMUM LAP LENGTH=1'-8")
G14**	#5(E)	60	(A) - 4", 10" 10" (MINIMUM LAP LENGTH=2'-2")

* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

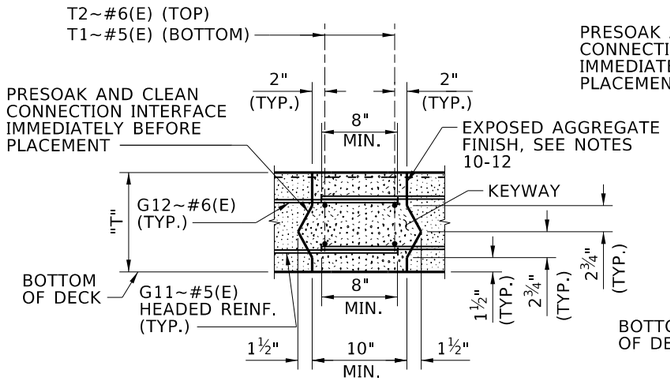
** HOOKS AT ABUTMENT ENDS ONLY

*** FOR JOINTS OR DISCONTINUITIES IN THE PARAPET, BUNDLE A #4(E) WITH THE G12A BARS FOR A DISTANCE EQUAL TO 8' FROM THE JOINT/DISCONTINUITY.

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PRESTRESSED DECK BULB TEE GIRDER	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	STATE SYSTEM	BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_4E.DGN			BRIDGE LRFD DESIGN MANUAL B5.4E	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

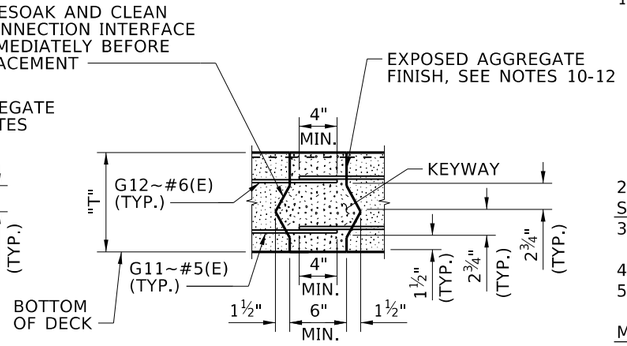


PLAN



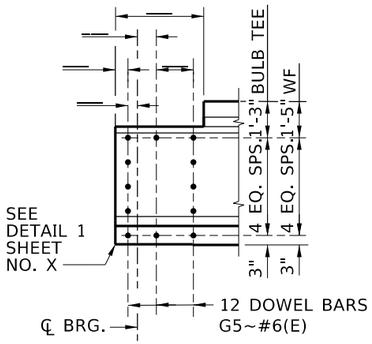
HESC CLOSURE POUR DETAIL

¾"=1'-0"



UHPC CLOSURE POUR DETAIL

¾"=1'-0"

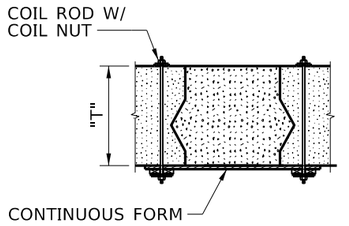


ELEVATION

TYPE B

END DIAPHRAGM DOWEL DETAILS

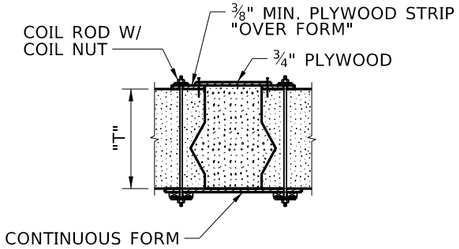
¼"=1'-0"



HESC CLOSURE POUR FORMING DETAIL

(HESC = HIGH EARLY STRENGTH CONCRETE)

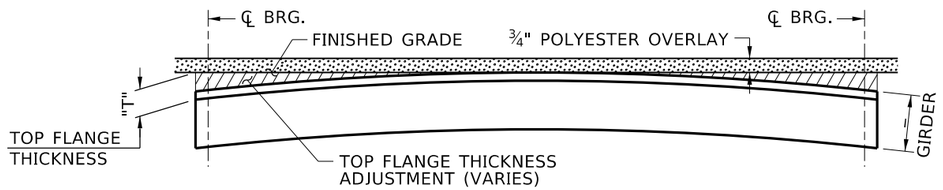
¾"=1'-0"



UHPC CLOSURE POUR FORMING DETAIL

(UHPC = ULTRA HIGH PERFORMANCE CONCRETE)

¾"=1'-0"



TOP FLANGE THICKNESS ADJUSTMENT DIAGRAM

1½"=1'-0"

NOTES

DOWELS

1. PROVIDE DOWELS BY ANY OF THE FOLLOWING METHODS:
   a. COIL ROD INSERTS AND THREADED DOWELS, MAY BE PROVIDED, IF THE ULTIMATE STRENGTH OF THE INSERT IS IN ACCORDANCE WITH THE FOLLOWING:

BAR SIZE	MINIMUM ULTIMATE TENSION CAPACITY (LBS.)
#4	12,000
#5	18,600
#6	26,400

   b. 1½"Ø HOLES MAY BE PROVIDED DURING FABRICATION AND DOWELS GROUTED IN PLACE AFTER DELIVERY TO THE JOB SITE.
2. PLACE DOWELS PARALLEL TO ℄ BEARING.

SHOP DRAWINGS

3. PROVIDE SHOP DRAWING DETAILS THAT CONFORM TO CURRENT AASHTO SPECIFICATIONS. SHOW DETENSIONING SEQUENCE AND LIFT POINTS ON THE SHOP DRAWINGS.
4. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 506.03 AND 105.02.
5. LATERALLY RESTRAIN GIRDERS IN AN UPRIGHT POSITION DURING TRANSPORTATION AND ERECTION. SHOW METHOD OF LATERAL RESTRAINT ON THE SHOP DRAWINGS.

MISCELLANEOUS GIRDER DETAILS

6. WELDED WIRE REINFORCEMENT STIRRUPS MAY BE PROVIDED IN ACCORDANCE WITH THE DETAILS SHOWN ON THE OPTIONAL PRESTRESSED GIRDER WWR DETAILS SHEET.
7. PROVIDE GIRDERS WITH ENDS THAT ARE PLUMB WHEN SET TO GRADE.
8. DIMENSION Ⓐ IN THE PRESTRESSED GIRDER SCHEDULE TABLE IS A HORIZONTAL DIMENSION. CORRECT THE FINISHED GIRDER LENGTH FOR GRADE AND PROVIDE AN ALLOWANCE FOR BEAM SHORTENING.
9. BLOCK OUT TOP FLANGE OF BULB TEE AND WF GIRDERS TO ALLOW PLACEMENT OF CONCRETE FOR THE END DIAPHRAGMS.
10. IF THE TOP FLANGE OVERHANG IS USED TO SUPPORT CURB FORMS, SUBMIT THE METHOD OF SUPPORT FOR APPROVAL BEFORE CASTING THE GIRDERS. SHOW THE METHOD OF CURB FORM SUPPORT ON THE SHOP DRAWINGS,.
11. INTENTIONALLY ROUGHEN INTERFACES OF SHEAR KEYS AND KEYWAYS THROUGH THE USE OF A CHEMICAL RETARDER APPLIED TO THE PRECAST COMPONENT FORMWORK TO PRODUCE AN EXPOSED AGGREGATE SURFACE. SUBMIT THE MATERIAL SPECIFICATIONS OF THE CHEMICAL RETARDER FOR REVIEW AND APPROVAL.
12. PROVIDE AN AMPLITUDE OF ETCH OF AT LEAST 0.25" AND NO LARGER THAN ½ THE NORMAL COARSE AGGREGATE SIZE OF THE PRECAST COMPONENT CONCRETE.
13. DO NOT SANDBLAST, ABRADE, OR USE A FORM LINER TO CREATE AN EXPOSED AGGREGATE SURFACE.
14. FABRICATE IN ACCORDANCE WITH 506.

CONCRETE

15. PROVIDE CONCRETE THAT CONFORM TO 502 EXCEPT ENTRAINED AIR WILL BE 5% ± 1%.

STRAND

16. DESIGN BASED UPON 0.6" DIA. AASHTO M203 LOW RELAXATION STRAND.

DEFLECTION DATA

17. ΔG INCLUDES GIRDER AND TOP FLANGE THICKNESS ADJUSTMENT FOR CAMBER.
18. ΔC INCLUDES GROUT KEY AND INTERMEDIATE DIAPHRAGM.
19. ΔD INCLUDES POLYESTER OVERLAY, RAIL, UTILITIES, AND FUTURE WEARING SURFACE.

GIRDER SHIPPING

20. DO NOT SHIP PRESTRESSED CONCRETE MEMBERS UNTIL TESTS ON CONCRETE CYLINDERS MANUFACTURED FROM THE SAME CONCRETE AND CURED UNDER THE SAME CONDITIONS AS THE GIRDERS INDICATE THAT THE CONCRETE OF THE PARTICULAR MEMBER HAS ATTAINED A COMPRESSIVE STRENGTH EQUAL TO THE SPECIFIED DESIGN 28 DAY COMPRESSIVE STRENGTH.

BASIS OF PAYMENT

21. PRESTRESSING CONCRETE MEMBERS IS INCIDENTAL TO THE PRECAST AND PRESTRESSED PAY ITEMS IN 502.

DEFLECTION DATA ~ INCHES

LOCATION	ΔP PRESTRESS	ΔG GIRDER	∑Δ * ΔP + ΔG	ΔC CURB	Δ1** 1.55 ΔP + 1.65(ΔG)	ΔD	Δ2 ΔD + ΔC
	↑	↓	↑	↑	↓	↓	↓
	↑	↓	↑	↑	↓	↓	↓

*ESTIMATED DEFLECTION OF PRESTRESSED GIRDER AT RELEASE

**ESTIMATED DEFLECTION OF PRESTRESSED GIRDER AT GIRDER ERECTION. GIRDER ERECTION ASSUMED TO OCCUR WITHIN 60 TO 90 DAYS AFTER GIRDER FABRICATION.

REVISIONS NO.	DATE	BY	DESCRIPTION
△			
△			
△			
△			
△			

DESIGNED

DESIGN CHECKED

DETAILED

DWG. CHECKED

CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY

CADD FILE NAME

Standards/Bridge Standard Drawings/B05_4F.DGN

DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT

YOUR Safety→YOUR Mobility→YOUR Economic Opportunity

APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:

ENGLISH

PROJECT NO.

PRESTRESSED DECK GIRDER DETAILS

STATE SYSTEM

BRIDGE LRFD DESIGN MANUAL, B5.4F

BRIDGE PLANS

BRIDGE KEY NO.

COUNTY | KEY NO.

BRIDGE DWG. NO. | SHEET OF

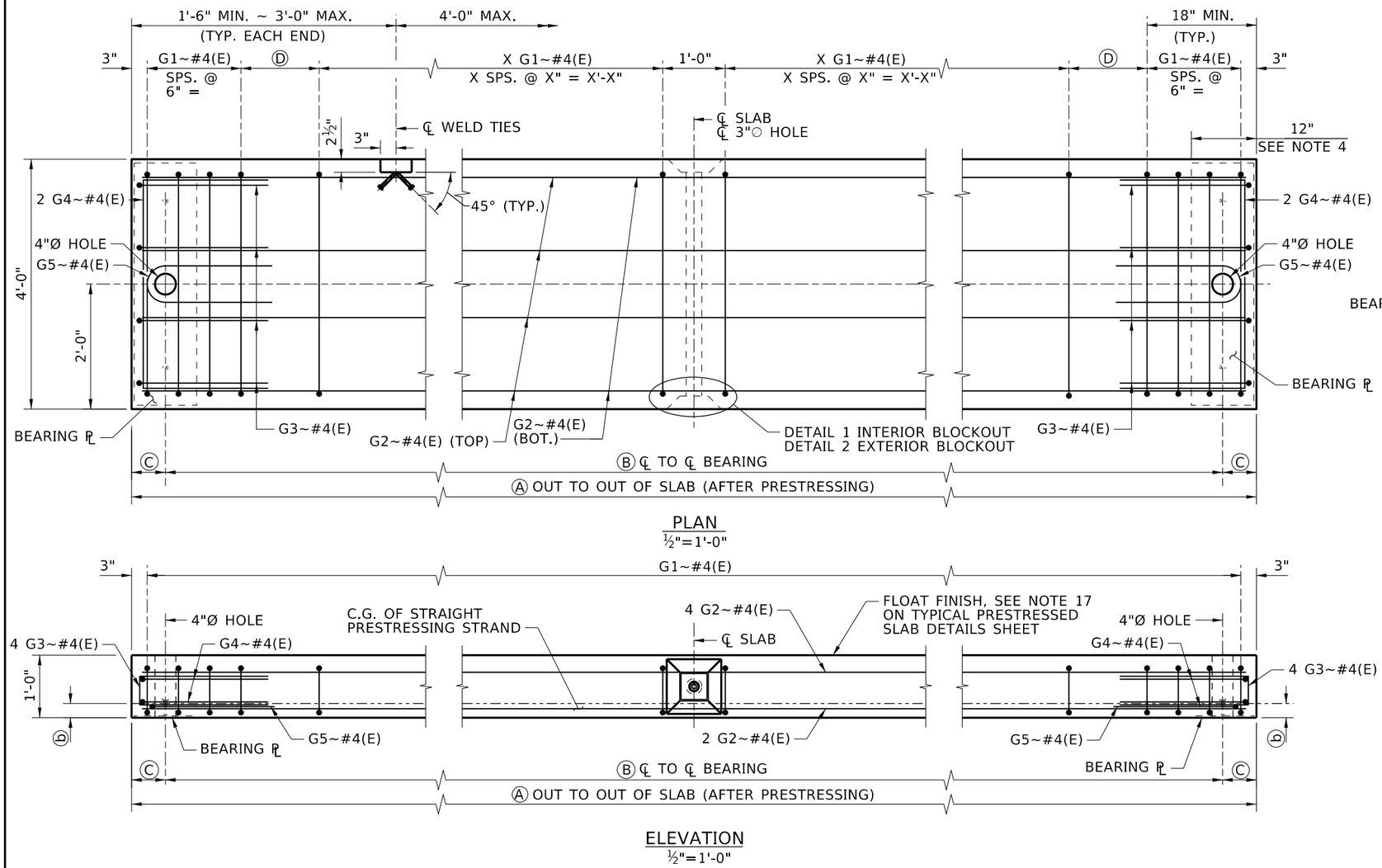
PRESTRESSED SLAB SCHEDULE

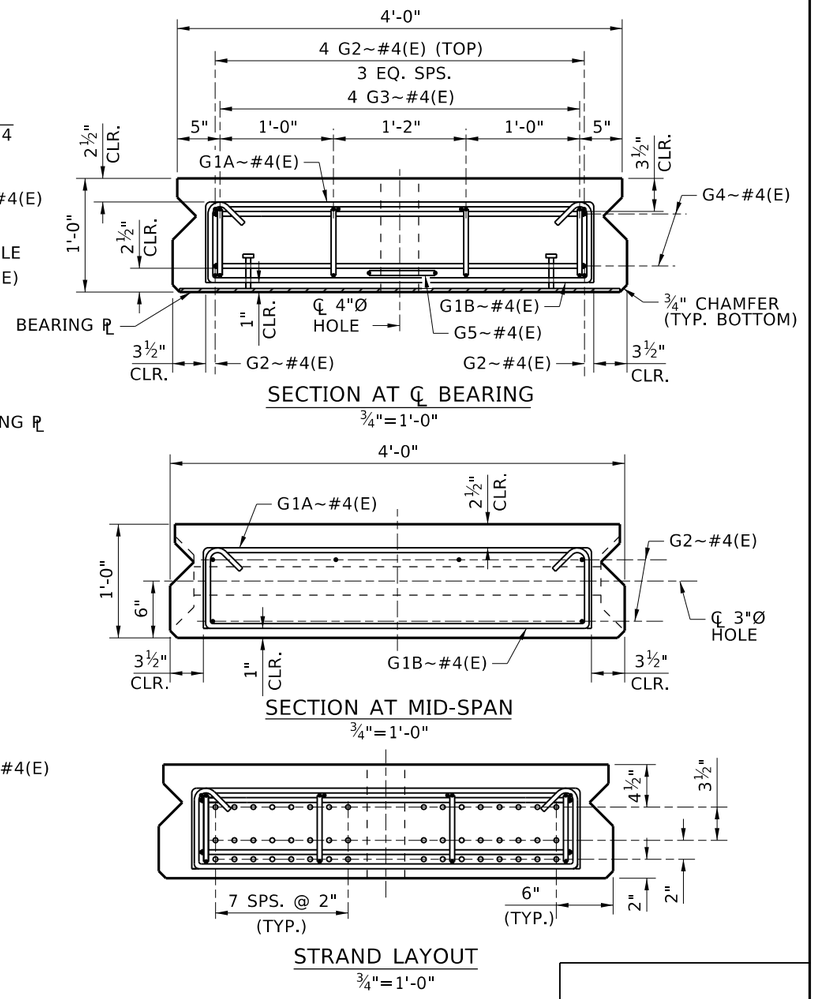
SLAB		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		SLAB DIMENSIONS						C.G. OF STRAND
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	Ⓐ	Ⓑ	Ⓒ LEFT	Ⓒ RIGHT	Ⓓ LEFT	Ⓓ RIGHT	ⓑ

*STIRRUP AND TIE HOOK BEND DIMENSIONS.
APPROXIMATE SLAB SHIPPING WEIGHT IS 585 LB/FT.
STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWELS ARE GIVEN AT ℄ OF SLAB.
2. FOR NOTES, BLOCKOUT, BEARING PLATE AND MISCELLANEOUS DETAILS, SEE PRESTRESSED SLAB DETAILS, SHEET NO. ___.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.
4. REINFORCEMENT IN ACCORDANCE WITH AASHTO ARTICLE 5.9.4.4.1.
5. FOR TIE ROD LAYOUT, SEE FRAMING PLAN, SHEET NO. ___.
6. KEYWAY IS TYPICAL EACH SIDE OF SLAB EXCEPT EXTERIOR SIDE OF EXTERIOR SLABS. OMIT KEYWAY ON OUTSIDE OF EXTERIOR SLABS ONLY.





REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	12" PRESTRESSED SOLID SLAB	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
△				DETAILED	Standards/Bridge Standard Drawings/ B05_5A.dgn			OFF SYSTEM AND LOCAL ROADS BRIDGE LRFD DESIGN MANUAL B5.5A	COUNTY / KEY NO.
△				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
△				CORRECTIONS					

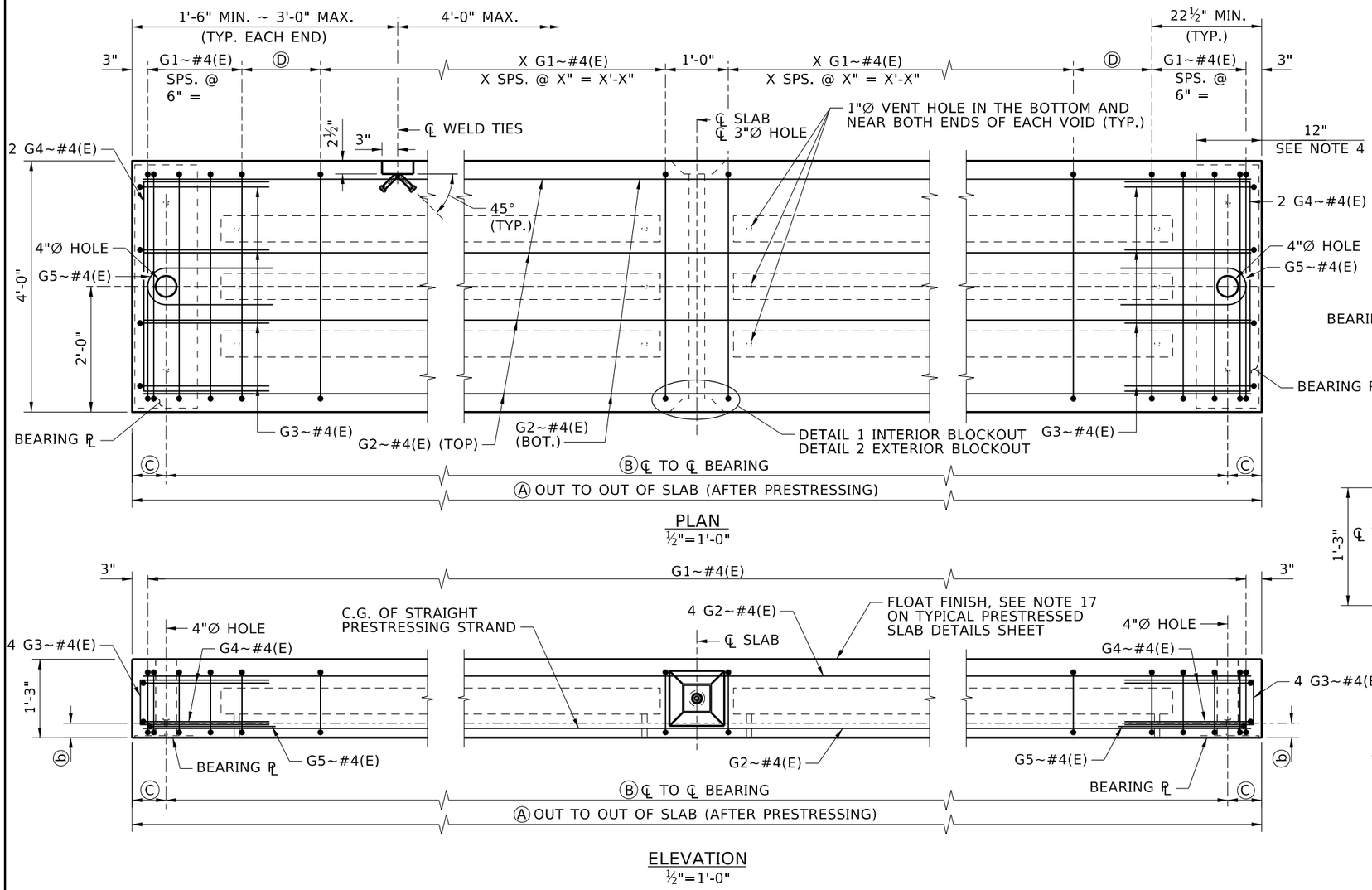
PRESTRESSED SLAB SCHEDULE

SLAB		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		SLAB DIMENSIONS						C.G. OF STRAND
										Ⓒ		Ⓓ		
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	Ⓐ	Ⓑ	LEFT	RIGHT	LEFT	RIGHT	ⓑ

*STIRRUP AND TIE HOOK BEND DIMENSIONS.
APPROXIMATE SLAB SHIPPING WEIGHT IS 673 LB/FT.
STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWELS ARE GIVEN AT ℄ OF SLAB
2. FOR NOTES, BLOCKOUT, BEARING PLATE AND MISCELLANEOUS DETAILS, SEE PRESTRESSED SLAB DETAILS, SHEET NO. ___.
3. BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.
4. REINFORCEMENT IN ACCORDANCE WITH AASHTO ARTICLE 5.9.4.4.1.
5. FOR TIE ROD LAYOUT, SEE FRAMING PLAN, SHEET NO. ___.
6. KEYWAY IS TYPICAL EACH SIDE OF SLAB EXCEPT EXTERIOR SIDE OF EXTERIOR SLABS. OMIT KEYWAY ON OUTSIDE OF EXTERIOR SLABS ONLY.



REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	1'-3" PRESTRESSED VOIDED SLAB	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	OFF SYSTEM AND LOCAL ROADS BRIDGE LRFD DESIGN MANUAL B5.5B	BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_5B.dgn				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

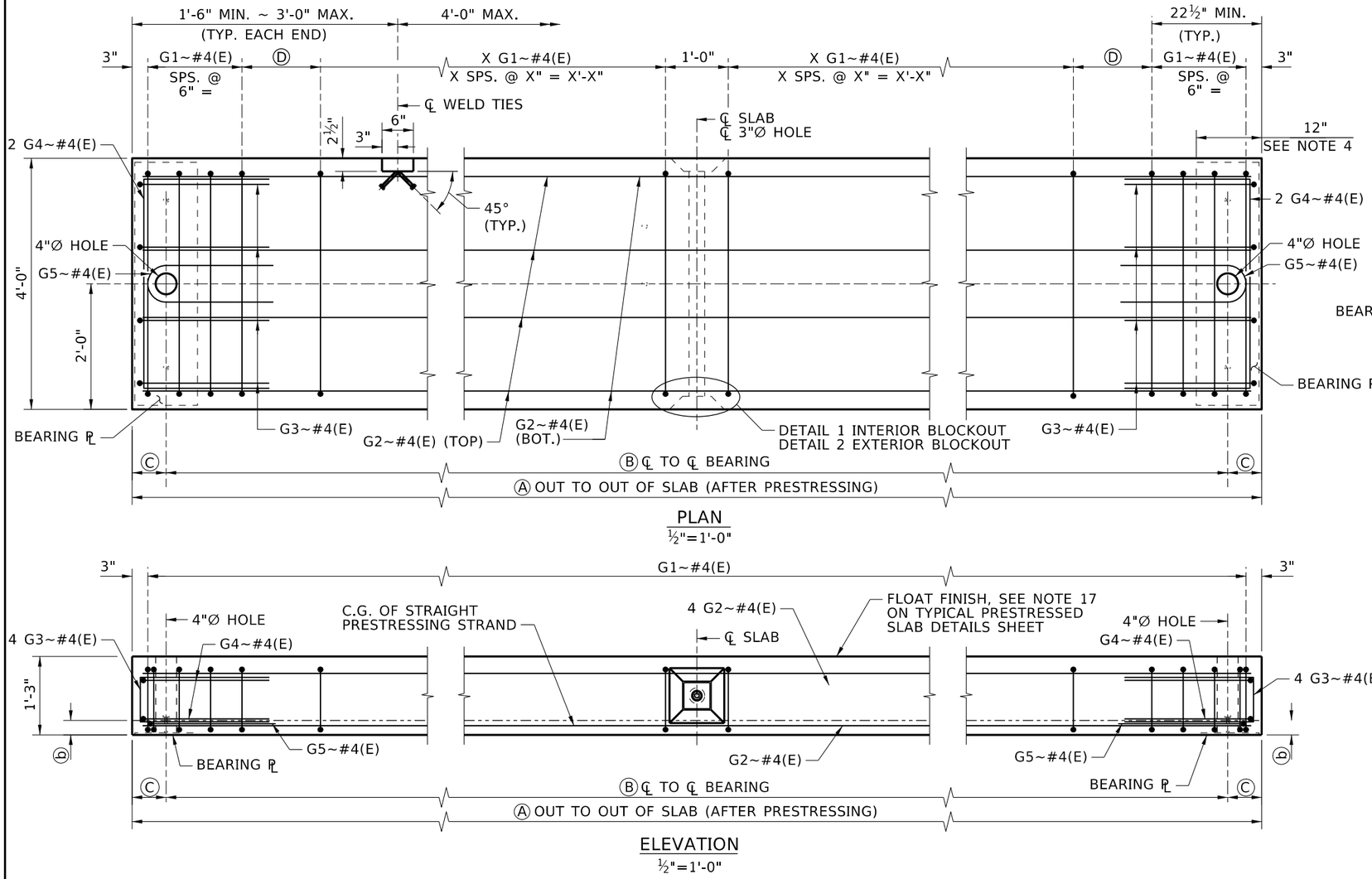
PRESTRESSED SLAB SCHEDULE

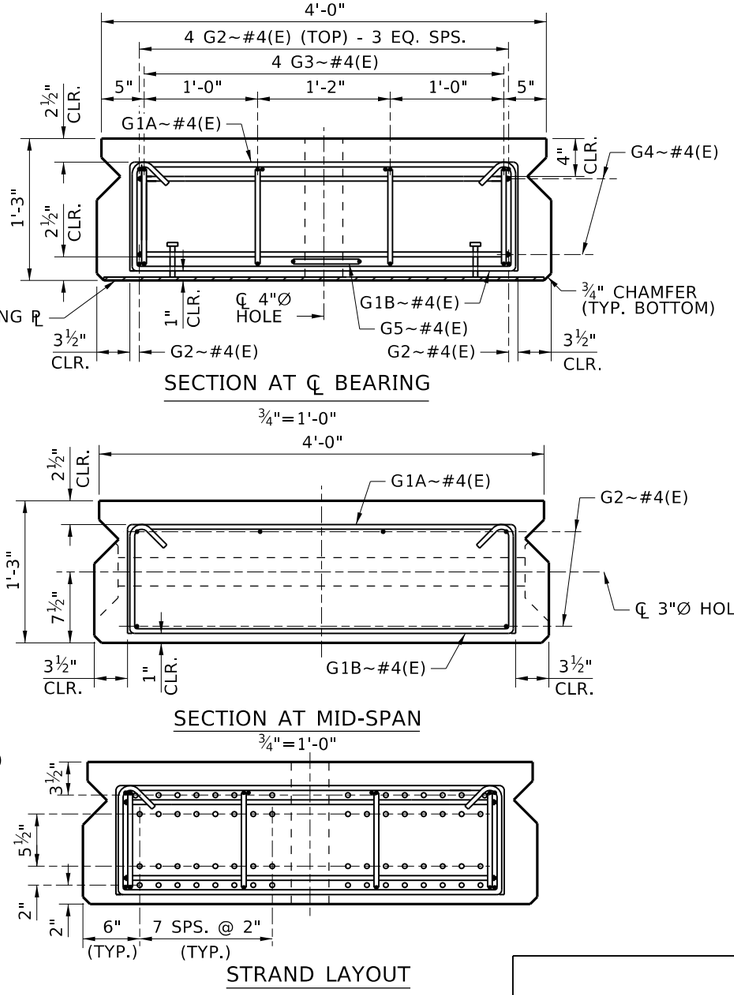
SLAB		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		SLAB DIMENSIONS						C.G. OF STRAND
										Ⓒ		Ⓓ		
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	Ⓐ	Ⓑ	LEFT	RIGHT	LEFT	RIGHT	ⓑ

*STIRRUP AND TIE HOOK BEND DIMENSIONS.
APPROXIMATE SLAB SHIPPING WEIGHT IS 735 LB/FT.
STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWELS ARE GIVEN AT ℄ OF SLAB
2. FOR NOTES, BLOCKOUT, BEARING PLATE AND MISCELLANEOUS DETAILS, SEE PRESTRESSED SLAB DETAILS, SHEET NO. ___.
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6. KEYWAY IS TYPICAL EACH SIDE OF SLAB EXCEPT EXTERIOR SIDE OF EXTERIOR SLABS. OMIT KEYWAY ON OUTSIDE OF EXTERIOR SLABS ONLY.





REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	1'-3" PRESTRESSED SOLID SLAB	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/B05_5C.dgn			OFF SYSTEM AND LOCAL ROADS	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL B5.5C	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

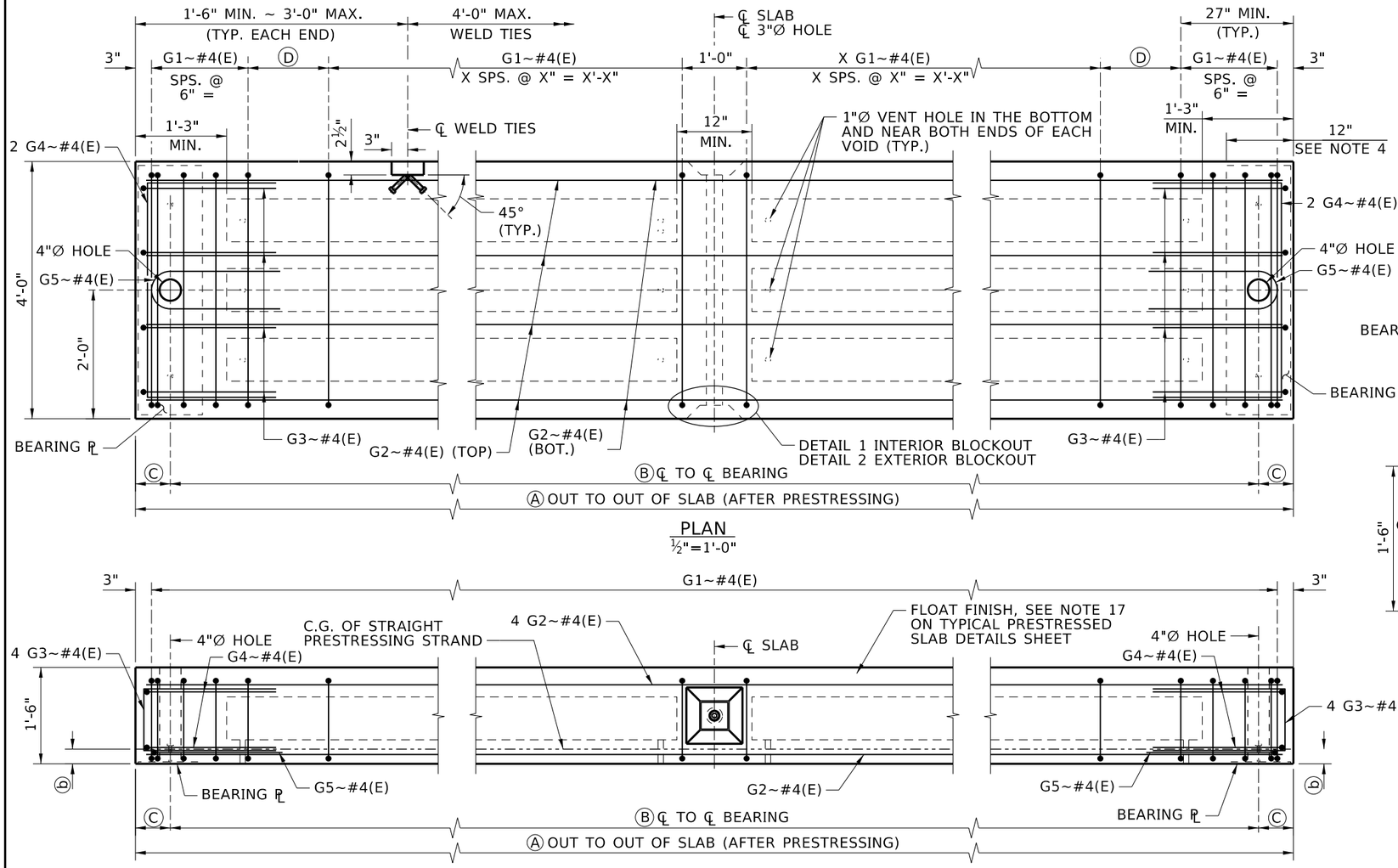
PRESTRESSED SLAB SCHEDULE

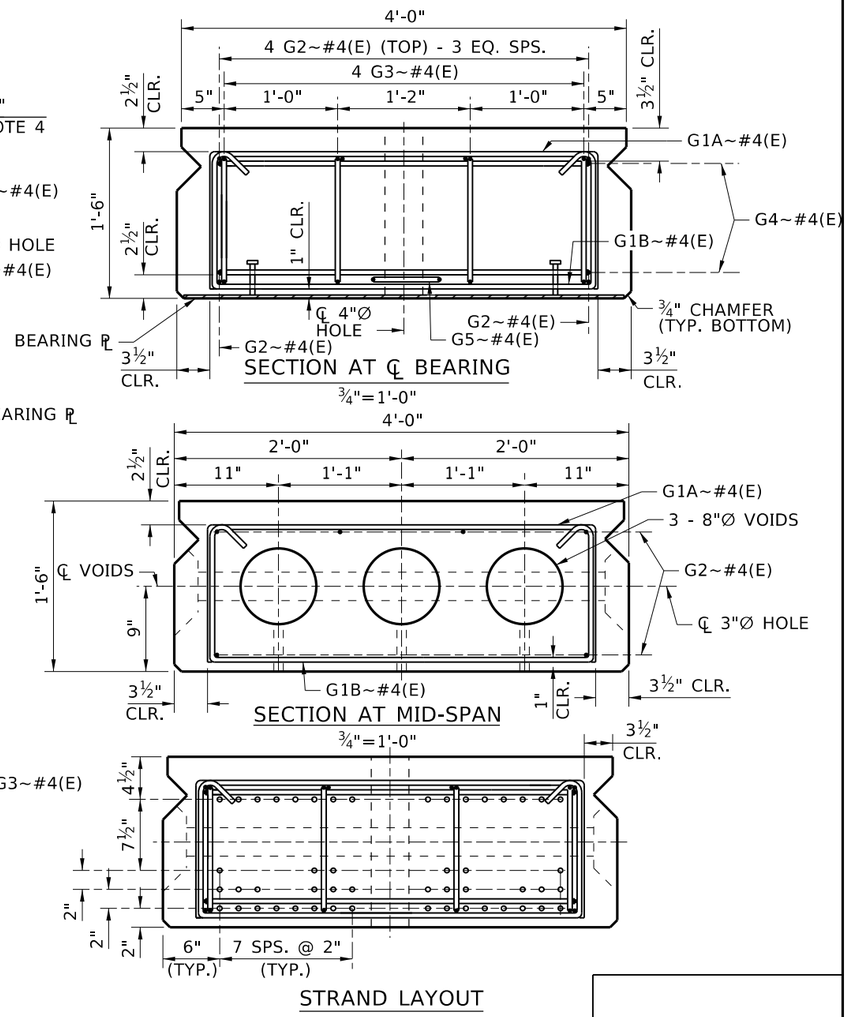
SLAB		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		SLAB DIMENSIONS						C.G. OF STRAND
										Ⓒ		Ⓓ		
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	Ⓐ	Ⓑ	LEFT	RIGHT	LEFT	RIGHT	ⓑ

*STIRRUP AND TIE HOOK BEND DIMENSIONS.
APPROXIMATE SLAB SHIPPING WEIGHT IS 728 LB/FT.
STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWELS ARE GIVEN AT ℄ OF SLAB
2. FOR NOTES, BLOCKOUT, BEARING PLATE AND MISCELLANEOUS DETAILS, SEE PRESTRESSED SLAB DETAILS, SHEET NO. ___.
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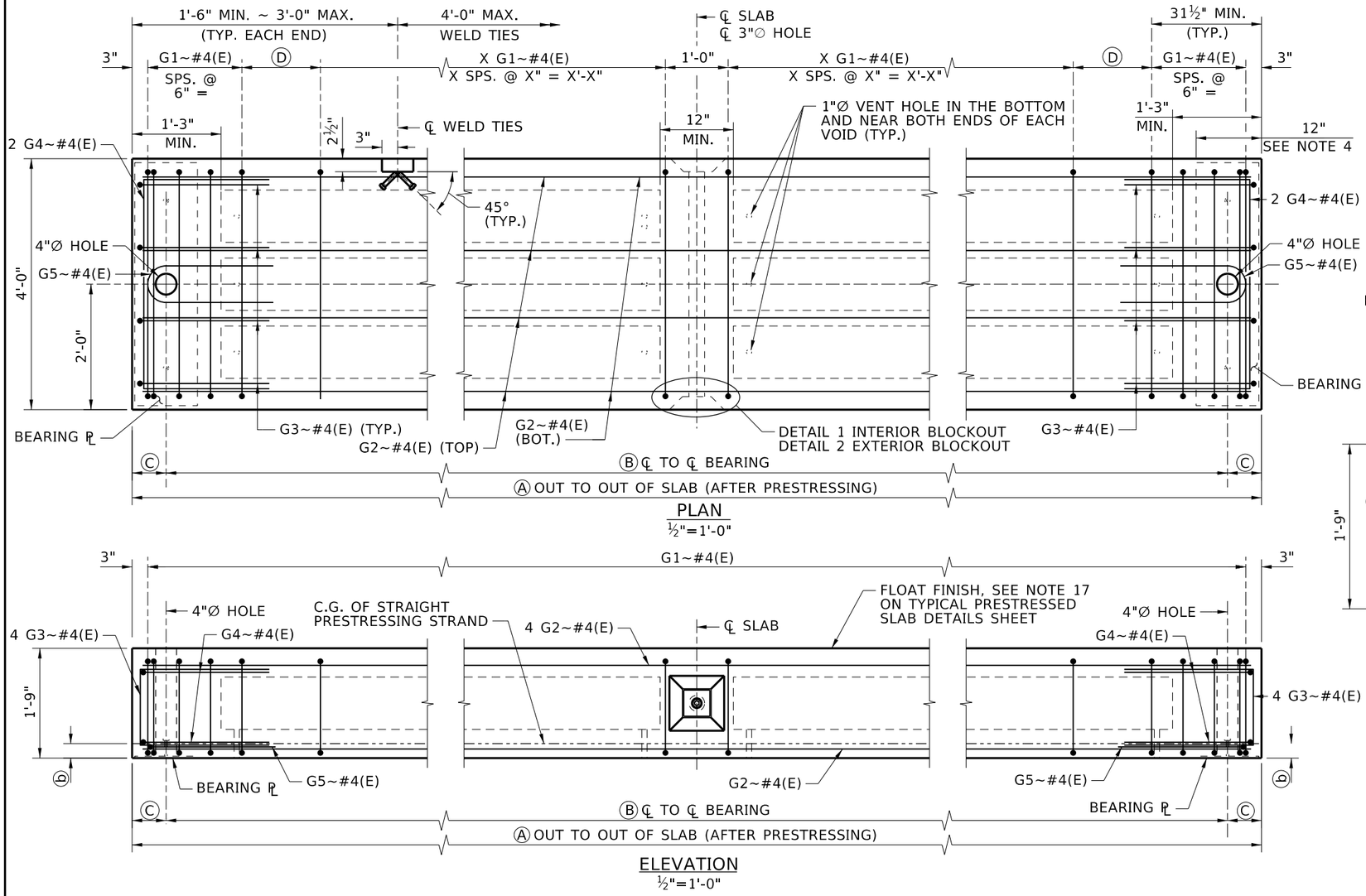


REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	1'-6" PRESTRESSED VOIDED SLAB	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_5D.dgn			OFF SYSTEM AND LOCAL ROADS BRIDGE LRFD DESIGN MANUAL B5.5D	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

PRESTRESSED SLAB SCHEDULE

SLAB		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		SLAB DIMENSIONS						C.G. OF STRAND
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	Ⓐ	Ⓑ	Ⓒ LEFT	Ⓒ RIGHT	Ⓓ LEFT	Ⓓ RIGHT	ⓑ

* STIRRUP AND TIE HOOK BEND DIMENSIONS.
APPROXIMATE SLAB SHIPPING WEIGHT IS 789 LB/FT.
STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

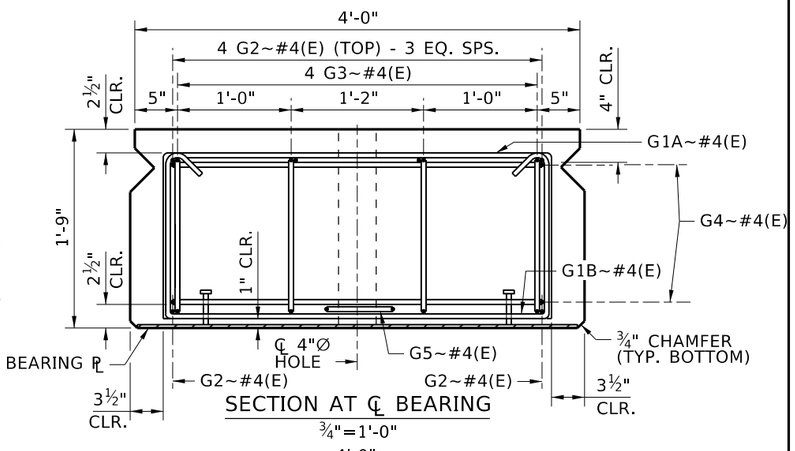


PLAN
½"=1'-0"

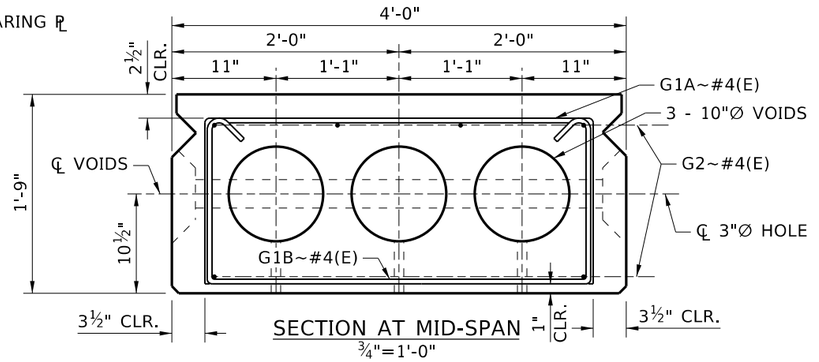
ELEVATION
½"=1'-0"

NOTES

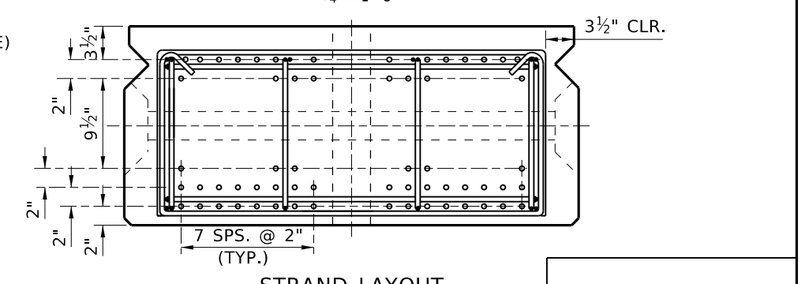
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SECTION AT ℄ BEARING
¾"=1'-0"



SECTION AT MID-SPAN
¾"=1'-0"



STRAND LAYOUT

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	1'-9" PRESTRESSED VOIDED SLAB	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME Standards/Bridge Standard Drawings/B05_5E.dgn	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	OFF SYSTEM AND LOCAL ROADS BRIDGE LRFD DESIGN MANUAL B5.5E	BRIDGE KEY NO.
				DETAILED					COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

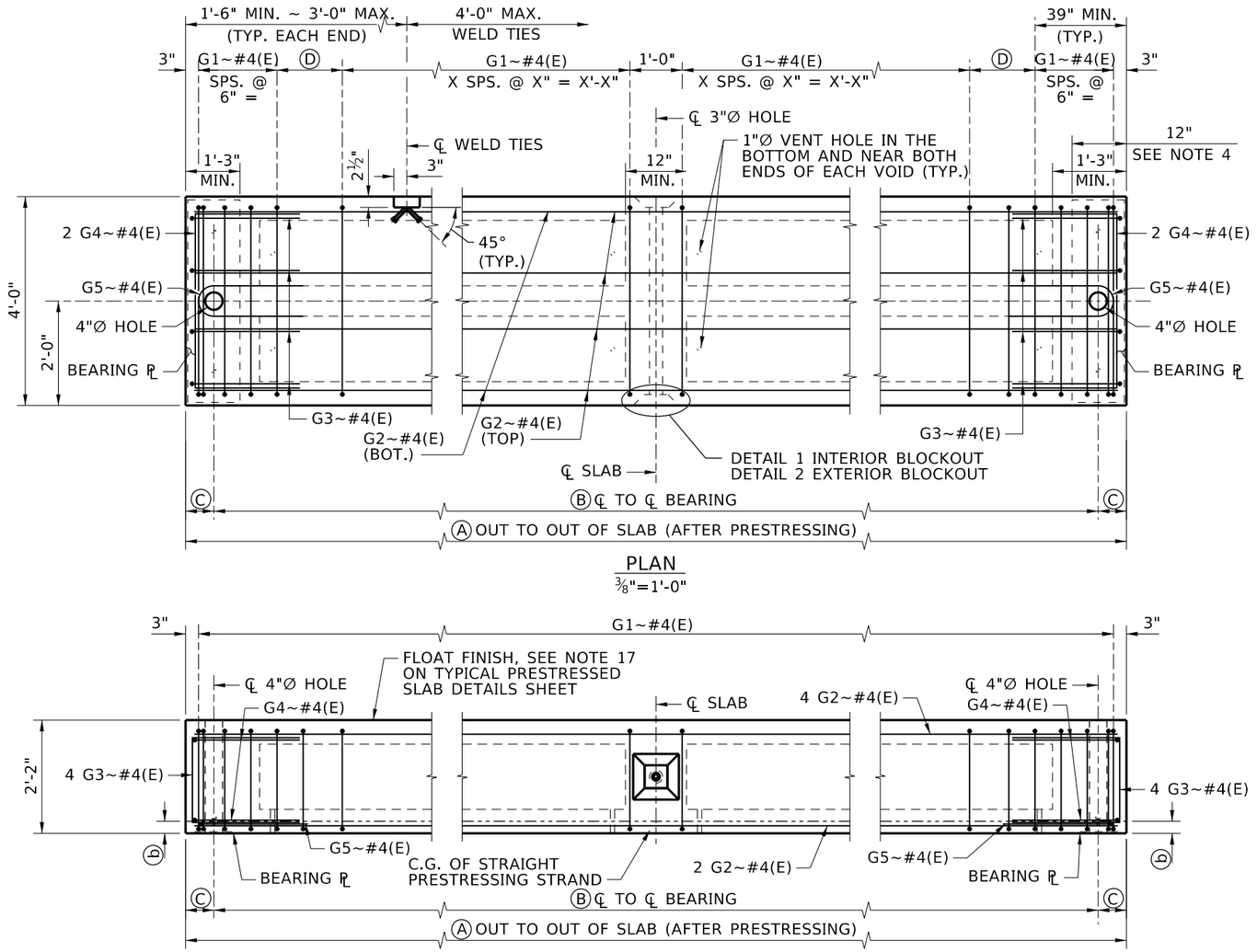
PRESTRESSED SLAB SCHEDULE

SLAB		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		SLAB DIMENSIONS						C.G. OF STRAND
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	Ⓐ	Ⓑ	Ⓒ LEFT	Ⓒ RIGHT	Ⓓ LEFT	Ⓓ RIGHT	ⓑ

*STIRRUP AND TIE HOOK BEND DIMENSIONS.
APPROXIMATE SLAB SHIPPING WEIGHT IS 917 LB/FT.
STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

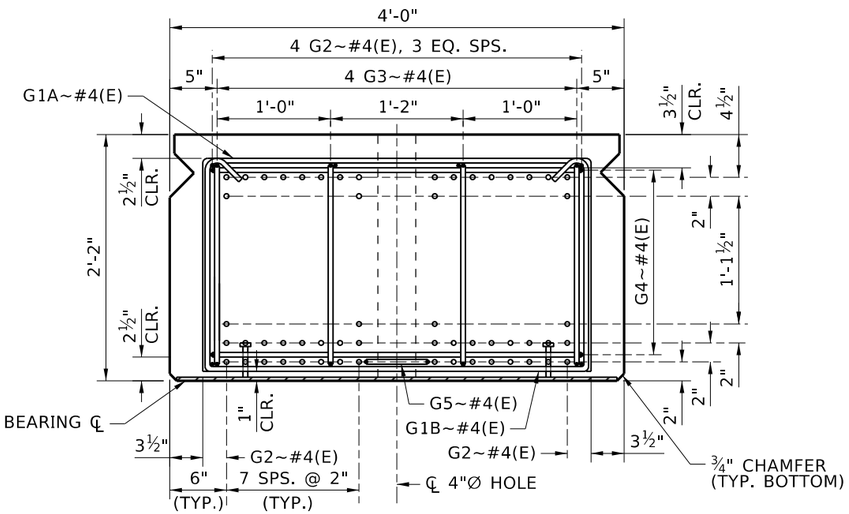
NOTES

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5. FOR TIE ROD LAYOUT, SEE FRAMING PLAN, SHEET NO. ___.
6. KEYWAY IS TYPICAL EACH SIDE OF SLAB EXCEPT EXTERIOR SIDE OF EXTERIOR SLABS. OMIT KEYWAY ON OUTSIDE OF EXTERIOR SLABS ONLY.



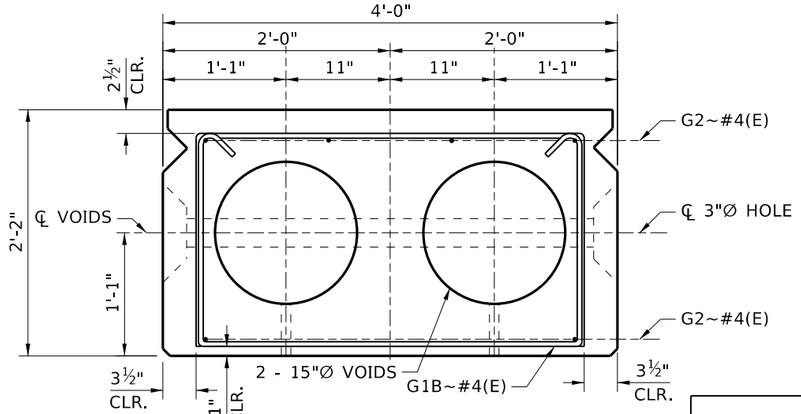
PLAN
⅜"=1'-0"

ELEVATION
⅜"=1'-0"



STRAND LAYOUT & SECTION AT ℄ BEARING

¾"=1'-0"



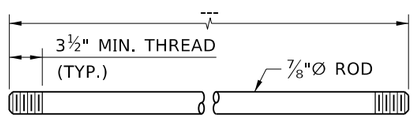
SECTION AT MID-SPAN

¾"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	2'-2" PRESTRESSED VOIDED SLAB	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME Standards/Bridge Standard Drawings/ B05_5F.dgn	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	OFF SYSTEM AND LOCAL ROADS BRIDGE LRFD DESIGN MANUAL B5.5F	BRIDGE KEY NO.
△				DETAILED					COUNTY / KEY NO.
△				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
△				CORRECTIONS					

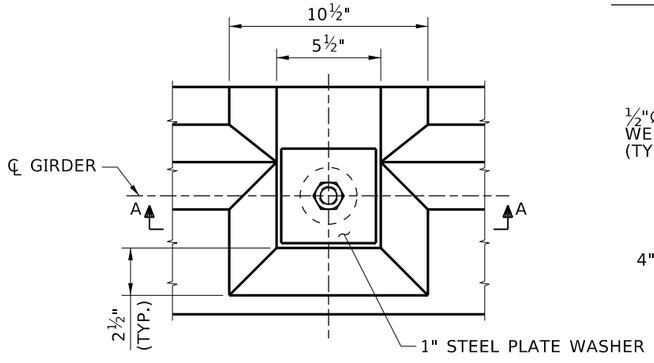
DEFLECTION DATA - INCHES						
LOCATION	ΔP PRESTRESS ↑	ΔG GIRDER ↓	ΣΔ * ΔP + ΔG ↑	Δ 1** 1.55 ΔP + 165 ΔG ↑	ΔS NON COMP. DL ↓	Δ2 ΔS + ΔC ↓

* ESTIMATED DEFLECTION OF PRESTRESSED GIRDER AT RELEASE
** ESTIMATED DEFLECTION OF PRESTRESSED GIRDER AT ERECTION

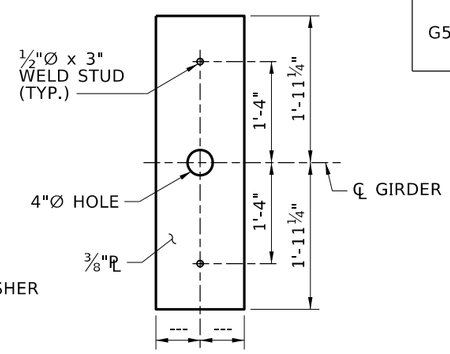


FURNISH TIE RODS WITH 2 HEAVY HEX NUTS, 2 WASHERS & 2 - 5" x 5" x 1" PLATES

TIE ROD DETAIL
¾" = 1'-0"



DETAIL 1
(INTERIOR GIRDER BLOCKOUT DETAIL)
1½" = 1'-0"
USE DETAIL 1 ONLY WHEN TIE ROD ENDS AT AN INTERIOR GIRDER



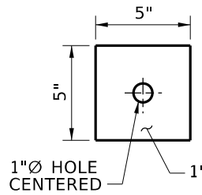
GIRDER BEARING PLATE
½" = 1'-0"

CONSTRUCTION SEQUENCE
1. SET SLABS.
2. TENSION TIE RODS.
3. GROUT 4"Ø VERTICAL DOWEL HOLE AT THE ABUTMENT.
4. WELD 1¼" ROD AT WELD TIE LOCATIONS.
5. GROUT KEYWAY.

REINFORCEMENT DIAGRAM
AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1A*	#4(E)	60	VAR. 3'-5" VAR.
G1B*	#4(E)	60	VAR. 3'-5" VAR.
G2	#4(E)	60	Ⓐ - 4"
G3*	#4(E)	60	VAR. 2'-3"
G4*	#4(E)	60	2'-3" 3'-4" 2'-3"
G5*	#4(E)	60	2'-3" 2½" RAD. 6"

BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.
* STIRRUP AND TIE HOOK BEND DIMENSIONS. STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.



STEEL PLATE WASHER DETAIL
1½" = 1'-0"

NOTES
1. PROVIDE ⅞"Ø ASTM A449 HIGH STRENGTH TIE RODS.
2. PROVIDE AN INITIAL MINIMUM TENSION OF 39,250 LBS. FOR THE RODS.
3. MEASURE BOLT TENSION BY THE USE OF DIRECT TENSION INDICATORS. PROVIDE D.T.I. THAT CONFORM TO ASTM F959 AND HARDENED STEEL WASHERS THAT CONFORM TO ASTM F436.
4. PROVIDE BEARING PLATES THAT CONFORM TO ASTM A36.
5. PROVIDE NUTS THAT CONFORM TO ASTM A563 GRADE DH.
6. HOT DIP GALVANIZE TIE RODS, NUTS, WASHERS AND BEARING PLATES AFTER FABRICATION. APPLY AN ANTIGALLING LUBRICANT TO THE THREADS BEFORE TENSIONING THE TIE RODS.

CONCRETE
7. PROVIDE CONCRETE STRENGTH AS SHOWN ON THE PLANS.
8. PROVIDE CONCRETE THAT CONFORM TO 502 EXCEPT THAT ENTRAINED AIR WILL BE 5% ±1%. SELF CONSOLIDATING CONCRETE MAY BE USED IN ACCORDANCE WITH 502.

GROUT
9. PROVIDE GROUT THAT CONFORM TO TYPE "B", CLASS I NON-METALLIC NON-SHRINK AS SPECIFIED IN 705.02.
10. SANDBLAST, CLEAN, AND GROUT LEVEL WITH SURROUNDING GIRDER SURFACES, KEYWAYS AND BLOCKOUTS. PROVIDE A BACKER ROD AS A SEAL FOR THE GROUT.
11. NO VEHICULAR TRAFFIC ALLOWED ON THE STRUCTURE UNTIL THE GROUT HAS ATTAINED A MINIMUM STRENGTH OF 4,000 PSI.

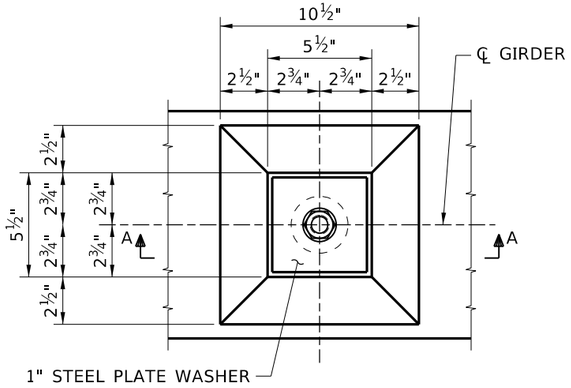
SHOP DRAWINGS
12. PROVIDE SHOP DRAWING DETAILS THAT CONFORM TO CURRENT AASHTO SPECIFICATIONS. SHOW DETENSIONING SEQUENCE AND GIRDER LIFT POINTS ON SHOP DRAWINGS.
13. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 506.03 AND 105.02.
14. KEEP THE PRESTRESSED SLAB IN A FLAT POSITION (TOP SURFACE UPWARDS) DURING TRANSPORTATION AND ERECTION AND LIFT ONLY BY MEANS OF THE LIFTING DEVICES PROVIDED. SUBMIT THE PROVISION FOR SUPPORT POINTS TO BE USED DURING TRANSPORTATION TO THE JOB SITE FOR APPROVAL.

MISCELLANEOUS GIRDER DETAILS
15. DIMENSIONS ARE HORIZONTAL DIMENSIONS. CORRECT THE FINISHED SLAB LENGTH FOR GRADE AND PROVIDE AN ALLOWANCE FOR BEAM SHORTENING.
16. FABRICATE IN ACCORDANCE WITH 506.
17. FINISH THE TOP SURFACE OF THE SLAB IN ACCORDANCE WITH 502.03, PART I, PARAGRAPH 3d.
18. SLAB ERECTION ASSUMED TO OCCUR 60-90 DAYS AFTER SLAB FABRICATION.

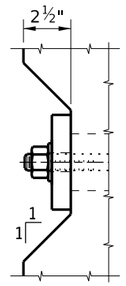
STRAND
19. DESIGN BASED UPON 0.6" DIA. AASHTO M203 LOW RELAXATION STRAND.

GIRDER SHIPPING
20. DO NOT SHIP PRESTRESSED CONCRETE MEMBERS UNTIL TESTS ON CONCRETE CYLINDERS MANUFACTURED FROM THE SAME CONCRETE AND CURED UNDER THE SAME CONDITIONS AS THE GIRDERS INDICATE THAT THE CONCRETE OF THE PARTICULAR MEMBER HAS ATTAINED A COMPRESSIVE STRENGTH EQUAL TO THE SPECIFIED DESIGN 28 DAY COMPRESSIVE STRENGTH.

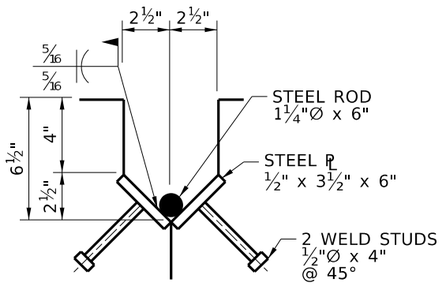
BASIS OF PAYMENT
21. PRESTRESSING CONCRETE MEMBERS IS INCIDENTAL TO PRECAST AND PRESTRESSED PAY ITEMS IN 502.



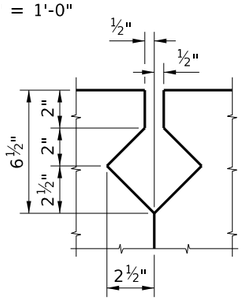
DETAIL 2
(EXTERIOR GIRDER BLOCKOUT DETAIL)
1½" = 1'-0"



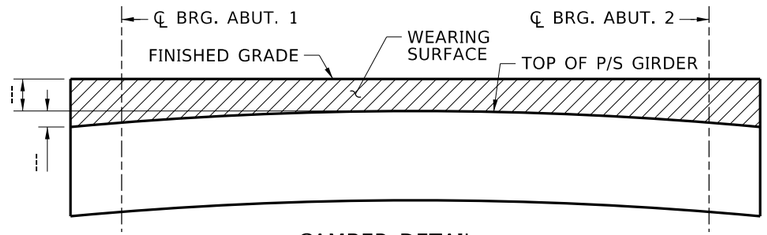
SECTION A-A
1½" = 1'-0"



WELD TIE DETAIL
1½" = 1'-0"



KEYWAY DETAIL
1½" = 1'-0"



CAMBER DETAIL
⅜" = 1'-0"

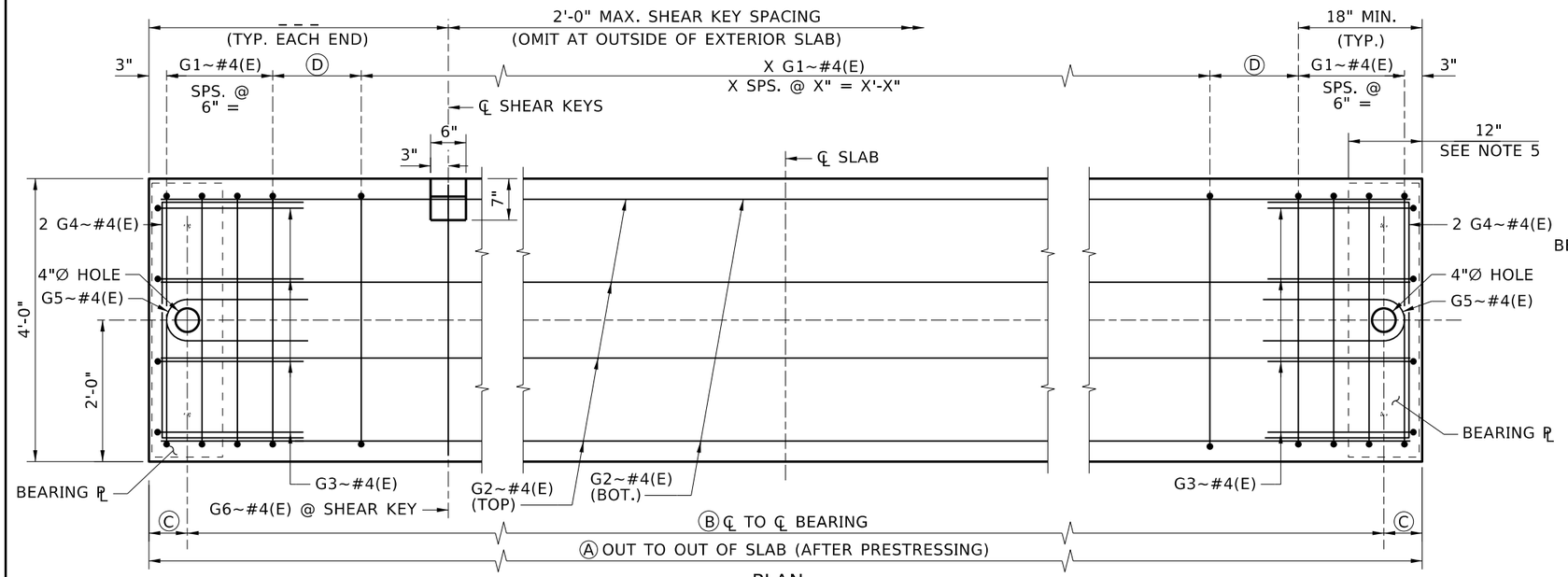
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	TYPICAL PRESTRESSED SLAB DETAILS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_5G.DGN			OFF SYSTEM AND LOCAL ROADS BRIDGE LRFD DESIGN MANUAL B5.5G	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

PRESTRESSED SLAB SCHEDULE

SLAB		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		SLAB DIMENSIONS						C.G. OF STRAND
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	Ⓐ	Ⓑ	Ⓒ LEFT	Ⓒ RIGHT	Ⓓ LEFT	Ⓓ RIGHT	ⓑ

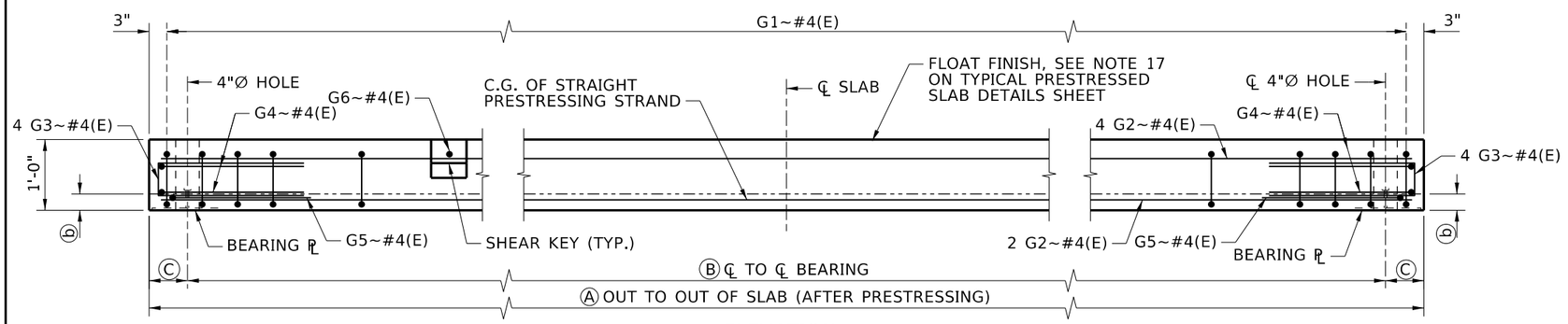
NOTES

1. DIMENSIONS TO STIRRUPS AND DOWELS ARE GIVEN AT ℄ OF SLAB
2. FOR NOTES, BLOCKOUT, BEARING PLATE, AND DETAILS, SEE TYPICAL PRESTRESSED SLAB DETAILS SHEET.
3. SEE PARAPET DETAILS ON SHEET NO. __.
4. APPROXIMATE SLAB SHIPPING WEIGHT IS 585 LB/FT.
5. REINFORCEMENT IN ACCORDANCE WITH AASHTO ARTICLE 5.9.4.4.1.
6. KEYWAY IS TYPICAL EACH SIDE OF SLABS EXCEPT EXTERIOR SIDE OF EXTERIOR SLABS. OMIT KEYWAY ON OUTSIDE OF EXTERIOR SLABS ONLY.



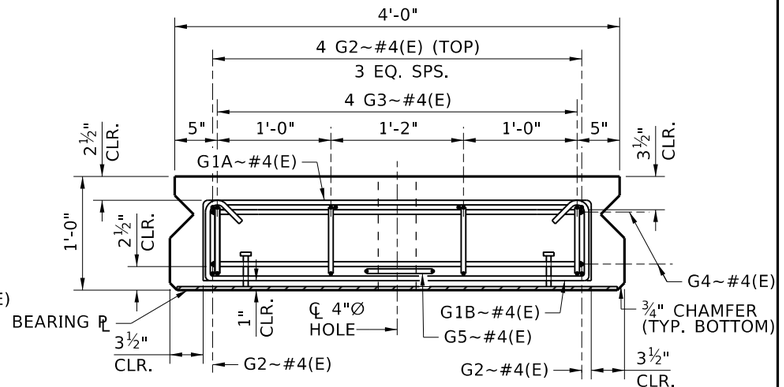
PLAN

½"=1'-0"



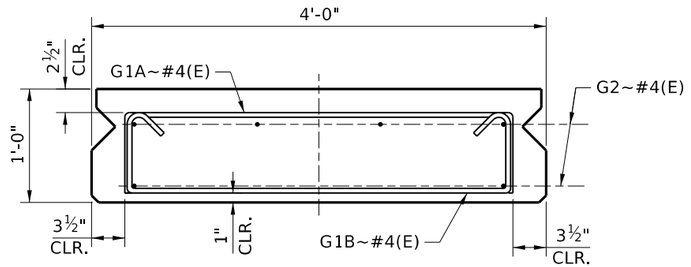
ELEVATION

½"=1'-0"



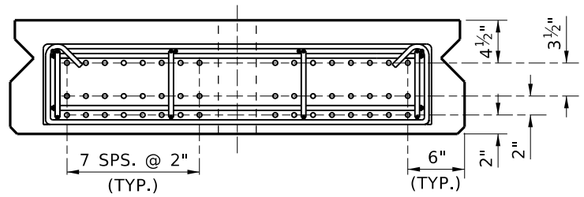
SECTION AT ℄ BEARING

¾"=1'-0"



SECTION AT MID-SPAN

¾"=1'-0"



STRAND LAYOUT

¾"=1'-0"

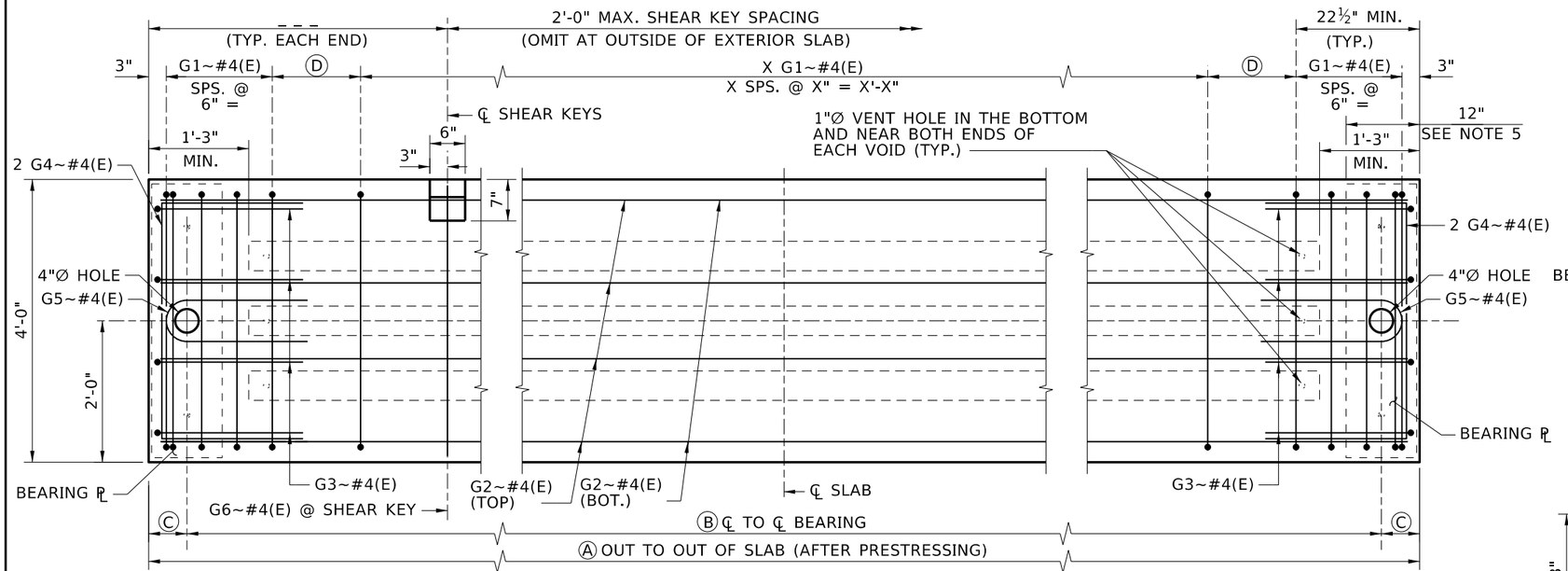
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	12" PRESTRESSED SOLID SLAB	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_6A.dgn			STATE SYSTEM	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B5.6A	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

PRESTRESSED SLAB SCHEDULE

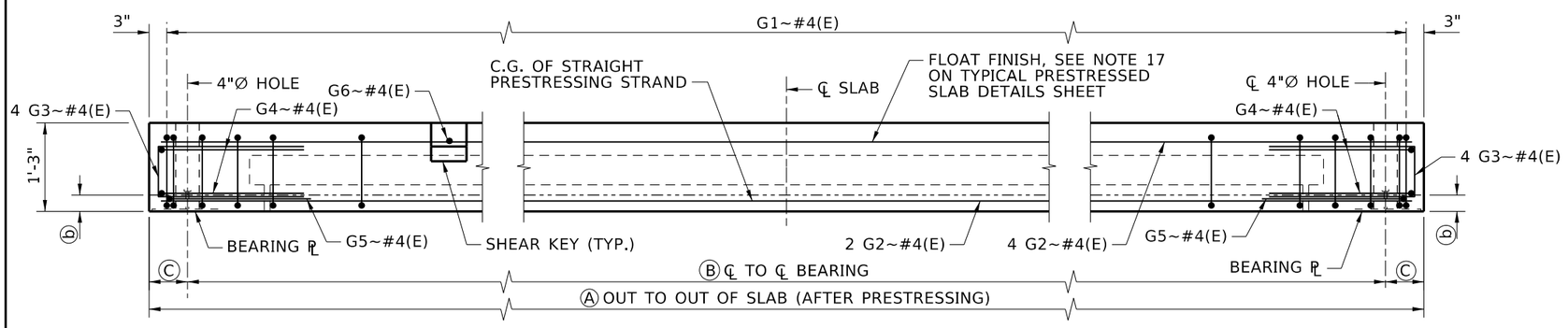
SLAB		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		SLAB DIMENSIONS						C.G. OF STRAND
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	Ⓐ	Ⓑ	Ⓒ LEFT	Ⓒ RIGHT	Ⓓ LEFT	Ⓓ RIGHT	ⓑ

NOTES

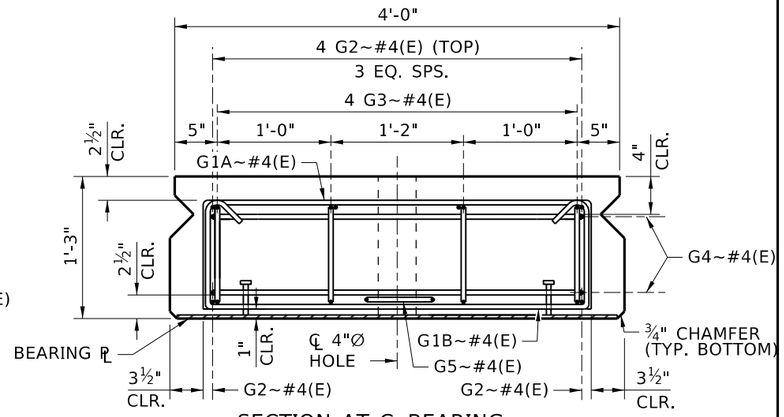
1. DIMENSIONS TO STIRRUPS AND DOWELS ARE GIVEN AT ℄ OF SLAB
2. FOR NOTES, BLOCKOUT, BEARING PLATE, AND DETAILS, SEE TYPICAL PRESTRESSED SLAB DETAILS SHEET.
3. SEE PARAPET DETAILS ON SHEET NO. __.
4. APPROXIMATE SLAB SHIPPING WEIGHT IS 673 LB/FT.
5. REINFORCEMENT IN ACCORDANCE WITH AASHTO ARTICLE 5.9.4.4.1.
6. KEYWAY IS TYPICAL EACH SIDE OF SLABS EXCEPT EXTERIOR SIDE OF EXTERIOR SLABS. OMIT KEYWAY ON OUTSIDE OF EXTERIOR SLABS ONLY.



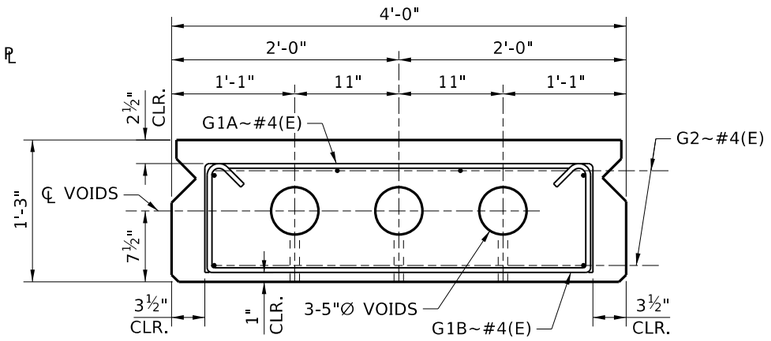
PLAN
½"=1'-0"



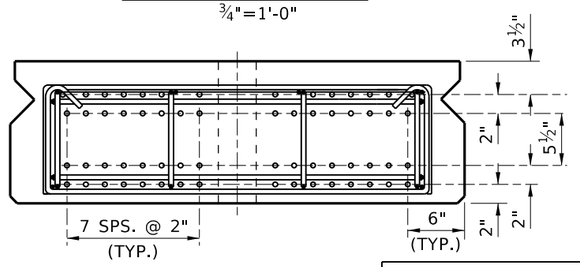
ELEVATION
½"=1'-0"



SECTION AT ℄ BEARING
¾"=1'-0"



SECTION AT MID-SPAN
¾"=1'-0"



STRAND LAYOUT
¾"=1'-0"

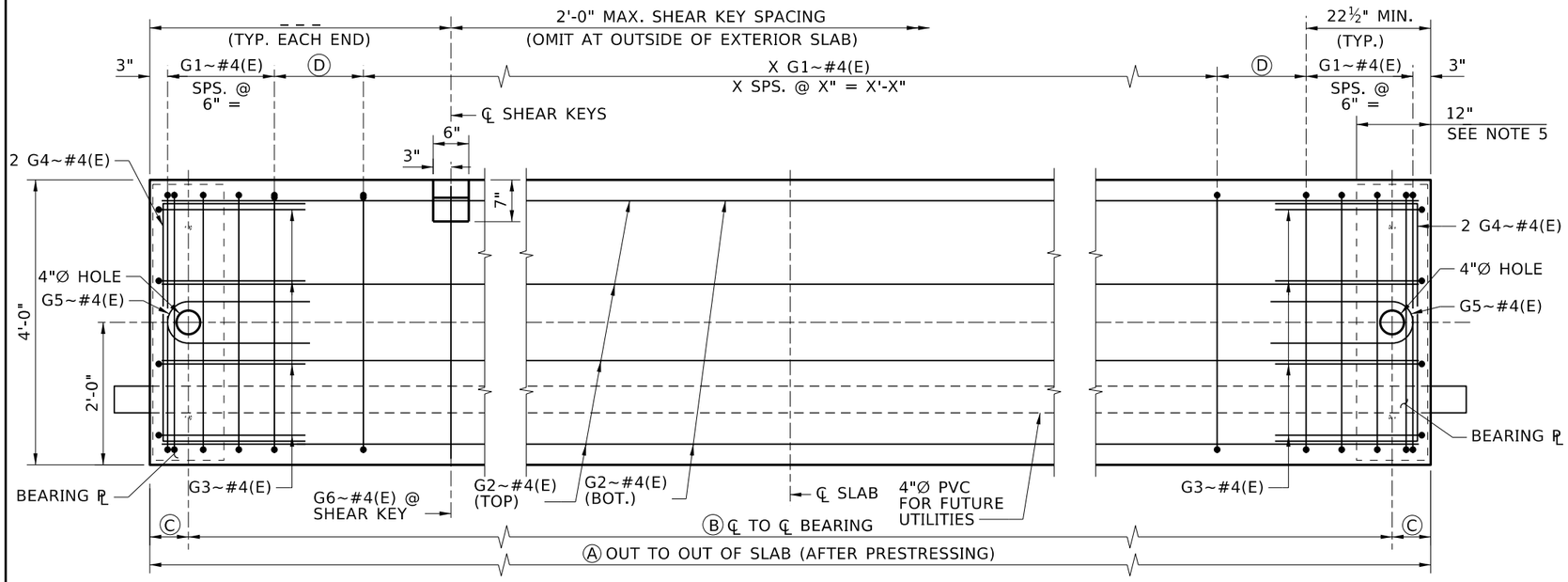
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	1'-3" PRESTRESSED VOIDED SLAB	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_6B.dgn			STATE SYSTEM	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B5.6B	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

PRESTRESSED SLAB SCHEDULE

SLAB		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		SLAB DIMENSIONS						C.G. OF STRAND
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	Ⓐ	Ⓑ	Ⓒ LEFT	Ⓒ RIGHT	Ⓓ LEFT	Ⓓ RIGHT	ⓑ

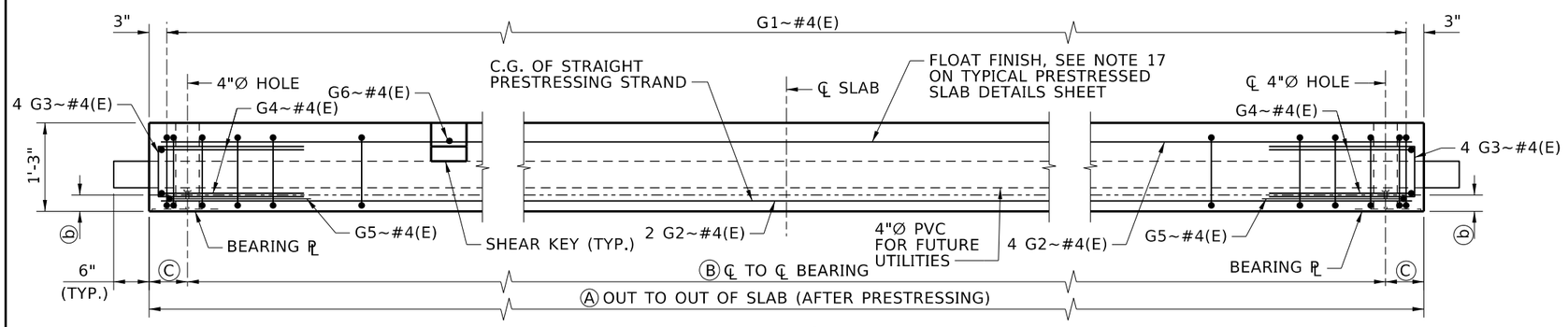
NOTES

1. DIMENSIONS TO STIRRUPS AND DOWELS ARE GIVEN AT ℄ OF SLAB
2. FOR NOTES, BLOCKOUT, BEARING PLATE, AND DETAILS, SEE TYPICAL PRESTRESSED SLAB DETAILS SHEET.
3. SEE PARAPET DETAILS ON SHEET NO. __.
4. APPROXIMATE SLAB SHIPPING WEIGHT IS 735 LB/FT.
5. REINFORCEMENT IN ACCORDANCE WITH AASHTO ARTICLE 5.9.4.4.1.
6. KEYWAY IS TYPICAL EACH SIDE OF SLABS EXCEPT EXTERIOR SIDE OF EXTERIOR SLABS. OMIT KEYWAY ON OUTSIDE OF EXTERIOR SLABS ONLY.



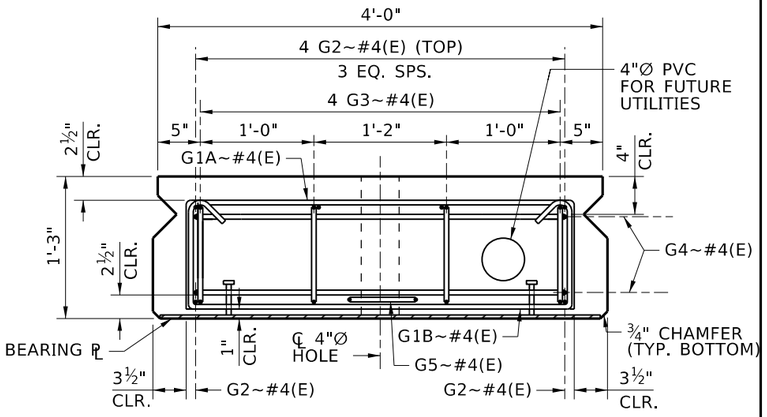
PLAN

½"=1'-0"



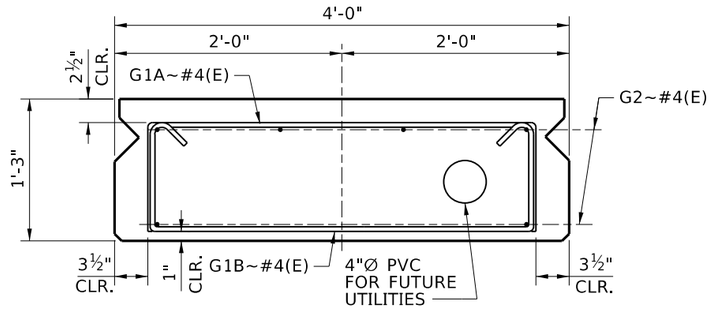
ELEVATION

½"=1'-0"



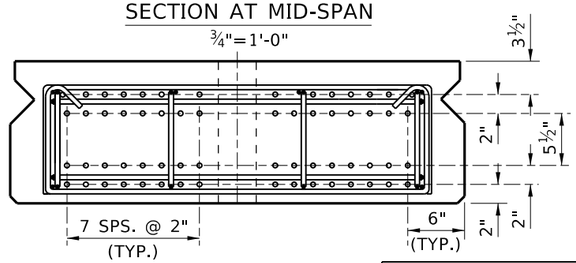
SECTION AT ℄ BEARING

¾"=1'-0"



SECTION AT MID-SPAN

¾"=1'-0"



STRAND LAYOUT

¾"=1'-0"

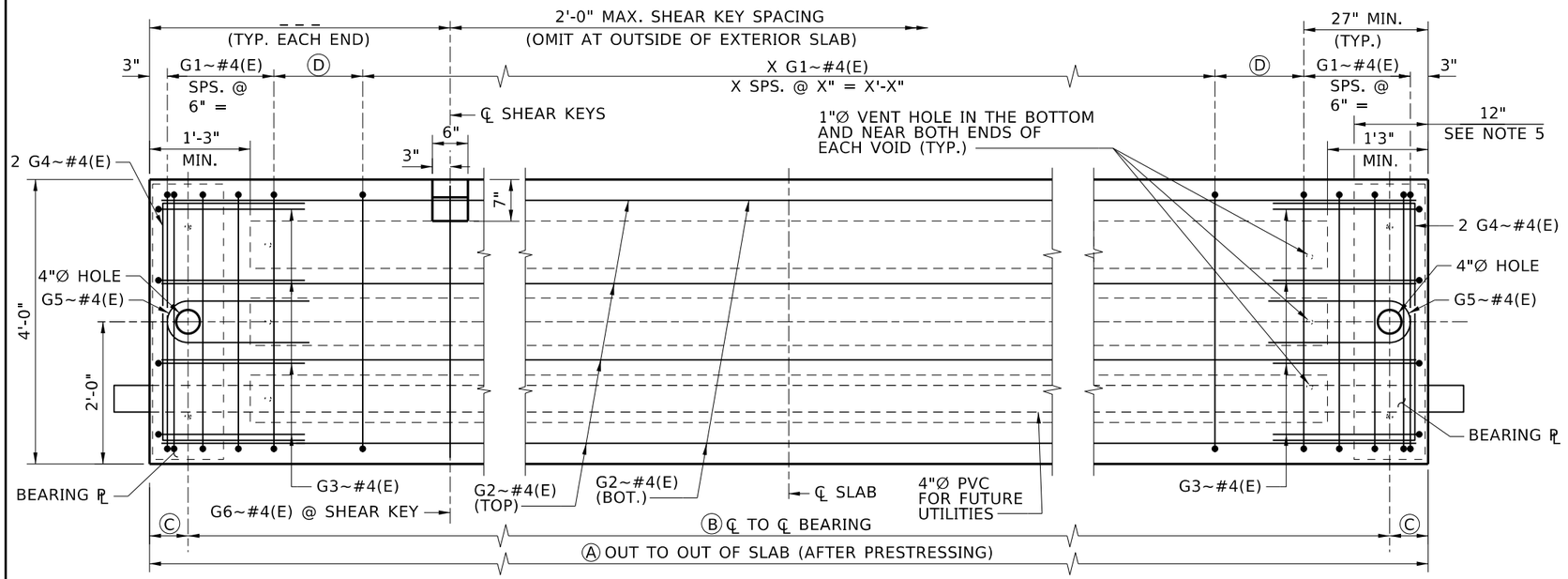
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	1'-3" PRESTRESSED SOLID SLAB	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME Standards/Bridge Standard Drawings/ B05_6C.dgn	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	STATE SYSTEM BRIDGE LRFD DESIGN MANUAL, B5.6C	BRIDGE KEY NO.
				DETAILED					COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

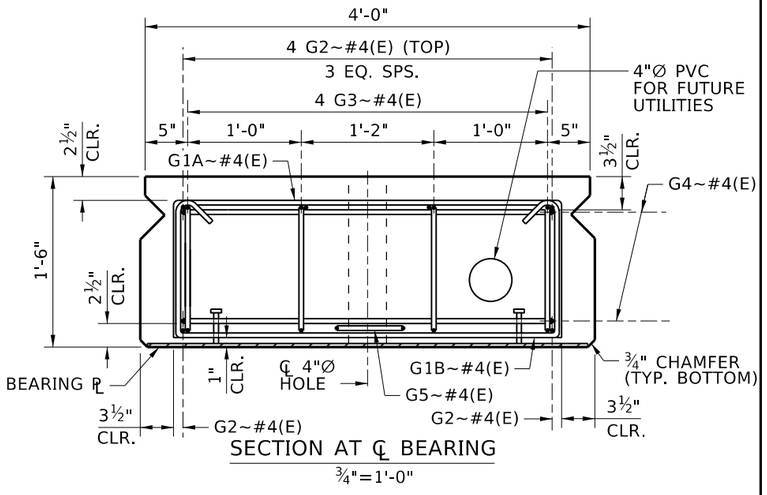
PRESTRESSED SLAB SCHEDULE

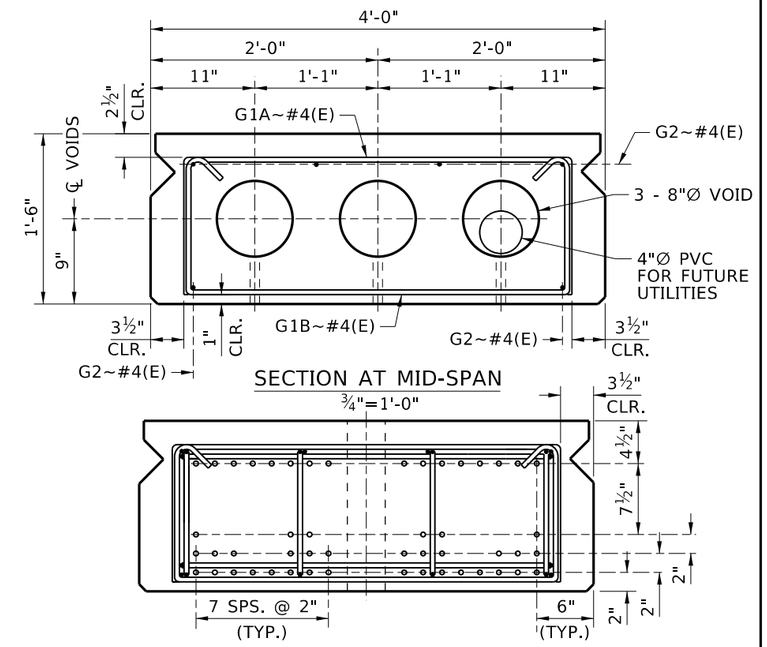
SLAB		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		SLAB DIMENSIONS						C.G. OF STRAND
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	Ⓐ	Ⓑ	Ⓒ LEFT	Ⓒ RIGHT	Ⓓ LEFT	Ⓓ RIGHT	ⓑ

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWELS ARE GIVEN AT ℄ OF SLAB
2. FOR NOTES, BLOCKOUT, BEARING PLATE, AND DETAILS, SEE TYPICAL PRESTRESSED SLAB DETAILS SHEET.
3. SEE PARAPET DETAILS ON SHEET NO. __.
4. APPROXIMATE SLAB SHIPPING WEIGHT IS 728 LB/FT.
5. REINFORCEMENT IN ACCORDANCE WITH AASHTO ARTICLE 5.9.4.4.1.
6. KEYWAY IS TYPICAL EACH SIDE OF SLABS EXCEPT EXTERIOR SIDE OF EXTERIOR SLABS. OMIT KEYWAY ON OUTSIDE OF EXTERIOR SLABS ONLY.







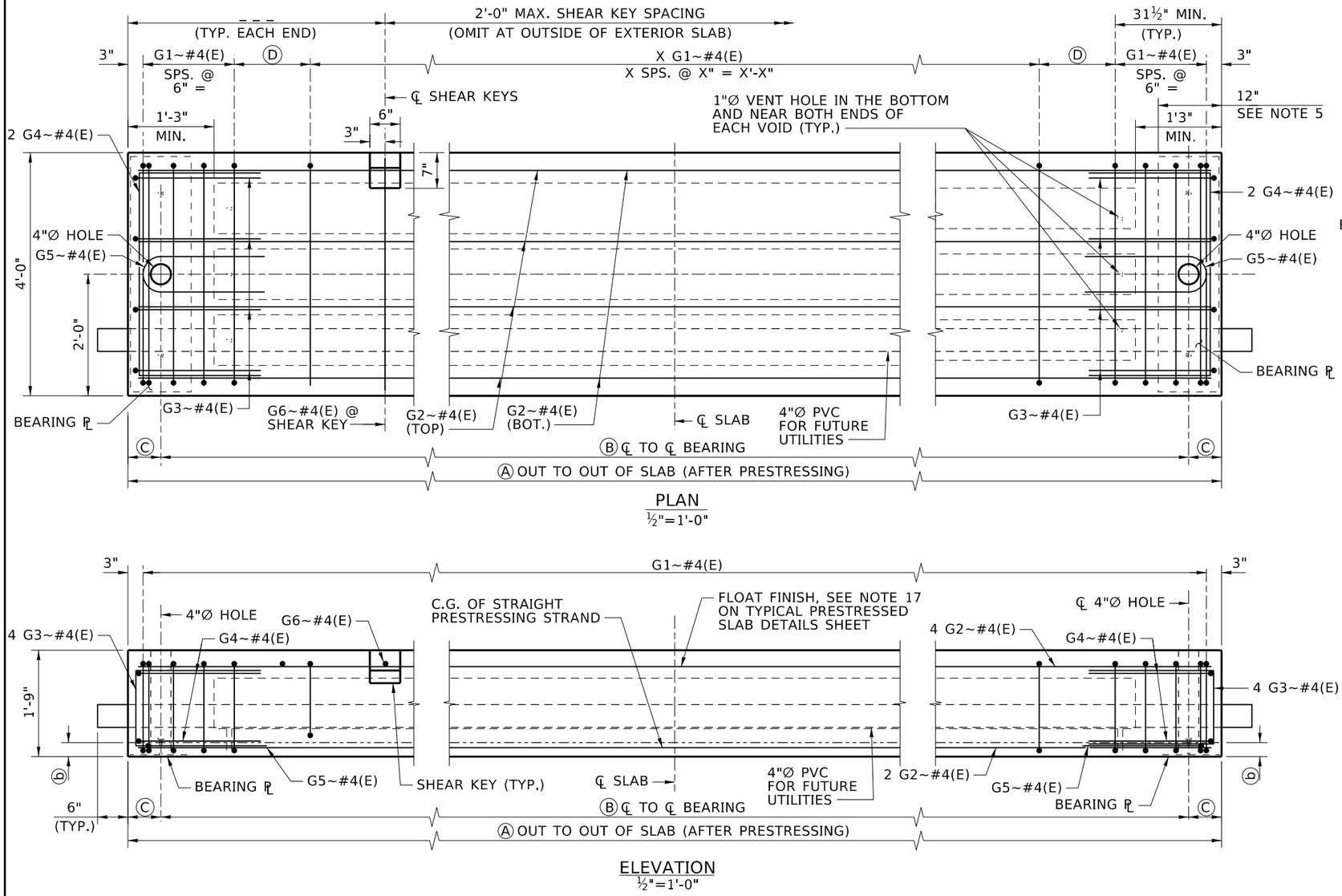
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	1'-6" PRESTRESSED VOIDED SLAB	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_6D.dgn			STATE SYSTEM	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B5.6D	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

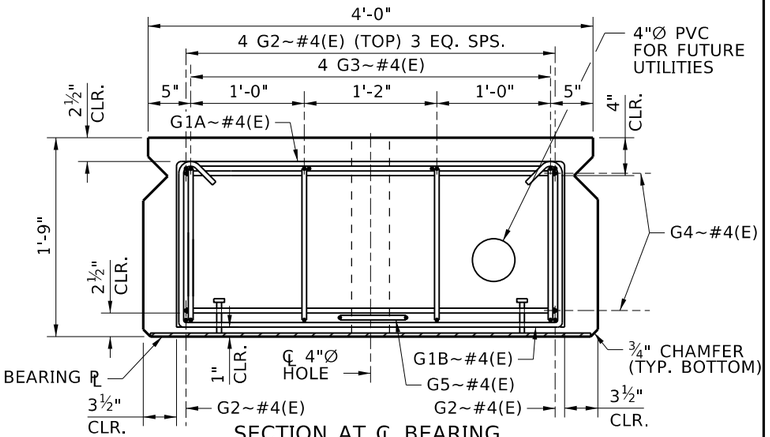
PRESTRESSED SLAB SCHEDULE

SLAB		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		SLAB DIMENSIONS						C.G. OF STRAND
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	Ⓐ	Ⓑ	Ⓒ LEFT	Ⓒ RIGHT	Ⓓ LEFT	Ⓓ RIGHT	ⓑ

NOTES

1. DIMENSIONS TO STIRRUPS AND DOWELS ARE GIVEN AT ℄ OF SLAB
2. FOR NOTES, BLOCKOUT, BEARING PLATE, AND DETAILS, SEE TYPICAL PRESTRESSED SLAB DETAILS SHEET.
3. SEE PARAPET DETAILS ON SHEET NO. ___.
4. APPROXIMATE SLAB SHIPPING WEIGHT IS 789 LB/FT.
5. REINFORCEMENT IN ACCORDANCE WITH AASHTO ARTICLE 5.9.4.4.1.
6. KEYWAY IS TYPICAL EACH SIDE OF SLABS EXCEPT EXTERIOR SIDE OF EXTERIOR SLABS. OMIT KEYWAY ON OUTSIDE OF EXTERIOR SLABS ONLY.





STRAND LAYOUT

¾"=1'-0"

REVISIONS NO.	DATE	BY	DESCRIPTION
△			
△			
△			
△			
△			

DESIGNED
DESIGN CHECKED
DETAILED
DWG. CHECKED
CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY
CADD FILE NAME
Standards/Bridge Standard Drawings/B05_6E.dgn
DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT
YOUR Safety→YOUR Mobility→YOUR Economic Opportunity
APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE: _____

ENGLISH
PROJECT NO.

1'-9" PRESTRESSED VOIDED SLAB

STATE SYSTEM
BRIDGE LRFD DESIGN MANUAL, B5.6E

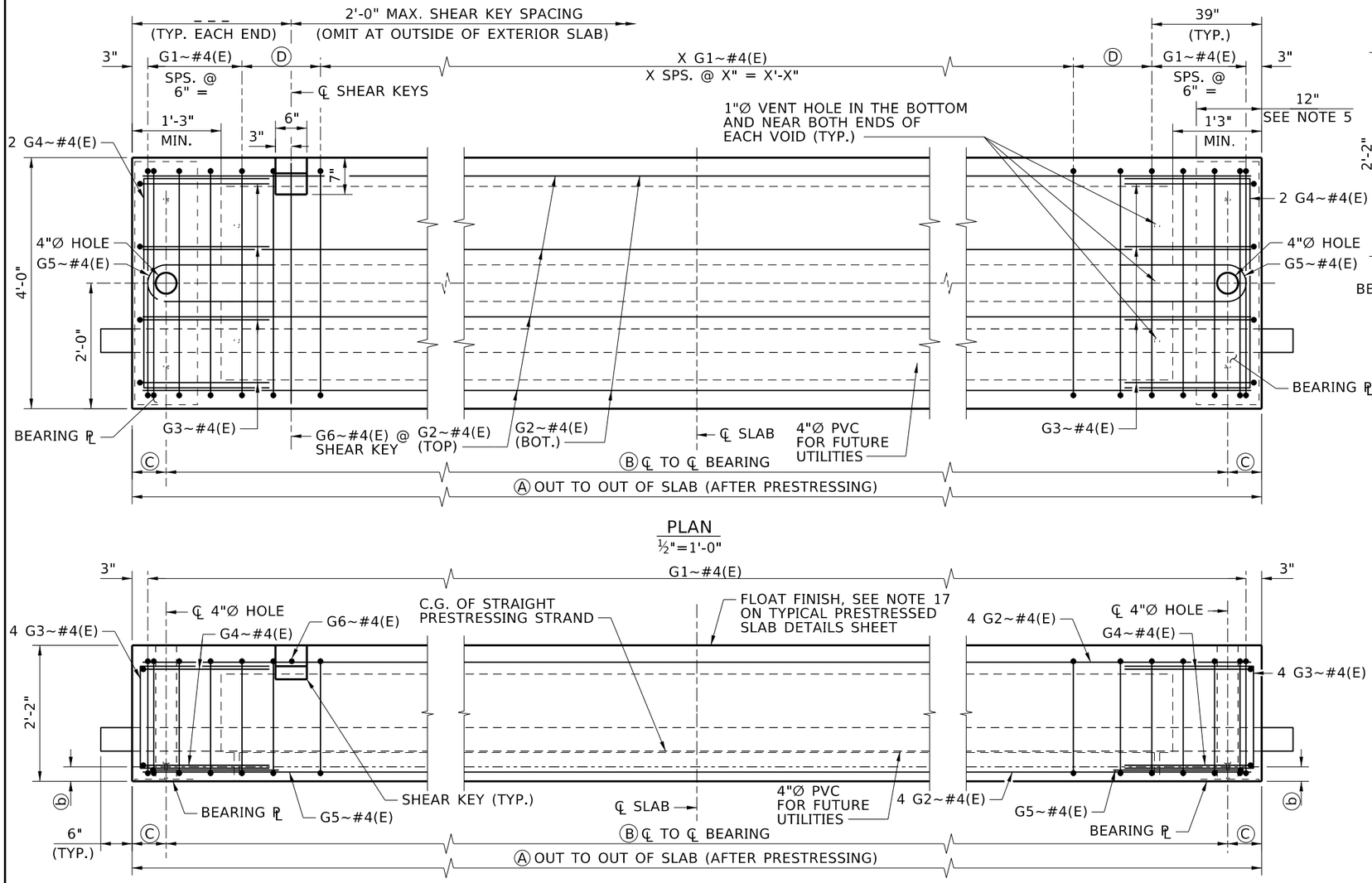
BRIDGE PLANS
BRIDGE KEY NO.
COUNTY | KEY NO.
BRIDGE DWG. NO. | SHEET OF

PRESTRESSED SLAB SCHEDULE

SLAB		PRESTRESS FORCE ~ KIPS		PRESTRESS LOSSES ~ KSI		CONCRETE STRENGTH ~ KSI		SLAB DIMENSIONS						C.G. OF STRAND
NO.	LOCATION	INITIAL BEFORE LOSSES	FINAL AFTER LOSSES	IMMEDIATE LOSSES	FINAL TOTAL LOSSES	AT RELEASE f'ci	AT 28 DAYS f'c	Ⓐ	Ⓑ	Ⓒ LEFT	Ⓒ RIGHT	Ⓓ LEFT	Ⓓ RIGHT	ⓑ

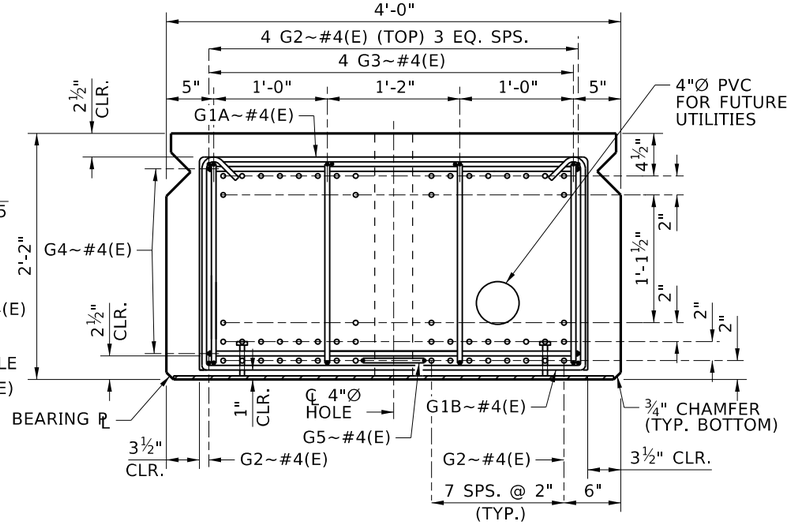
NOTES

1. DIMENSIONS TO STIRRUPS AND DOWELS ARE GIVEN AT ℄ OF SLAB.
2. FOR NOTES, BLOCKOUT, BEARING PLATE, AND DETAILS, SEE TYPICAL PRESTRESSED SLAB DETAILS SHEET.
3. SEE PARAPET DETAILS ON SHEET NO. __.
4. APPROXIMATE SLAB SHIPPING WEIGHT IS 917 LB/FT.
5. REINFORCEMENT IN ACCORDANCE WITH AASHTO ARTICLE 5.9.4.4.1.
6. KEYWAY IS TYPICAL EACH SIDE OF SLABS EXCEPT EXTERIOR SIDE OF EXTERIOR SLABS. OMIT KEYWAY ON OUTSIDE OF EXTERIOR SLABS ONLY.

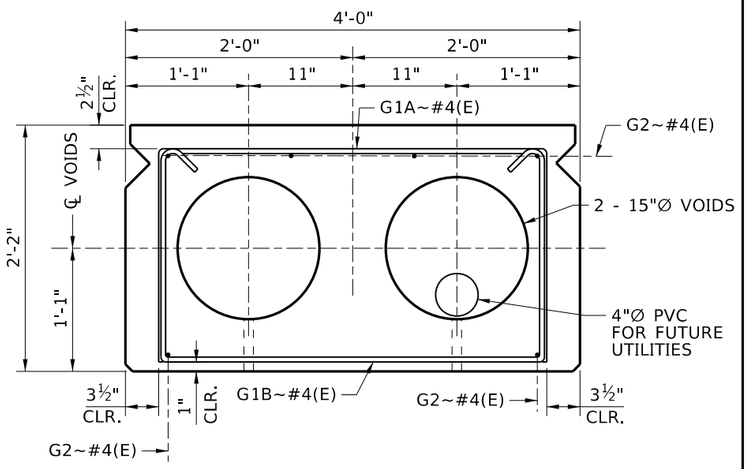


PLAN
½"=1'-0"

ELEVATION
½"=1'-0"



STRAND LAYOUT & SECTION AT ℄ BEARING
¾"=1'-0"



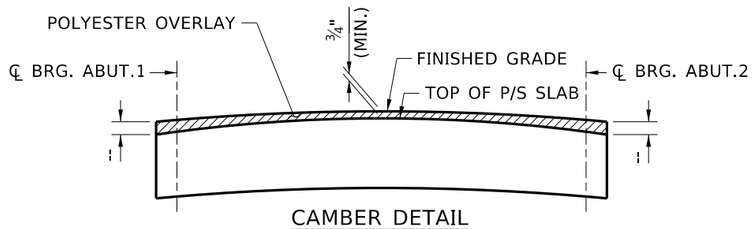
SECTION AT MID-SPAN
¾"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	2'-2" PRESTRESSED VOIDED SLAB	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/B05_6F.dgn			STATE SYSTEM	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B5.6F	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

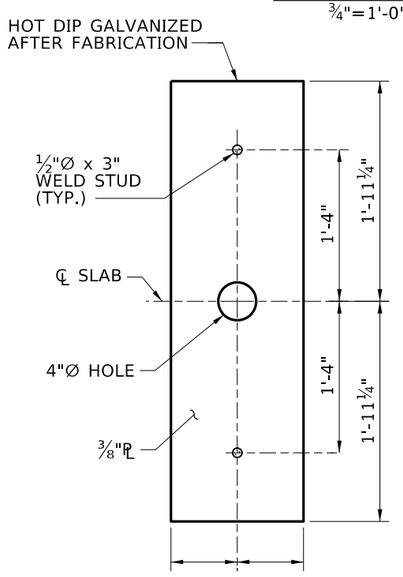
DEFLECTION DATA ~ INCHES

LOCATION	Δ P PRESTRESS	Δ G SLAB	Σ Δ * P + Δ G	Δ 1 ** 1.55 Δ P + 1.65 Δ G	Δ BARRIER NON COMP DL	Δ POLYESTER NON COMP DL	Δ 2 Δ BARRIER + Δ POLYESTER
_ _ _	_ _ _ ↑	_ _ _ ↓	_ _ _ ↑	_ _ _ ↑	_ _ _ ↓	_ _ _ ↓	_ _ _ ↓
_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _

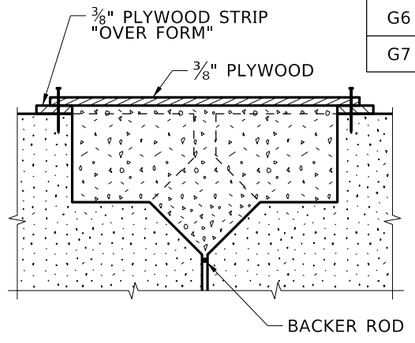
* ESTIMATED DEFLECTION OF PRESTRESSED SLAB AT RELEASE
** ESTIMATED DEFLECTION OF PRESTRESSED SLAB AT ERECTION



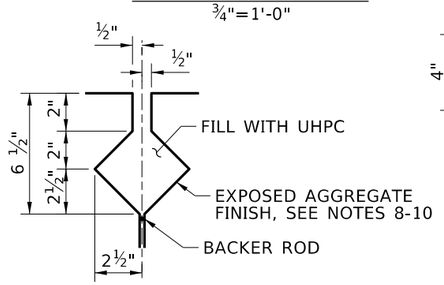
CAMBER DETAIL
¾"=1'-0"



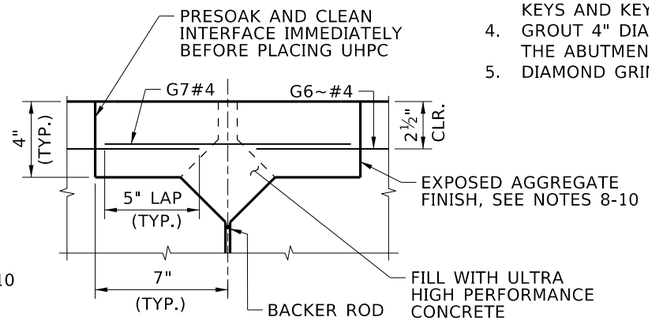
SLAB BEARING PLATE
¾"=1'-0"



SHEAR KEY FORMING DETAILS
¾"=1'-0"



KEYWAY DETAIL
1½"=1'-0"



SHEAR KEY DETAIL
1½"=1'-0"

REINFORCEMENT DIAGRAM
AASHTO M31 GRADE 60 TYPE S

MARK	SIZE	GRADE	SKETCH
G1A*	#4(E)	60	VAR. 3'-5" VAR.
G1B*	#4(E)	60	VAR. 3'-5" VAR.
G2	#4(E)	60	Ⓐ - 4"
G3*	#4(E)	60	VAR. 2'-3"
G4*	#4(E)	60	2'-3" 3'-4" 2'-3"
G5*	#4(E)	60	2'-3", 2½" RAD., 6"
G6	#4(E)	60	3'-9"
G7	#4(E)	60	1'-1"

BEND DETAILS IN ACCORDANCE WITH LATEST ACI STANDARD PRACTICE.

* STIRRUP AND TIE HOOK BEND DIMENSIONS.

STIRRUPS AND TIES MUST HAVE A MINIMUM 1" COVER OUTSIDE OF BARS.

CONSTRUCTION SEQUENCE
1. SET SLABS.
2. ENSURE THAT SHEAR KEYS, KEYWAYS AND SURROUNDING SURFACES TO RECEIVE UHPC ARE FREE FROM DIRT, OIL, GREASE, RUST AND OTHER FOREIGN MATERIAL.
3. PLACE BACKER ROD AND UHPC IN SHEAR KEYS AND KEYWAYS.
4. GROUT 4" DIA. VERTICAL DOWEL HOLE AT THE ABUTMENTS.
5. DIAMOND GRIND TOP SURFACE OF UHPC.

NOTES

CONCRETE
1. PROVIDE CONCRETE STRENGTH AS SHOWN ON THE PLANS.
2. PROVIDE CONCRETE THAT CONFORM TO 502 EXCEPT THAT ENTRAINED AIR WILL BE 5% ±1%. SELF CONSOLIDATING CONCRETE MAY BE USED IN ACCORDANCE WITH 502.

STRAND
3. DESIGN IS BASED ON 0.6" DIA. AASHTO M203 LOW RELAXATION STRAND.

GROUT
4. PROVIDE GROUT FOR 4" DIA. HOLES THAT CONFORM TO TYPE "B" CLASS I NON-METALLIC NON-SHRINK AS SPECIFIED IN 705.02.

ULTRA HIGH PERFORMANCE FIBER REINFORCED CONCRETE (UHPC)
5. FILL SHEAR KEYS AND KEYWAYS WITH UHPC.
6. PROVIDE UHPC THAT CONFORM TO THE REQUIREMENTS OF S501-40A.
7. NO TRAFFIC IS ALLOWED ON THE SLAB UNTIL FOUR DAYS AFTER UHPC PLACEMENT AND UNTIL UHPC HAS REACHED A MINIMUM COMPRESSIVE STRENGTH OF 14,000 PSI.

SHEAR KEYS AND KEYWAYS
8. INTENTIONALLY ROUGHEN INTERFACES OF SHEAR KEYS AND KEYWAYS THROUGH THE USE OF A CHEMICAL RETARDER APPLIED TO THE PRECAST COMPONENT FORMWORK TO PRODUCE AN EXPOSED AGGREGATE SURFACE. SUBMIT THE MATERIAL SPECIFICATIONS OF THE CHEMICAL RETARDER FOR APPROVAL.
9. PROVIDE AN AMPLITUDE OF ETCH AT LEAST 0.25" AND NO LARGER THAN 1/2 OF THE NOMINAL COARSE AGGREGATE SIZE OF THE PRECAST COMPONENT CONCRETE.
10. DO NOT SANDBLAST, ABRADE, OR USE A FORM LINER TO CREATE AN EXPOSED AGGREGATE SURFACE.
11. PLACE A BACKER ROD AT THE BOTTOM OF SHEAR KEYS AND KEYWAYS FOR CONTAINING THE UHPC.

SHOP DRAWINGS
12. PROVIDE SHOP DRAWING DETAILS THAT CONFORM TO CURRENT AASHTO SPECIFICATIONS. SHOW DETENSIONING SEQUENCE AND LIFT POINTS ON THE SHOP DRAWINGS.
13. SUBMIT SHOP DRAWINGS ACCORDANCE WITH 506.03 AND 105.02.
14. KEEP THE PRESTRESSED SLABS IN A FLAT POSITION (TOP SURFACE UPWARD) DURING TRANSPORTATION AND ERECTION AND LIFT ONLY BY THE MEANS OF THE LIFTING DEVICES PROVIDED. SUBMIT THE PROVISION FOR SUPPORT POINTS TO BE USED DURING TRANSPORTATION TO THE JOB SITE.

MISCELLANEOUS SLAB DETAILS
15. DIMENSIONS ARE HORIZONTAL DIMENSIONS. CORRECT THE FINISHED SLAB LENGTH FOR GRADE AND PROVIDE AN ALLOWANCE FOR BEAM SHORTENING.
16. FABRICATE IN ACCORDANCE WITH 506.
17. FINISH THE TOP SURFACE OF THE SLAB IN ACCORDANCE WITH 502.03,PART 1, PARAGRAPH 3d.
18. SLAB ERECTION IS ASSUMED TO OCCUR 60-90 DAYS AFTER FABRICATION.
19. DIAMOND GRIND THE TOP OF THE UHPC FLUSH WITH THE SURFACE OF THE SLAB AFTER UHPC HAS REACHED A MINIMUM COMPRESSIVE STRENGTH OF 10,000 PSI.

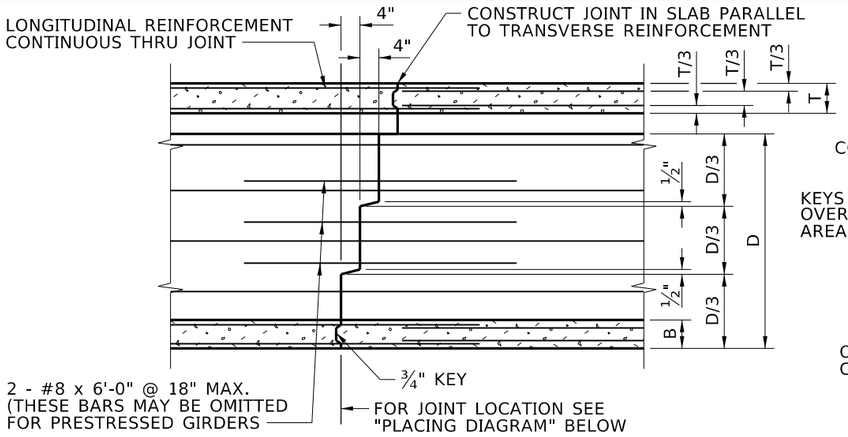
FOR SLABS RECEIVING POLYESTER OVERLAYS
20. PROVIDE A PPC OVERLAY SYSTEM TO THE TOP SURFACE OF THE SLAB FROM FACE OF CURB TO FACE OF CURB AND FROM BEGINNING TO END OF BRIDGE IN ACCORDANCE WITH 551. ADJUST THE OVERLAY THICKNESS AS REQUIRED TO MATCH FINISH GRADE PROFILE. DETERMINE THE AMOUNT OF ADJUSTMENT BASED ON SURVEYED ELEVATIONS ALONG THE GIRDERS AND SUBMIT FOR APPROVAL.

FOR SLABS RECEIVING AC OVERLAYS
20A. PROVIDE A SPRAY-APPLIED WATERPROOFING SYSTEM (TYPE E) TO THE TOP OF THE SLAB FROM FACE OF CURB TO FACE OF CURB AND FROM BEGINNING TO END OF BRIDGE IN ACCORDANCE WITH 511.

GIRDER SHIPPING
21. DO NOT SHIP PRESTRESSED CONCRETE MEMBERS UNTIL TESTS ON CONCRETE CYLINDERS MANUFACTURED FROM THE SAME CONCRETE AND CURED UNDER THE SAME CONDITIONS AS THE SLABS INDICATE THAT THE CONCRETE OF THE PARTICULAR MEMBER HAS ATTAINED A COMPRESSIVE STRENGTH EQUAL TO THE SPECIFIED DESIGN 28 DAY COMPRESSIVE STRENGTH.

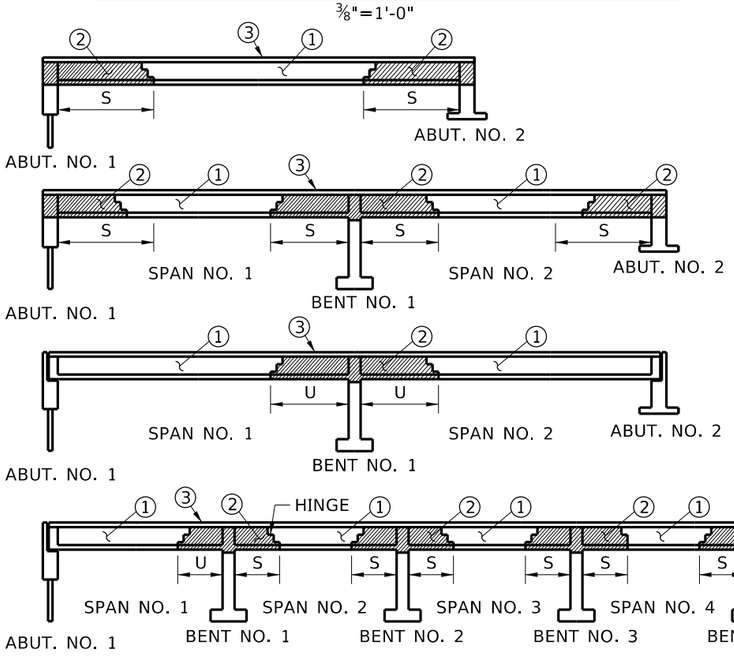
BASIS OF PAYMENT
22. PRESTRESSING CONCRETE MEMBERS IS INCIDENTAL TO THE PRECAST AND PRESTRESSED PAY ITEMS IN 502.

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	TYPICAL PRESTRESSED SLAB DETAILS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_6G.DGN			STATE SYSTEM	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL B5.6G	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



TRANSVERSE GIRDER CONSTRUCTION JOINT DETAIL

⅜"=1'-0"

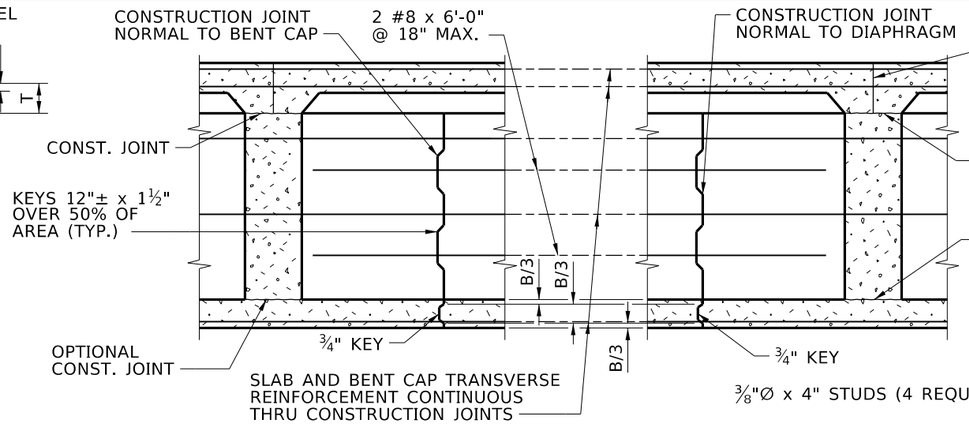


BOX GIRDER SUPERSTRUCTURE PLACING DIAGRAM

½"=1'-0"

NOTE

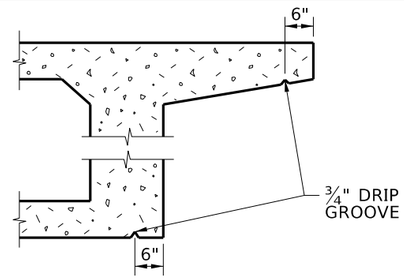
1. NUMBERS ① AND ② INDICATE THE SEQUENCE OF PLACING BOTTOM FLANGE AND GIRDER STEM CONCRETE WHEN EACH SECTION CONSTITUTES A SEPARATE POUR. ① AND ② SECTIONS MAY BE PLACED IN ONE CONTINUOUS POUR, PROGRESSING FROM ONE END PROVIDING ① SECTIONS ARE PLACED ON BOTH SIDES OF THE ② SECTIONS THAT ARE PLACED DURING THIS POUR.
2. PLACE TOP SLAB CONCRETE ③ SEPARATELY FROM ① AND ②. PLACE ③ CONTINUOUSLY OR IN PARTS AS APPROVED, PROVIDING NO TRANSVERSE CONSTRUCTION JOINTS FALL WITHIN THE ② AREAS.
3. PLACEMENT OF THE NEXT SECTION MUST NOT COMMENCE UNTIL AT LEAST 48 HOURS HAVE ELAPSED AFTER THE PLACEMENT OF ADJACENT SECTIONS.
4. S = ⅕ SPAN LENGTH; U = ¼ SPAN LENGTH.
5. NO DEVIATIONS FROM THE ABOVE NOTES ALLOWED UNLESS APPROVED.



AT BENT CAP AT DIAPHRAGMS

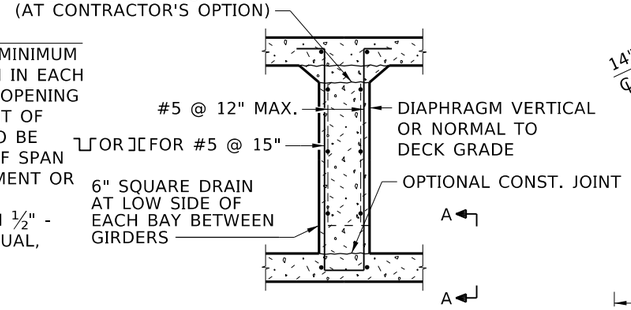
LONGITUDINAL CONSTRUCTION JOINTS

½"=1'-0"



DRIP GROOVE DETAIL

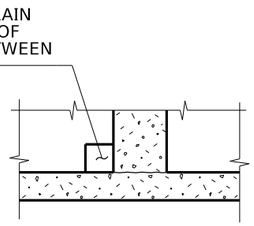
⅜"=1'-0"



INTERMEDIATE DIAPHRAGM SECTION

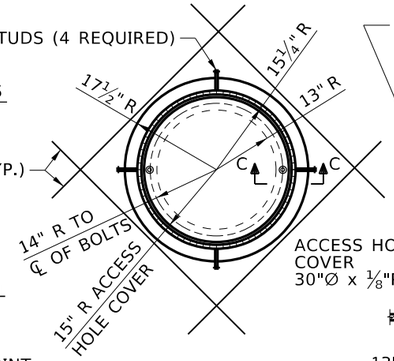
½"=1'-0"

NOTE:
5" OPENING IN LOWER SLAB. MINIMUM OF TWO OPENINGS PER SPAN IN EACH BAY BETWEEN GIRDERS. ONE OPENING TO BE LOCATED AT LOW POINT OF SPAN AND OTHER OPENING TO BE LOCATED AT OPPOSITE END OF SPAN @ 1'-6" FROM FACE OF ABUTMENT OR BENT. COVER OPENINGS WITH EXPANDED ALUMINUM SCREEN ½" - .051 AMICO OR APPROVED EQUAL, SECURELY ATTACHED WITH GALVANIZED FASTENERS.

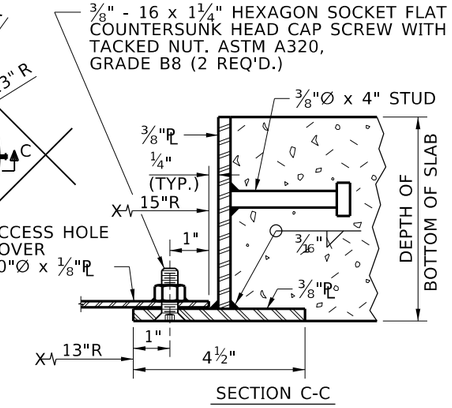


SECTION A-A

½"=1'-0"

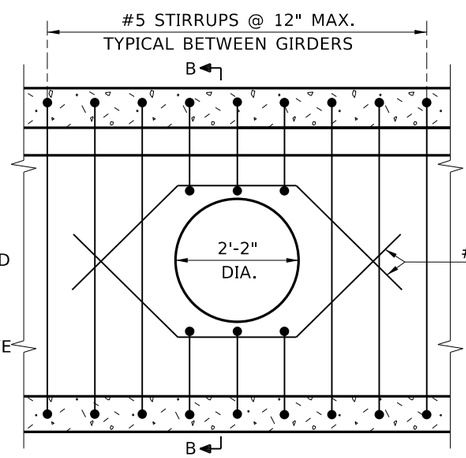


PLAN

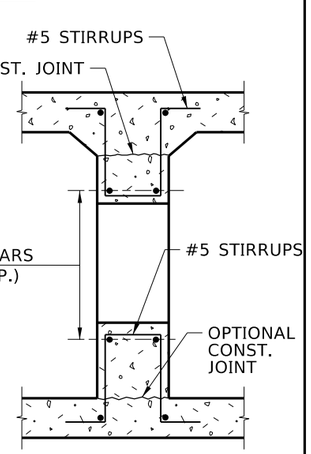


SECTION C-C

ACCESS HOLE COVER

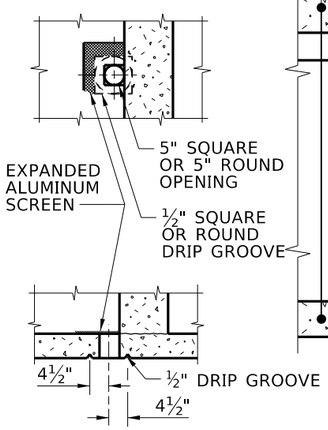


ELEVATION



SECTION B-B

ACCESS HOLE THRU DIAPHRAGM



BOTTOM SLAB OPENINGS

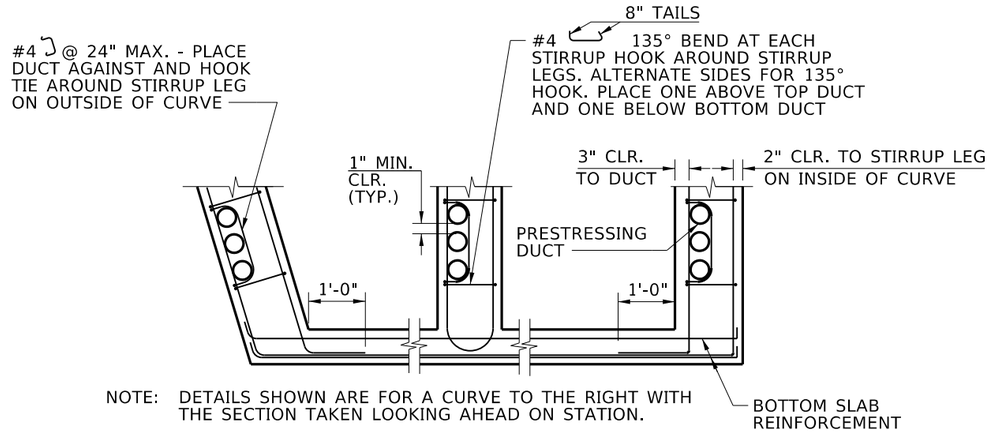
DRAIN AND VENT DETAILS

⅜"=1'-0"

INSPECTION ACCESS HOLE DETAILS

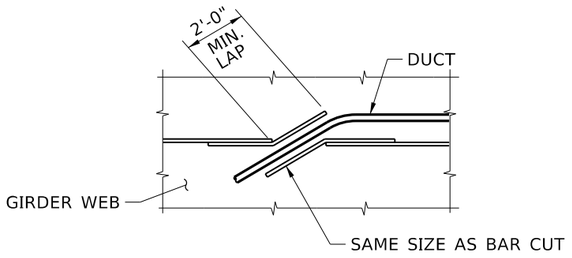
⅜"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	BOX GIRDER DETAILS	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
				DETAILED	Standards/Bridge Standard Drawings/ B05_7A.DGN				COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: OCT 2023	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B5.7A	BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						



NOTE: DETAILS SHOWN ARE FOR A CURVE TO THE RIGHT WITH THE SECTION TAKEN LOOKING AHEAD ON STATION.

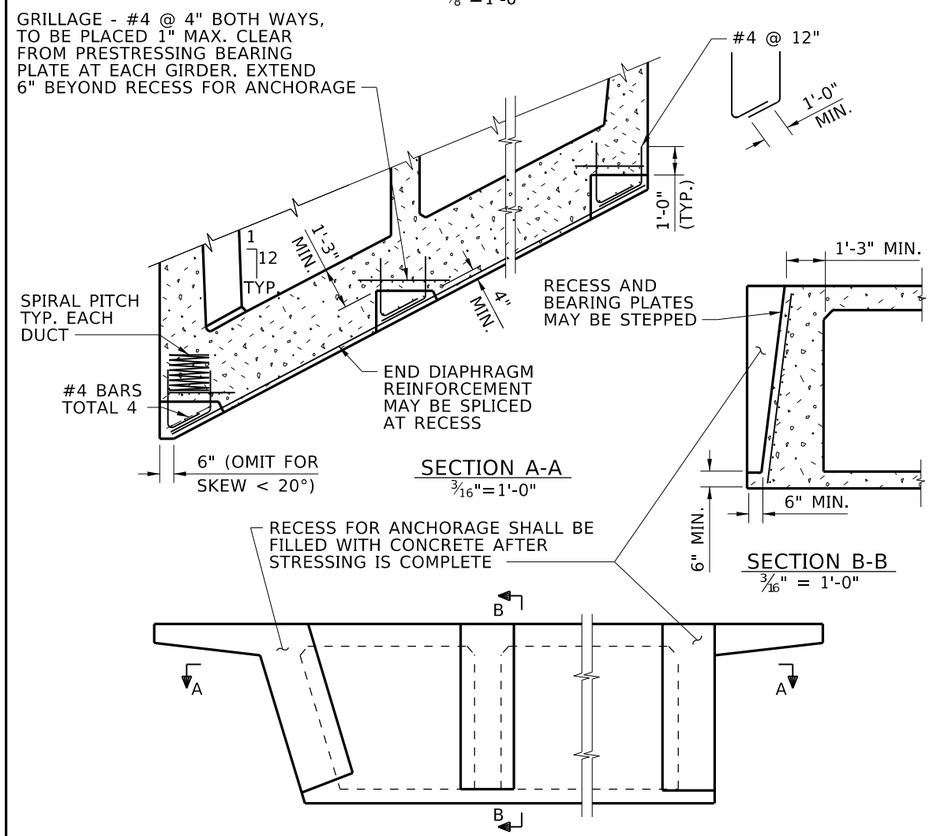
PART GIRDER SECTION
3/8"=1'-0"



ELEVATION
ADJUSTMENT OF WEB REINF. CONFLICTING WITH DUCTS
NTS

GENERAL NOTES

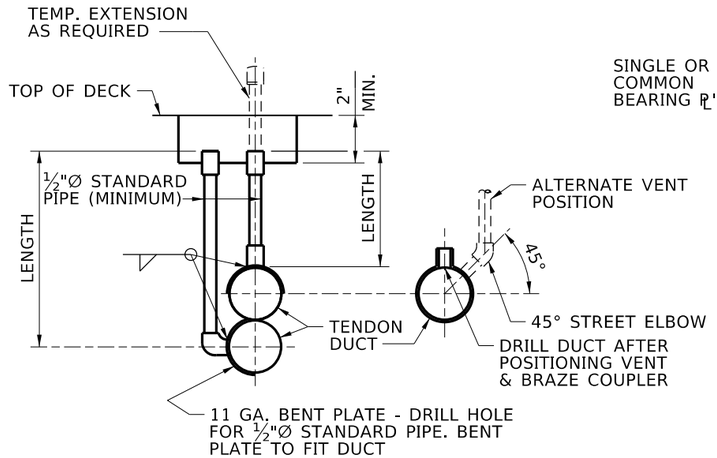
1. START STRESSING AT THE CENTERLINE OF THE STRUCTURE AND WORK TOWARDS THE EDGES OF STRUCTURE.
2. FLARE GIRDER STEMS AS NECESSARY NEAR ANCHORAGE TO PROVIDE A MINIMUM OF 2" CONCRETE COVERING THE DUCTS. FLARE GIRDER WEBS TO ACCOMMODATE POST TENSION ANCHORS.
3. SUBMIT DESIGN CALCULATIONS SEALED AND SIGNED BY AN IDAHO LICENSED PROFESSIONAL ENGINEER FOR APPROVAL THE LENGTH OF FLARES, ADDITIONAL CURVATURE, SHEAR REINFORCEMENT AND ANCHORAGES ZONE REINFORCEMENT.
4. PROVIDE EXTERIOR GIRDER FLARE ON INSIDE OF GIRDER ONLY.
5. GIRDER FLARES MUST BE A MINIMUM OF 1 TO 12.
6. WHEN FLARE DUCT PATTERN IS USED, EXTRA DUCT TIES, EXTRA STIRRUPS, AND EXTRA CONCRETE ARE INCIDENTAL TO POST-TENSION PAY ITEM. SUBMIT THESE DETAILS IN THE SHOP DRAWINGS FOR APPROVAL.
7. SUBMIT ADJUSTMENT OF BAR REINFORCEMENT INTERFERING WITH THE PRESTRESSING TENDON ALIGNMENT FOR APPROVAL.



SECTION A-A
3/16"=1'-0"

SECTION B-B
3/16" = 1'-0"

PRESTRESSED ANCHORAGE DETAILS AT SEAT TYPE ABUTMENTS
3/4"=1'-0"



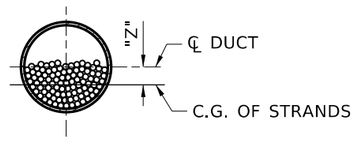
GROUT VENT DETAILS
NTS

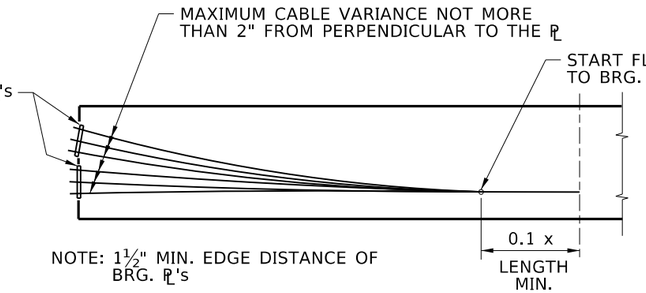
VENT NOTES:

1. SECURE GROUT VENT TO TENDON DUCT WITH HOSE CLAMPS AND SEAL WITH TAPE TO PREVENT CONCRETE ENTRY DURING GIRDER POUR.
2. SUBMIT SHOP DRAWINGS OF VENT DETAILS FOR APPROVAL.

"Z" IS THE AMOUNT OF TENDON OFFSET WITHIN THE DUCT:

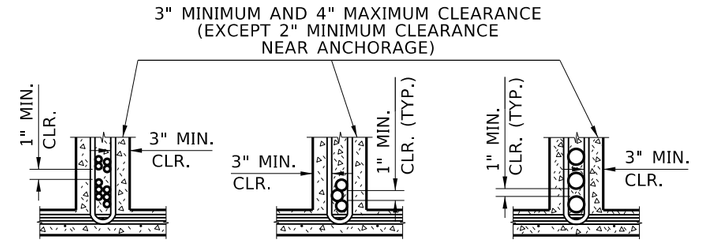
DUCT SIZE	Z
3" O.D. AND LESS	1/2"
OVER 3" O.D. TO 4"	3/4"
OVER 4" O.D.	1"





NOTE: 1½" MIN. EDGE DISTANCE OF BRG. ℄'s

BEARING PLATE PRESTRESSING PATH
3/4"=1'-0"

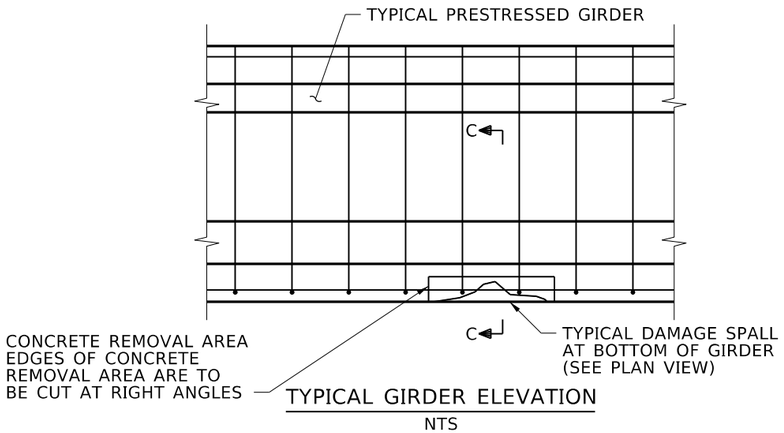


CLEARANCE REQUIREMENTS FOR DUCTS
3/4"=1'-0"

CLEARANCE NOTES:

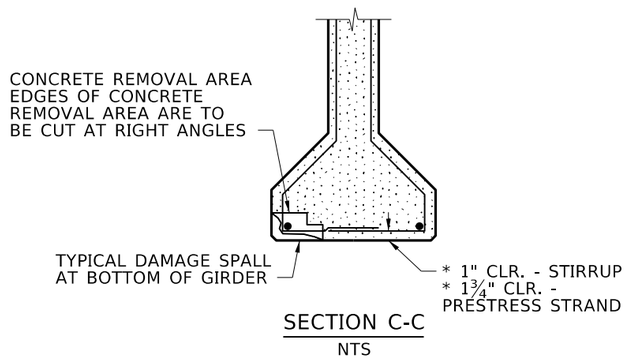
DUCT PATTERNS SHOWN ARE FOR A 12" WIDE GIRDER STEM; FOR OTHER WIDTHS THE MINIMUM CLEARANCES MUST BE MAINTAINED. PLACE LONGITUDINAL TEMPERATURE REINFORCEMENT INSIDE STIRRUPS. SUBMIT DEVIATIONS OF CLEARANCE REQUIREMENTS FOR APPROVAL.

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	POST-TENSIONING DETAILS	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
△				DETAILED	Standards/Bridge Standard Drawings/ B05_7B.DGN				COUNTY	KEY NO.
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△				CORRECTIONS						



TYPICAL GIRDER ELEVATION

NTS



SECTION C-C

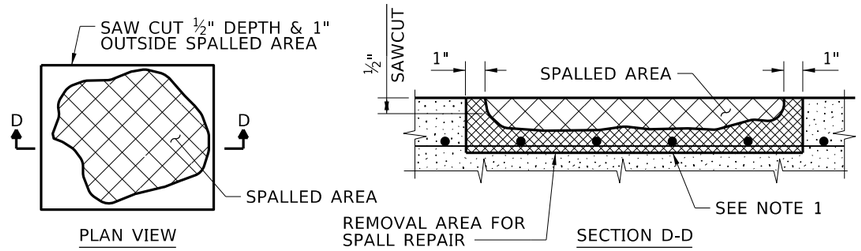
NTS

NOTES

1. PATCH AND REPAIR CONCRETE IN ACCORDANCE WITH 582 EXCEPT CONCRETE REMOVAL MUST BE TO A MINIMUM DEPTH OF ¾" BELOW THE OUTER LAYER OF REINFORCEMENT.
2. EXERCISE CARE DURING CONCRETE REMOVAL TO PREVENT ADDITIONAL DEBONDING OF REINFORCEMENT.
3. DO NOT REMOVE CONCRETE IN ANY AREA WITHIN ½" OF GIRDER BEARING SYSTEMS INCLUDING NEOPRENE PADS AND LEAD PLATES FOR THE FULL DEPTH OF THE PIER CAP, EXCLUDING THE BOTTOM 4" OF THE PIER CAP. NOTIFY THE ENGINEER OF ANY UNSOUND CONCRETE FOUND WITHIN THIS AREA.
4. PROGRESSIVELY REPAIR PIER CAPS TO MAINTAIN STRUCTURAL INTEGRITY UNDER TRAFFIC LOADING. EXPOSE NO MORE THAN 5' OF MAIN REINFORCEMENT AND NO MORE THAN 50% OF THE PERIMETER OF THE PIER CAP AT ANY GIVEN TIME.
5. REPAIR CONCRETE SURFACE CRACK WIDTHS EXCEEDING 0.016" IN ACCORDANCE WITH 581.
6. REPAIR QUANTITIES ARE APPROXIMATE. REPAIR ADDITIONAL DETERIORATED CONCRETE AREAS NOT SHOWN OR NOTED IN ACCORDANCE WITH 581 AND 582 AS DIRECTED.

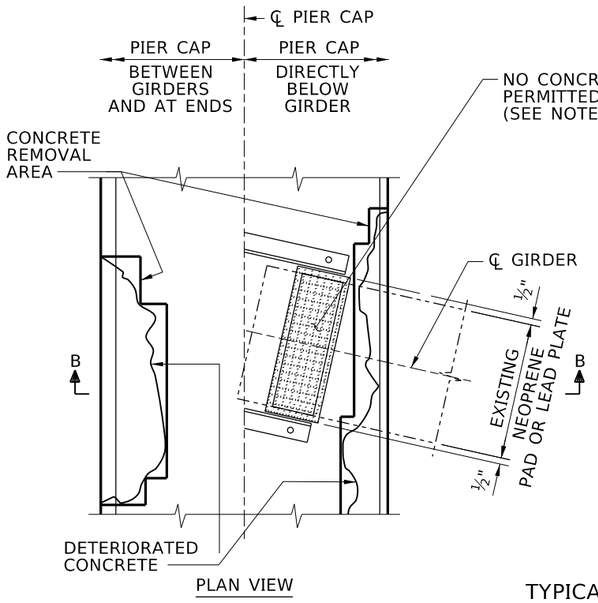
TABLE OF ESTIMATED BRIDGE REPAIR QUANTITIES

LOCATION	581-005A CONCRETE CRACK REPAIR PREPARATION (FT)	581-010A CONCRETE CRACK EPOXY INJECTION (GAL)	582-005A PATCH & REPAIR CONC. SURFACE QUANTITIES (SF)	582-010A PATCH & REPAIR DECK CONC. SURFACE QUANTITIES (SF)
DECK/APPROACH SLABS				
GIRDERS/END DIAPHS.				
ABUTMENTS				
PIER CAPS				
RAILING				
TOTAL				



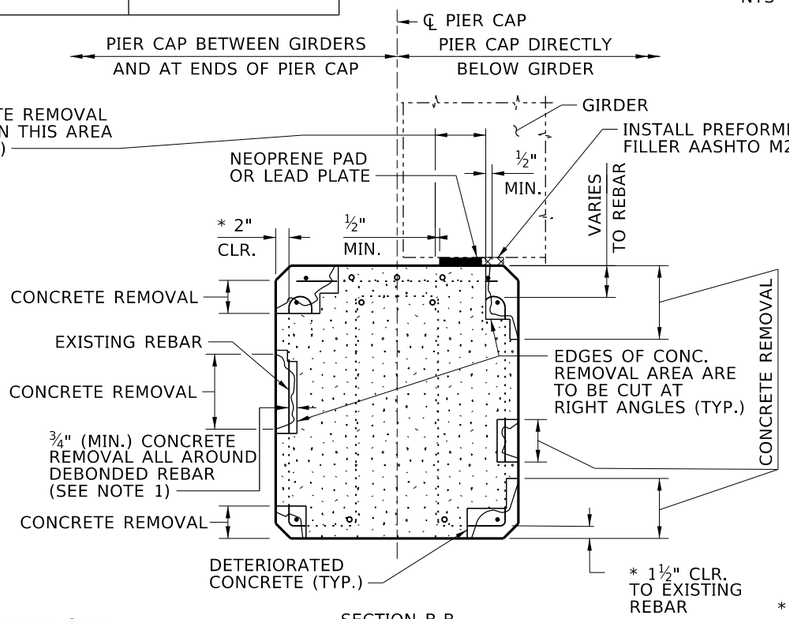
SPALL REPAIR DETAIL

NTS

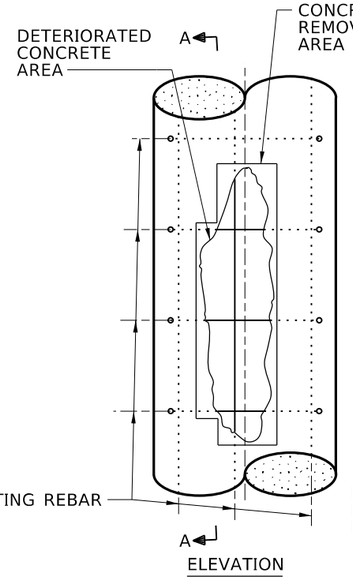


TYPICAL PIER CAP

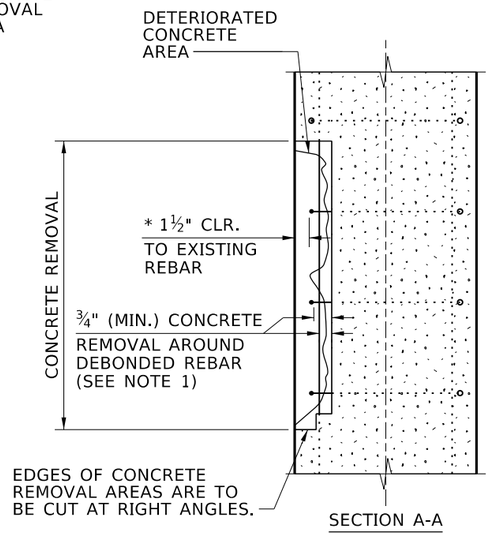
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SECTION B-B



ELEVATION



SECTION A-A

* FIELD VERIFY CLEAR COVER AND ADJUST SAWCUT DEPTH TO AVOID REBAR DAMAGE

TYPICAL COLUMN

NTS

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	ENGLISH	CONCRETE REPAIR DETAILS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME		PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B05_8.DGN			BRIDGE LRFD DESIGN MANUAL, B5.8	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

CHAPTER 6

STEEL

6.6.2 FRACTURE

A Fracture Critical Member (FMC) is defined as a component in tension whose failure is expected to result in the collapse of the bridge or the inability of the bridge to perform its function.

Examples of fracture critical members include components of steel non-redundant bridges in tension. See AASHTO LRFD Section 1.3.4 for a discussion of Redundancy. Generally, this can include tension members of trusses, floor beam flanges in tension, tension flanges of two girders bridges and bottom flanges of twin box girder bridges.

As noted in AASHTO LRFD Article 6.6.2 the location of all FCMs shall be clearly delineated on the contract plans. The contract documents shall require that FCMs shall be fabricated according to Section 12 of the *AASHTO/AWS D1.5M/D1.5 Bridge Welding Code*.

FMCs are subject to more stringent Charpy V-notch impact energy requirements than non-fracture components.
Good construction practices for FMCs are covered under AASHTO LRFD Construction Specification Section 11- Steel Structures, designers should be familiar with these sections.

ITD has several bridges with FMCs in its inventory, including trusses, arches, two girder steel bridges, and twin box girder bridges. Designers may find information regarding special inspection criteria for these bridges in ITD's Manual for Bridge Evaluation. From time to time preservation projects for these bridges are initiated; a good reference for designers to address maintenance issues is the 2013 FHWA Manual for Repair and Retrofit of Fatigue Cracks in Steel Bridges.

Revisions:
May 2014 Added new article.

6.7.2 DEAD LOAD CAMBER

Steel girders require cambering in order to compensate for the effects of roadway vertical curvature, dead load deflections and concrete deck shrinkage deflections. In order to maintain a constant dimension from the top of the bridge deck to the top of the girder web throughout the length of the girder, the web must be fabricated to a profile that matches the finished grade profile of the bridge, along the girder line, after all permanent design loads are applied to the girder. The camber information shall be shown on the plans at the tenth points of each span and at field splice points in both graphic (a camber diagram) and tabular form.

The first aspect of developing the camber diagram is to establish a baseline from which all camber dimensions can be measured. While any straight line, whether horizontal or sloped, is adequate for this purpose the preferred baseline is a line that connects a point at the top of the web at one end of a continuous girder to a point at the top of the web at the other end of the same girder. This line is represented on the camber diagram as a horizontal line. This baseline definition is preferred over other definitions because if the conditions stated below are met the resulting camber diagram will have zero offset from the baseline at both the beginning and end of the girder and the same camber values will be good for all girders in the cross-section, regardless of bridge skew angle.

- All girders in the cross-section are straight and the same length.
- The beginning or end of a vertical curve does not fall within the limits of the bridge (this is only critical if the bridge is skewed).
- No abrupt changes occur in the deck cross-slope on the bridge (such as the start or end of a super transition).

In those cases where the bridge geometry does not meet the above conditions the baseline may be defined, at the discretion of the engineer, as something other than what is described above. In such cases a separate camber table may be required for each girder. Curved girders will always require a separate camber table for each girder. In all cases the definition of the baseline shall be clearly indicated on the bridge plans.

It should be noted here that interior and exterior girders on straight bridges should be cambered the same even if the design dead loads are different. For camber purposes all dead loads should be distributed equally to all girders in a cross-section. If the exterior girders are cambered different from the interior it will not only be difficult to attach the cross-frames but it will be impossible to control the finished grade across the width of the deck with a screed machine supported on the exterior girders. If the screed rails are set for finishing to the exterior girders they will not be correct for finishing over the interior girders. The exterior and interior girders essentially deflect the same during deck placement due to the load distribution effects of the diaphragms.

The second part of developing the camber diagram is determining the amount of offset from the baseline to the finished position of the girder after all permanent loads have been applied. For bridges with no vertical curvature or abrupt changes in cross-section this offset will be zero the full length of the girder. Bridges fully or partially on vertical curves will have camber values varying from zero at the ends to a maximum value near the center of the girder (with positive values for crest and negative values for sag vertical curves). These values should be labeled in the camber table as vertical curve.

The third part of developing the camber diagram is determining the amount of deflection dead loads and deck shrinkage cause in the girder. There are four types of deflections to consider: the self-weight of the steel (non-composite load), the weight of the deck concrete (partial-composite load), the weight of all other dead loads such as parapet & future wearing surface (fully-composite load) and the effect of deck shrinkage over time (fully-composite load). Each one of these deflection types are calculated separately and shown in the camber table, a downward deflection is shown as positive camber and vice versa. The camber diagram shall only show the total of all camber values added together for a given point.

The calculation of the deflections for girder self-weight and the parapet & FWS are relatively straight forward, however the calculation of the deflections due to the deck concrete and shrinkage are more complex. It is ITD policy to determine deflections due to the deck concrete based on the pour sequence. The deflections of the first pour are based on the whole girder acting non-composite, then the deflections of the second pour are based on the area of the first pour acting compositely with the rest of the girder non-composite and so on until the last pour. The deflections due to each pour sequence are added together and only the total is shown in the camber table. For deck shrinkage deflections a method based on classical structure analysis is presented below. Other methods that utilize structural analysis software (such as LARSA) may also be used provided they are based on the same concrete shrinkage strain.

STEEL GIRDER CAMBER DUE TO DECK SHRINKAGE

In addition to dead load and vertical curvature, steel structures should also be cambered for the effect of concrete deck shrinkage. The deflection due to shrinkage should be calculated based on the shrinkage strain of the deck acting on the composite girder sections of the structure.

From Article 5.4.2.3.3 the shrinkage strain can be calculated as follows: $\varepsilon_{sh} = -k_{vs}\, k_{hs}\, k_f\, k_{td}\, (0.00048)$

where: ε_{sh} = shrinkage strain of plain concrete
k_{vs} = factor for volume to surface ratio (assume 1.0 for decks)
k_{hs} = humidity factor (1.16 for Idaho based on an average humidity of 60%)
k_f = factor for concrete strength (1.0 for 4000 psi concrete)
k_{td} = time development factor (0.99 after ten years)

Using these assumptions; $\varepsilon_{sh} = -0.00055$

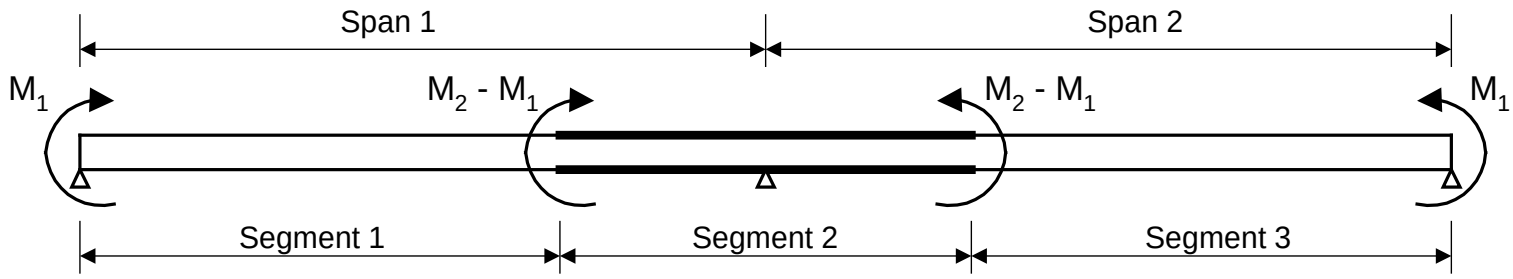
The shrinkage deflection of composite beams can be determined by substituting an equivalent compression force for the shrinkage strain, this force is applied to the ends of each girder segment at mid depth of the deck. For deflection purposes this eccentric compression load has the same effect as applying a positive moment to the ends of each girder segment (a segment being a length of girder with the same section properties). The magnitude of the applied moments is equal to the compression force times the distance from the mid depth of the deck to the c.g. of the composite section for that segment. Where two segments join the applied moment is the difference between the calculated moments for each segment. The equivalent force and moments are determined as follows:

$F_{sh} = (1 - \rho)\varepsilon_{sh}\, AE/3$ (this expression is divided by 3 to account for creep)

$M_i = |F_{sh}(cg_i - T/2)|$ (Moment is always positive)

where: F_{sh} = compression force required to produce a strain equal to ε_{sh}
M_i = moment applied to each end of a particular segment to model the shrinkage effect
A = tributary area of the deck per girder (use total area of deck divided by number of girders)
E = modulus of elasticity of the concrete
cg_i = center of gravity as measured from the top of a particular composite section
T = thickness of the deck
ρ = average ratio of longitudinal deck steel to deck area for a given girder segment

Example of a two span bridge with two different girder sections:

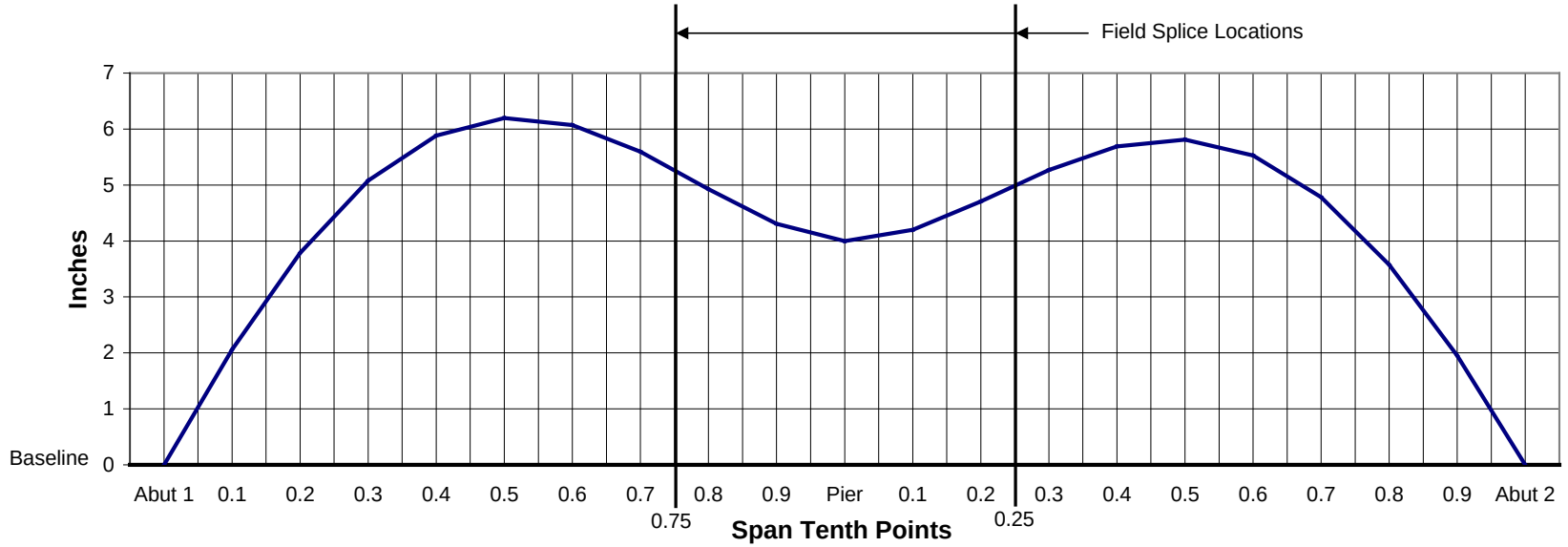


The composite "I" for the girder sections in this analysis should be based on "3n" to account for the long-term creep effect and, at the engineer's option, the transformed deck section to take advantage of the deck reinforcement. It should be noted that while M_1,M_2 etc. are always positive, the difference can be negative. The resulting deflections for this load case are equivalent to the shrinkage deflections. These deflections can then be added to the dead load deflections and combined with the vertical curvature corrections to determine the total camber. This method is appropriate for both single and multiple spans.

Revisions:

June 2006	Revised the shrinkage strain calculations to comply with the 2005 Interims.
Oct 2009	Revised M_i equation to ensure that it is always positive.

Example of a Steel Girder Camber Diagram



	Span 1												Span 2										
Span Point	Abut 1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	Field Splice 0.75	0.8	0.9	Pier	0.1	0.2	Field Splice 0.25	0.3	0.4	0.5	0.6	0.7	0.8	0.9	Abut 2
Girder D.L.	0	0.18	0.34	0.44	0.49	0.47	0.40	0.29	0.22	0.16	0.05	0	0.05	0.16	0.22	0.29	0.40	0.47	0.49	0.44	0.34	0.18	0
* Deck D.L.	0	0.75	1.39	1.83	2.04	1.99	1.71	1.26	0.99	0.71	0.24	0	0.13	0.49	0.71	0.93	1.33	1.60	1.68	1.53	1.17	0.64	0
Shrinkage	0	0.20	0.32	0.37	0.36	0.31	0.24	0.16	0.12	0.08	0.02	0	0.02	0.08	0.12	0.16	0.24	0.31	0.36	0.37	0.32	0.20	0
All Other D.L.	0	0.16	0.30	0.40	0.44	0.42	0.36	0.26	0.20	0.14	0.04	0	0.04	0.14	0.20	0.26	0.36	0.42	0.44	0.40	0.30	0.16	0
Total Deflection Camber	0	1.30	2.35	3.04	3.32	3.20	2.71	1.96	1.52	1.09	0.35	0	0.24	0.87	1.24	1.63	2.33	2.81	2.97	2.74	2.14	1.19	0
Vertical Curve	0	0.76	1.44	2.04	2.56	3.00	3.36	3.64	3.75	3.84	3.96	4.00	3.96	3.84	3.75	3.64	3.36	3.00	2.56	2.04	1.44	0.76	0
Total Camber	0	2.06	3.79	5.08	5.88	6.20	6.07	5.60	5.27	4.93	4.31	4.00	4.20	4.71	4.99	5.27	5.69	5.81	5.53	4.78	3.58	1.95	0

* The deck dead load deflections are not symmetrical because they are based on a three part deck placement sequence.

6.10.3 Constructibility Considerations for Steel Plate Girder Bridges

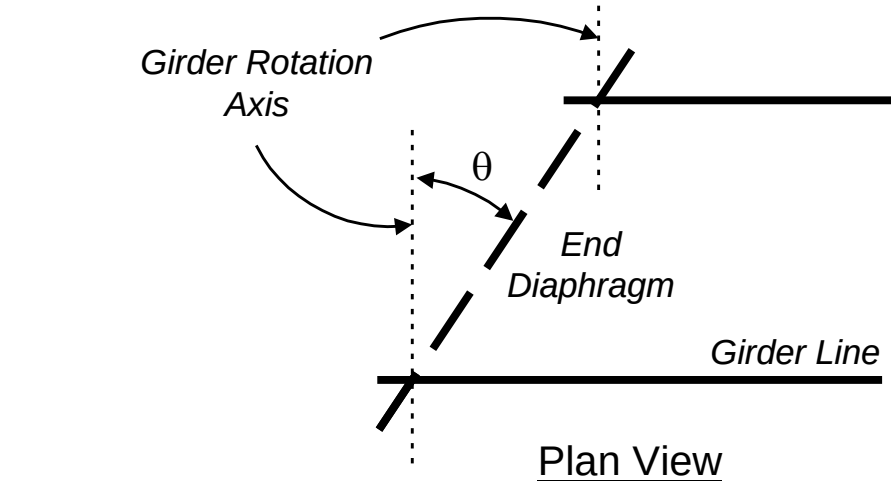
There are several constructibility issues that are unique to steel plate girder bridges that designers should account for in the design, plan preparation, and shop drawing review stages of a project.

Diaphragm Installation for Skewed Bridges:

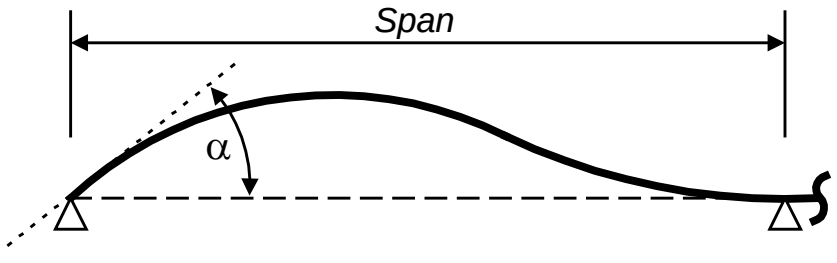
On straight non-skewed bridges all girders across the width of the bridge rotate at their bearings about a single axis line which is perpendicular to the girders, therefore as each girder is loaded all the girders rotate about a common line and the end diaphragms that connect the girders are unaffected. On skewed bridges each girder rotates about its own axis offset from adjacent girders, consequently as the girders are loaded and the girder ends rotate a distorting force is induced in the end diaphragms that connect the girders, since the diaphragms are very stiff diagonally and the girders are relatively flexible torsionally the diaphragms will twist the girders, pulling the web out of plumb.

The angle that the girder web is twisted out of plumb can be calculated as follows:

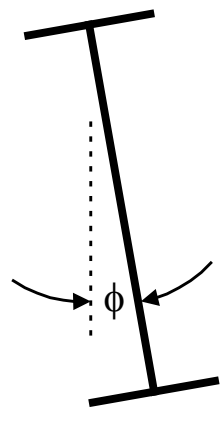
$\phi = \alpha \tan(\theta)$ where: ϕ = the out-of-plumb angle
θ = the bridge skew angle
α = the angle of the end of the girder due to the dead load camber (other than girder self weight)



Plan View



Elevation View of Camber



Girder End View

While there is no way to prevent girder twisting without the complete removal of diaphragms, when and how the girders twist can be controlled by the way the girders are detailed and fabricated. If the girders and diaphragms are detailed and fabricated for the diaphragms to fit the initial position of the girders, before the bridge deck is placed, then the girders will be plumb when the erection is complete. However, after the deck is placed, the girders will be twisted permanently in their final position, the girders will not sit level on the bearings and high distortional stresses will be locked into the diaphragms and girders. The only advantage to this method is that the girders and diaphragms fit initially, making it easier for the contractor to assemble.

On the other hand, if the girders and diaphragms are detailed and fabricated for the final position then the girders will need to be twisted out of plumb initially in order to get the diaphragms installed. However, after the deck is placed, the girders will be plumb for their final permanent position with a minimum amount of permanent distortional stresses in the diaphragms and girders. Standard practice for ITD is to detail diaphragms for the final position. Since some fabricators detail for the initial fit all shop drawings should be carefully checked to ensure they conform to the plans and the design. It is also good practice to specify the direction of the deck placement on the plans. The girders will initially be out of plumb to the greatest extent at the ends of the girders so the deck placement should progress from the dead load inflection point of the span toward the end of the girders so that the girders are near plumb by the time the placement reaches the girder ends.

There is a similar effect from intermediate diaphragms on skewed bridges. Because intermediate diaphragms are typically detailed to attach to the girders such that the diaphragms are perpendicular to the girder lines, they connect adjacent girders at slightly different span points. Since the amount of camber is different at each of these points the girders will need to twist initially out of plumb if the diaphragms are detailed to fit in the final deflected position. But, like the end diaphragms, once the deck has been placed the girders at the intermediate diaphragms will be in the correct upright position.

Camber Differences of Interior and Exterior Girders:

Interior and exterior girders for a given span are often designed for different amounts of dead load due to different tributary areas. This can result in a difference in the dead load camber shown in the plans for interior and exterior girders. However, if the girders are fabricated with different cambers it may become difficult to install the diaphragms during erection, but more importantly the deck may not be finished to the desired thickness across the full width of the bridge. Typically the screed rails for deck finishing machines are supported by the exterior girders, therefore if the exterior girders have more or less camber than the interior girders the deck will either be screeded too thick or too thin over the interior girders since the girders will not yet be fully loaded and therefore not in their final deflected position at the time the screed is finishing the deck. Even though it is appropriate to design the interior and exterior girders for different dead loads for the strength limit state, the dead load camber should be based on the dead load distributed equally to all girders so that all girders are cambered the same. This is really more representative of how the girders will actually deflect during construction as they are all connected to each other by diaphragms.

Bearing Alignment and Changes in Girder Length:

Bearings are often designed to accommodate the movement of girders for such effects as temperature change and live load rotations, but bearings should also accommodate construction tolerances and the length change that occurs in the bottom flange of girders between the initial unloaded condition and the final fully loaded condition.

While there are two construction tolerances to consider: 1) girder length, and 2) bearing placement on abutments and piers, there are also two parts to bottom flange lengthening: 1) the elastic lengthening due to the strain in the bottom flange resulting from the applied loads, and 2) the geometric change in the effective horizontal length of the girder due to the flattening of the fabricated camber. Typically most of the lengthening is the result of elastic strain while the effect due to the flattening of the camber is usually minor and can be ignored in most cases, however camber flattening may become significant when there is a large amount of total camber constructed in the girder.

Accommodating the various factors that contribute to nonalignment of sliding bearings is relatively straight forward since the sliding surface can just be increased. However for elastomeric bearings without a sliding surface it becomes more difficult because the bearings need to be designed to accommodate the extra lateral displacement by increasing the elastomer thickness. This in turn can affect other bearing properties such as load capacity, stability and vertical deflection. To avoid potential problems due to these issues, rather than increasing the elastomer thickness, the contractor can be required by specification to jack the girders and reposition the bearings after all dead loads have been applied and the temperature is near the midpoint of the design range.

Lateral Deflections of Exterior Girders due to Deck Overhang Brackets:

The construction of deck overhangs on steel girders is usually done with the use of standard deck overhang brackets. The use of these brackets introduces a torsional load into the exterior girders during placement of the concrete deck and the potential exists for the girder to rotate laterally, resulting in excessive overhang deflections. This can adversely affect finished grades

when the screed rail is placed at the end of the overhang, the resulting deflection causes the screed to finish the deck lower than anticipated across the full width of the bridge. In order to minimize this problem all steel girder bridges should be checked for exterior girder rotational deflections due to overhang brackets. Anytime the calculated deflection at the edge of the overhang due to torsional effects exceeds 0.20” a revision should be made in the plans to reduce the deflection, such as closer diaphragm spacings, a larger top girder flange, or smaller overhangs. When the structural details cannot be altered temporary girder bracing should be detailed in the plans to resist the rotational effect. For more information on analyzing torsional loading refer to Article 6.10.3.4 and Appendix 6.1 of the Bridge Design LRFD Manual or to the Kansas Torsional Analysis of Exterior Girders method found on the Bridge Design X-Drive or available from KDOT.

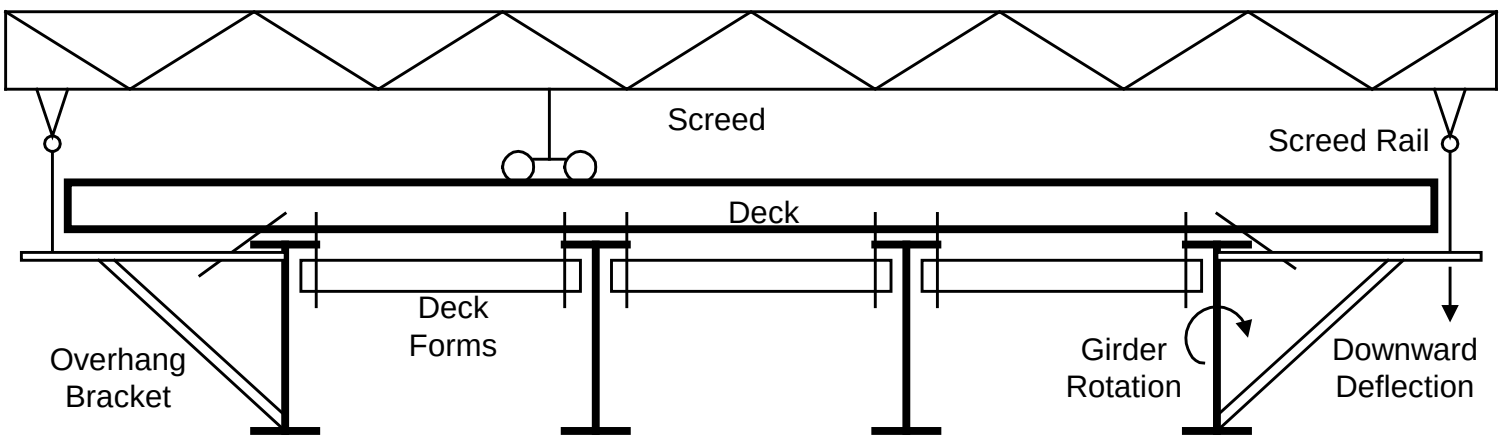
Revisions:

April 2008	Added new article

6.10.3.4 DECK PLACEMENT

LATERAL GIRDER ROTATION

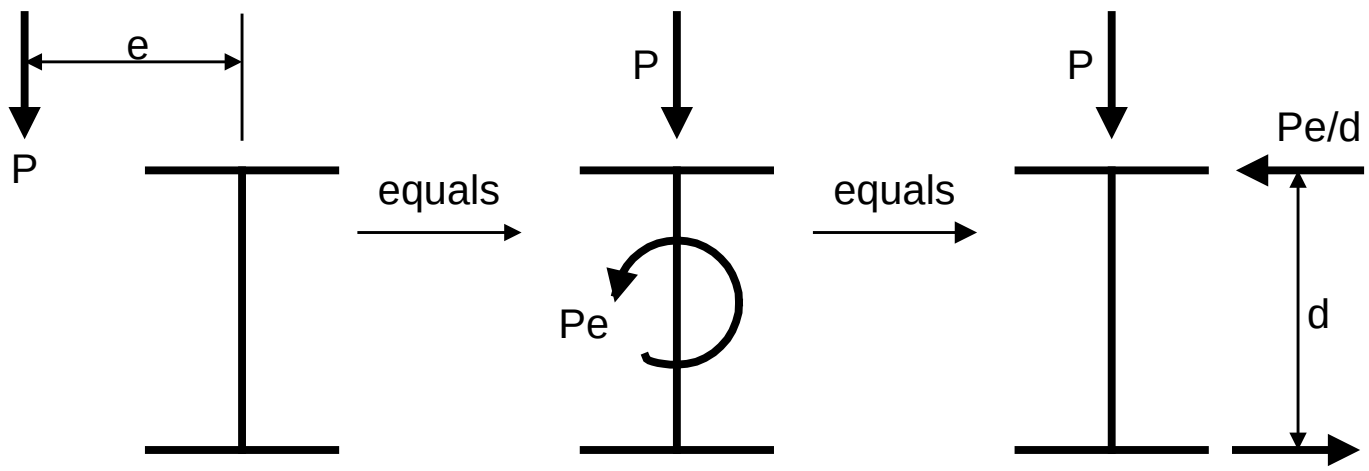
The construction of deck overhangs on steel girders is most often accomplished with the use of standard overhang brackets. The use of these brackets introduces a torsional load into the exterior girders during placement of the concrete deck and the potential exists for the girder to rotate, resulting in excessive overhang deflections. This can adversely affect finished grades when the screed rail is placed at the end of the overhang, the resulting deflection causes the screed to finish the deck lower than anticipated. In order to minimize this problem all steel girder bridges should be checked for rotational deflection.



The magnitude of the deflection at the edge of the deck in relation to the exterior girder is dependent on several factors; rotational stiffness of the girder, diaphragm spacing, amount of deck overhang and screed weight and location.

The calculation of actual rotational stiffness of a welded I-girder is complex, and is made more difficult by the use of diaphragms, the change in flange sizes and the use of unsymmetrical sections. However the problem can be simplified by assuming that any applied torsion acts as a couple with one component of the couple applied to the top flange and the other opposing component applied to the bottom flange. The flanges can then be assumed to carry their respective loads as independent beams in the lateral direction (neglecting the effect of the web). The sum of the two resulting deflections divided by the depth of the girder is the amount of rotation at any given location. This method is conservative and results in rotations approximately 10% greater than would be calculated from a more precise torsional stiffness analysis.

The flanges can be assumed to be continuous beams along the length of the structure with the diaphragms acting as supports. As a result the diaphragm spacing becomes the effective span when calculating the lateral deflections in each flange. The diaphragms should also be checked to be sure they are structurally adequate to carry the resulting reactions.



The couple that is applied to the flanges can be calculated from the net eccentric vertical loading applied to the exterior girders. A typical construction detail involves an overhang bracket on the exterior side of the girder and a beam hanger on the interior side. The loads from this arrangement are multiplied by their respective moment arms as measured from the centerline of the girder and algebraically added together resulting in the applied torsional moment. This moment is then divided by the girder depth and the resulting load applied to both the top and bottom flange to form a couple.

The flanges are then checked for the greatest deflection case and the resulting deflections for the top and bottom flange are added together and divided by the girder depth, which will give the rotation in radians. This value is then multiplied by the overhang dimension giving the amount of deflection that will occur at the end of the overhang. The deflection at the overhang should not be greater than 0.20 inches.

Revision:
April 2008 Renumbered article from 6.10.3 to 6.10.3.4 and changed title to Deck Placement.

6.10.6.2 – Strength Limit State – Flexure

Steel girder bridges with corrugated metal decks shall be designed and load rated using the provisions of section 6.10.6.2.3 of the AASHTO LRFD BDS based on the non-composite girder behavior. Using Appendix A6 and plastic analysis for bridges that don't meet the requirements in section 6.10.6.2.3 is not allowed.

Commentary:
Recently, skewed bridges (over 20 degrees) with corrugated metal decks have been designed using plastic analysis theory from Appendix A6, which is explicitly not allowed in the code. During the load rating of these bridges, the HL-93 inventory rating was less than 1.0. The research to determine if steel members subjected to lateral loads caused when a skewed bridge with staggered cross frame can obtain plastic capacity is limited. Thus, AASHTO uses a potentially conservative approach for the design of skewed non-composite steel sections. More research is anticipated; however, ITD will follow this provision of the code unless research verifies non-composite skewed girders reaches plastic capacity.

Revisions:

Oct 2023	Added new article.

6.10.10.2 Shear Connectors – Fatigue Resistance

Where the girders satisfy the Fatigue I Limit State (i.e., infinite fatigue life), ITD prefers the shear connectors be designed for the same limit state regardless of the $ADTT_{SL}$. Where girders are designed to the Fatigue II Limit State, design the shear connectors per the code.

Commentary:

The language above prevents a bridge where the girders are designed for infinite fatigue life but the shear connectors are designed for a finite fatigue life. This is an undesirable method of failure as the shear studs are controlling the fatigue life of the bridge.

Revisions:
Oct 2023 Added new article.

6.13.2.7 SHEAR RESISTANCE

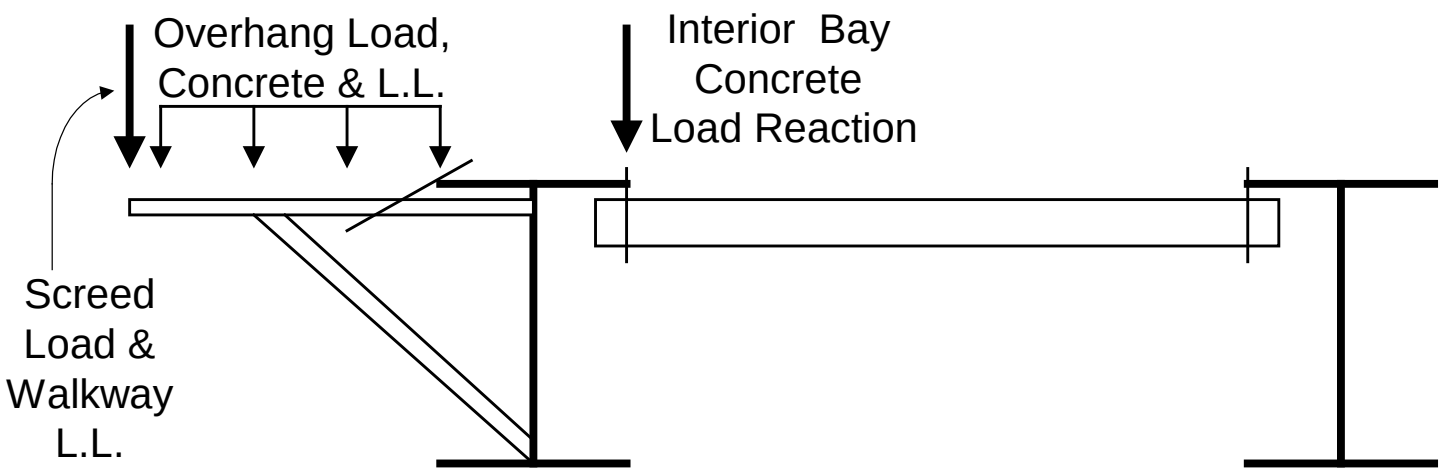
Threads in Shear Plane
Shear planes located in the transition thread length region of the bolt (RCSC, 2020) should be evaluated as a bolt with the threads included in the shear plane using equation 6.13.2.7-2. The plans should clearly specify which connections were designed with threads included or excluded from the shear plane.

Commentary:
For more information, refer to Table C-2.1 in the Research Council on Structural Connections (RCSC) Specification for Structural Joints Using High-Strength Bolts, 2020.

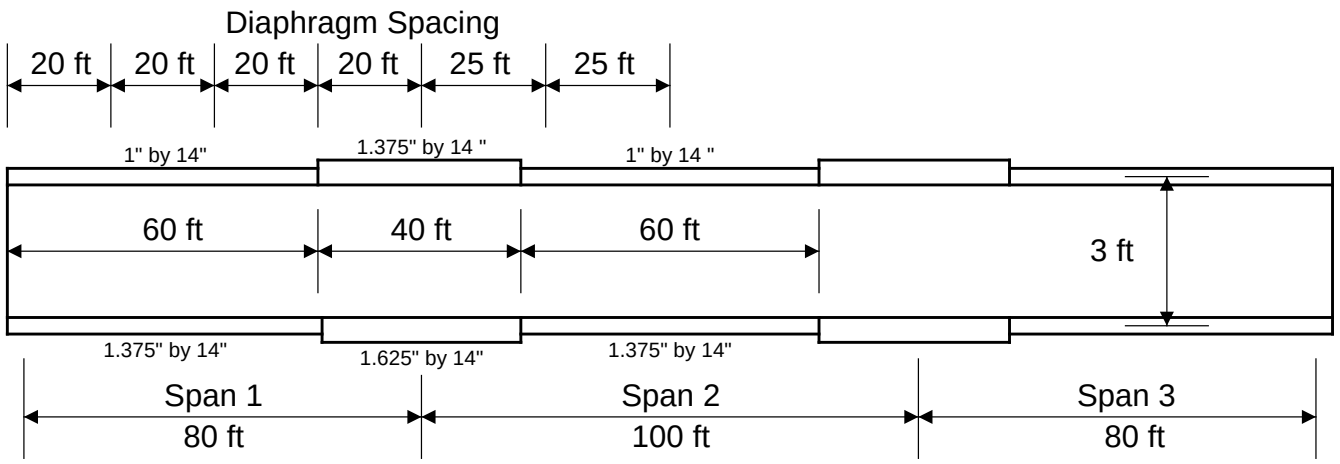
Revisions:
Jan 2022 Added new article.

LATERAL GIRDER ROTATION

Example:



Assume a three span welded plate girder bridge with overhangs of 3.25 ft and a deck thickness of 8 inches. The spans are 80 ft –100 ft – 80 ft. The distance between the centers of the top and bottom flange is approximately 3.0 ft. The diaphragms are bent plates spaced at 20 ft in spans one and three and 25 ft in span two. The Girder spacings are 9.5 ft. The flanges vary as follows:



The top and bottom flanges actually act as twelve continuous sections for lateral load, however the remote sections have very little effect on deflections. Only two sections behind and one section in front of the section being checked need to be considered in the structural model, this limits the analysis to no more than four sections (see case 1 and 2 in this example).

There are four vertical loads that should to be considered for the rotational effects:

1. The deck overhang concrete load.
2. The deck interior bay concrete load reaction on the exterior girder.
3. The screed load on the overhang.
4. The construction live load and walkway load in the work zone.
   (The work zone is considered to be a 20 ft. long zone centered on the screed)

It is not necessary to consider the weight of the falsework because it is already in place when the form grades and screed rail settings are made.

In this example the deck weighs 100 lbs/ft^2, however an assumption must be made for the screed load. In this example the screed is assumed to weigh 4500 lbs per side spread out over 10 ft. The construction live load is 30 lbs/ft^2 and the walkway load is 75 lbs/ft.

The load per foot of length with associated moment arms, the resulting torsion and the equivalent lateral load applied to the flanges are as follows:

Deck Overhang – Load = 100(3.25 – (1.16/2)) = 267 lbs/ft (overhang minus half the flange width)
MomArm = (3.25 – (1.16/2))/2 + 1.16/2 = 1.92 ft
Torsion = 267(1.92) = 513 lbs*ft/ft
Lateral Load = 513/3 = 171 lbs/ft

Interior Deck – Load = 100{(9.5 – 1.16)/2} = 417 lbs/ft (girder spacing minus flange width divided by 2)
MomArm = 1.16/2 = 0.58 ft (one half the flange width)
Torsion = 417(0.58) = 242 lbs*ft/ft
Lateral Load = 242/3 = 81 lbs/ft

Total Lateral Concrete Loads = 171 – 81 = <u>90 lbs/ft</u> (applied to all sections behind and including the one being checked)

Screed Load – Load = 4500/10 = 450 lbs/ft
MomArm = 3.25 ft
Torsion = 450(3.25) = 1463 lbs*ft/ft

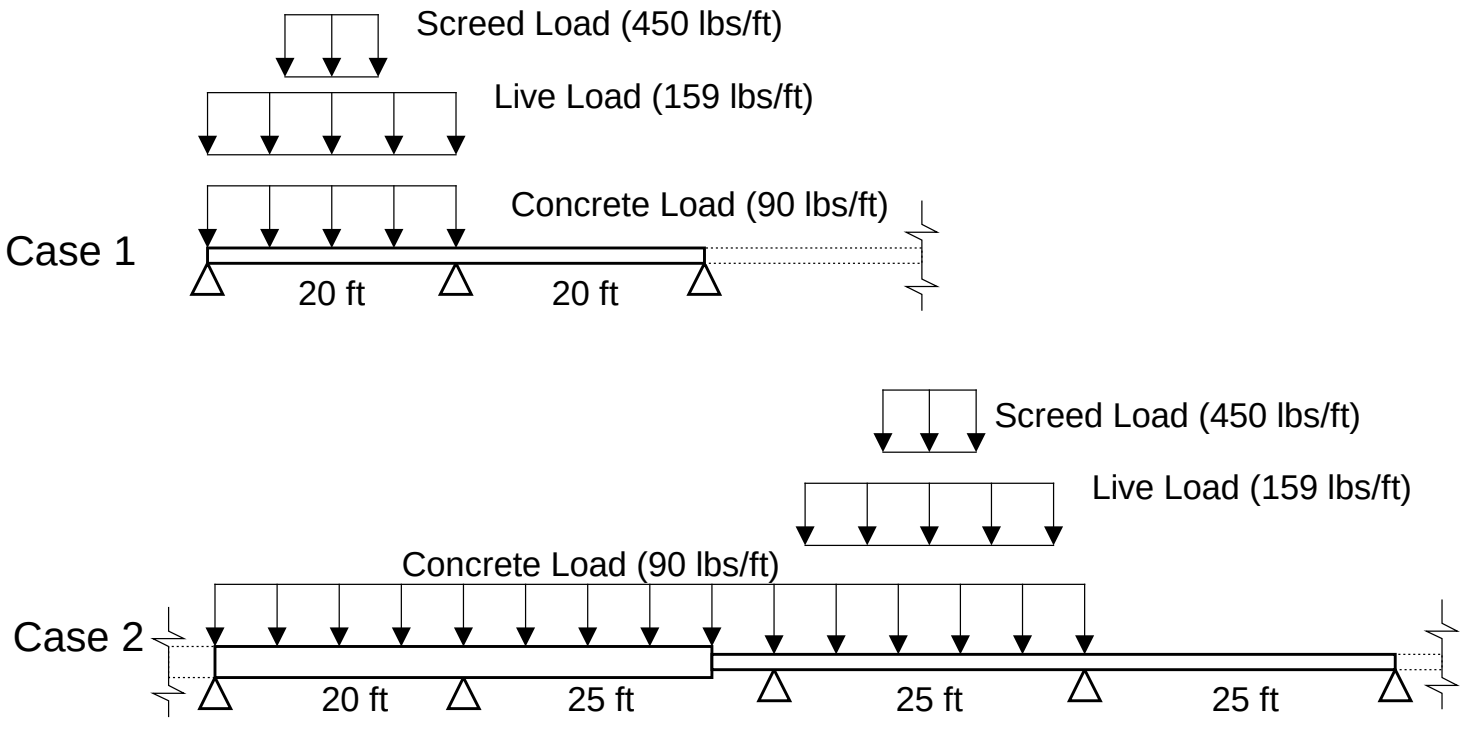
Screed Lateral Load = 1463/3 = <u>488 lbs/ft</u> (only applied to 10 ft at center of section checked)

Uniform L.L. – Load = 30(3.25) = 98 lbs/ft (only applied to overhang area, a conservative assumption)
MomArm = (3.25)/2 = 1.63 ft
Torsion = 98(1.63) = 160 lbs*ft/ft
Lateral Load = 160/3 = 53 lbs/ft

Walkway L.L. – Load = 75 lbs/ft
MomArm = 3.25+1 = 4.25 (applied one foot beyond edge of deck)
Torsion = 75(4.25) = 319 lbs/ft
Lateral Load = 319/3 = 106 lbs/ft

Total Lateral L.L. = 53 + 106 = <u>159 lbs/ft</u> (only applied to 20 ft at center of section checked)

The top flange has a moment of inertia of 229 in^4 or 314 in^4, depending on flange thickness. The bottom flange has a moment of inertia of 314 in^4 or 372 in^4. The deflection in this example is checked at two places, halfway between the abutment and first diaphragm (Case 1) and halfway between the fifth and sixth diaphragm, which is near the center of the second span (Case 2). The girder is assumed to be progressively loaded as the deck is placed with the screed located at the center of the last section to be loaded. For analysis purposes only one unloaded section and at most two loaded sections, other than the section being checked, need to be included when calculating the deflections. This is a conservative simplification; actual deflections will be slightly less.



Case 1: Deflection at midspan of the first section in the case 1 model:

Concrete Load Deflection Top Flange = 0.035 in
Screed Load Deflection Top Flange = 0.124 in
Live Load Deflection Top Flange = 0.061 in

Concrete Load Deflection Bottom Flange = 0.025 in
Screed Load Deflection Bottom Flange = 0.090 in
Live Load Deflection Bottom Flange = 0.044 in

Rotation = (0.035 + 0.124 + 0.061 + 0.025 +0.090 + 0.044)/36 = 0.0105 radians

Deflection at end of overhang = 0.0105(3.25)(12) = 0.41 in > 0.20 *Deflection is too great.*

Case 2: Deflection at midspan of the third section of the case 2 model:

Concrete Load Deflection Top Flange = 0.043 in
Screed Load Deflection Top Flange = 0.182 in
Live Load Deflection Top Flange = 0.100 in

Concrete Load Deflection Bottom Flange = 0.031 in
Screed Load Deflection Bottom Flange = 0.134 in
Live Load Deflection Bottom Flange = 0.074 in

Rotation = (0.043 + 0.182 + 0.100 + 0.031 + 0.134 + 0.074)/36 = 0.0157 radians

Deflection at end of overhang = 0.0157(3.25)(12) = 0.61 in > 0.20 *Deflection is also too great, either the diaphragm spacing will need to be reduced or a smaller overhang used.*

Once the deflections are satisfactory the diaphragm and its connection to the girder should be checked:

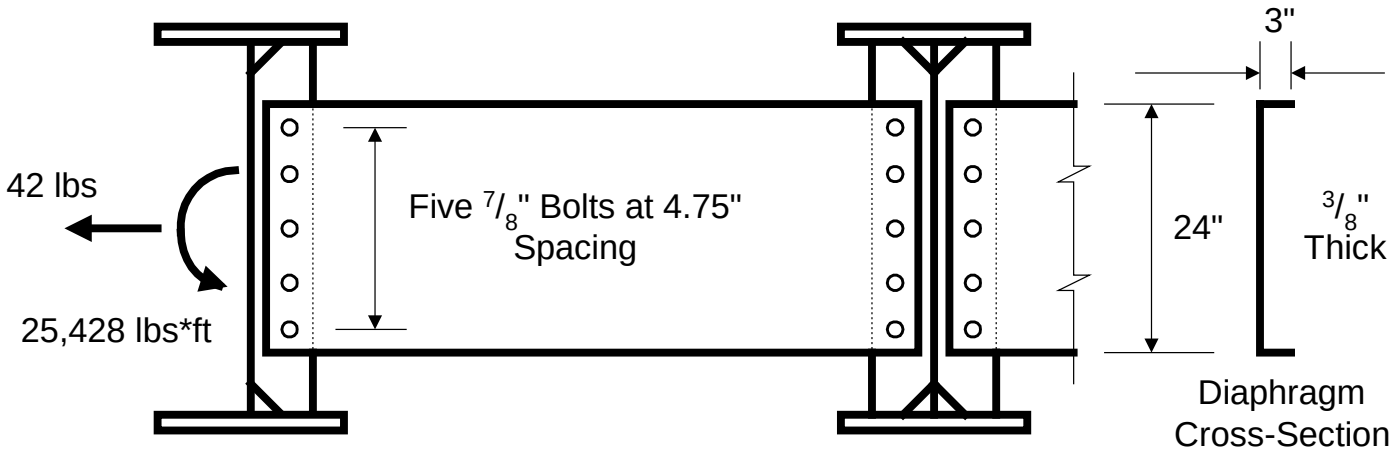
The greatest reaction at a diaphragm is in Case 2 just to the left of the section that has the screed load applied to it. The reaction loads at this diaphragm are as follows:

Top Flange Reaction– Concrete Load = 2400 lbs
Screed Load = 2790 lbs
Live Load = 1900 lbs

Bottom Flange Reaction– Concrete Load = 2410 lbs
Screed Load = 2760 lbs
Live Load = 1890 lbs

Assuming the diaphragm is centered on the girder web the net “LRFD Service II” slip critical moment and force on the bolt pattern is,

Net factored moment = (3/2){1.0(2400 + 2410) + 1.3(2790 + 1900 + 2760 + 1890)} = 25,428 lbs*ft
Net factored force = 1.0(2400 – 2410) + 1.3(2790 + 1900 – 2760 – 1890) = 42 lbs



The bolt pattern has a moment of inertia of 226 in^2 therefore the maximum bolt shear is:

25,428(12)(9.5)/226 + 42/5 = 12835 lbs

The nominal resistance of a $^7/_8$", A325 bolt for a standard hole with a Class A surface (Art. 6.13.2.8):

$K_h K_s N_s P_t$ = 1.0(0.33)(1.0)(39) = 12.87 kips 12.835 kips < 12.87 kips *OK*

The diaphragm has a section modulus of 63 in^3 and therefore the factored bending moment in the diaphragm and the associated stress for "Strength I":

Factored moment = (3/2){1.25(2400 + 2410) + 1.75(2790 + 1900 + 2760 + 1890)} = 33,536 lb*ft
Factored stress = 33,536(12)/63 = 6388 lbs/in^2

The factored resistance is based on a stress equal to the yield stress of 50 ksi.

6.388 ksi < 50 ksi *OK*

*** Revision of 11/2003 added uniform live load and walkway live load to overhang.**

STEEL GIRDER QUANTITY ESTIMATE

The curves for pounds of structural steel per square foot of deck plan area should only be used as an aid in preliminary design.

The value from the curves should be increased 10% - 15% for x-frames, etc.

The curves are from the NSBA web site at the following link:
Steel Span to Weight Curves | American Institute of Steel Construction (aisc.org)

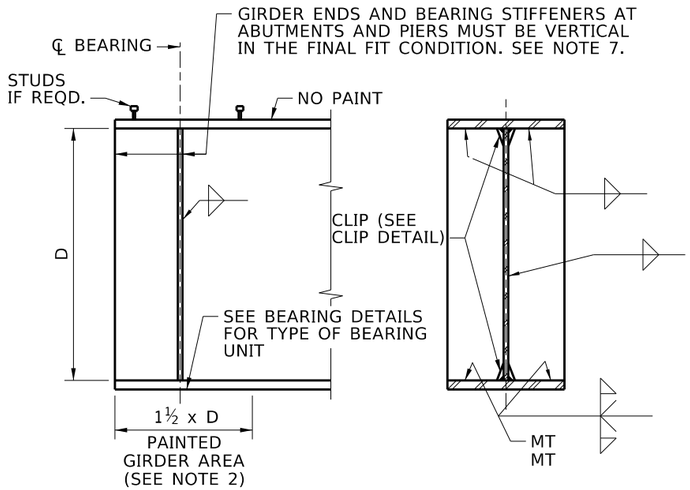
Revisions:

Oct 2023	Added new article.

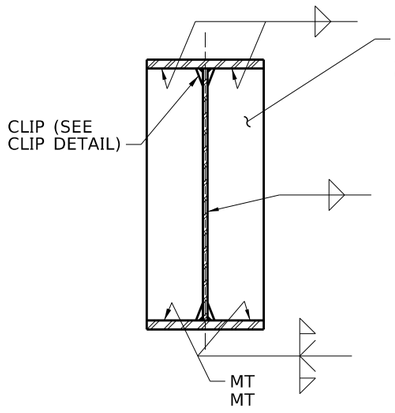
CHAPTER 6
STANDARD DRAWING REVISION LOG

B6.1 Standard Steel Details

June 2006	Corrected weld symbol for bearing stiffener bottom flange/web weld. Added Jacking Stiffeners to title for Bearing Stiffeners. Made drip control bar gap around bottom flange equal to 1/16”. Added reference for locating shop splices to Assembly and Fabrication Details. Deleted the faying surfaces from Note 1 to conform to the requirements of 627.03 paragraph C of the Supplemental Specifications. Changed “field splices” to “bolted connections” in Note 3. Added Note 8 requiring girder web to be vertical under full dead load and deck shrinkage. Added Note 9 limiting shop splices.
April 2008	Note 2 revised to match SSP for painting structural steel. Note 3 added AASHTO M164 Type 3 and defined design assumption for threads in the shear plane.
July 2009	Revised Note 3 for threads in the shear plane.
Sept 2012	Revised Note 2 to paint for a distance of 1.5xgirder depth from the deck expansion joints. Added topcoat color 20108, Federal Standard 595.
May 2014	Revised reference to AASHTO M164 in note 3 to ASTM A325. AASHTO M164 has been withdrawn. Added note 9 for welded fabrication in accordance with AASHTO/AWS D1.5
March 2015	Revised Intermediate Stiffener Details reference from “tension flange” to “tension/reversal zone flange”. Revised note 2 to add Part C to the reference to subsection 627.03.
Sept 2016	Revised reference for high strength bolts to ASTM F3125 A325 Type 3 in note 3.
Oct 2017	Changed minimum clearance to top of stud to 4” to keep the stud below the deck reinforcement. Deleted maximum stud height dimension. Changed minimum stud spacing from 3” to 4 times the stud diameter. Revised Note 7 to TDLF (total dead load fit) to agree with Article 6.7.2 of the AASHTO LRFD Bridge Design Specifications. Referenced note 7 in the Girder End Details.
Nov 2019	Revised topcoat color to 20122 of AMS-STD-595. Revised format of notes to active voice, imperative mood. Changed reference from AASHTO M270 to ASTM A709. ASTM standards are updated sooner than AASHTO. Corrected seal weld symbol in Section A-A. Changed TDLF to Total Dead Load Fit in Note 7.
May 2021	Added note in Girder End details that girder ends & bearing stiffeners shall be vertical in the final fit condition.
Jan 2022	Converted sheet to ORD format.
June 2022	Revised note 2 to separate into parts a-e. Added note 2d for painting girder embedded in concrete. Revised format of leader lines.
Oct 2023	Revised notes for active voice, imperative mood and Writer’s Style Guide**.** Reformatted note 2.

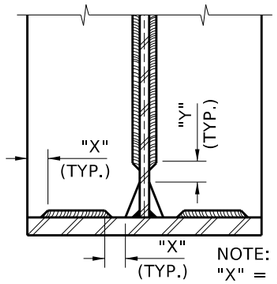


GIRDER END DETAILS



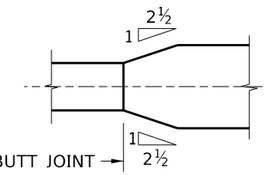
CONTINUOUS SUPPORT DETAILS

BEARING & JACKING STIFFENERS
NTS

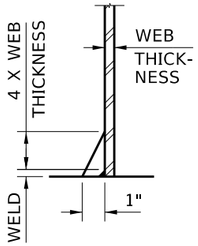


NOTE:
"X" = ¼" ± ⅛"
"Y" = ½" ± ¼"

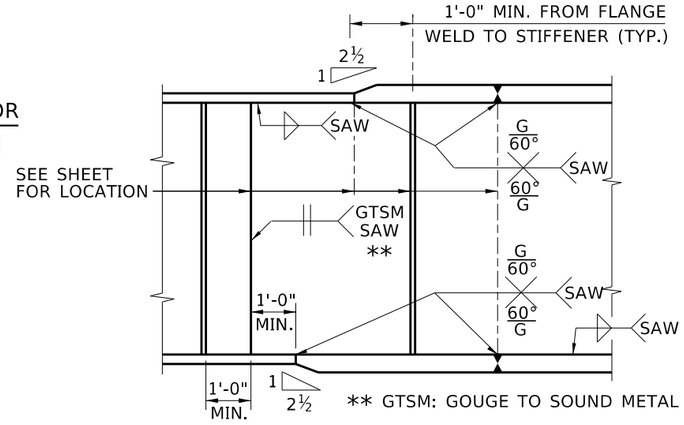
STIFFENER FILLET WELD TERMINATION DETAILS
NTS



TYPICAL TRANSITION FOR FLANGE PLATE WIDTH
NTS

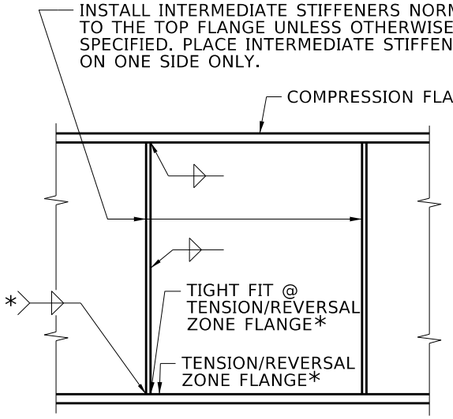


CLIP DETAILS
NTS



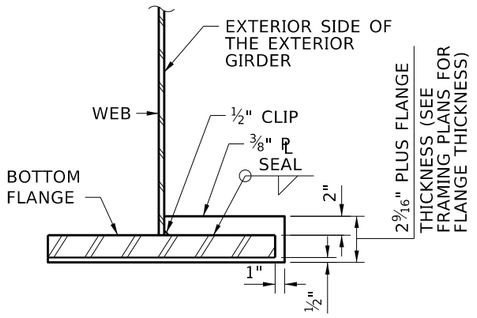
** GTSM: GOUGE TO SOUND METAL

ASSEMBLY AND FABRICATION DETAILS
NTS

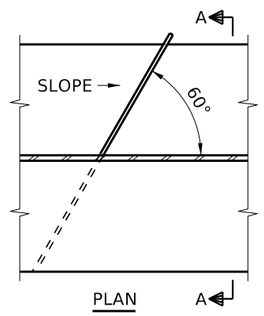


* WELD INTERMEDIATE STIFFENER TO FLANGE IN TENSION AND REVERSAL ZONES ONLY WHERE LATERAL BRACING DIAPHRAGMS OR CROSS FRAMES ARE ATTACHED TO STIFFENERS. TIGHT FIT AT FLANGE IN TENSION AND REVERSAL ZONE AT ALL OTHER LOCATIONS.

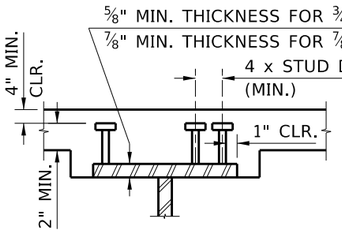
INTERMEDIATE STIFFENER DETAILS
NTS



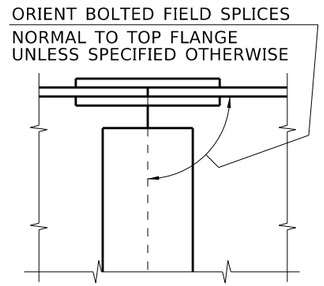
SECTION A-A



DRIP CONTROL BAR DETAIL
(EXTERIOR GIRDERS ONLY)
NTS



WELD STUDS DETAIL
NTS



FIELD SPLICE ORIENTATION
NTS

GENERAL STEEL NOTES

1. PROVIDE STRUCTURAL STEEL THAT CONFORMS TO ASTM A709 GRADE 50W UNLESS OTHERWISE NOTED ON THE PLANS.
2. DO NOT PAINT THE TOP SURFACE OF THE TOP FLANGE. PAINT THE FOLLOWING SURFACE IN ACCORDANCE WITH 627.03 PART A AND C USING A TOP COAT COLOR OF 20122 AMS-STD-595:
   a. BOLTED FAYING SURFACES EXCEPT APPLY ONLY THE PRIME COAT.
   b. BEARING UNITS, CROSS FRAMES (OR DIAPHRAGMS), AND GIRDER ENDS WITHIN A HORIZONTAL DISTANCE OF 1.5 X GIRDER DEPTH FROM THE DECK EXPANSION JOINTS.
   c. GIRDER ENDS EMBEDDED IN CONCRETE FROM THE END OF GIRDER TO 3' BEYOND THE FACE OF THE CONCRETE END DIAPHRAGM.
3. PROVIDE SLIP-CRITICAL JOINTS AT BOLTED CONNECTIONS WITH CLASS B SURFACE CONDITIONS MADE WITH ⅞"○ HIGH STRENGTH BOLTS CONFORMING TO ASTM F3125 GRADE A325 TYPE 3. (EXCLUDE/INCLUDE) THREADS FROM THE SHEAR PLANE. FIELD INSPECT CONTACT SURFACES OF THE BOLTED CONNECTIONS IMMEDIATELY BEFORE ASSEMBLY TO ENSURE THAT THE SURFACES ARE FREE OF MILL SCALE, DIRT, ROAD OIL, AND OTHER FOREIGN MATERIAL.
4. COMPLETE STEEL GIRDER SUPERSTRUCTURE ERECTION FOR EACH SPAN AND TWO ADJACENT SPANS IN EACH DIRECTION, BEFORE PLACING FORMS.
5. DO NOT WELD IN THE TENSION OR STRESS REVERSAL ZONES OF THE GIRDERS EXCEPT AS SHOWN ON THE PLANS.
6. IF THE PLATE THICKNESS FOR PARALLEL GROOVE WELDS EXCEED THE PREQUALIFIED THICKNESS LISTED IN AASHTO/AWS D1.5 THEN V-GROOVE WELDS MAY BE SUBSTITUTED.
7. USE TOTAL DEAD LOAD FIT (TDLF) FIT CONDITION IN ACCORDANCE WITH ARTICLE 6.7.2 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
8. NO ADDITIONAL SHOP SPLICES ARE ALLOWED UNLESS APPROVED.
9. WELD IN ACCORDANCE WITH AASHTO/AWS D1.5 AND INTERIM REVISIONS.

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	STEEL DETAILS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME: Standards/Bridge Standard Drawings B06_1.DGN	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	BRIDGE LRFD DESIGN MANUAL, B6.1	BRIDGE KEY NO.
				DETAILED					COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: OCT 2023	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

CHAPTER 9

DECKS

9.7.1.5 DESIGN OF CANTILEVER SLABS

NCHRP-350 STANDARD RAILS

Bridge Section policy for the reinforcement of deck overhangs that support ITD 32" concrete parapet, 2 tube curb-mounted rail, and combination rail shall be the reinforcement for the empirical deck design requirements for the top mat (#5 rebar at 12") with the addition of #6 rebar spaced between the standard #5 bars. This reinforcement shall be considered adequate for those areas at least 8 feet from any joint or discontinuity in the parapet. For areas less than 8 feet from joints or discontinuities in the parapet two #6 bars shall be evenly spaced between the #5 bars. The length of the additional #6 rebar shall be such that the bar extends at least halfway between the exterior girder and the first interior girder. This policy only applies to 8 inch minimum thick decks with a minimum overhang of 24 inches from the centerline of the exterior girder to a maximum overhang of 72 inches.

MASH 42" STANDARD RAILS

Bridge Section policy for the reinforcement of deck overhangs that support ITD 42" single slope concrete parapet and 3-Tube Curb Mount Rail shall be the reinforcement for the empirical deck design requirements for the top mat (#5 rebar at 12") with the addition of 2 bundled #6 rebar spaced between the standard #5 bars. This reinforcement shall be considered adequate for entire length of the parapet including those areas at any joint or discontinuity in the parapet. The length of the additional #6 rebars shall be such that the bar extends at least halfway between the exterior girder and the first interior girder. This policy only applies to 8 inch minimum thick decks with a minimum overhang of 24 inches from the centerline of the exterior girder to a maximum overhang of 96 inches.

Commentary

The 42"single slope parapet was analyzed according to AASHTO Article A13.4 for TL-4 loads to insure the parapet would yield before the cantilever deck. An 8" cantilever deck with a top mat of transverse #5 bars @ 12" and 2-#6 bundled bars at 12" between the #5 bars (As = 1.19) would provide the moment capacity greater than the parapet for a TL-4 loading.

The crash test for the 3-Tube Curb Mount Rail provided #6 @ 6" = 0.88 in^2/*ft for the top mat of deck reinforcement. The reinforcement provided in the overhang in accordance with ITD standards is 1.19 in^2/ft.

Revisions:

June 2013	Article was renumbered from A13.4.1
Mar 2015	Revised article for change to #5 top mat reinforcement for the empirical design.
May 2018	Added design criteria for NCHRP-350 rails and MASH Rils. Revised commentary.
June 2022	Added 3-Tube Curb Mount Rail to MASH Standard rails. Added commentary for deck reinforcement for the 3-Tube Curb Mount Rail.

9.7.2 EMPIRICAL DESIGN

Empirical deck design is the Bridge Section preference for the reinforcement of concrete decks. All the requirements of Article 9.7.2.4, Design Conditions, shall be satisfied.

The reinforcement requirements for the top mat shall be epoxy coated #5 rebar at 12" in both transverse and longitudinal mats. The reinforcement requirements for the bottom mat shall be uncoated #5 rebar at 12" in both transverse and longitudinal mats.

The Class B lap length required is 18" for the top mat epoxy coated #5 bars and 15" for the uncoated bottom mat #5 bars. Use a 21" lap for both the top and bottom mats to be conservative.

Negative moment reinforcement over the pier shall be designed in accordance with ITD Bridge Design Manual Article 5.12.3.3.

Commentary

Article 9.7.2.5 for Reinforcement Requirements specifies a minimum top mat reinforcement of 0.18 in^2/ft for each layer or #4 bars at 12" spacing (0.20 in^2/ft). The bar size was increased to a #5 due to construction concerns, i.e. workers walking on the rebar mat during placement.
The lap splice length for the #5 epoxy-coated bar utilizes the excess reinforcement factor of 0.645 (0.20/0.31).
Ld =21.6*0.645 = 13.9"
Class B splice length = 1.3*13.9 = 18"

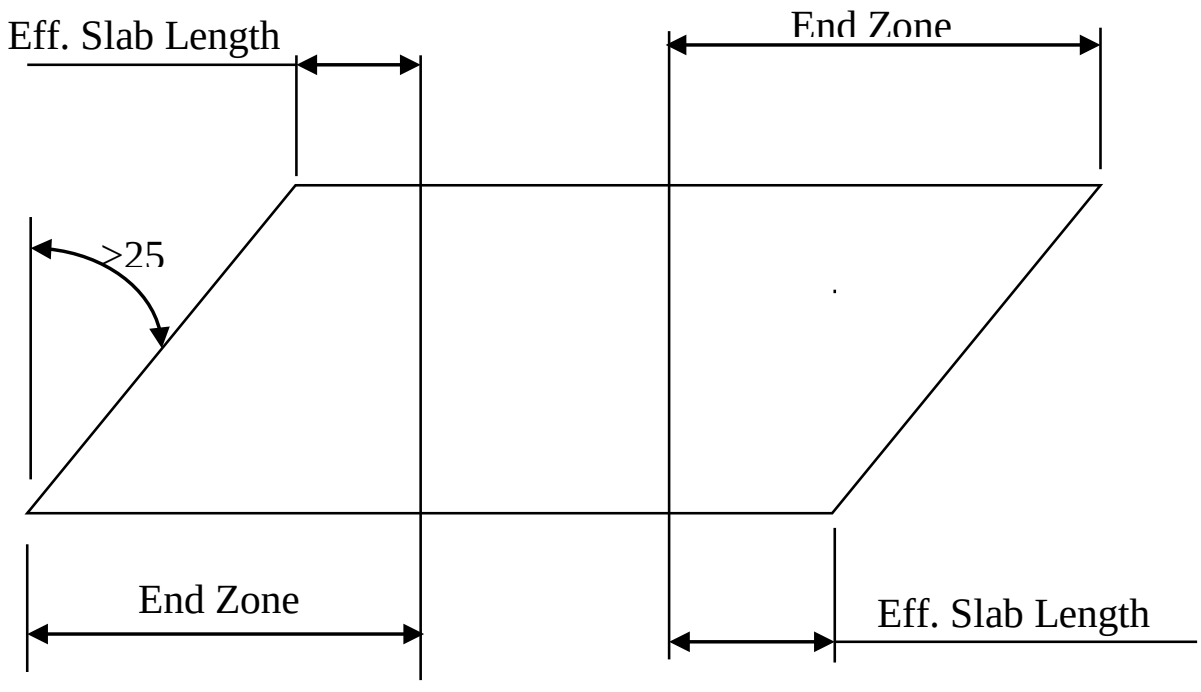
Revisions:

Mar 2015	Added new article.
March 2018	Revised the reference to 5.14.1.4 to 5.12.3.3 to agree with the 8th Edition of the AASHTO LRFD Bridge Design Specifications.
Oct 2023	Added minimum lap splice length equals 18" to agree with AASHTO Articles 5.10.8.4.2a and 5.10.8.4.3a for a Class B splice but use 21" to be conservative. Added commentary to document the use of the excess reinforcement factor.

9.7.2.5 REINFORCEMENT REQUIREMENTS FOR SKEWED END ZONES

For skews exceeding 25º, the specified reinforcement in both directions shall be doubled in the end zones.

The following diagram shall define the end zone.



9.7.2 EMPIRICAL DESIGN

Recommended Deck Thickness

AASHTO TYPE 2

			ITD Slab Depth Inches		½" wearing surface		no wearing surface	
Girder Spacing Feet	Effective Length feet (2)	Minimum Slab Depth inches(1)	½" wearing surface	no wearing surface	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet
5.0	4.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
5.5	4.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.0	5.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.5	5.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.0	6.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.5	6.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.0	7.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.5	7.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.0	8.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.5	8.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.0	9.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.5	9.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.75	10.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.0	10.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.5	10.75	7.17	8.00	8.00	2.00	3.33	2.00	3.33
12.015	11.27	7.51	8.50	8.00	2.13	3.54	2.00	3.33
12.500	11.75	7.83	8.50	8.00	2.13	3.54	2.00	3.33
12.765	12.02	8.01	9.00	8.50	2.25	3.75	2.13	3.54
13.000	12.25	8.17	9.00	8.50	2.25	3.75	2.13	3.54
13.515	12.77	8.51	9.50	9.00	2.38	3.96	2.25	3.75
14.0	13.25	8.83	9.50	9.00	2.38	3.96	2.25	3.75
14.25	13.50	9.00	9.50	9.00	2.38	3.96	2.25	3.75

9.7.2 EMPIRICAL DESIGN

Recommended Deck Thickness

AASHTO TYPE 3

			ITD Slab Depth Inches		½" wearing surface		no wearing surface	
Girder Spacing Feet	Effective Length (2)	Minimum Slab Depth[1]	½" wearing surface	no wearing surface	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet
5.0	4.04	7.00	8.00	8.00	2.00	3.33	2.00	3.33
5.5	4.54	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.0	5.04	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.5	5.54	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.0	6.04	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.5	6.54	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.0	7.04	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.5	7.54	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.0	8.04	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.5	8.54	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.0	9.04	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.5	9.54	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.0	10.04	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.5	10.54	7.03	8.00	8.00	2.00	3.33	2.00	3.33
11.8483	10.89	7.26	8.00	8.00	2.00	3.33	2.00	3.33
12.0000	11.04	7.36	8.00	8.00	2.00	3.33	2.00	3.33
12.2233	11.26	7.51	8.50	8.00	2.13	3.54	2.00	3.33
12.5000	11.54	7.69	8.50	8.00	2.13	3.54	2.00	3.33
12.9733	12.01	8.01	9.00	8.50	2.25	3.75	2.13	3.54
13.0	12.04	8.03	9.00	8.50	2.25	3.75	2.13	3.54
13.7233	12.76	8.51	9.50	9.00	2.38	3.96	2.25	3.75
14.0	13.04	8.69	9.50	9.00	2.38	3.96	2.25	3.75
14.458	13.50	9.00	9.50	9.00	2.38	3.96	2.25	3.75

9.7.2 EMPIRICAL DESIGN

Recommended Deck Thickness

AASHTO TYPE 4

			ITD Slab Depth Inches		½" wearing surface		no wearing surface	
Girder Spacing Feet	Effective Length (2)	Minimum Slab Depth[1]	½" wearing surface	no wearing surface	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet
5.0	3.83	Empirical Deck Design not allowed - effective span/design depth < 6.0						
5.5	4.33	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.0	4.83	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.5	5.33	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.0	5.83	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.5	6.33	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.0	6.83	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.5	7.33	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.0	7.83	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.5	8.33	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.0	8.83	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.5	9.33	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.0	9.83	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.5	10.33	7.00	8.00	8.00	2.00	3.33	2.00	3.33
12.0	10.83	7.22	8.00	8.00	2.00	3.33	2.00	3.33
12.4317	11.27	7.51	8.50	8.00	2.13	3.54	2.00	3.33
12.500	11.33	7.56	8.50	8.00	2.13	3.54	2.00	3.33
13.0	11.83	7.89	8.5	8.00	2.13	3.54	2.00	3.33
13.18167	12.02	8.01	9.00	8.50	2.25	3.75	2.13	3.54
13.5000	12.33	8.22	9.00	8.50	2.25	3.75	2.13	3.54
13.9317	12.77	8.51	9.50	9.00	2.38	3.96	2.25	3.75
14.6667	13.50	9.00	9.50	9.00	2.38	3.96	2.25	3.75

9.7.2 EMPIRICAL DESIGN

Recommended Deck Thickness

BULB TEE w/37" Top Flange

Girder Spacing Feet	Effective Length (2)	Minimum Slab Depth[1]	ITD Slab Depth Inches		½" wearing surface		no wearing surface	
			½" wearing surface	no wearing surface	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet
5.0	3.17	Empirical Deck Design not allowed - effective span/design depth < 6.0						
5.5	3.67	Empirical Deck Design not allowed - effective span/design depth < 6.0						
6.0	4.17	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.5	4.67	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.0	5.17	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.5	5.67	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.0	6.17	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.5	6.67	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.0	7.17	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.5	7.67	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.0	8.17	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.5	8.67	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.0	9.17	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.5	9.67	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.8483	10.01	7.00	8.00	8.00	2.00	3.33	2.00	3.33
12.0	10.17	7.00	8.00	8.00	2.00	3.33	2.00	3.33
12.5000	10.67	7.11	8.00	8.00	2.00	3.33	2.00	3.33
13.09833	11.26	7.51	8.50	8.00	2.13	3.54	2.00	3.33
13.5	11.67	7.78	8.50	8.00	2.13	3.54	2.00	3.33
14.000	12.17	8.11	9.00	8.50	2.25	3.75	2.13	3.54
14.598	12.76	8.51	9.50	9.00	2.38	3.96	2.25	3.75
15.000	13.17	8.78	9.50	9.00	2.38	3.96	2.25	3.75
15.333	13.50	9.00	9.50	9.00	2.38	3.96	2.25	3.75

9.7.2 EMPIRICAL DESIGN

Recommended Deck Thickness

WF GIRDER

			ITD Slab Depth Inches		½" wearing surface		no wearing surface	
Girder Spacing Feet	Effective Length (2)	Minimum Slab Depth[1]	½" wearing surface	no wearing surface	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet
5.0	2.70	Empirical Deck Design not allowed - effective span/design depth < 6.0						
5.5	3.20	Empirical Deck Design not allowed - effective span/design depth < 6.0						
6.0	3.70	Empirical Deck Design not allowed - effective span/design depth < 6.0						
6.5	4.20	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.0	4.70	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.5	5.20	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.0	5.70	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.5	6.20	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.0	6.70	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.5	7.20	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.0	7.70	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.5	8.20	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.0	8.70	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.5	9.20	7.00	8.00	8.00	2.00	3.33	2.00	3.33
12.0	9.70	7.00	8.00	8.00	2.00	3.33	2.00	3.33
12.5	10.20	7.00	8.00	8.00	2.00	3.33	2.00	3.33
13.0	10.70	7.14	8.00	8.00	2.00	3.33	2.00	3.33
13.5000	11.20	7.47	8.00	8.00	2.00	3.33	2.00	3.33
13.5671	11.27	7.51	8.50	8.00	2.13	3.54	2.00	3.33
14.0000	11.70	7.80	8.50	8.00	2.13	3.54	2.00	3.33
14.3119	12.02	8.01	9.00	8.50	2.25	3.75	2.13	3.54
14.5000	12.20	8.14	9.00	8.50	2.25	3.75	2.13	3.54
15.0619	12.77	8.51	9.50	9.00	2.38	3.96	2.25	3.75
15.5000	13.20	8.80	9.50	9.00	2.38	3.96	2.25	3.75
15.7969	13.50	9.00	9.50	9.00	2.38	3.96	2.25	3.75

9.7.2 EMPIRICAL DESIGN

Recommended Deck Thickness

STEEL GIRDER W/12" TOP FLANGE

			ITD Slab Depth Inches		½" wearing surface		no wearing surface	
Girder Spacing Feet	Effective Length (2)	Minimum Slab Depth[1]	½" wearing surface	no wearing surface	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet
5.00	4.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
5.50	5.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.00	5.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.50	6.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.00	6.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.50	7.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.00	7.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.50	8.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.00	8.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.25	8.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.50	9.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.00	9.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.50	10.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.00	10.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.50	11.00	7.33	8.00	8.00	2.00	3.33	2.00	3.33
11.765	11.27	7.51	8.50	8.00	2.13	3.54	2.00	3.33
12.00	11.50	7.67	8.50	8.00	2.13	3.54	2.00	3.33
12.50	12.00	8.00	8.50	8.00	2.13	3.54	2.00	3.33
12.515	12.02	8.01	9.00	8.50	2.25	3.75	2.13	3.54
13.00	12.50	8.33	9.00	8.50	2.25	3.75	2.13	3.54
13.265	12.77	8.51	9.50	9.00	2.38	3.96	2.25	3.75
13.50	13.00	8.67	9.50	9.00	2.38	3.96	2.25	3.75
14.000	13.50	9.00	9.50	9.00	2.38	3.96	2.25	3.75

9.7.2 EMPIRICAL DESIGN

Recommended Deck Thickness

STEEL GIRDER W/15" TOP FLANGE

			ITD Slab Depth Inches		½" wearing surface		no wearing surface	
Girder Spacing Feet	Effective Length (2)	Minimum Slab Depth[1]	½" wearing surface	no wearing surface	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet
5.00	4.38	7.00	8.00	8.00	2.00	3.33	2.00	3.33
5.50	4.88	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.00	5.38	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.50	5.88	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.00	6.38	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.50	6.88	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.00	7.38	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.50	7.88	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.00	8.38	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.38	8.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.50	8.88	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.00	9.38	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.50	9.88	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.625	10.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.00	10.38	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.890	11.265	7.51	8.50	8.00	2.13	3.542	2.00	3.33
12.00	11.38	7.58	8.50	8.00	2.13	3.54	2.00	3.33
12.50	11.88	7.92	8.50	8.00	2.13	3.54	2.00	3.33
12.64	12.02	8.01	9.00	8.50	2.25	3.75	2.13	3.54
13.000	12.375	8.25	9.000	8.500	2.250	3.750	2.13	3.54
13.39	12.77	8.51	9.50	9.00	2.38	3.96	2.25	3.75
14.00	13.38	8.92	9.50	9.00	2.38	3.96	2.25	3.75
14.125	13.50	9.00	9.50	9.00	2.38	3.96	2.25	3.75

9.7.2 EMPIRICAL DESIGN

Recommended Deck Thickness

STEEL GIRDER W/18" TOP FLANGE

			ITD Slab Depth Inches		½" wearing surface		no wearing surface	
Girder Spacing Feet	Effective Length (2)	Minimum Slab Depth[1]	½" wearing surface	no wearing surface	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet
5.00	4.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
5.50	4.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.00	5.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.50	5.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.00	6.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.50	6.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.00	7.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.50	7.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.00	8.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.50	8.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.00	9.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.50	9.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.75	10.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.00	10.25	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.50	10.75	7.17	8.00	8.00	2.00	3.33	2.00	3.33
12.015	11.27	7.51	8.50	8.00	2.13	3.54	2.00	3.33
12.50	11.75	7.83	8.50	8.00	2.13	3.54	2.00	3.33
12.765	12.02	8.01	9.00	8.50	2.25	3.75	2.13	3.54
13.000	12.25	8.17	9.00	8.50	2.25	3.75	2.13	3.54
13.515	12.77	8.51	9.50	9.00	2.38	3.96	2.25	3.75
14.00	13.25	8.83	9.50	9.00	2.38	3.96	2.25	3.75
14.25	13.50	9.00	9.50	9.00	2.38	3.96	2.25	3.75

9.7.2 EMPIRICAL DESIGN

Recommended Deck Thickness

STEEL GIRDER W/24" TOP FLANGE

			ITD Slab Depth Inches		½" wearing surface		no wearing surface	
Girder Spacing Feet	Effective Length (2)	Minimum Slab Depth[1]	½" wearing surface	no wearing surface	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet	Min Overhang to center of girder w/continuous barrier Feet	Min Overhang to center of girder w/o continuous barrier Feet
5.00	4.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
5.50	4.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.00	5.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
6.50	5.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.00	6.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
7.50	6.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.00	7.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
8.50	7.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.00	8.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.50	8.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
9.75	8.75	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.00	9.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
10.50	9.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.00	10.00	7.00	8.00	8.00	2.00	3.33	2.00	3.33
11.50	10.50	7.00	8.00	8.00	2.00	3.33	2.00	3.33
12.00	11.00	7.33	8.00	8.00	2.00	3.33	2.00	3.33
12.265	11.27	7.51	8.50	8.00	2.13	3.54	2.00	3.33
12.50	11.50	7.67	8.50	8.00	2.13	3.54	2.00	3.33
13.015	12.02	8.01	9.00	8.50	2.25	3.75	2.13	3.54
13.765	12.77	8.51	9.50	9.00	2.38	3.96	2.25	3.75
14.00	13.00	8.67	9.50	9.00	2.38	3.96	2.25	3.75
14.50	13.50	9.00	9.50	9.00	2.38	3.96	2.25	3.75

9.7.2 EMPIRICAL DESIGN

Recommended Deck Thickness

FOOTNOTES

[1] Section 9.7.2.4 Design Condition
The ratio of effective length to design depth shall not be less than 6.0 nor exceed 18.0

[2] Section 9.7.2.4 Design Condition
The effective length shall not exceed 13.5 feet

Section 4.6.2.2.2b Interior Beams with Concrete Decks
Table 4.6.2.2.2b-1 limits the maximum deck thickness to 12 inches

Three-tube curb mounted rail is not a continuous barrier

Revisions:

Jun-13	Added WF girder table
Oct-17	Added footnote 5
Jun-23	Added deck thickness for decks designed without a ½" wearing surface
Dec-24	Deleted ITD deck thickness based on (S+10)/30 and used (eff span)/18.0

PERMANENT METAL DECK FORMS

Permanent Metal Deck Forms prohibit visual inspection of the underside of the deck and should only be used where necessary.

Sub-Section 502.03 E3.b prohibits the use of permanent metal deck forms for decks. If needed on a project, a construction note allowing their use at the contractor's option should be added to the Design & General Notes sheet of the plans. The weight/sf of the metal deck forms should also be added to the Permanent Design Loads on the Design & General Notes sheet of the plans.

The use of permanent metal deck forms should be considered for the following situations:

- Forming over water where removal of forms would be difficult.
- Forming over railroads and highways where removal would be difficult and where protection from falling objects is provided.

Revisions:

Nov 2019 Added new article**.**

CHAPTER 9
STANDARD DRAWING REVISION LOG

B9.1A Permanent Metal Deck Forms – Steel Girders

June 2006	Revised Note 1 to conform to the 2004 Standard Specifications..
	Added new Note 4 requiring submittal of shop drawings & design calculations for the deck overhang brackets with the metal forms submittal..
	Added new Note 5 requiring mylars of approved shop drawings.
	Renumbered Notes.
	Added "Styrofoam shall not be placed in the flutes" to new Note 6.
	ASTM A-525 has been deleted and the reference to ASTM A-525 in Note 2 was removed.
	Deleted Note 10 for not adding chlorides to the concrete because it is covered in the Standard Specifications.
March 2011	Changed title of "Composite Section" to "Typical Support Details".
	Revised Note 9 from "no welding permitted in tension or stress reversal zone" to "no welding is permitted to the girder flanges".
	Deleted size of fillet welds.
	Deleted hold down clips.
March 2015	Revised notes 3 & 5 for electronic shop drawings.
Nov 2019	Changed clearance to bottom reinforcement from 1" to 1½" to agree with Article 5.14.
	Revised format of notes to active voice, imperative mood.
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Deleted 2.5" maximum nominal flute depth requirement and only require a maximum of 17 psf additional weight.
	Corrected clearance to bottom reinforcement in Typical Longitudinal Section from 2½" to 1½".
	Revised Note 1 to delete "Idaho Transportation Department Standard Specifications for Highway Construction" and only reference "Section 502.03, Part E".
	Revised reference to shop drawings in note 3 to subsections 502.03E2 and 105.02.
	Revised notes format for active voice, imperative mood and Writer's Style Guide.
Dec 2024	Changed name of "Detail A" to "Detail 1".

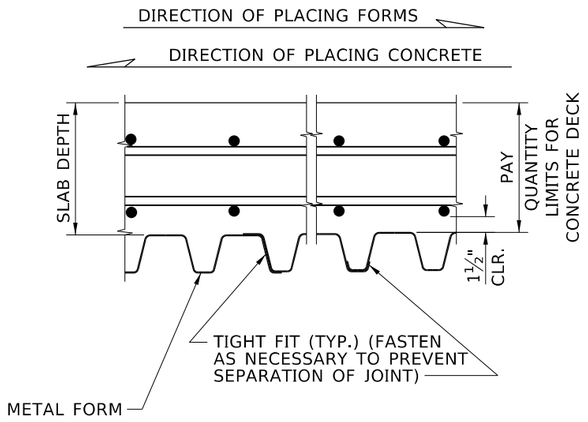
B9.1B Permanent Metal Deck Forms – Concrete Girders

June 2006	Revised Note 1 to conform to the 2004 Standard Specifications.
	Added new Note 4 requiring submittal of shop drawings & design calculations for the deck overhang brackets with the metal forms submittal..
	Added new Note 5 requiring mylars of approved shop drawings.
	Renumbered Notes.
	Added "Styrofoam shall not be placed in the flutes" to new Note 6.
	ASTM A-525 has been deleted and the reference to ASTM A-525 in Note 2 was removed.
	Deleted Note 10 for not adding chlorides to the concrete because it is covered in the Standard Specifications.
March 2011	Deleted size of fillet welds.
	Deleted fillet weld at bottom of support angle to embedded angle.
March 2015	Revised notes 3 & 5 for electronic shop drawings.
Nov 2019	Changed clearance to bottom reinforcement from 1" to 1½" to agree with Article 5.14.
	Revised format of notes to active voice, imperative mood.

CHAPTER 9
STANDARD DRAWING REVISION LOG

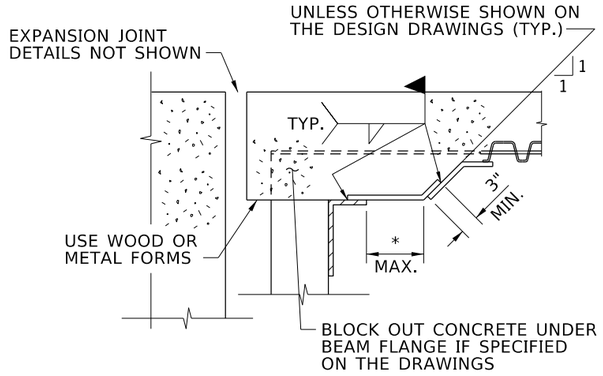
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Deleted 2.5" maximum nominal flute depth requirement and only require a maximum of 17 psf additional weight. Revised Note 1 to delete "Idaho Transportation Department Standard Specifications for Highway Construction" and only reference "Section 502.03, Part E". Revised reference to shop drawings in note 3 to subsections 502.03E2 and 105.02. Revised notes format for active voice, imperative mood and Writer's Style Guide.

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TYPICAL LONGITUDINAL SECTION

NTS



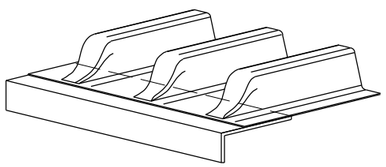
* AS SHOWN ON THE DESIGN DRAWING (6" MAX.)

ABUTMENT EXPANSION JOINT

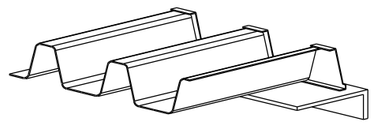
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NOTES

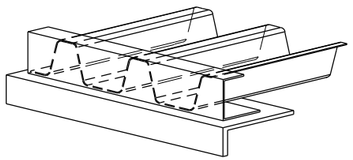
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2. PROVIDE MATERIAL IN ACCORDANCE WITH ASTM A653 SS GRADE 40 OR 50 HAVING A COATING DESIGNATION OF G165.
3. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 502.03E2 AND 105.02.
4. SUBMIT THE SHOP DRAWINGS AND CALCULATIONS FOR DECK OVERHANG BRACKETS WITH THE S-I-P METAL DECK FORMS SHOP DRAWINGS.
5. DO NOT EXCEED 17 psf FOR THE WEIGHT OF THE STAY-IN-PLACE METAL DECK FORMS AND ADDITIONAL WEIGHT OF CONCRETE IN THE FLUTES. DO NOT PLACE STYROFOAM IN THE FLUTES.
6. SHOW GAGE AND SIZE OF SUPPORTING ELEMENTS AND FORMS ON THE SHOP DRAWINGS ALONG WITH LENGTH, SIZE AND SPACING OF WELDS.
7. ATTACH FORM SHEETS IMMEDIATELY TO AVOID HAZARDS THAT CAN RESULT FROM LATERAL MOVEMENT OR SUDDEN UPLIFT.
8. NO WELDING IS PERMITTED TO THE GIRDER FLANGES.
9. PLACE THE FORMS OPPOSITE TO DIRECTION OF CONCRETE POUR, SPECIFY DIRECTION OF POUR TO ERECTOR BEFORE PLACEMENT OF DECK.
10. DETERMINE VERTICAL ADJUSTMENT OF SUPPORT ANGLES IN FIELD TO MAINTAIN CORRECT SLAB THICKNESS AND ROADWAY SLOPE.



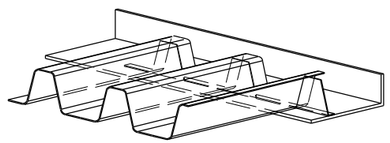
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BUTT



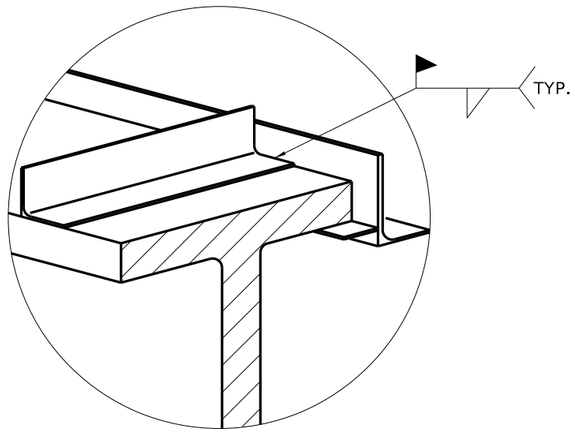
CHANNEL OR ANGLE



UNDERFORM

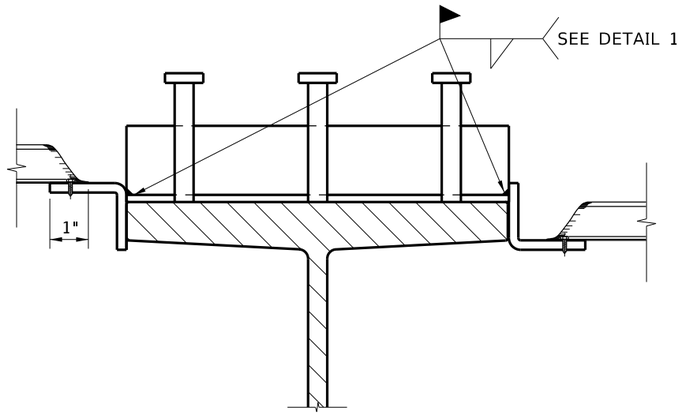
TYPES OF END CLOSURES

NTS



DETAIL 1

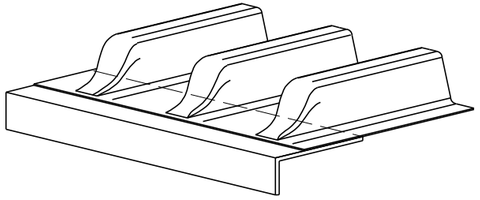
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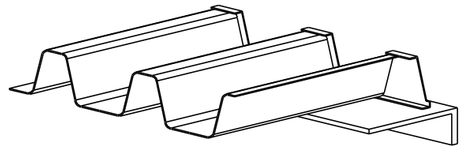
TYPICAL SUPPORT DETAIL

NTS

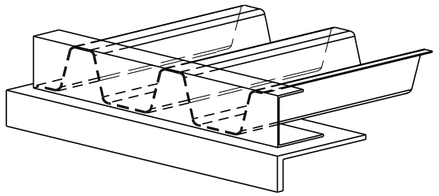
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NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED		YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	CADD FILE NAME Standards/Bridge Standard Drawings/ B09_1A.DGN			STEEL GIRDER BRIDGE BRIDGE LRFD DESIGN MANUAL, B9.1A	COUNTY / KEY NO.
				DWG. CHECKED					BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			



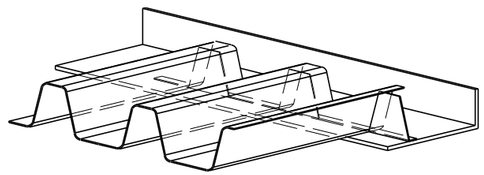
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CHANNEL OR ANGLE



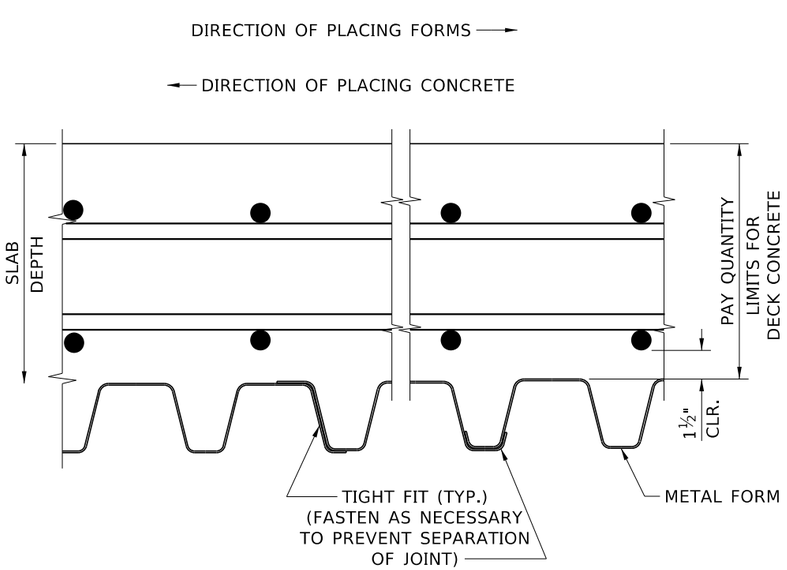
UNDERFORM

NOTES

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2. PROVIDE MATERIAL IN ACCORDANCE WITH ASTM A653 SS GRADE 40 OR 50 HAVING A COATING DESIGNATION OF G165.
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9. DETERMINE THE VERTICAL ADJUSTMENT OF SUPPORT ANGLES IN FIELD TO MAINTAIN CORRECT SLAB THICKNESS AND ROADWAY SLOPE.

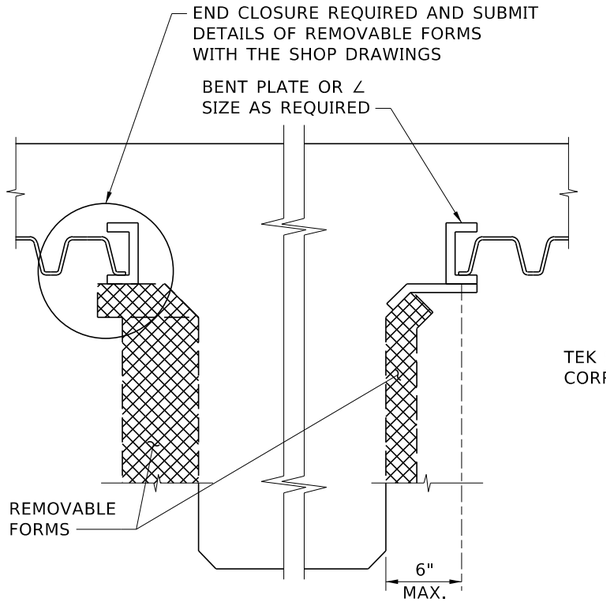
TYPES OF END CLOSURES

NTS



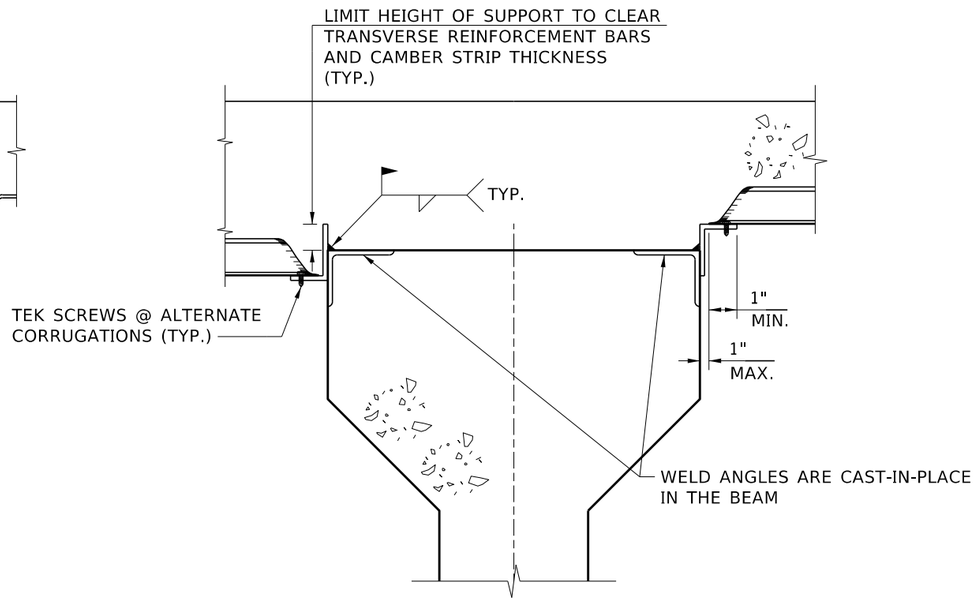
TYPICAL LONGITUDINAL SECTION

1½"=1'-0"



DETAIL AT CONCRETE DIAPHRAGM

1"=1'-0"



DETAIL SHOWN FOR P/S I-BEAM BRIDGE
SIMILAR FOR P/S BOX BEAM BRIDGE

TYPICAL SUPPORT DETAIL

1½"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PERMANENT METAL DECK FORMS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B09_1B.DGN			PRECAST/PRESTRESSED CONCRETE GIRDER BRIDGE BRIDGE LRFD DESIGN MANUAL, B9.1B	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: OCT 2023	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

CHAPTER 10

FOUNDATIONS

DESIGN GUIDELINES FOR SPREAD FOOTINGS ON ROCK

The design of spread footing on rock shall be in accordance with the AASHTO LRFD Bridge Design Specifications as summarized in the following procedure.

General
On rock, a linear pressure distribution is used for all limit states. This is because the rock will not be able to yield to form a more rectangular pressure distribution. The deformation of the rock will basically stay linear. The flexibility of the footing will affect this, but the linear distribution is the closest distribution to use.

Service Limit State

- In the design of the footing reinforcement, the service limit state must be checked for crack control.
- Settlement does not need to be checked for footings on competent rock.
- As per Article **10.6.2.4.4**, elastic settlement on rock may generally be assumed to be less than ½". If settlements of this magnitude are unacceptable and a settlement analysis is required, there are no eccentricity requirements.
- There are no sliding requirements.
- The resistance factor is 1.0.

Strength Limit State

- The eccentricity requirements should be in accordance with Article **10.6.3.3**.
- The resistance factors should be provided by the Geotechnical Engineer based upon his method of estimating the capacity of the rock.
- Sliding should be checked in accordance with Article **10.6.3.4**. For equation **10.6.3.4-2**, the friction angle shall be in accordance with Table **C3.11.5.3-1**.

Extreme Limit State

- The eccentricity requirements should be in accordance with Article **10.6.4.2**.
- Sliding should be checked in accordance with Article **10.6.3.4**. For equation **10.6.3.4-2**, the friction angle shall be in accordance with Table **C3.11.5.3-1**.

Seismic Design of Abutments
Article 11.6.5.1 allows the location of resultant of the reaction forces to within the middle ⅔ f**or $\lambda_{EQ} = 0$** and to middle 0.8 of the footing base **for $\lambda_{EQ} = 1$**.

Commentary

Spread Footings on Rock Design Guidelines established based on LRFD specifications and correspondence from Monte Smith of Sargent Engineers.

Revisions:

June 2006	Added new article.
Jan 2022	Revised Article references to agree with the 9th Edition of the AASHTO LRFD Bridge Design Specifications.

10.7.1.2 PILE SPACING, CLEARANCES, AND EMBEDMENT

Spacing, clearances, and embedment of piles shall be in accordance with AASHTO Article 10.7.1.2, except as follows:

1. If there is calculated uplift on a pile, positive means of anchorage and 12" of embedment shall be provided.

2. If there is a possibility of scour under footings, use 12" of embedment.

3. Use 24" embedment in the case of stubby abutments where the superstructure is integral with the pile cap and rotation is accomplished by bending in the piles.

4. For encased pile bents, the cut-off elevation should be a minimum of 1' above normal water elevation to avoid cutting off piles under water.

5. The concrete cover at the sides of piles in encased pile bents shall be a minimum of 12".

Pile spacing greater than 10' should be avoided. Consult your Group Leader on designs with proposed pile spacing exceeding 10'.

Commentary

The 12” side cover requirement is based on AASHTO Article 10.7.1.2 requirement of a minimum 6” plus an allowance for pile misalignment but not less than 9”. The ITD Standard Specifications 505 O specifies pile location at cutoff are within 6” of plan location. The 12” side cover is derived from 6” minimum plus 6” misalignment.

Revisions:

November 2006	Corrected the article number to agree with the 2006 Interims.
April 2008	Revised the concrete cover in note 5 from 8” to 9”.
Sept 2021	Changed the minimum side cover in note 5 from 9” to 12” and added Commentary.

10.7.1.5 PILE DESIGN REQUIREMENTS

The ultimate load capacity for driven steel H-pile or Pipe-pile shall not exceed:

1) The geotechnical capacity determined by an analysis of the foundation soils as recommended in the Geotechnical Engineering Report.

2) The structural capacity of the pile as determined by the Nominal Compressive Resistance per Article 6.9.4.1 of the AASHTO LRFD Design Specifications based on the pile acting as a column with the appropriate unsupported length.

3) 75% of the yield strength of the specified pile steel multiplied by the cross-sectional area of the pile.

Commentary

For the purpose of determining the structural capacity of the pile per Article 6.9.4.1the appropriate unsupported pile length for exposed pile bents should be based on the initial unsupported length plus the anticipated scour depth. For pile caps that are initially buried the appropriate unsupported pile length should be based on the anticipated scour depth below the bottom of the pile cap or seal concrete.

A limit of 75% of the yield strength of the pile is imposed to avoid potential pile damage during driving.

Revisions:

April 2008	Added new article.
Oct 2023	Corrected reference to Foundation Investigation Report to Geotechnical Engineering Report. Deleted comment for using 36 ksi steel piles since 36 ksi piles are no longer available.

10.8 DRILLED SHAFTS

Concrete cover to the reinforcing steel in drilled shafts shall be in accordance with AASHTO LRFD Bridge Construction Specifications 4th Edition Article 5.4.8.

Recommended minimum concrete cover to reinforcing steel shall be as shown in the following table.

Shaft Diameter	Minimum Concrete Cover
Less than or equal to 3.0 ft	3.0 inches
Greater than 3.0 ft and less than 5.0 ft	4.0 inches
5.0 ft or larger	6.0 inches

Commentary
The table is from C5.4.8 of the AASHTO LRFD Bridge Construction Specifications 4th Edition Article 5.4.8.

Revisions:
Oct 2023 Added new article.

FOOTING LAYOUT AND PILE NOTES

The details and notes shown on B10.1 are intended as a design and detailing aid. Only those details and notes required should be shown on the plans. Notes should be modified or added to match the requirements of each structure.

Unless otherwise noted, exposed pile bents shall be painted in accordance with specifications.

For estimating purposes, test piles shall be approximately 50 percent longer than normal piles.

For drivability, steel shell piles shall have a minimum ½" wall thickness.

In order for all of the project specific test pile instructions to be located in one place in the contract documents, specific instructions as to when in the pile driving sequence CAPWAP analyses are to be performed should be added as a test pile note under the "Miscellaneous" heading on B10.1. These instructions are not intended to be given via a specification modification in the contract special provisions. The specific recommendations are in the Geological Engineering Report.

Pile point type recommendations needed for Note 3 on B10.1 are in the Geological Engineering Report.

Only pile points and prefabricated splicers from the Qualified Products List shall be used.

Revisions:

June 2006	Split Footing Layout & Pile Notes and Approved Points, Shoes, Boots, & Splicers into separate articles.
Nov 2019	Deleted exposed pile bent minimum shell pile wall thickness of 5/16" and added minimum steel shell pile ` wall thickness of ½" for drivability. Added instructions for specific test pile notes to be added to B10.1. Added pile point & prefabricated splicers from QPL note.
Sep 2020	Changed name of "Phase 4 Foundation Report" to "Geotechnical Engineering Report" to agree with the Materials Manual.

CHAPTER 10
STANDARD DRAWING REVISION LOG

B10.1 Foundation Plan

Oct 2023	Added new sheet for pile layout Added shell pile & H-pile legend. Changed shell test pile symbol to a solid circle.

B10.2 Foundation Details

June 2006	Modified Note 4 to require prefabricated splicers to be welded in accordance with ANSI/AWS D1.1. Modified Note 5 to include Inspection and limited AWS D1.5 to piles with an OD greater than 18". Added Note 5a requiring all HP piles and shell piles ≤ 18" OD to conform to AWS D1.1.
April 2008	Corrected reference in Notes 3 & 4 to A10.2
July 2009	Deleted pile pay length detail Added Note 14 for estimated pile length shown in the Pile Schedule. Added Estimated Cut-off and Estimated Pile Tip Elevations in the Pile Schedule. Revised Note 5 to AWS D1.1 with 25% of all welds UT.
July 2010	Note 4 revised to move welding requirements to Note 7. Revised Note 7 to require welding of all pile points and prefabricated splicers. Revised Note 7 to require approval of welding details and procedures.
March 2011	Deleted Note 15 that referenced predrilling Special Provisions.
Feb 2012	Revised Note 9 to require the wave equation be performed by the contractor in accordance with Section 505-G. Revised Note 10 to notify the "Engineer" and not "Geotechnical Engineer". Revised Note 11 to refer to "Highest Pile Tip Elevation" instead of "minimum penetration".
June 2013	Added Grade 3 shell piles to note 1A.
May 2014	Revised H-piles to ASTM A572 Grade 50 in note 1. Revised note 2 for splice plates to be the same material as the piles. Changed bearing capacity to Kips in note 9.
March 2015	Revised note 1A to define shell pile diameter as "outside diameter". Revised note 14 to change "estimated cut-off" to "cut-off". Revised Pile Schedule to change "estimated pile cut-off" to "pile cut-off". Revised H-Beam Splice Detail to show extending backing plate and then trim flush.
Aug 2016	Revised notes based upon comments from Materials/Construction Section.
March 2018	Changed thickness of shell pile closure plate from 1" to 1½". The thicker plate gives better results for dynamic pile testing.
Nov 2019	Revised Notes 3 & 4 for Pile Points and splicers to reference ITD's QPL list. Added Note 15 for test pile recommendations. Revised format of notes to active voice, imperative mood.
May 2021	Changed title of sheet from "Footing Layout and Pile Notes" to "Foundation Details". Changed name from "H-Beam Pile" to "H-Pile" in the Butt Welded Splice Detail and Tension Connection Detail.
Jan 2022	Converted sheet to ORD format.
June 2022	Removed inch symbol from weld symbol. Revised format of leader lines.

CHAPTER 10
STANDARD DRAWING REVISION LOG

Oct 2023 Revised Note 5 to require "ultrasonic test (UT) 25% of all welds in each construction stage".
Added Test Pile notes 12 – 15.
Added Notes to Designer for tension connection in accordance with Article 5.11.3.2.1.
Revised notes format for active voice, imperative mood and Writer's Style Guide.
Renamed sheet from B10.1 to B10.2

Dec 2024 Deleted H-pile and Shell pile details and created new sheets B10.3 and B10.4 for pile details.
Revised note 1A to specify ASTM A-709 Grade 50 steel for closure plates instead of ASTM A572.
Added Note to Designer "Select the appropriate details from B10.3 or B10.4 and then place them in this space."

B10.3 H-Pile Details

Dec 2024 Added new sheet.

B10.4 Shell Pile Details

Dec 2024 Added new sheet.

NOTES

1. SEE FOUNDATION DETAILS SHEET FOR PILE NOTES, PILE DETAILS, AND PILE SCHEDULE.

FOUNDATION PLAN AND PILE LAYOUT

SCALE

SHELL PILE LEGEND

- ● DENOTES VERTICAL TEST PILE
- ●→ DENOTES BATTERED PILING _H:_V IN DIRECTION SHOWN
- ○ DENOTES VERTICAL PILING
- ○→ DENOTES BATTERED PILING _H:_V IN DIRECTION SHOWN

H-PILE LEGEND

- Ⓘ DENOTES VERTICAL TEST PILE
- Ⓗ→ DENOTES BATTERED PILING _H:_V IN DIRECTION SHOWN
- I DENOTES VERTICAL PILING
- H→ DENOTES BATTERED PILING _H:_V IN DIRECTION SHOWN

REVISIONS			
NO.	DATE	BY	DESCRIPTION
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DESIGNED
DESIGN CHECKED
DETAILED
DWG. CHECKED
CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY

CADD FILE NAME
Standards/Bridge Standard Drawings/B10_1.DGN

DRAWING DATE: OCT 2023

IDAHO TRANSPORTATION DEPARTMENT

YOUR Safety→YOUR Mobility→YOUR Economic Opportunity

APPROVED BY:
BRIDGE ENGINEER MICHAEL T. JOHNSON DATE: _____

ENGLISH

PROJECT NO.

FOUNDATION PLAN

BRIDGE LRFD DESIGN MANUAL, B10.1

BRIDGE PLANS

BRIDGE KEY NO.

COUNTY | KEY NO.

BRIDGE DWG. NO. | SHEET OF

NOTES

MATERIAL SPECIFICATIONS

1. PROVIDE HP0x0 STEEL H-PILES THAT CONFORM TO ASTM A572 GRADE 50.

1A. PROVIDE 0" DIAMETER CONCRETE-FILLED STEEL SHELL PILES WITH 0" WALL THICKNESS THAT CONFORM TO ASTM A-252 GRADE 2 OR GRADE 3 AND 708.30. PROVIDE 0" CLOSURE PLATE THAT CONFORM TO ASTM A-709 GRADE 50. PROVIDE CLASS 30 CONCRETE THAT IS INCIDENTAL TO THE STEEL SHELL PILE PAY ITEM.

2. PROVIDE SPLICE PLATES OF THE SAME MATERIAL AS THE STEEL H-PILES.

2A. PROVIDE BACKUP PLATES/BACKING RINGS THAT ARE AT LEAST ⅜" THICK AND CONFORM TO ASTM A-36 OR OF THE SAME MATERIAL AS THE STEEL SHELL PILES.

3. DRIVE PILES WITH HARDENED STEEL DRIVE SHOES ACCORDING TO ITD'S QUALIFIED PRODUCTS LIST FOR CATEGORY 505 PILING AND SUB-CATEGORY (_____)

4. SPLICE PILE ACCORDING TO THE PILE SPLICE DETAIL OR PROVIDE PREFABRICATED SPLICERS ACCORDING TO ITD'S QUALIFIED PRODUCTS LIST FOR CATEGORY 505 PILING AND SUB-CATEGORY "SPLICING FOR STEEL H-PILES" OR "SPLICING FOR STEEL PIPE PILES".

WELDING

5. QUALIFICATION OF WELDERS, MATERIALS, INSPECTION, AND PROCEDURES FOR WELDING SHELL PILES WITH AN O.D. GREATER THAN 18" MUST CONFORM TO THE CURRENT EDITION OF AWS D1.1. ULTRASONIC TEST (UT) 25% OF WELDS IN EACH CONSTRUCTION STAGE.

5A. QUALIFICATION OF WELDERS, MATERIALS, INSPECTION, AND PROCEDURES FOR WELDING H-PILE AND SHELL PILES WITH AN O.D. EQUAL TO OR LESS THAN 18" MUST CONFORM TO THE CURRENT EDITION OF AWS D1.1.

6. PROVIDE WELDING QUALIFICATION TESTS TO DEMONSTRATE THE WELDABILITY OF SHELL PILES UNDER FIELD CONDITIONS FOR WELDS TO BE MADE ON THE PILES.

7. ATTACH PILE POINTS AND PREFABRICATED SPLICERS BY WELDING IN ACCORDANCE WITH THE CURRENT EDITION OF AWS D1.1. SUBMIT WELDING DETAILS AND PROCEDURES FOR APPROVAL.

DRIVING DATA

8. SUBMIT THE TYPE AND OPERATION SPECIFICATIONS OF THE HAMMER 15 CALENDAR DAYS BEFORE PILE DRIVING BEGINS.

9. DRIVE PILES TO (REFUSAL) (NOMINAL AXIAL RESISTANCE OF 0 KIPS PER PILE) AS DETERMINED BY A WAVE EQUATION ANALYSIS IN ACCORDANCE WITH 505.03 PART G.

10. THE RATED ENERGY FOR THE HAMMER USED FOR DRIVING PILES IS RECOMMENDED TO BE BETWEEN 0 AND 0 FOOT-POUNDS. THE RATED ENERGY RANGE MAY BE CHANGED IF APPROVED.

11. NOTIFY THE ENGINEER BEFORE FURTHER PILE DRIVING IF THE HIGHEST PILE TIP ELEVATION IS NOT OBTAINED.

TEST PILES

12. DRIVE TEST PILES TO 1½ TIMES THE ESTIMATED PILE PENETRATION LENGTH OR REFUSAL, WHICHEVER COMES FIRST. FOR EACH TEST PILE, PERFORM PILE DYNAMIC TESTING DURING INITIAL PILE DRIVING AND DURING RESTRIKE IF NECESSARY, OR AS DIRECTED.

13. IF THE TEST PILE NOMINAL AXIAL RESISTANCE IS NOT ACHIEVED, RESTRIKE THE TEST PILE TO 4 INCHES OF PENETRATION AFTER A __ HOUR WAITING PERIOD, OR AS DIRECTED. IF THE TEST PILE ACHIEVES THE NOMINAL AXIAL RESISTANCE DURING INITIAL DRIVING, TEST PILE RESTRIKE IS NOT REQUIRED.

14. INCORPORATE TEST PILES THAT MEET PRODUCTION PILE DRIVING CRITERIA INTO THE PERMANENT WORK.

15. PERFORM CAPWAP ANALYSIS AT TWO TEST PILE PENETRATION DEPTHS:
    1. AT THE DEPTH WHERE THE CASE METHOD INDICATES THE ESTIMATED TEST PILE CAPACITY EQUALS THE NOMINAL AXIAL RESISTANCE SHOWN ON THE PLANS (THIS DEPTH MUST BE EQUAL TO OR DEEPER THAN THE HIGHEST PILE TIP ELEVATION SHOWN ON THE PLANS), OR AS DIRECTED.
    2. AT THE END OF INITIAL DRIVING AND ON PILE RESTRIKES.

MISCELLANEOUS

16. PILE TIP ELEVATIONS ARE SHOWN FOR ESTIMATING PURPOSES ONLY.

17. ESTIMATED PILE LENGTHS ARE COMPUTED FROM PILE CUT-OFF AND ESTIMATED PILE TIP ELEVATIONS.

NOTE TO DESIGNER

SELECT THE APPROPRIATE DETAILS FROM B10.3 OR B10.4 AND THEN PLACE THEM IN THIS SPACE.

PILE SCHEDULE					
LOCATION	NO.	ELEVATION			ESTIMATED PILE LENGTH (FT)
		PILE CUT-OFF	ESTIMATED PILE TIP	HIGHEST PILE TIP	

REVISIONS			
NO.	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			

DESIGNED

DESIGN CHECKED

DETAILED

DWG. CHECKED

CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY

CADD FILE NAME
Standards/Bridge Standard Drawings/B10_2.DGN

DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT

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APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE: _____

ENGLISH

PROJECT NO.

FOUNDATION DETAILS

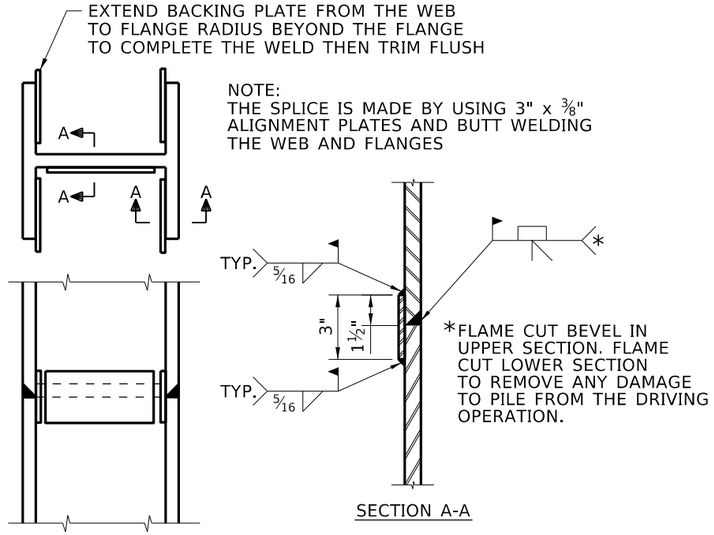
BRIDGE LRFD DESIGN MANUAL, B10.2

BRIDGE PLANS

BRIDGE KEY NO.

COUNTY | KEY NO.

BRIDGE DWG. NO. | SHEET OF

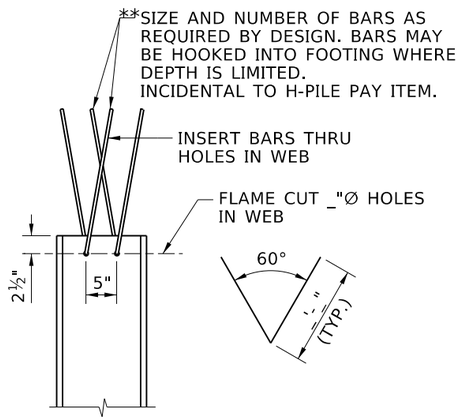


H-PILE BUTT WELDED SPLICE DETAIL

NTS

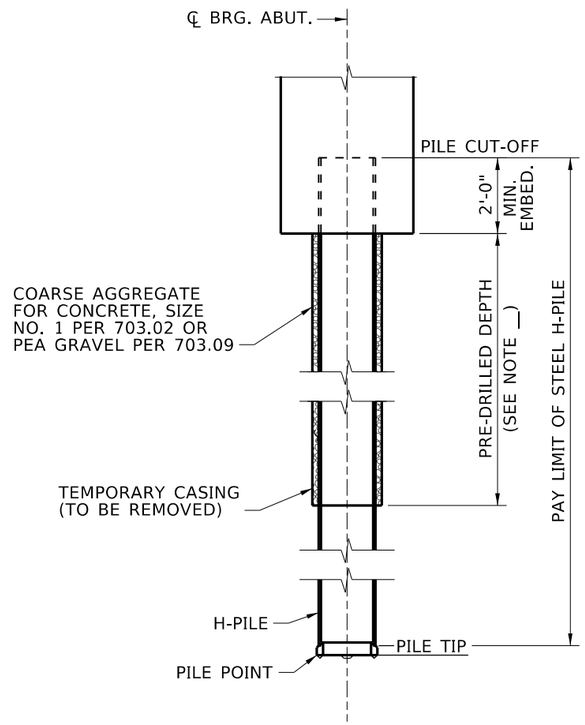
NOTE TO DESIGNER

**LRFD ARTICALE 5.11.3.2.1 REQUIRES TENSION CONNECTION FOR STRUCTURES IN SEISMIC ZONE 2 OR GREATER. MINIMUM UPLIFT FORCE MUST NOT BE TAKEN LESS THAN 10 PERCENT OF THE FACTORED AXIAL COMPRESSIVE RESISTANCE OF THE PILE.



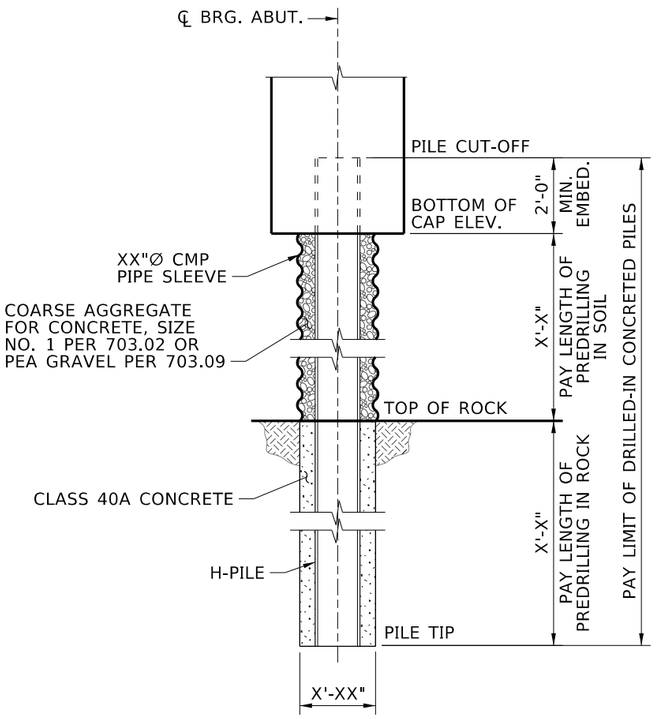
H-PILE TENSION CONNECTION

NTS



SECTION THROUGH ABUTMENT

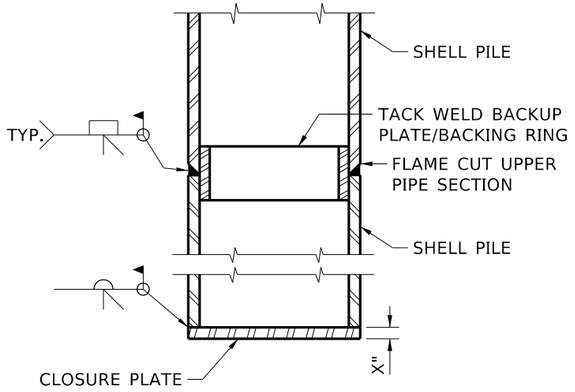
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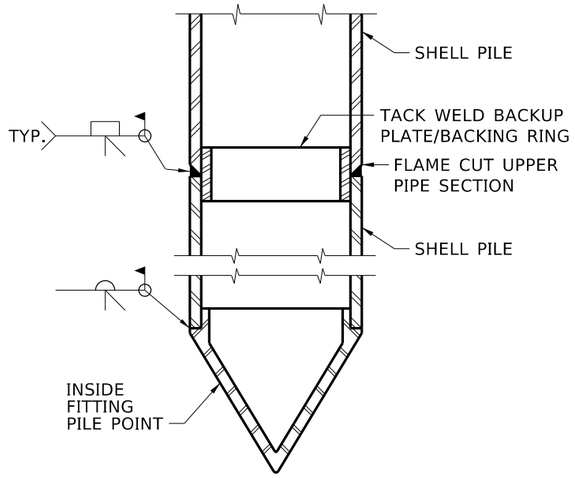
DRILLED-IN CONCRETED PILES DETAIL

NTS

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	H-PILE DETAILS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/B10_3.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B10.3	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



SHELL PILE SPLICE DETAIL
NTS

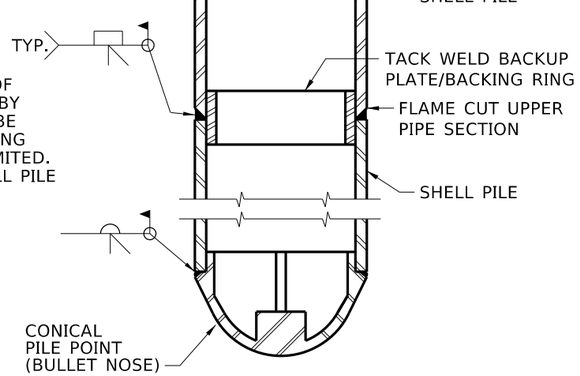


SHELL PILE SPLICE DETAIL
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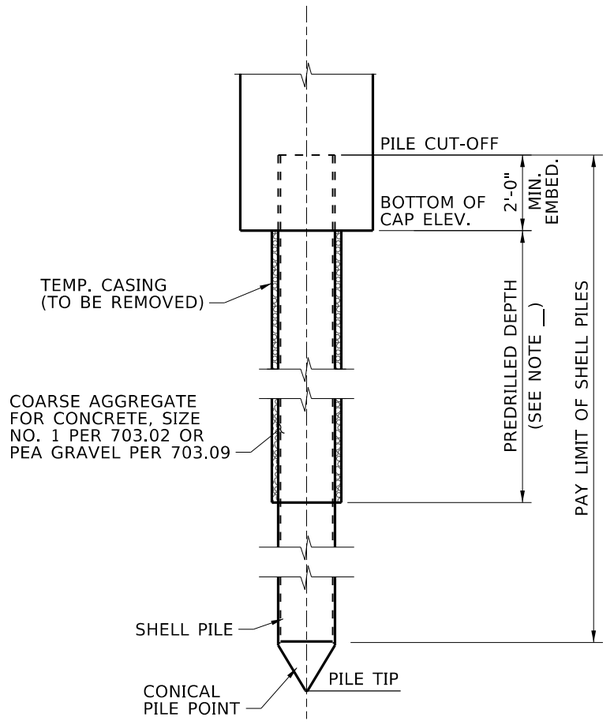
NOTE TO DESIGNER

**LRFD ARTICALE 5.11.3.2.1 REQUIRES TENSION CONNECTION FOR STRUCTURES IN SEISMIC ZONE 2 OR GREATER. MINIMUM UPLIFT FORCE MUST NOT BE TAKEN LESS THAN 10 PERCENT OF THE FACTORED AXIAL COMPRESSIVE RESISTANCE OF THE PILE.

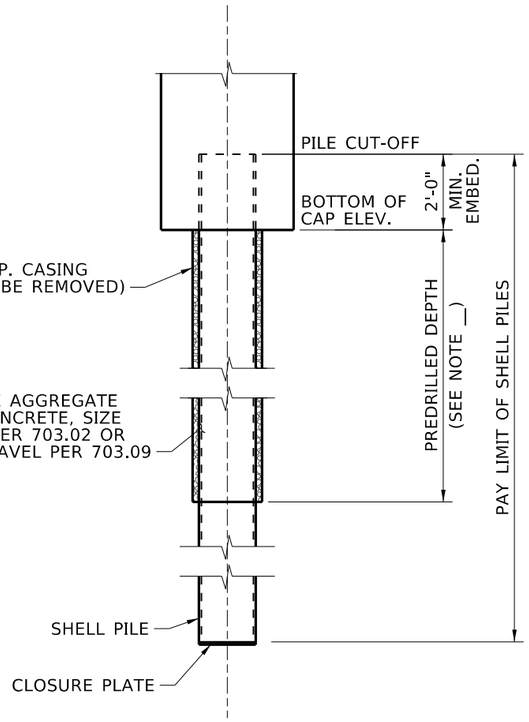
SHELL PILE TENSION CONNECTION
NTS



SHELL PILE SPLICE DETAIL
NTS



SECTION THROUGH ABUTMENT
NTS



SECTION THROUGH ABUTMENT
NTS

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	SHELL PILE DETAILS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED		YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	CADD FILE NAME Standards/Bridge Standard Drawings/ B10_4.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B10.4	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

CHAPTER 11

ABUTMENTS, PIERS, WALLS

11.6.1.3 DESIGN GUIDELINES FOR INTEGRAL ABUTMENTS

Integral abutments, where appropriate, should be considered for most bridge projects in order to eliminate joints and bearings thereby simplifying construction and reducing maintenance problems. Integral abutments are defined as those abutments that are rigidly attached to both the superstructure and the supporting piles so that all thermal movements and girder end rotations are transferred from the superstructure through the abutment to the piles.

Design Limitations for the Use of Integral Abutments

Length & Skew

*SKEW (Θ)	MAXIMUM TOTAL STRUCTURE LENGTH	
	CONCRETE STRUCTURES	STEEL STRUCTURES
$0^o \le \Theta \le 20^o$	650 ft	350 ft
$20^o \le \Theta \le 30^o$	130 ft	130 ft
$*30^o \le \Theta \le 45^o$	90 ft	90 ft

*Use of integral abutments for bridges with skews greater than 30º requires approval from Group Leader or State Bridge Engineer.

For bridge skews of 25º or less, no skew effects need to be considered. For skews greater than 25º the forces tending to rotate the structure shall be accounted for in the design.

Foundations: Abutments shall be supported on a single row of steel H-piles, steel smooth hollow pipe pile or steel-encased concrete piles utilizing smooth steel tubes. Piles should be embedded into the abutment concrete at least 2 feet. The preferred orientation of the piles is for bending about the strong axis. On skewed bridges the pile flanges should remain parallel with the abutment.

Abutment Thickness:

PILE TYPE	MINIMUM ABUTMENT THICKNESS
HP12 or 12"Ø Shell Pile	3.0 ft
HP14	3.25 ft
16"Ø Shell Pile	3.5 ft

Refer to BDM Article 10.7.1.2 for additional guidance for other pile sizes not shown.

Wing Walls: The wing walls should be cantilevered off of the abutments and shall be constructed parallel with the girders in order to minimize the soil pressure against the wings.

Pile Design Procedures

The number of piles in the abutment shall be based on the vertical load requirements. The total dead load reaction of the structure at the abutment shall be distributed to all piles equally. The live load reactions at each pile shall be determined by assuming the piles in the abutment act as a group:

$$R = \frac{P}{N} + \frac{Pex}{I}$$

where: R = single pile live load reaction (KIPS)
P = total live load reaction at the abutment, without impact (KIPS)
N = number of piles in the abutment
e = the eccentricity of the total live load relative to the center of the pile group (FT)
x = the distance from a given pile to the center of the pile group (FT)
I = the moment of inertia of the pile group (FT^2)

For vertical loads piles shall be designed in accordance with Article 10.7 of the AASHTO LRFD Bridge Design Specifications for Strength I.

Lateral loads on the piles may need to be considered on bridges skewed more than 25º when required to resist the soil pressure forces tending to rotate the structure.

Piles must be ductile enough to accommodate both thermal movements and dead load and live load rotations of the superstructure. The ductility of the piles may be checked using the following equations:

For Steel H-pile:

$$2\left[\frac{\Delta}{L}-\frac{M_pL}{6EI}\right]+\theta_w \le \frac{3C_iM_pL}{4EI} \qquad C_i=\frac{19}{6}-5.68\sqrt{\frac{f_y}{E}}\frac{b_f}{2t_f}, \qquad 0<C_i<1.0$$

For hollow and concrete-filled pipe piles:

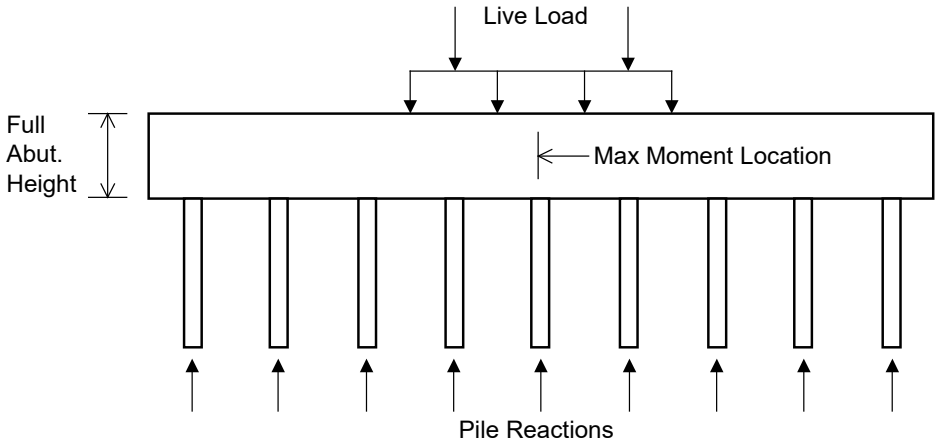
$$2\left[\frac{\Delta}{L}-\frac{M_pL}{6EI}\right]+\theta_w \le \frac{C_iM_pL}{2.08EI} \qquad C_i=3.5-1.25\sqrt{\frac{f_y}{E}}\frac{D}{t}, \qquad 0<C_i<1.0$$

where:
- Δ = one half the factored thermal movement range at the abutment (IN)
- L = twice the length from the bottom of the abutment to the first point of zero moment in the pile determined taking into account the effect of the soil on pile behavior and assuming a lateral deflection of Δ (IN)
- M_p = plastic moment of the H-pile about the axis of bending or the plastic moment of the steel pipe pile without considering the concrete filling (KIP-IN)
- E = modulus of elasticity of the steel (KSI)
- I = H-pile moment of inertia about axis of bending, the moment of inertia of the hollow pipe, or moment of inertia of the concrete-filled pipe considering both the concrete and steel (IN^4)
- θ_w = maximum range of the factored angle of rotation of the superstructure at the abutment calculated assuming the structure is simply supported on the abutment (continuity of the superstructure over piers may be considered on multi-span bridges). This rotation is the sum of the rotations due to live loads plus all dead loads applied after making the rigid connection between the superstructure and the abutment assuming the loads are equally distributed to all girders (RAD)
- C_i = a ductility reduction factor for piles
- b_f = width of H-pile flange (IN)
- t_f = thickness of H-pile flange (IN)
- D = outer diameter of pipe pile (IN)
- t = thickness of pipe pile (IN)

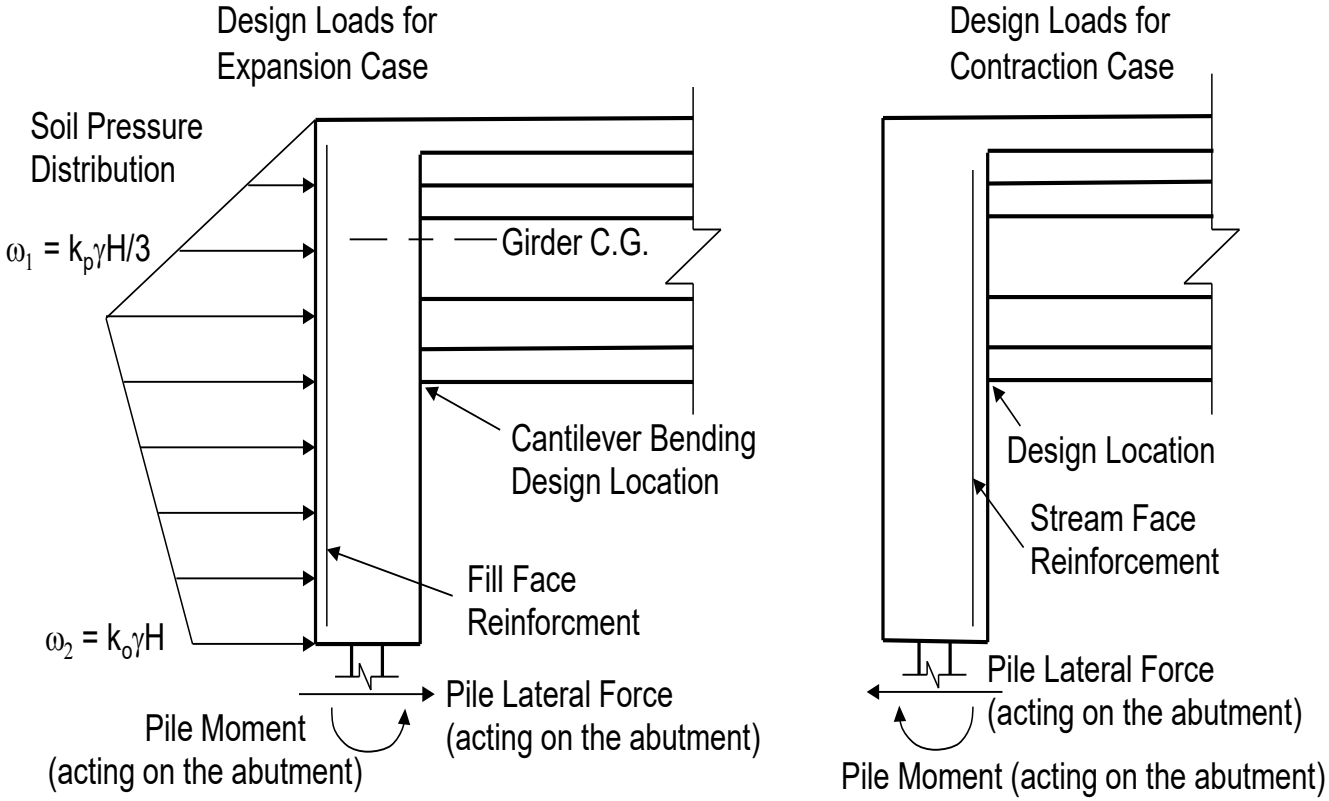
Abutment Backwall Design Procedures

The total height of the abutment shall be as short as practical with a minimum of 3 feet below the fill slope and 2 feet clear between the bottom of the girders and the fill slope. The abutment shall be designed for both Strength I and Service I using the following cases:

- Bending of the abutment acting as a horizontal pile cap for vertical dead loads and live loads assuming that all piles are loaded equally. The maximum positive moment (bottom steel) will occur approximately in the center of the abutment when the live load reactions are concentrated near the center; one, two, or possibly more lanes should be checked for positive moment. The maximum negative moment will occur approximately in the center of the abutment when two lanes are placed at the outside edges of the structure, two lanes will govern on abutments up to 80’ wide. For dead loads only the pile cap section of the abutment shall be considered effective and for live loads the full abutment (both pile cap and end diaphragm) may be considered effective.



- Bending of the abutment acting as a vertical cantilever below the beam seat elevation to resist soil pressures and lateral pile forces and moments for thermal expansion, and the lateral pile forces and moments only for thermal contraction.



- Bending of the abutment acting as a continuous beam spanning between the girders under a soil pressure load. The full section of abutment (both pile cap and end diaphragm) may be used.

For all design elements the soil pressure distribution may be assumed as the passive pressure for the top third of the abutment with the pressure varying linearly down to the at-rest pressure at the base of the abutment (strength I load factor for soil pressure of 1.00, 3rd Edition Article C10.5.5). This distribution is appropriate for concrete bridges up to 320 feet in length and

steel bridges up to 120 feet in length. A more in-depth analysis of soil pressure distribution should be made for longer structures.

The abutment need not be designed by the strut and tie model if the longitudinal reinforcement is determined by conventional beam analysis for each of the above cases and a minimum orthogonal grid of reinforcing bars is provided in accordance with Article 5.8.2.6.

Girder End Capacity

The capacity of the end of the girders shall be checked for negative moment using Strength I for steel and concrete girders with an additional check of Service III for prestressed concrete girders. The design load shall be determined by assuming the maximum soil pressure (strength I load factor of 1.00), as determined above, acting on the back of the abutment combined with the lateral pile reaction and moment resulting from thermal expansion (strength I load factor of 0.5). The resulting compression force and bending moment taken about the c.g. of the composite girder section shall be applied to the end of the girders. The loads shall be distributed equally to all girders.

Also, for concrete girders, the tension force resulting from the lateral resistance of the piles due to contraction shall be used in the design of the longitudinal reinforcement of the girders in accordance with Article 5.8.3.5 (strength I load factor of 0.5).

Skew Affects

On structures with skews greater than 25 degrees, the tendency for the structure as a whole to rotate due to the non-concentric soil pressure forces acting against the abutments must be checked. A rotational moment about the center of the structure is induced by the soil pressure (strength I load factor of 1.00) acting on the abutment backwall at an angle normal to the backwall minus the soil-concrete interface friction angle;

$$\delta = \tan^{-1}(0.8\tan\phi_f) \qquad \text{(Article 10.6.3.4)}$$

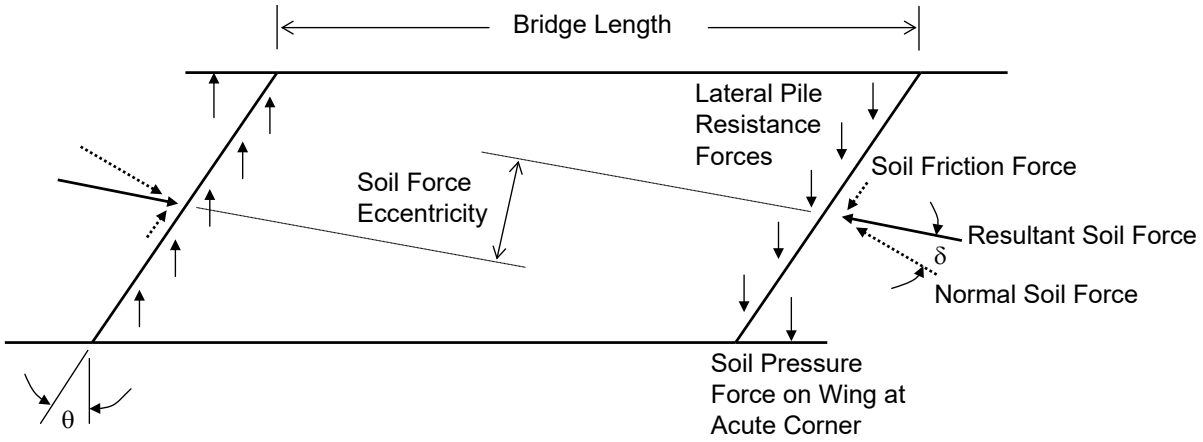
Where: δ = soil-concrete friction angle
ϕ_f = internal soil friction angle

If δ is greater than or equal to the bridge skew angle there will be no tendency for the structure to rotate and no further check is required. If δ is less than the bridge skew angle the magnitude of the induced rotational moment will be equal to the resultant soil force times the eccentricity of the opposing forces. The resultant soil force is based on the normal soil force (from assumed soil pressure distribution used for the abutment backwall design procedures) increased by the vector addition of the friction component. The eccentricity of these two opposing soil forces is equal to the bridge length times the sine of the difference between the bridge skew angle and the friction angle;

$$M_{RS} = F_{RS}(e_{RS}) \qquad F_{RS} = \frac{F_{NS}}{\cos\delta} \qquad e_{RS} = L\sin(\theta - \delta) >= 0 \text{ ft.}$$

where: M_{RS} = the soil pressure induced rotational moment
F_{RS} = resultant soil force
e_{RS} = the eccentricity of the opposing soil forces
F_{NS} = normal soil force based on the assumed soil pressure distribution
δ = the soil-concrete friction angle
L = bridge length
θ = the bridge skew angle

The resulting rotational moment must be resisted by a combination of the lateral pile resistance (strength I resistance factor of 0.55, ITD policy), and the soil force acting against the inside face of the wings at the acute corners (strength I resistance factor of 0.50, Table 10.5.5.2.2-1), as indicated in the sketch below. It can be assumed for simplicity that the resisting forces in the piles as well as the soil force against the wing walls is applied at right angles to the bridge centerline and their respective eccentricities calculated accordingly.



Wing Wall Design

The wing walls shall be designed for at-rest pressure unless they are utilized to resist the rotational tendency of skewed bridges. In which case the wings at the acute corners shall be designed for the actual pressure required to stabilize the structure but need not exceed the passive pressure (strength I factor of 1.35).

Approach Slabs

Approach slabs shall be used on all integral abutment bridges with a total thermal movement of more than ¾ inch. This will result in approach slabs on all concrete girder bridges over 130 feet long and on all steel girder bridges over 65 feet long. The expansion joints at the ends of the approach slabs need only be sized to accommodate thermal expansion assuming the joints are constructed at 60º F with a maximum temperature of 80º F for concrete and 100º F for steel.

Commentary

The allowable bridge length for integral abutments was determined by limiting the total thermal movement range to 4", which results in 2" of movement per abutment. Studies at Iowa State University in 1987 and at the University of Tennessee in 1996 have shown that for lateral displacements of H-piles up to 2" there is no reduction in vertical capacity of the pile. Therefore the only design requirements are vertical capacity and ductility, provided the piles remain embedded in the soil. (It is unlikely that a bridge would remain in service with an abutment that has scoured to the extent the piles become exposed for any significant length.) When the bridge is skewed more than 25 degrees there is also the design consideration for lateral capacity if it is assumed that the piles are used to resist skew induced rotation.

It is preferred to orient H-piles so that thermal expansion and contraction causes bending about the strong axis. While the resulting forces induced in the abutment will be higher, the pile itself will handle larger deflections without flange buckling. The forces and moments induced in the pile due to thermal deflections should be determined based on the soil-pile interaction assuming the pile head is fixed against rotation. This can be done using the LPILE program or a similar program that takes into account the soil properties. In order to simplify details and provide sufficient room for reinforcement the piles on skewed bridges should also be skewed so that the flanges remain parallel with the abutments.

Studies by the University of Tennessee in 1999 showed that piles with an embedment depth of 2 feet led to significantly lower stresses in the concrete and, in turn, to significantly less cracking at large values of lateral displacement when compared to piles embedded only 1 foot.

The equations used to determine pile ductility are from, "Rational Design Approach for Integral Abutment Piles," Transportation Research Record 1233 (year 1983).

The assumed soil pressure distribution at the abutments, which is based on passive pressure for the top third of the abutment varying to at-rest pressure at the base, was developed by Maine as the result of studies done in 1992 where the pressure was monitored behind an integral abutment for one year. Because the appropriate maximum span length for this distribution is not known it is limited here to a deflection into the soil of a ¼ inch, assuming the abutments are constructed at 60° F.

The strut and tie model can become complicated for an abutment with a large number of piles and several models may be necessary for the different live load cases. Because the minimum reinforcement requirements of Article 5.8.2.6 almost always governs when checking the strut and tie model it is sufficient to design the main steel for bending using conventional analysis and then provide the orthogonal grid of minimum reinforcement required for strut and tie.

Skew affects do not need to be considered for skews less than 25 degrees. The soil-to-concrete friction angle at the abutment will always be at least 25 degrees; therefore soil friction alone will stabilize the structure. The ultimate lateral capacity of the piles, for the purpose of resisting rotational effects, shall be defined as the lateral force developed in the pile when subjected to a lateral displacement of 2". As stated above this is the limiting displacement for which there is no reduction in vertical capacity of the pile.

Approach slabs are needed to prevent excessive compaction behind the abutments as well as provide an expansion joint that will minimize, if not prevent, the approach pavement from shoving, settling and cracking. It also isolates the joint away from the main structure where damage due to a leaking joint will be minimized. The joint width at the end of the approach slab where it rests on the sleeper beam should only be large enough to prevent the joint from completely closing during hot weather, with an allowance for the minimum compressed width of the joint seal material. It is not necessary to design the joint for the full movement range that would be required in a typical joint design.

Revisions:

April 2008	Corrected references to agree with 2008 Interims.
May 2021	Corrected reference to Article 5.6.3.3 to 5.8.2.6 to agree with the 9th Edition. Added "acting on the abutment" to the Pile Moment and Pile Lateral Force in the diagram on page 3 of 5. Added e_{RS} must be >= 0 ft.
Oct 2023	Changed reference to COM624 to LPILE.
Dec 2024	Added Table for Length & Skew in Design Limitations Added Table for Abutment Thickness in Design Limitations

11.10.11 MSE ABUTMENTS

ITD's Special Provision stipulates that 15º is the maximum angle that reinforcement can be skewed from a line perpendicular to the wall. The layout of the abutment in relation to the MSE wall should take the above into account.

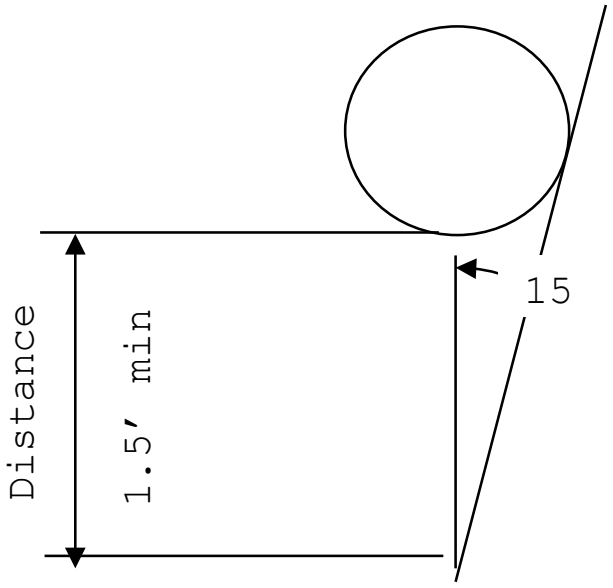
Where interference between the piles, drilled shafts, or concrete columns and soil reinforcement occurs, the reinforcements must be designed around the casings that are used to encase those piles, drilled shafts, or concrete columns. A clear distance of no less than 1.5 feet from the back of the wall facing to the edge of the nearest casing or deep foundation element shall be provided in accordance with the AASHTO LRFD Bridge Design Specifications.

When skewing of the reinforcements up to 15 degrees is needed to avoid interference of the casings, use the setback dimensions in the Table below.

For two-stage walls with concrete panels, assume a minimum 6" air gap between the welded wire wall and concrete facing panel.

Commentary

The setback dimensions are not applied if the wall fabricator uses a different means to solve the problem of obstruction of the casing.



Casing Diameter -ft	Distance from casing to fill face of MSE panel - ft
1.0	1.50
1.5	2.25
2.0	3.00
2.5	3.50
3.0	4.50
3.5	5.00
4.0	6.00

Revisions:

Oct 2023 Added notes for welded wire walls.
Rounded distance from casing to MSE wall
Clarified the type of obstructions.

CHAPTER 11
STANDARD DRAWING REVISION LOG

B11.1 Geosynthetic Lined Structural Backfill

Aug 2016 Added new sheet

Nov 2019 Deleted approach slab details and notes since this detail is not used with approach slabs.
Added notes 2, 3, 4, 5 & 6 as recommended by HQ Materials.
Added drain detail.
Changed slope from 1.5:1 to 2:1.
Added "Notes to Designer".

Jan 2022 Converted sheet to ORD format.

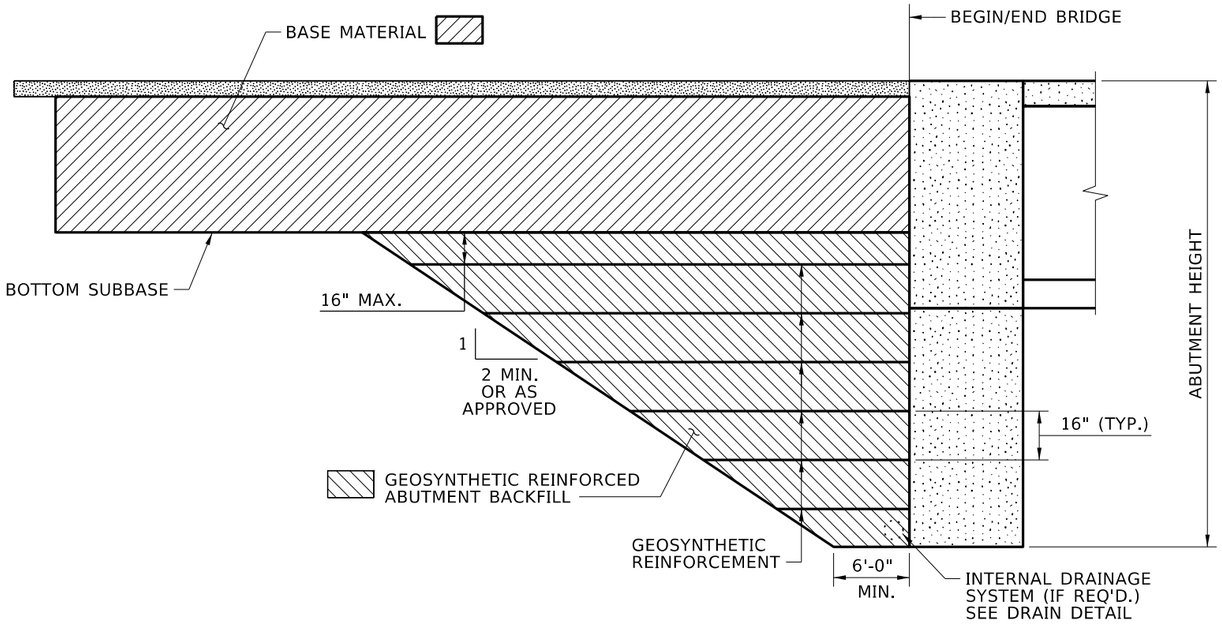
June 2022 Deleted notes 1-6 and added note 1 to provide in accordance with new Section 215 of the Standard Specifications.
Deleted note D.
Deleted "Direction of Compaction" since it addressed in Section 215.
Revised format of leader lines.

Oct 2023 Added Note to the Designer "Do not use GRAB on buried structures".
Added "See BDM Article 2.5.2.4" to note B.

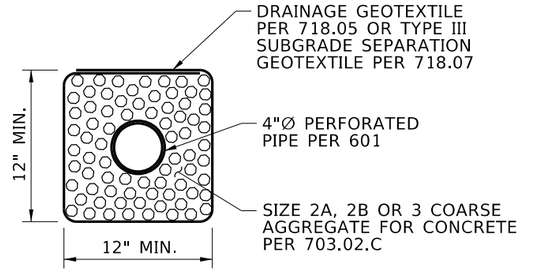
Dec 2024 Changed reference of "bottom subgrade" to "bottom subbase".
Changed thickness of top layer to "16" max".
Changed slope designation from 1V:2H to 1:2.

NOTES

1. PROVIDE GEOSYNTHETIC REINFORCED ABUTMENT BACKFILL IN ACCORDANCE WITH 215.



TYPICAL SECTION
GEOSYNTHETIC REINFORCED ABUTMENT BACKFILL
(TYPICAL BOTH ABUTMENTS)
(ABUTMENT SHOWN, SIMILAR PLACEMENT AT WINGS)
NTS



TYPICAL DRAIN DETAIL
NTS

NOTE TO THE DESIGNER

A. THERE IS NO COMPACTING BACKFILL QUANTITY WITHIN THE LIMITS OF THE GEOSYNTHETIC REINFORCEMENT.
B. GEOSYNTHETIC REINFORCEMENT ABUTMENT BACKFILL SHOULD BE USED ON BRIDGES THAT DO NOT NEED AN APPROACH SLAB. SEE BDM ARTICLE 2.5.2.4.
C. THIS DETAIL ONLY REDUCES SETTLEMENT BUT DOES NOT REDUCE ANY LATERAL PRESSURE.
D. DO NOT USE GEOSYNTHETIC REINFORCEMENT ABUTMENT BACKFILL ON BURIED STIFFLEG OR BOX CULVERT.

REVISIONS				DESIGNED
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED
				DETAILED
				DWG. CHECKED
				CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY

CADD FILE NAME
Standards\Bridge Standard Drawings\B11_1.DGN

DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT
YOUR Safety→YOUR Mobility→YOUR Economic Opportunity

APPROVED BY:
BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:

ENGLISH

PROJECT NO.

GEOSYNTHETIC REINFORCED ABUTMENT BACKFILL

BRIDGE LRFD DESIGN MANUAL, B11.1

BRIDGE PLANS

BRIDGE KEY NO.

COUNTY | KEY NO.

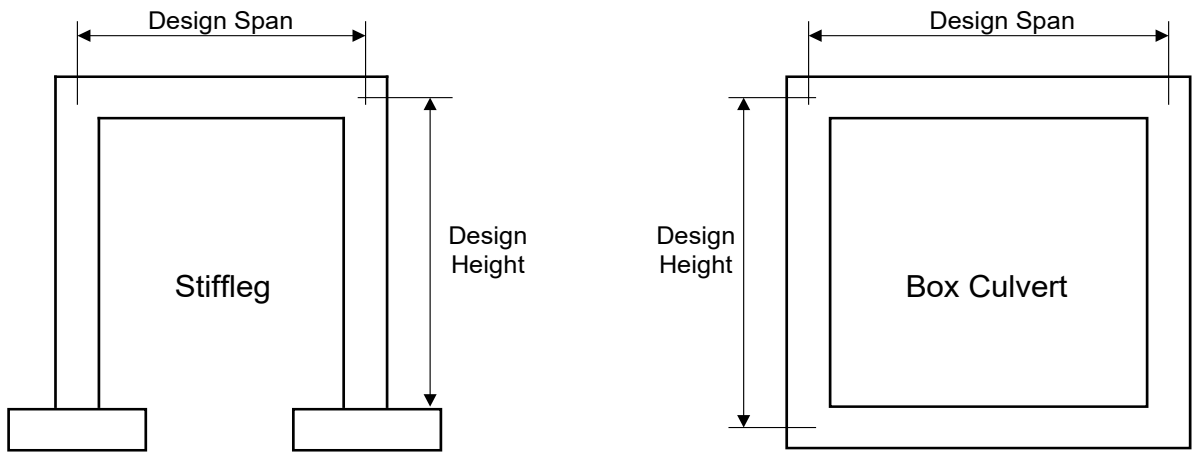
BRIDGE DWG. NO. | SHEET OF

CHAPTER 12

BURIED STRUCTURES

DESIGN GUIDELINES FOR PRECAST & CAST-IN-PLACE STIFFLEGS AND BOX CULVERTS

The design of concrete cast-in-place and precast culverts shall be in accordance with the AASHTO LRFD Bridge Design Specifications, Chapter 12, except for the ITD policy noted below.



GENERAL

The following apply to both cast-in-place and precast culverts.

DISTANCE BETWEEN FINISHED GRADE & TOP OF DECK BETWEEN PAVED SHOULDERS	TOP REINFORCEMENT COVER	TYPE OF REINFORCEMENT
Less than 4”	2½”	Epoxy coat all bars within 4” of the top of deck
Greater than 4” but less than 24”	2½”	Plain bars
24” or greater	2”	Plain bars

Apply a waterproof membrane as specified in Section 511 of the Standard Specifications to the top slab of all buried culverts. Use waterproof membrane Type D when ballast and asphalt pavement are placed across the culvert. Use waterproof membrane Type E when only asphalt pavement is placed across the culvert.

Concrete shall have a minimum compressive strength of 4 ksi.

Reinforcement shall have a minimum yield strength of 60 ksi.

Spacing of reinforcement should be in accordance with Article 5.10.3 and concrete cover should be in accordance with Article 5.10.1.

Fillets should have a minimum leg of 6”. The maximum leg should be less than the 12” for canals and 24” for streams to keep the fillet out of the waterway cross-section.

Concrete Dead Load. Assume 150 lbs/ft^3 for the concrete and reinforcement (Table 3.5.1-1 & C3.5.1).

Wearing Surface. Assume a future overlay of 6” with a weight of 140 lbs/ft^3 (Table 3.5.1-1).

Earth Fill D.L. Use the density given in the Geotechnical Engineering Report. When not given assume 140 lbs/ft^3 (rolled gravel from table
3.5.1-1). The earth loads should be modified to account for soil-structure interaction specified in Article 12.11.2.2.

Earth Pressure. Assume to be linearly proportional to the depth of the soil based on the at rest pressure coefficient specified in Article 3.11.5.2.

Earth Surcharge. When the structure is buried, the fill above the deck is considered an earth surcharge and a constant uniform horizontal earth pressure shall be applied in addition to the basic earth pressure. The uniform horizontal pressure due to earth surcharge should be based on the at rest coefficient specified in Article 3.11.6.1.

Live Load Surcharge. Live load surcharge shall be determined as specified in Article 3.11.6.4.

Live Loads. Live loads and live load distribution shall be determined as specified in Article 12.11.2.

Water Pressure. Culverts should be designed assuming static water pressure on the inside of the walls for the full design height.

PRECAST BOX CULVERTS

- Precast Wing Walls and Barrel Walls shall be double reinforced.
- Precast wing walls shall have a minimum thickness of 8".
- Top slab thickness shall be a minimum of 8" or (S +10)/30 whichever is greater (Table 2.5.2.6.3-1 for continuous spans) for structures that are designed. The span length to determine the minimum thickness is the clear span between walls.
- Minimum standard dimensions and reinforcement for Precast box culverts are shown in AASHTO M259 (ASTM C1577) and AASHTO M273 (ASTM C850). These structures will require design calculations to verify the reinforcement provided.
- For simplification in determining the shears and moments in the structure, the foundation soil pressure on box culverts may be considered to be uniformly distributed across the floor for all load cases.

PRECAST STIFFLEG CULVERTS

- Precast Wing Walls and Barrel Walls shall be double reinforced.
- Precast wing walls shall have a minimum thickness of 8".
- Slab thickness shall be a minimum of 8" or (S +10)/30 whichever is greater (Table 2.5.2.6.3-1 for continuous spans). The span length to determine the minimum thickness is the clear span between walls.
- Precast stiffleg walls shall be a minimum of 8" for spans under 24' and 10" for spans 24' and larger as specified in Article 12.14.4.
- The minimum footing width should be 2' on rock and 3' on other materials.

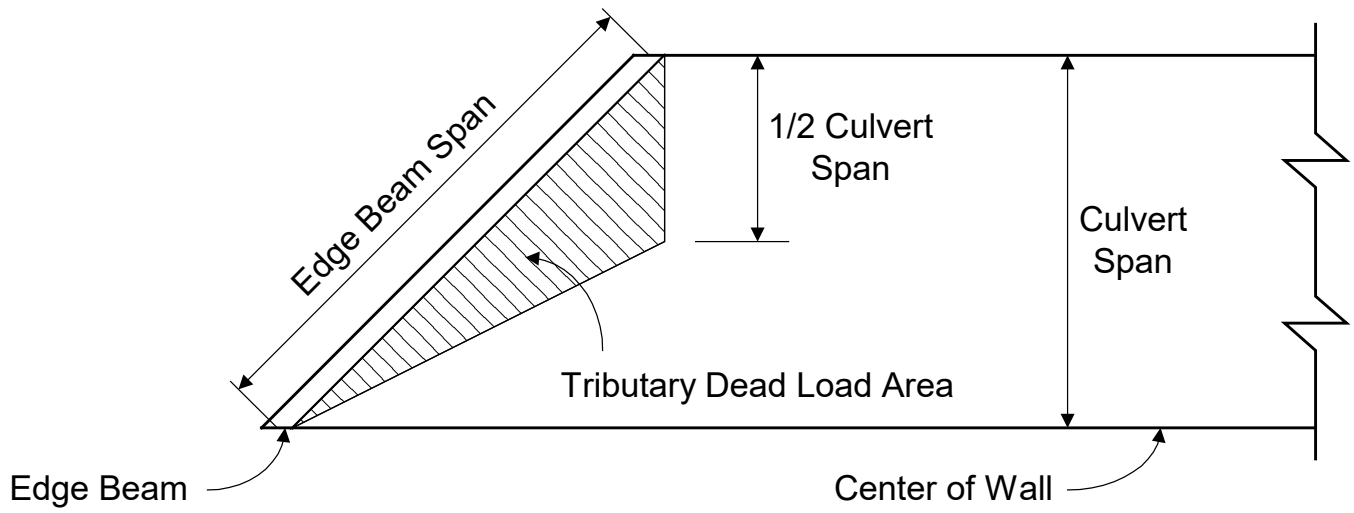
CAST-IN-PLACE CULVERTS

- Slab thickness shall be a minimum of 8" or (S +10)/30 whichever is greater (Table 2.5.2.6.3-1 for continuous spans). The span length to determine the minimum thickness is the clear span between walls.
- Main reinforcement for skews greater than 25° (Article 9.7.1.3) shall be placed perpendicular to the centerline of the culvert. For skews 25° or less, the main reinforcement should be placed on the skew and the design span measured along the skew.
- Cast-In-Place Wing Walls and Barrel Walls shall be double reinforced and have a minimum thickness of 10".
- The minimum footing width for stifflegs should be 2' on rock and 3' on other materials.
- For simplification in determining the shears and moments in the structure the foundation soil pressure on box culverts may be considered to be uniformly distributed across the floor for all load cases.
- Construction joints with keyways should be placed transverse to the barrel and should be located in the walls, top slab, and bottom slab. Joint spacing should not exceed 40'. In lieu of a construction joint in the walls, the contractor may substitute an approved contraction joint.

EDGE BEAM DESIGN

The Live Load on edge beams shall be one line of wheels (either truck or tandem) plus a tributary portion of the lane load (Art. 4.6.2.1.4b). The tributary portion of the lane load shall be considered to be a uniform load of 64 lbs/ft^2 on either the effective edge beam width, or in the case where the edge beam is skewed relative to the main slab reinforcement, on the same tributary area as defined for dead load. The effective edge beam width for culverts with main slab reinforcement parallel with the edge beam shall be the distance between the edge of deck and the inside face of the barrier or curb, plus 12", plus one-quarter of the strip width, E, determined above. The effective width shall not exceed either one-half the full strip width or 72" (Art. 4.6.2.1.4b). The dead load should be the weight of all structure components and the fill on the effective width. When the end of the culvert is skewed relative to the main slab reinforcement the dead load applied to the edge beam shall also include the weight of all loads on the tributary area at the end of the culvert as shown below. These loads may be applied to the edge

beam as a uniform load. The edge beam should be designed as a simple span with a span length based on center-of-wall to center-of-wall along the skew.



Footing Pressures

The dead load footing pressures on the footings of stifflegs and the floor of box culverts may be uniformly distributed to the total footing area. The live load footing pressures may be assumed to act on a length of footing equal to the width of the design lane plus 1.15 times the distance from the surface to the bottom of the footing (this is the same distribution rate as the live load on the fill over a buried structure). Overlapping areas from more than one lane loaded shall be uniformly distributed over the length of the overlapping regions, multiple presence factors shall be applied where applicable. The total design loaded length shall not exceed the actual footing length. The footing pressure should be assumed to be uniform across the width of the footing or floor. Foundation design shall be in accordance with Section 10 of the LRFD Code.

Wing Wall Design

Live load surcharge shall be applied where vehicular load is expected to act on the surface of the backfill within a distance equal to one-half the wall height behind the back face of the wall. H_{eq}, the equivalent height of soil in feet, should be based on Table 3.11.6.4-2.

The typical wing wall on a spread footing is free to deflect at the top under soil pressure and may therefore be designed using soil pressures based on the active state. The soil pressure coefficient, k_a, may be determined by the Coulomb method from the information in the Geotechnical Engineering Report.

Foundation design shall be in accordance with Section 10 of the LRFD Code.

Revisions:

Nov 2019	Reformatted the article to delete copying AASHTO LRFD Manual data.
Oct 2023	Corrected reference to Phase IV Report to Geotechnical Engineering Report.

CHAPTER 12
STANDARD DRAWING REVISION LOG

B12.1 Culvert Joint Details

June 2006	Added new standard drawing.
Nov 2019	Revised format of notes to active voice, imperative mood.
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide. Wrapped bars extending beyond the expansion joint to allow movement.

B12.2 Precast Stiffleg Culvert Details

June 2013	Added new standard drawing.
March 2015	Specified 12" wide joint wrap conforming to ASTM C877.
Aug 2016	Added note 7 for wall thickness to comply with Article 12.14.4.
Nov 2019	Revised Note 7 to clarify that dimensions are minimums. Added Note 8 for dimensional tolerances to comply with ASTM C1504 Section 11. Added footing closure pour detail. Revised reference to waterproofing system to Type D to match 2018 Standard specifications. Rounded Slab Joint Detail dimensions to 4" and ¼" from 3-15/16" & 5/16". Revised format of notes to active voice, imperative mood.
Jan 2022	Converted sheet to ORD format.
June 2022	Deleted inch symbol from angle designation and weld size designation. Revised format of leader lines.
Oct 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide. Changed Weld Connection detail for the top plate width to 7½" to allow welding on 3 sides.
Dec 2024	Changed "Typical Precast Cross Section" to "Precast Typical Section". Revised Design Fill Depth note in Precast Typical Section to match B12.3. Changed Concrete Leveling Course Detail to "NTS". Added Date Panel details.

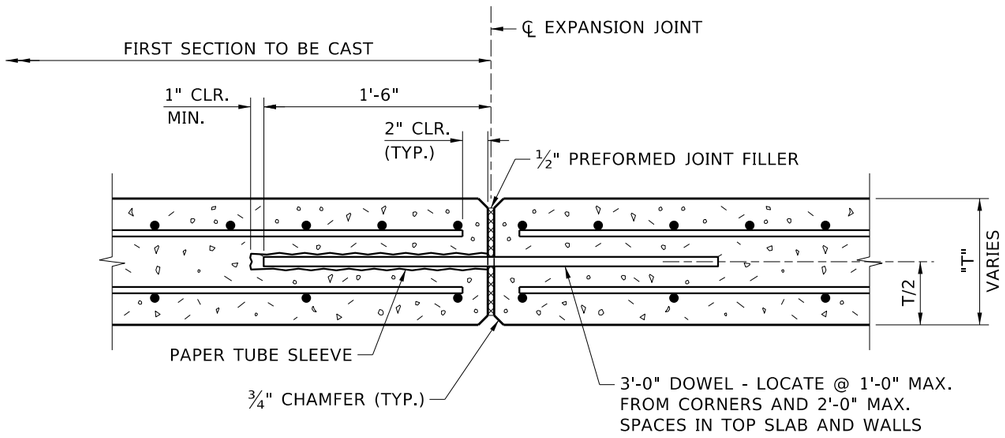
B12.3 Precast Box Culvert Details

June 2013	Added new standard drawing.
March 2015	Moved wing wall details to new sheet B12.4 Added note 6 for watertight joints on pedestrian underpasses. Specified 12" wide joint wrap conforming to ASTM C877 Specified ASTM C990 for joint sealant.
Aug 2016	Deleted minimum wall thickness from Typical Precast Cross-Section.
Nov 2019	Added Note 7 for dimensional tolerances to comply with ASTM C1577 Section 12. Revised reference to waterproofing system to Type D to match 2018 Standard specifications. Revised format of notes to active voice, imperative mood.
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
June 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide
Dec 2024	Changed "Typical Precast Cross Section" to "Precast Typical Section". Changed Concrete Leveling Course Detail to "NTS". Added Date Panel details.

CHAPTER 12
STANDARD DRAWING REVISION LOG

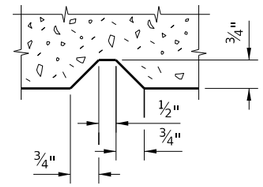
B12.4 Miscellaneous Precast Culvert Details

March 2015	Added new standard drawing.
Jan 2022	Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Dec 2024	Added “top of wingwall elevation” and “Top of footing elevation” to precast wingwall and precast cutoff wall Elevations. Corrected “wing wall” to “wingwall”.

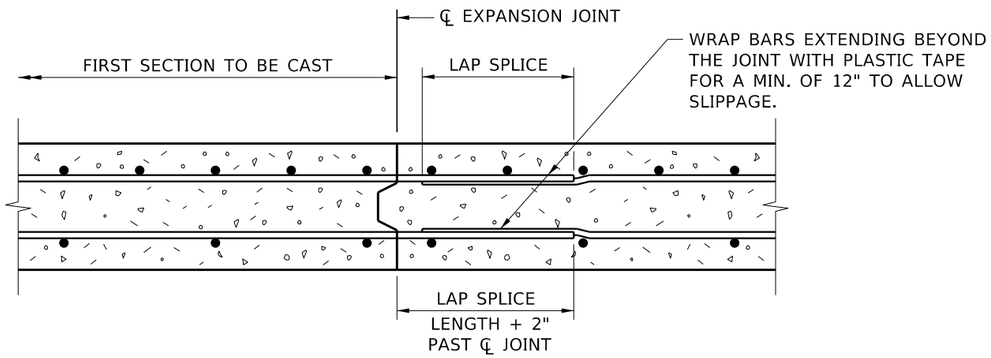


SECTION THRU WALLS & TOP SLAB
1"=1'-0"

NOTES:
1. PROVIDE EXPANSION JOINTS SHOWN ON THE PLANS.
2. PROVIDE CONSTRUCTION JOINTS WITH A MAXIMUM SPACING OF 40 FEET.
3. LOCATE NO CONSTRUCTION JOINT CLOSER THAN 40 FEET TO AN EXPANSION JOINT.
4. PROVIDE WATERSTOPS IN PEDESTRIAN TUNNEL JOINTS.
5. CONTRACTION JOINTS MAY BE SUBSTITUTED FOR CONSTRUCTION JOINTS IN THE WALLS.

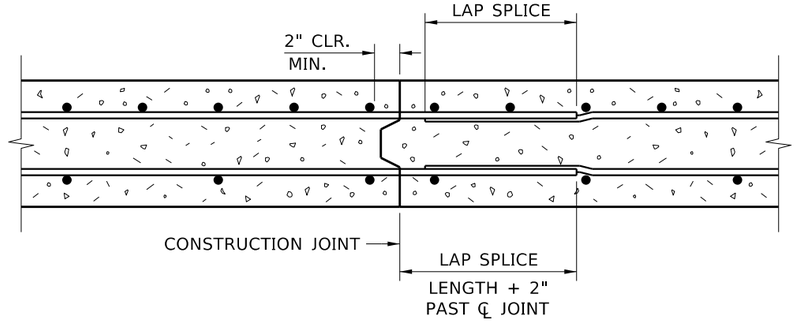


CONTRACTION JOINT
(TYP. FOR BOTH SIDES OF CULVERT WALLS)
3" = 1'-0"



SECTION THRU BOTTOM SLAB

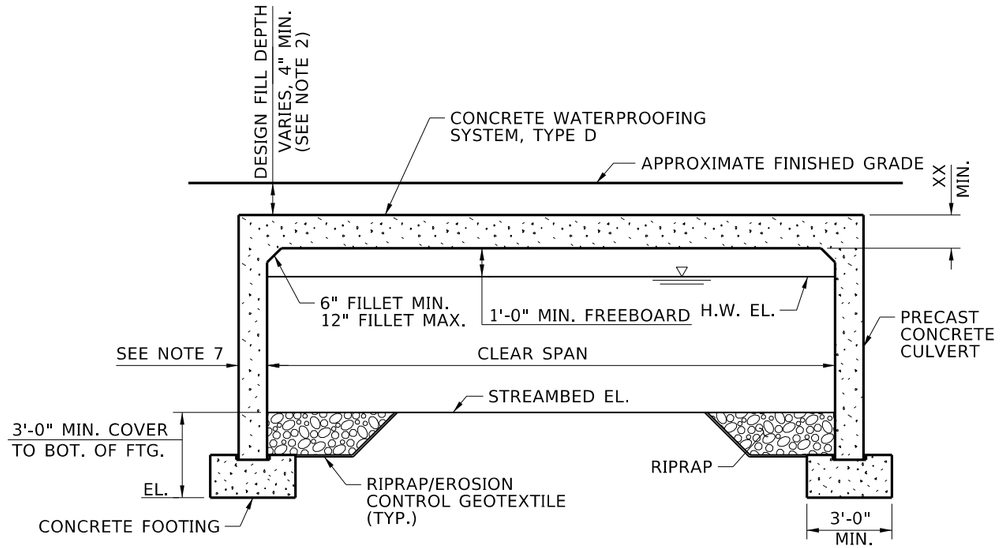
EXPANSION JOINT DETAILS
1"=1'-0"



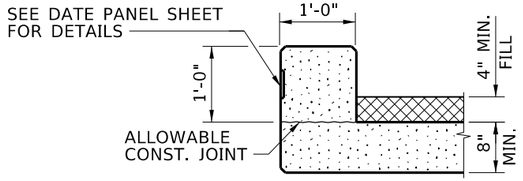
TYPICAL CONSTRUCTION JOINT
(TYPICAL @ SLABS AND WALLS)
1"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	CAST-IN-PLACE CULVERT JOINT DETAIL	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B12_1.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: OCT 2023	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B12.1	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

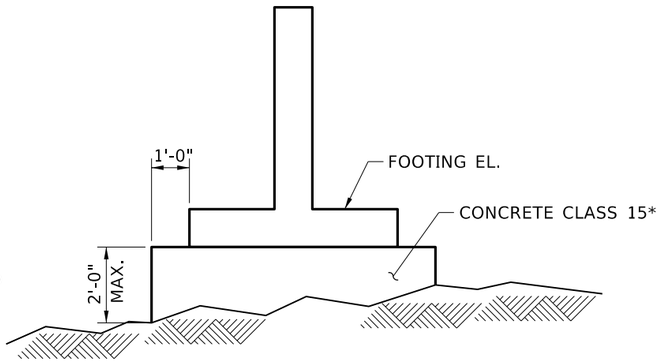
NOTES:
1. SEE SITUATION LAYOUT SHEET FOR CANAL INVERT AND WATER SURFACE ELEVATIONS AT INLET AND OUTLET OF CULVERT.
2. SEE SITUATION AND LAYOUT SHEET FOR ROADWAY HORIZONTAL ALIGNMENT AND PROFILE GRADE. COMPUTE DEPTH OF FILL FOR THE SELECTED PROPRIETARY PRECAST SYSTEM.
3. APPLY WATERPROOFING SYSTEM, TYPE D TO TOP SLAB FROM FACE OF CURB TO FACE OF CURB.
4. PROVIDE A PROPRIETARY PRECAST SYSTEM SELECTED FROM TYPICAL SECTION SHOWN OR APPROVED EQUAL AND INCLUDE DETAILS AS SHOWN BELOW OR APPROVED EQUAL.
5. PROVIDE EITHER CAST-IN-PLACE OR PRECAST CULVERT COMPONENTS SUCH AS FOOTINGS, EDGE BEAMS, AND WINGWALLS.
6. OFFSET JOINTS BETWEEN PRECAST FOOTING SECTIONS A MINIMUM OF 2' FROM PRECAST BARREL SECTION JOINTS. CONNECT PRECAST FOOTING SECTIONS BY SPLICING THE REINFORCEMENT WITHIN A CLOSURE POUR.
7. PROVIDE A MINIMUM BARREL WALL THICKNESS OF: 8" FOR SPANS < 24', 10" FOR SPANS ≥ 24'.
8. PROVIDE DIMENSIONAL TOLERANCES IN ACCORDANCE WITH ASTM C1504 SECTION 11.



PRECAST TYPICAL SECTION
3/16"=1'-0"



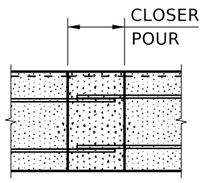
EDGE BEAM DETAIL
1"=1'-0"



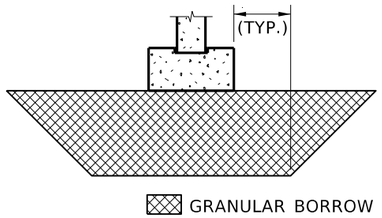
WALL/WINGWALL

*QUANTITIES ARE BASED ON A 1'-0" THICKNESS. NOTIFY THE ENGINEER IF THE THICKNESS EXCEEDS 2'-0".

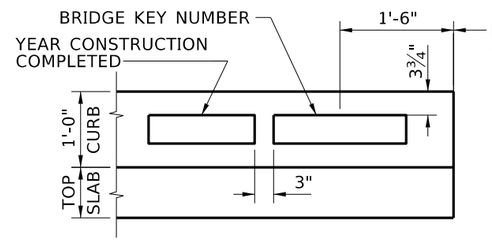
CONCRETE LEVELING COURSE DETAIL
NTS



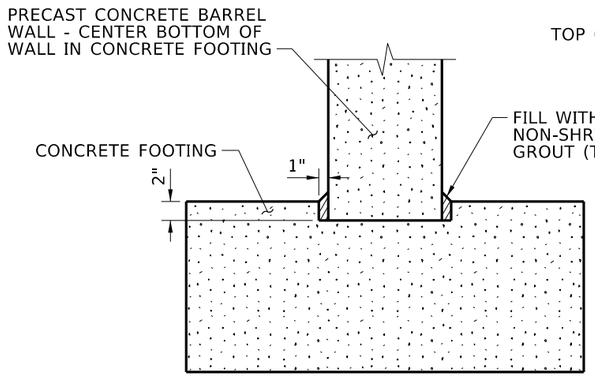
PRECAST FOOTING CLOSURE POUR
NTS



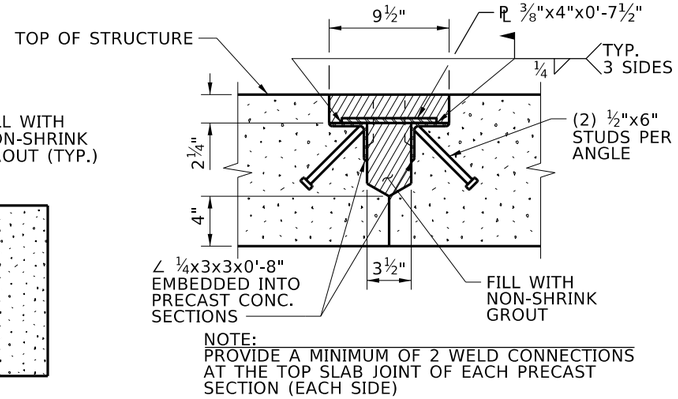
BACKFILL DETAIL
NTS



DATE PANEL ELEVATION
1"=1'-0"

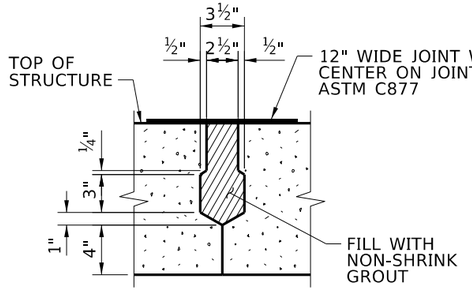


BARREL WALL/FOOTING CONNECTION
¾"=1'-0"



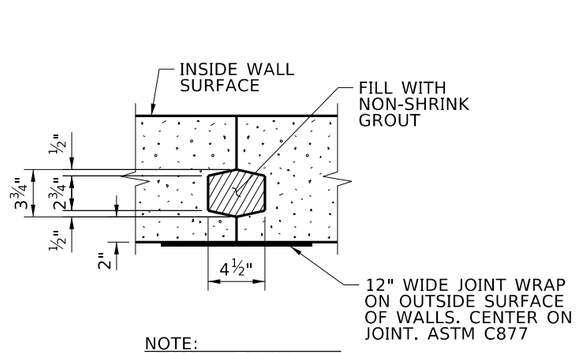
NOTE:
PROVIDE A MINIMUM OF 2 WELD CONNECTIONS AT THE TOP SLAB JOINT OF EACH PRECAST SECTION (EACH SIDE)

WELD CONNECTION
1"=1'-0"



NOTE:
TYPICAL AT SLAB JOINTS, FULL LENGTH

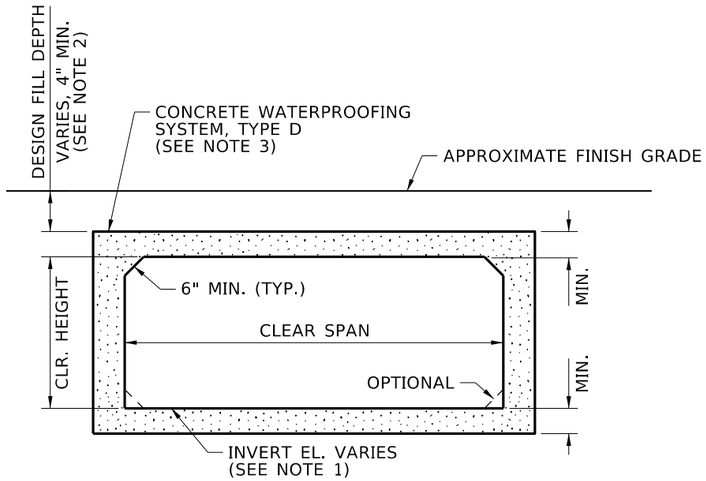
SLAB JOINT
1"=1'-0"



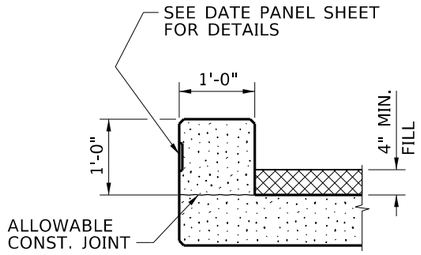
NOTE:
TYPICAL AT WALL JOINTS, FULL HEIGHT

VERTICAL WALL JOINT
1"=1'-0"

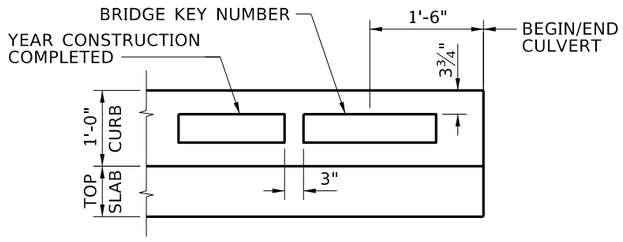
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PRECAST STIFFLEG CULVERT DETAILS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B12_2.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DDESIGN MANUAL, B12.2	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



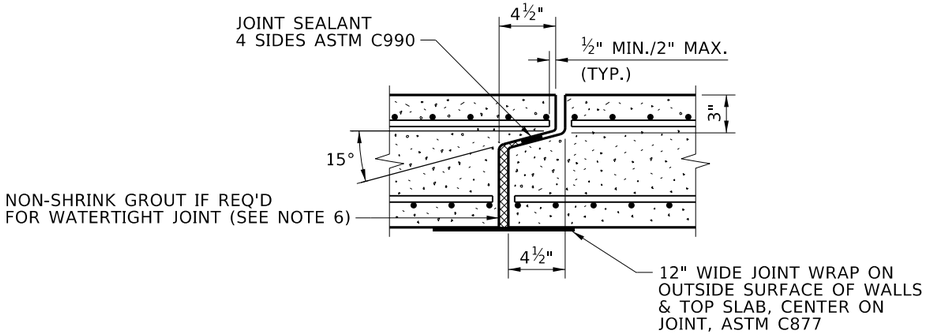
PRECAST TYPICAL SECTION
¼"=1'-0"



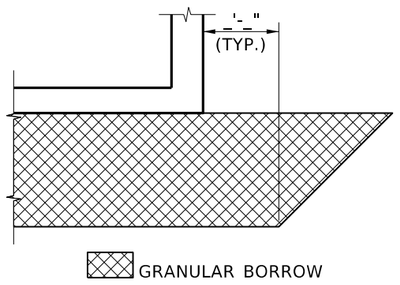
EDGE BEAM DETAILS
½"=1'-0"



DATE PANEL ELEVATION
½"=1'-0"

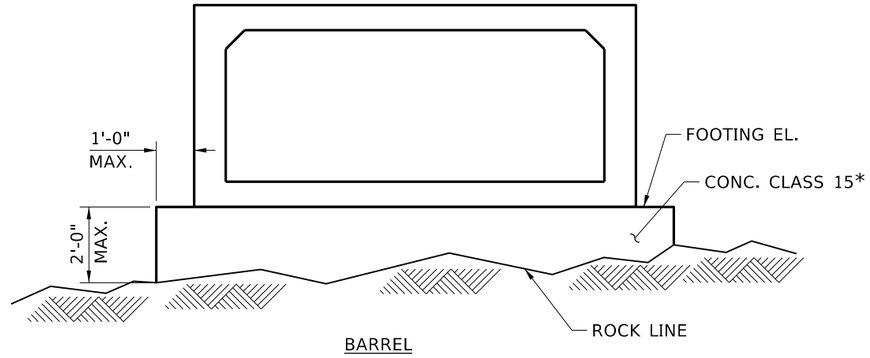


WALL & SLAB JOINT
1"=1'-0"

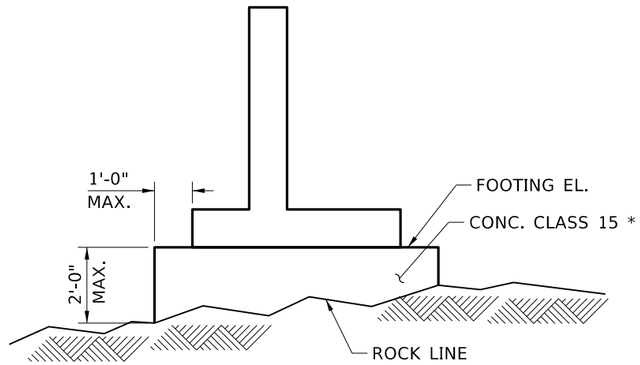


BACKFILL DETAILS
NTS

NOTES
1. SEE SITUATION AND LAYOUT SHEET FOR CANAL INVERT AND WATER SURFACE ELEVATIONS AT INLET AND OUTLET OF CULVERT.
2. SEE SITUATION AND LAYOUT SHEET FOR ROADWAY HORIZONTAL ALIGNMENT AND PROFILE GRADE. COMPUTE DEPTH OF FILL FOR THE SELECTED PROPRIETARY PRECAST SYSTEM.
3. APPLY WATERPROOFING SYSTEM, TYPE D TO TOP SLAB FROM FACE OF CURB TO FACE OF CURB.
4. PROVIDE A PROPRIETARY PRECAST SYSTEM SELECTED FROM TYPICAL SECTION SHOWN OR APPROVED EQUAL AND INCLUDE DETAILS AS SHOWN BELOW OR APPROVED EQUAL.
5. PROVIDE EITHER PRECAST OR CAST-IN-PLACE EDGE BEAMS AND WINGWALLS.
6. PROVIDE WATERTIGHT JOINTS FOR PEDESTRIAN UNDERPASSES.
7. PROVIDE DIMENSIONAL TOLERANCES IN ACCORDANCE WITH ASTM C1577 SECTION 12.



BARREL

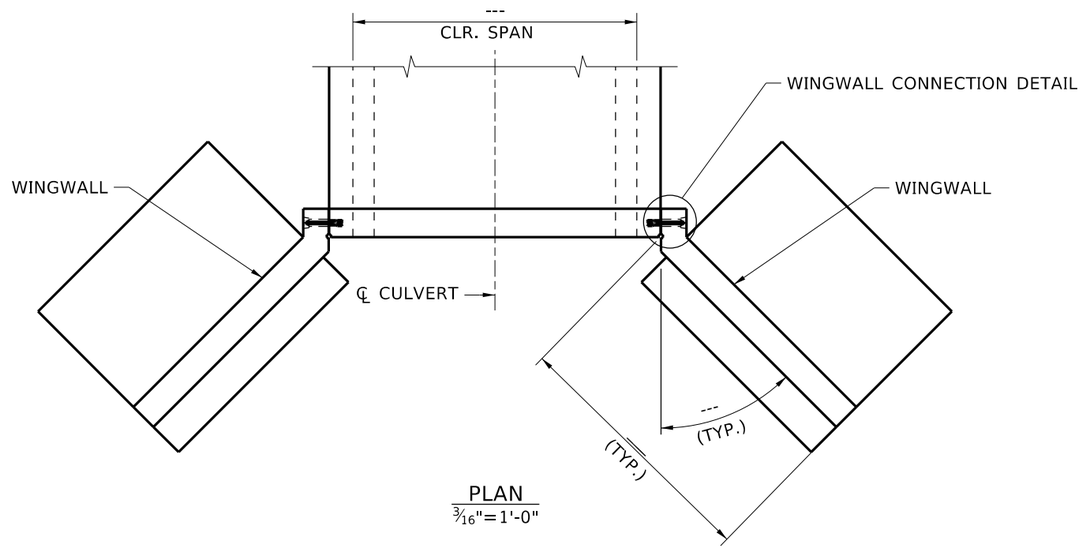


WINGWALL

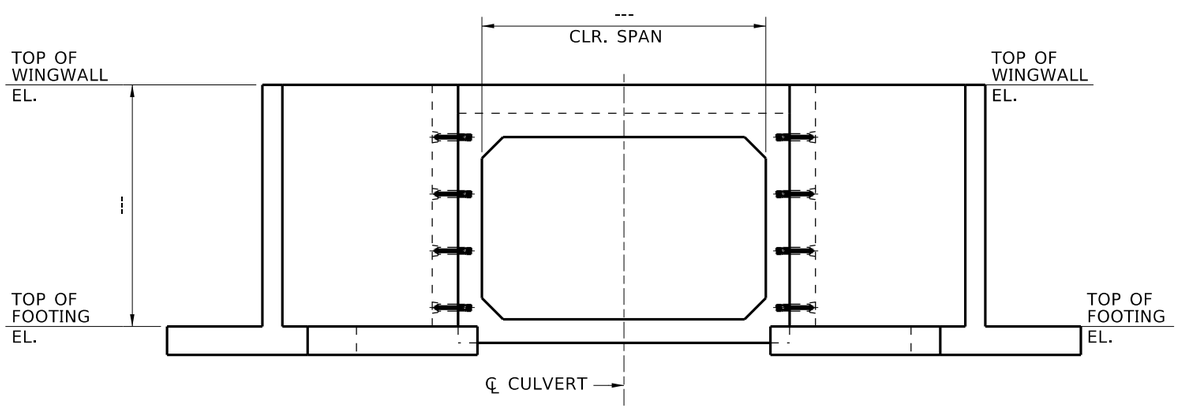
*QUANTITIES ARE BASED ON A 1'-0" THICKNESS. NOTIFY THE ENGINEER IF THE THICKNESS EXCEEDS 2'-0".

CONCRETE LEVELING COURSE DETAILS
NTS

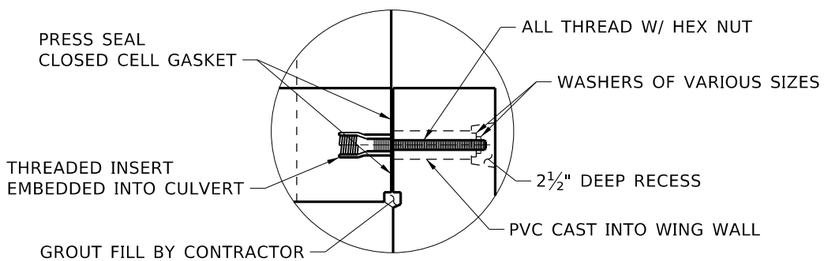
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PRECAST BOX CULVERT DETAILS	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
				DETAILED	Standards/Bridge Standard Drawings/ B12_3.DGN				COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B12.3	BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						



PLAN
3/16"=1'-0"

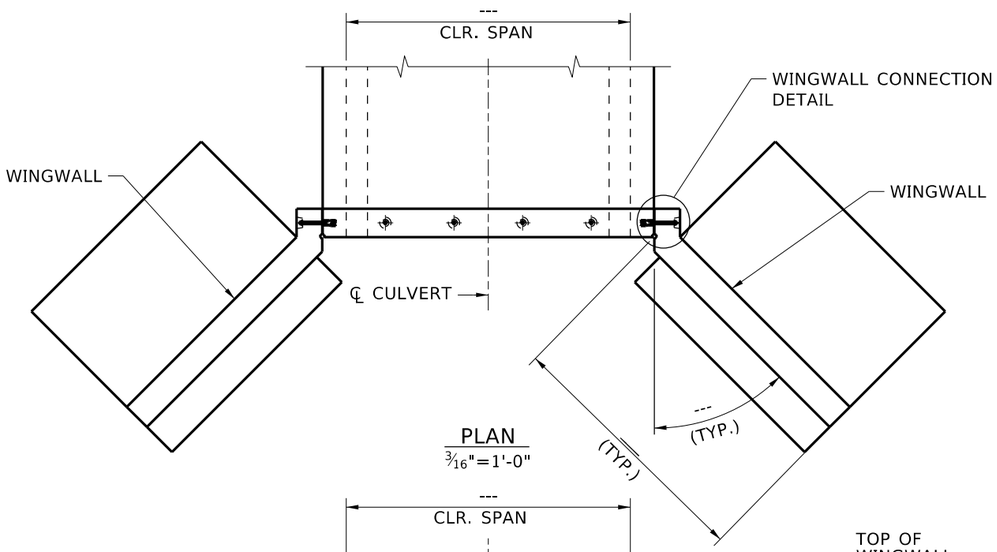


ELEVATION
3/16"=1'-0"

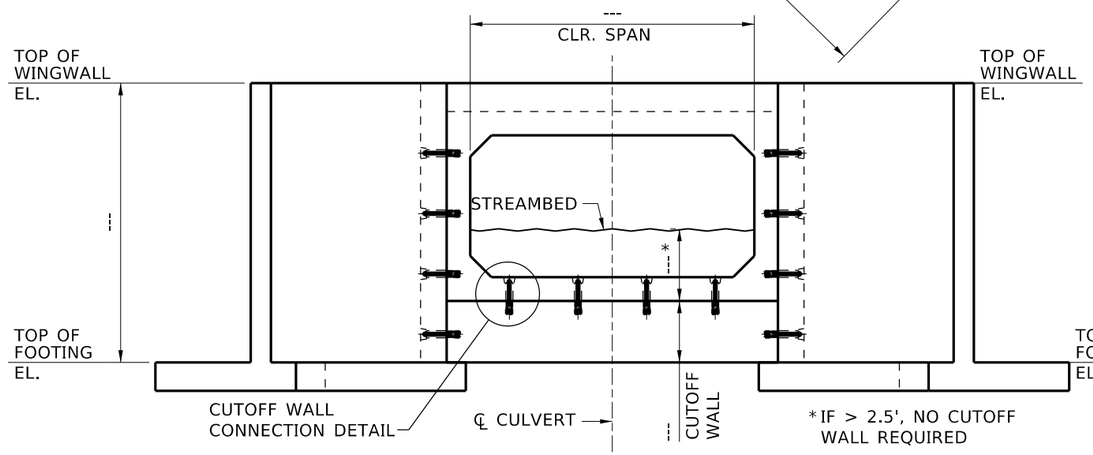


WINGWALL CONNECTION DETAIL
1½"=1'-0"

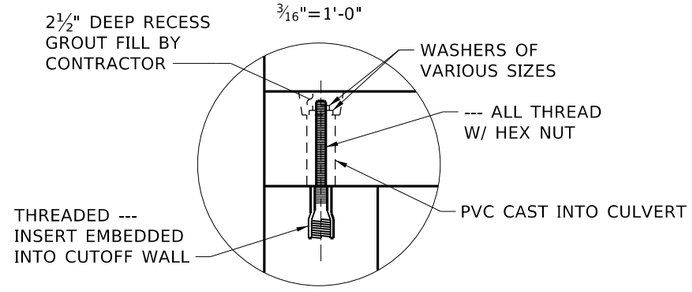
PRECAST WINGWALL



PLAN
3/16"=1'-0"



ELEVATION
3/16"=1'-0"



CUTOFF WALL CONNECTION DETAIL
1½"=1'-0"

PRECAST CUTOFF WALL

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	MISCELLANEOUS PRECAST CULVERT DETAILS	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
				DETAILED	Standards\Bridge Standard Drawings\B12_4.DGN				COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B12.4	BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						

CHAPTER 13

RAILING

13.4 BRIDGE RAILINGS - GENERAL

All bridge railing on the State Highway System and Local/Off System routes shall conform to MASH criteria. Bridge traffic railing at the edge of deck on Interstate and 4 lane highways shall conform to at least TL-4 requirements and shall be at least 42" tall. Bridge railing at the edge of deck on all other bridges on the State Highway System shall conform to at least TL-3 requirements and shall be 42" tall (see commentary). This includes all overpass bridges that are over State or Interstate highways. Bridge railing not in the Bridge Design Manual may be used on Local/Off System bridges if the railing meets the MASH criteria and test level requirements of Article 13.7.2 in the AASHTO LRFD Bridge Design Specifications.

Median barriers shall conform to at least MASH TL-3 requirements and shall be at least 32" tall.

One of the standard rail types as shown in the Bridge Design Manual Standard Drawings shall be shown on the plans, unless there is a clearly provable advantage in doing otherwise. Among those types, selection shall be made with due consideration of economy, aesthetics, Level of Service, and the preference of the District Engineer. The following table indicates the test level of ITD standard railings. Test Levels are defined in the AASHTO LRFD Bridge Design Specifications Article 13.7.2.

STATE HIGHWAY SYSTEM & LOCAL/OFF SYSTEM

Bridge Railing at Edge of Deck	MASH Test Level
42" Single Slope Concrete Parapet	TL-4*
42" Combination Rail	TL-4
42" Three Tube Curb Mount Rail	TL-4
42" Single Slope Median Barrier	TL-4

*See commentary

NEW CONSTRUCTION

Concrete parapet is the preferred rail type for safety reasons. When an overlay is placed on the structure during original construction, the height of the rail should be from the top of the overlay. The height of the 42" Single Slope Concrete Parapet does not need to be raised if the depth of overlay is less than 6". Other rail types should be considered to meet Context Sensitive Design criteria.

Concrete parapets and median barriers shall be constructed perpendicular to the roadway cross slope for superelevation rates up to 6%. Bridges with superelevation rates greater than 6% shall be evaluated on a case-by-case basis.

For superelevation rates greater than 6%, revise the Notes on the Standard Drawing as follows:

- Concrete parapet shall be constructed so that the outside face is in a vertical plane. Height control shall be at the inside (traffic) face. End faces that fit up to precast concrete end sections shall be constructed perpendicular to the roadway grade.
- Concrete median barrier shall be constructed vertically.

The Three Tube Curb Mount Rail with the concrete end block, B13.2D-F, is the preferred option. When there is no cast-in-place concrete required on a project, the rail option without an end block can be used (B13.2A-C).

Combination railings shall be used on a raised sidewalk when there is no barrier between the roadway and sidewalk. The Three Tube Curb Mount Rail also meets the criteria for a combination railing.

Combination railing with a protective pedestrian fence shall be used on sidewalks on bridges over highways. The protective pedestrian fence is only needed where there is a sidewalk or dedicated bicycle lane. Refer to page B13.3C for details of railing. Fencing requirements for bridges over railroads shall follow the BNSF-UPRR Guidelines for Railroad Grade Separation Projects Overhead Structure Barriers and Fences details.

Pedestrian/Bicycle Railing shall be used when a traffic barrier separates the roadway from the sidewalk.

W-Beam railing may be used if the site meets TL-3 criteria and the span length is less than 40'.

REHABILITATION

The following bridge rail options should be considered on a deck rehab project:

DO NOTHING

When no deck replacement or bridge widening is being done on the bridge and the existing rail is in good condition and designed in accordance with the AASHTO Standard Specifications for Highway Bridges, then the existing rail is acceptable. The railing does not require a successful crash test, but the connection to the roadway railing should be modified to meet current standards.

If the railing is in good condition and the work done on the bridge does not impact the railing, the railing does not need to meet MASH criteria.

UP-GRADE

Up-grade the existing rail to MASH criteria when the deck slab is replaced. One of the standard rail types shown in the Bridge Design Manual should be used. The deck slab and exterior girder shall meet the requirements of the current AASHTO code.

TEMPORARY BARRIERS

Unpinned concrete barriers following the details of standard drawing 612-18 may be used if there is at least 2'-0" of clearance from the back of the barrier to the edge of deck.

Concrete barriers not meeting the requirements for an unpinned barrier shall be pinned. There are no known MASH crash-tested pinned barrier details at this time. The pinned barrier details on BDM B13.9 were designed for TL-4 according to the procedures in Appendix A13.

CONCRETE CULVERTS

Metal Railing

Stiffleg and box culverts that do not extend beyond the clear zone should use the w-beam railing details on BDM B13.6A & B13.6B for new and replacement projects. For rail retrofit projects with a culvert span length less than 25' along centerline of roadway, use roadway standard drawing details on 612-1 for a long span application.

Precast Concrete Barrier

Stiffleg and box culverts that do not extend beyond the clear zone should use the free-standing precast concrete barrier with 2'-0" from the traffic face of the edge beam to the back of the barrier.

Commentary:

All projects with a bid letting date after December 31, 2019 shall conform to MASH criteria to conform to the January 2016 AASHTO/FHWA Joint Implementation Agreement and the August 24, 2017 memo from Kevin Sablan, ITD Design/Traffic Services Engineer.

The 42"single slope parapet meets TL-5 MASH criteria. The parapet was analyzed according to AASHTO Article A13.4 for TL-4 loads to insure the parapet would yield before the cantilever deck. An 8" cantilever deck with a top mat of transverse #5 bars @ 12" and 2-#6 bundled bars at 12" between the #5 bars (As = 1.19) would provide the moment capacity greater than the parapet for a TL-4 loading.

Although AASHTO is the code that governs bridge design, OSHA regulations govern safety and health regulations for construction activities. The OSHA regulations in 29 CFR 29B Chapter XVII Part 1926 Subpart M 1926.502 state that employers shall provide guardrail systems that are at least 42 inches tall for employees. ITD has decided to provide bridge rail at the edge of deck that is 42 inches tall on the state highway system, regardless of the test level required by AASHTO to ensure that future work on the bridge will not require temporary rail or require workers to tie off to meet this OSHA requirement.

Crash Test Reports

STATE HIGHWAY SYSTEM & LOCAL/ OFF SYSTEM

RAIL TYPE	REPORT	MASH TEST LEVEL
42" Single Slope Concrete Parapet	MASH Equivalency of NCHRP Report 350-Approved Bridge Railings NCHRP20-07/Task 395 TTI Project 607141 November 2017	MASH Equivalency of NCHRP Report 350-Approved Bridge Railings Table 7.1 NCHRP350 TL5 equals MASH TL5
42" Combination Rail	Texas A&M Transportation Institute Report 0-6946-R2 March 2019	TL-4
42" Three Tube Curb Mount Rail	Texas A&M Transportation Institute Report 612711-01 February 2020	TL-4
42" Single Slope Median Barrier	Texas A&M Transportation Institute Report 0-6946-1 January 2018	TL-4
Culvert W-Beam Railing	FHWA eligibility letter B-355 February 22,2021	TL-3

Revisions:

June 2006	The Combination Rail Test Level was changed to TL-3 to comply with Article 13.7.3.2. Corrected the w-beam railing reference from PL-1 to TL-3. Added the Delaware Retrofit to the Retrofit options. Added reference for Context Sensitive Design rail options. Added reference to new rail retrofit standard drawings B13.7A – B13.7E.
Oct 2017	Added criteria for using protective pedestrian fence.
July 2018	Added MASH test levels for each rail type. Clarified the rail height when an overlay is placed during new construction. Clarified the need to upgrade the rail to MASH criteria during rehabilitation work. Added ITD policy for the minimum test levels required. Added Commentary for using TL-4 for a 42" single slope concrete parapet and Oregon Three Tube Curb Mount Rail. Added commentary on OSHA rail height requirements.
May 2021	Added Tables for applicable railing for use on State or Local/Off System highways. Added Crash Test Report Tables.
June 2022	Added railing at edge of deck shall be 42" tall. Added criteria for Local/Off System bridge railing. Added Median barriers shall be at least TL-3 and 32" tall.
Oct 2023	Added criteria for temporary barriers. Deleted 32" jersey parapet, 32" 2-tube curb mounted rail, and 32" median barrier.
Dec 2024	Added criteria for using the Three Tube Curb Mount Rail with or without an end block. Added criteria for culvert railing. Added culvert railing to MASH Crash Test Reports Table.

CURRENT STANDARD BRIDGE RAIL PROPERTIES

Rail Type	Weight – plf	CG from traffic face – inches
42” Single Slope Concrete Parapet	518	9.80
42” 3-Tube Curb Mount Rail & Curb	232	7.48
42” Combination Rail & Parapet	385	6.75
42” Pedestrian Rail & Curb	95	5.00
42” Single Slope Median Parapet	700	12.00

OLD STANDARD BRIDGE RAIL PROPERTIES

Rail Type	Weight – plf	CG from traffic face – inches
2’-9¾” Concrete Parapet w/9”Ø Void	368	11.75
2’-9¾” Concrete Parapet w/o Void	435	11.375
42” Concrete Parapet	413	10.97
5x9 Channel top/bottom Rail w/2x2x¼ angle pickets & 2’-4”x9” Curb	292	14.83
2-Tube Aluminum Rail & 6” Curb	112	6.75
3-Tube Aluminum Rail & 6” Curb	117	6.50
Combination Pedestrian Rail & Parapet NCHRP 350 TL-3	265	4.50
Combination Rail w/Protective Fence NCHRP 350 TL-3	296	3.83
G-2-F Rail Retrofit Type 1	31	7.09
G-2-F Rail Retrofit Type 2	35	7.61
G-2-F Rail Retrofit Type 4	14	4.63
Delaware Rail Retrofit	25	5.67
Iowa Concrete Parapet Retrofit	262	8.00
32” Concrete Parapet	312	10.08
32” 2-Tube Curb Mount Rail & Curb	183	8.19
32” Median Parapet	408	12.00

Revisions:

July 2009	Deleted Combination Bicycle Rail Deleted Bicycle Rail Deleted G-2-F Type 3 Changed weight of Pedestrian Rail from 96 plf to 102 plf Changed weight of G-2-F Type 4 from 13 plf to 20 plf Added Delaware Retrofit weight Added Iowa Retrofit weight Added Old Bridge Rail Table
July 2010	Added CG from traffic face to both tables
August 2016	Added 42” Concrete parapet
March 2018	Added 42” Single Slope Concrete Parapet
Nov 2019	Moved Rail Retrofit Types 1-4, Delaware Retrofit, and Iowa Retrofit to “Old Standard Drawings” Table.
May 2021	Moved 42” Concrete Parapet, Combination Rail (NCHRP 350 TL-3), and Combination Rail with fence to “Old Standard Drawings” Table. Added 3-Tube Curb Mount Rail, Combination Rail (MASH TL-4), and 42” Single Slope Median Barrier to Current Standard Rail Properties Table.
Oct 2023	Moved 32” Concrete Parapet, 32” 2-Tube Curb Mount Rail, and 32” Median Barrier from Current Standard Properties to Old Standard Properties.

BRIDGE NAME SIGNAGE

Bridges over Interstates and 4-lane divided highways shall have a sign attached to the bridge identifying the name of the cross road. The sign shall be a white on green 24" high extruded aluminum sign attached according to the details on B13.9.

A spreadsheet with tabs for each District and suggested sign names for bridges that require signs are listed in ProjectWise at HEADQUARTERS/BRIDGE/BRIDGE DESIGN/BRIDGE PROJECTS/BRIDGE SIGNS/BRIDGE SIGNS – MASTER LIST

When bridges are replaced or rehabilitated, the bridge sign details should be included in the plans. The "STATUS" column of the spreadsheet should be updated with the project key number when a sign is included in the plans.

DETAILING INSTRUCTIONS

ELEVATION VIEW
Show the actual name in the "Sign Text Area" as shown below.
The sign height for a one line sign is 2'-0". When a two line name is needed, the sign height shall be 3'-0".



SECTION A-A
Show the actual typical section details with the correct mounting bracket details.

FILLER PLATE
Show the correct thickness if a filler plate is required.
Delete the detail and reference in Detail A if a filler plate is not required.

MOUNTING BRACKET DETAIL
Only show the mounting bracket detail required.

Type 1 Mounting Bracket Application
- 32" Concrete Parapet
- 42" Concrete parapet
- 42" Single Slope Concrete Parapet
- Combination Rail

Type 2 Mounting Bracket Application
- Ped/Bicycle Rail
- Picket fence rail
- 2-Tube Curb Mount Rail

Type 3 Mounting Bracket Application
- Use when attachment depth is less than 12"

SCREW ANCHORS
Simpson Strong-Tie Titen HD Screw Anchors meet the specifications.

Revisions:

Nov 2019	Added new article.
Sep 2020	Added Detailing Instructions
May 2021	Deleted link to ProjectWise spreadsheet and added the ProjectWise location.
Jan 2022	Added Type 3 Mounting Bracket Added sign height is 2’ for a 1 line sign and 3’ for a 2 line sign.
Oct 2023	Added screw anchor information.

CHAPTER 13
STANDARD DRAWING REVISION LOG

B13.1A 32" Concrete Parapet with Thrie Beam Rail – without approach slab

July 2009 Added ½" V Groove detail 3" from edge of deck

July 2010 Changed spacing of bottom R3 bar to 2½" in Section A-A to match details in Section C-C.
Deleted lap splice in bottom R3 bar in Partial Parapet Elevation.

June 2013 Changed concrete to Class 40AF.

March 2015 Revised future overlay allowance to 2".
Added note for increasing the parapet height equal to the depth of overlay when overlay is applied during original construction.

Oct 2016 Changed deck reinforcement to #5 bars in Section C-C.
Added 1½" clearance to bottom reinforcement.
Changed title to 32" Concrete Parapet.
Added date panel details.

Oct 2017 Revised reference to Roadway Standard Drawing to agree with new numbering system.

Nov 2019 Added Note 16 for Date Panel and changed Date Panel references to "Year Built" and "Bridge Key Number".
Revised Notes to active voice, imperative mood.

Jan 2022 Changed reinforcement in Approximate Parapet Quantities and Parapet Reinforcement bar details to "Epoxy Reinforcement"
Deleted Delineator Attachment detail and threaded insert note.
Converted sheet to ORD format.

June 2022 Revised reference to Thrie beam Connector to "Standard Drawing 612-10 or 612-11"
Revised note 1.
Revised format of leader lines.

Oct 2023 deleted sheet.

B13.1B 32" Concrete Parapet with Precast End Connection - without approach slab

April 2008 Changed Section C-C in the Partial Elevation to D-D to avoid duplication in View A-A.

July 2009 Added ½" V Groove detail 3" from edge of deck.

July 2010 Changed spacing of R3 bars to match details for Concrete Parapet with Thrie Beam Rail.

Feb 2012 Labeled R1 bar in Section Thru Slab.

June 2013 Revised reference to concrete barrier roadway standard drawing to G-2-A-1 or G-2-A-2 in the Partial Parapet Plan.
Added Note for 2 loops at bottom of G-2-A-2 at connection to bridge parapet.
Increased bottom slot to 7" to accommodate 2 loops in roadway barrier connection
Changed concrete to Class 40AF.

March 2015 Revised future overlay allowance to 2".
Added note for increasing the parapet height equal to the depth of overlay when overlay is applied during original construction.

Oct 2016 Changed deck reinforcement to #5 bars in Section C-C.
Changed title to 32" Concrete Parapet.
Added date panel details.

Oct 2017 Revised reference to Roadway Standard Drawing to agree with new numbering system.

Nov 2019 Added Note 17 for Date Panel and changed Date Panel references to "Year Built" and "Bridge Key Number".
Moved location of date panel to 4'-0" from end of parapet.
Revised Notes to active voice, imperative mood.

Jan 2022 Changed reinforcement in Approximate Parapet Quantities and Parapet Reinforcement bar

CHAPTER 13
STANDARD DRAWING REVISION LOG

details to "Epoxy Reinforcement".
Deleted Delineator Attachment detail and threaded insert note.
Converted sheet to ORD format

June 2022 Revised reference to "Concrete Barrier" to "Standard Drawing 612-18".
Revised note 1.
Revised format of leader lines.

Oct 2023 deleted sheet

B13.1C-1 32" Concrete Parapet with Thrie Beam Rail – with approach slab @ Integral Abutment sheet 1 of 2

July 2009 Added ½" V Groove detail 3" from edge of deck

July 2010 Changed spacing of bottom R3 bar to 2½" in Section A-A to match details in Section C-C.
Deleted lap splice in bottom R3 bar in Partial Parapet Elevation.

Feb 2012 Changed reference to R7 bar to R1

June 2013 Changed concrete to Class 40AF

March 2015 Revised future overlay allowance to 2".
Added note for increasing the parapet height equal to the depth of overlay when overlay is applied during original construction.

Aug 2016 Changed deck reinforcement to #5 bars in Section C-C.
Added 1½" clearance to bottom reinforcement.
Changed title to 32" Concrete Parapet.
Added date panel details.

Oct 2017 Revised reference to Roadway Standard Drawing to agree with new numbering system.

Nov 2019 Added Note 16 for Date Panel and changed Date Panel references to "Year Built" and "Bridge Key Number".
Revised Notes to active voice, imperative mood.

July 2021 Added joint in parapet at approach slab/deck joint for integral abutments.
Added Section C-C and added "@Integral Abutment" in title block.
Added view of integral abutment in Elevation.
Added Detail A.

Jan 2022 Changed reinforcement in Approximate Parapet Quantities and Parapet Reinforcement bar details to "Epoxy Reinforcement".
Deleted Delineator Attachment detail and threaded insert note.
Converted sheet to ORD format

June 2022 Revised reference to Thrie beam Connector to "Standard Drawing 612-10 or 612-11".
Revised note 1.
Revised format of leader lines.

Oct 2023 deleted sheet

B13.1C-2 32" Concrete Parapet with Thrie Beam Rail – with approach slab @ Integral Abutment sheet 2 of 2

July 2021 Added new sheet**.**

Jan 2022 Converted sheet to ORD format

June 2022 Revised format of leader lines.

Oct 2023 deleted sheet

CHAPTER 13
STANDARD DRAWING REVISION LOG

B13.1D-1 32" Concrete Parapet with Precast End Connection – with approach slab @ Integral Abutment sheet 1 of 2

July 2009	Added ½" V Groove detail 3" from edge of deck. Added Note 16 Corrected height of parapet in Partial parapet Elevation
June 2013	Revised reference to concrete barrier roadway standard drawing to G-2-A-1 or G-2-A-2 in the Partial Parapet Plan. Added Note for 2 loops at bottom of G-2-A-2 at connection to bridge parapet. Increased bottom slot to 7" to accommodate 2 loops in roadway barrier connection Changed concrete to Class 40AF.
March 2015	Revised future overlay allowance to 2". Added note for increasing the parapet height equal to the depth of overlay when overlay is applied during original construction.
Aug 2016	Changed deck reinforcement to #5 bars in Section C-C. Added 1½" clearance to bottom reinforcement. Changed title to 32" Concrete Parapet. Added date panel details.
Oct 2017	Revised reference to Roadway Standard Drawing to agree with new numbering system.
Nov 2019	Added Note 18 for Date Panel and changed Date Panel references to "Year Built" and "Bridge Key Number". Moved location of date panel to 4'-0" from end of parapet. Revised Notes to active voice, imperative mood.
July 2021	Added joint in parapet at approach slab/deck joint for integral abutments. Added Section H-H and added "@Integral Abutment" in title block. Added view of integral abutment in Elevation. Added Detail B.
Jan 2022	Changed reinforcement in Approximate Parapet Quantities and Parapet Reinforcement bar details to "Epoxy Reinforcement". Deleted Delineator Attachment detail and threaded insert note. Converted sheet to ORD format
June 2022	Revised reference to "Concrete Barrier" to "Standard Drawing 612-18". Revised note 1. Revised format of leader lines.
Oct 2023	deleted sheet

B13.1D-2 32" Concrete Parapet with Precast End Connection – with approach slab @ Integral Abutment sheet 2 of 2

July 2021	Added new sheet.
Jan 2022	Converted sheet to ORD format
June 2022	Revised format of leader lines.
Oct 2023	deleted sheet

B13.1E 32" Concrete Parapet Light Pole Support

April 2008	Added new sheet
June 2013	Changed concrete to Class 40AF.
Sept 2016	Deleted Bolt Circle table and specified bolt circle according to manufacturer's specifications.

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Added 1½" clearance to bottom reinforcement.
Changed title to 32" concrete Parapet Light Pole Support.

Nov 2019 Changed L4 bars from #6 to #5 and added 3.5" dimension from top of parapet to the first L4 bar.
Revised Notes to active voice, imperative mood.

Jan 2022 Changed reinforcement in Approximate Parapet Quantities and Parapet Reinforcement bar details to "Epoxy Reinforcement".
Deleted Delineator Attachment detail and threaded insert note.
Converted sheet to ORD format.

June 2022 Deleted inch symbol from angle designation and from weld size designation.
Revised note 1.
Revised format of leader lines.

Oct 2023 deleted sheet

B13.1F Protective Fence for Concrete Parapet – 32" concrete parapet

Nov 2019 Added new sheet.

Sep 2020 Reformatted Notes.
Added weld symbol to Detail C.
Changed "See note 14" to "See note 15" in Detail B.
Changed "1" clear" to "2" max clear" in Section A-A.

May 2021 Renumbered drawing from B13.3G to B13.1F
Revised spacing of horizontal tubes to make the 32" concrete parapet & 42" single slope parapet details the same.
Revised dummy joint location to tube splices & uniformly spaced across bridge between 6' & 12'.

Jan 2022 Converted sheet to ORD format.

June 2022 Revised reference to Thrie beam Connector to "Standard Drawing 612-10 or 612-11".
Deleted inch symbol from HSS designation and angle designation.
Deleted inch symbol from weld size designation.
Revised note 4 to change ASTM A385 to A153 and added "Repair damaged coating in accordance with ASTM A780 and A123.
Revised note 10 to construct railing normal to longitudinal grade and vertical to transverse grade.
Revised note 17 to "Furnish and install parapet as shown on plans, complete in place."
Added 32" to title block name.
Revised format of leader lines.

Oct 2023 deleted sheet

B13.1A 42" Single Slope Concrete Parapet – without approach slab

July 2018 Added new sheet.

Nov 2019 Added Note 17 for Date Panel and changed Date Panel references to "Year Built" and "Bridge Key Number".
Revised Notes to active voice, imperative mood.
Revised Guardrail Attachment detail to include F-Shape to Single Slope connection details to match roadway standard drawing 612-25.

May 2021 Renumbered drawing from B13.1K to B13.2A
Moved start of back of parapet indent from 3'-6" to 8'-6" from begin of parapet.

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Jan 2022 Changed reinforcement in Approximate Parapet Quantities and Parapet Reinforcement bar details to "Epoxy Reinforcement".
Deleted Delineator Attachment detail and threaded insert note.
Converted sheet to ORD format.
June 2022 Revised reference to Thrie beam Connector to "Standard Drawing 612-10 or 612-11"
Revised note 1.
Revised format of leader lines.
Oct 2023 Revised notes format for active voice, imperative mood and Writer's Style Guide.
Added Grade 60 Type S to reinforcement bar details
Renumbered sheet from B13.2A to B13.1A.
Dec 2024 Added limits of textured concrete to Sections B-B & C-C.
Labeled "wingwall" in Section A-A and Section B-B.
Revised Note 15 to add "Provide both sets of holes" to both notes.
Added Note 16 for textured concrete.
Changed Approximate Parapet Quantities for concrete and epoxy reinforcement from 3.48 & 39.5 to 3.45 & 35.
Changed clearance for R1 from top of deck to bottom of deck.
Changed name of "Elevation D-D" to "View D-D".

B13.1B 42" Single Slope Concrete Parapet – with approach slab @ Integral Abutment

July 2018 Added new sheet.
Nov 2019 Added Note 16 for Date Panel and changed Date Panel references to "Year Built" and "Bridge Key Number".
Revised Notes to active voice, imperative mood.
Revised Guardrail Attachment detail to include F-Shape to Single Slope connection details to match roadway standard drawing 612-25.
May 2021 Renumbered drawing from B13.1L to B13.2B.
Moved start of back of parapet indent from 3'-6" to 8'-6" from begin of parapet.
July 2021 Added Section G-G for details of joint at abutment/deck joint.
Added "@Integral Abutment" to title block.
Jan 2022 Changed reinforcement in Approximate Parapet Quantities and Parapet Reinforcement bar details to "Epoxy Reinforcement".
Deleted Delineator Attachment detail and threaded insert note.
Converted sheet to ORD format.
June 2022 Revised reference to Thrie beam Connector to "Standard Drawing 612-10 or 612-11".
Revised note 1.
Revised format of leader lines.
Oct 2023 Revised notes format for active voice, imperative mood and Writer's Style Guide.
Added Grade 60 Type S to reinforcement bar details
Renumbered sheet from B13.2B to B13.1B
Aug 2024 Added limits of textured concrete to Sections B-B & C-C.
Labeled "wingwall" in Section B-B.
Revised Note 15 to add "Provide both sets of holes" to both notes.
Added Note 16 for textured concrete.
Changed Approximate Parapet Quantities for concrete and epoxy reinforcement from 3.48 & 39.5 to 3.45 & 35.
Changed clearance for R1 from top of deck to bottom of deck.

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Changed name of "Elevation D-D" to "View D-D" and "Detail a" to "Detail 1".

B13.1C 42" Single Slope Concrete Parapet Light Pole Support

Nov 2019 Added new sheet.
May 2021 Renumbered drawing from B13.1M to B13.2C.
Jan 2022 Changed reinforcement in Parapet Reinforcement bar details to "Epoxy Reinforcement".
Converted sheet to ORD format.
June 2022 Revised format of note 1.
Deleted inch symbol from angle designation and weld size designation.
Revised format of leader lines.
Oct 2023 Revised notes format for active voice, imperative mood and Writer's Style Guide.
Added Grade 60 Type S to reinforcement bar details
Revised Note 1 to require Concrete Class 40AF.
Renumbered sheet from B13.2C to B13.1C

B13.1D Protective Fence for Concrete Parapet – 42" single slope concrete parapet

Nov 2019 Added new sheet.
Sep 2020 Reformatted Notes.
Added weld symbol to Detail C.
Changed "See note 14" to "See note 15" in Detail B.
Changed "1" clear" to "2" max clear" in Section A-A.
May 2021 Renumbered drawing to from B13.3H to B13.2D.
Revised spacing of horizontal tubes to make the 32" concrete parapet & 42" single slope parapet details the same.
Revised dummy joint location to tube splices & uniformly spaced across bridge between 6' & 12'.
Jan 2022 Converted sheet to ORD format.
June 2022 Revised reference to Thrie beam Connector to "Standard Drawing 612-10 or 612-11".
Deleted inch symbol from HSS designation and angle designation.
Deleted inch symbol from weld size designation.
Revised note 4 to change ASTM A385 to A153 and added "Repair damaged coating in accordance with ASTM A780 and A123.
Revised note 10 to construct railing normal to longitudinal grade and vertical to transverse grade.
Revised note 17 to "Furnish and install parapet as shown on plans, complete in place."
Revised format of leader lines.
Oct 2023 Revised notes format for active voice, imperative mood and Writer's Style Guide.
Revised reference to shop drawings in note 9 to subsections 504.01F and 105.02.
Renumbered sheet from B13.2D to B13.1D
Dec 2024 Changed name of "Detail A" to "Detail 1", "Detail b" to "Detail 2", and "Detail C" to "Detail 3".

B13.3A-1 Two-Tube Curb Mounted Rail Sheet 1

June 2006 Revised Note 2 to make anchor bolts conform to ASTM F-1554 Grade 105.
Revised Note 14 reference to conform to the 2004 Standard Specifications.

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	Added 4" dimension between slotted holes in post and specified horizontally slotted holes in post.
July 2009	Added ½" V Groove detail 3" from edge of deck.
June 2013	Changed concrete to Class 40AF.
May 2014	Corrected reference in Note 14 to subsection 705.02 to agree with the 2012 Standard Specifications.
March 2015	Changed to a 180° hook for the #6(E) additional deck reinforcement. Revised note 2 to add ASTM A-325 for bolts. Revised note 5 for electronic shop drawings. Added note for increasing the curb height equal to the depth of the overlay when the overlay is applied during original construction.
Aug 2016	Added dummy joint details and note 16. Added 1½" clearance to bottom.
Oct 2017	Revised reference to Roadway Standard Drawing to agree with new numbering system.
Nov 2019	Revised Notes to active voice, imperative mood.
May 2021	Renumbered drawing from B13.2A to B13.3A-1
July 2021	Added joint in curb at approach slab/deck joint for integral abutments. Added Section B-B and added "Integral Abutment" in title block2021
Jan 2022	Changed reinforcement in Approximate Quantities and Parapet Reinforcement bar details to "Epoxy Reinforcement". Converted sheet to ORD format
June 2022	Revised rails to HSS designation. Revised reference to Thrie beam Connector to "Standard Drawing 612-10 or 612-11". Deleted inch symbol from HSS designation. Revised note 2 to provide ASTM F3125 Grade 325 bolts. Revised note 8 to galvanize in accordance with ASTM A123 and AA153. Added "Repair damaged coating in accordance with ASTM A780 and A123". Revised note 7 to construct railing normal to longitudinal grade and vertical to transverse grade. Revised note 13 to "Furnish and install parapet as shown on plans, complete in place." Changed pay limits from end of last post to end of approach slab. Changed title block name from "Two-Tube" to "2-Tube". Revised format of leader lines.
Oct 2023	deleted sheet.

B13.3A-2 Two-Tube Curb Mounted Rail Sheet 2

July 2009	Added ½" V Groove detail 3" from edge of deck.
March 2015	Changed Guardrail Connection Plate detail reference to "hex head cap screw"
Oct 2017	Revised reference to Roadway Standard Drawing to agree with new numbering system.
May 2021	Renumbered drawing from B13.2B to B13.3A-2.
Jan 2022	Converted sheet to ORD format.
June 2022	Deleted inch symbol from weld size designation and angle designation. Revised reference to Thrie beam Connector to "Standard Drawing 612-10 or 612-11". Changed title block name from "Two-Tube" to "2-Tube". Revised format of leader lines.
June 2023	deleted sheet.

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B13.2A Three-Tube Curb Mount Rail Sheet 1 with approach slab

May 2021	Added new sheet.
July 2021	Added joint in curb at approach slab/deck joint for integral abutments. Added Section B-B and added "Integral Abutment" in title block
Jan 2022	Changed reinforcement in Approximate Quantities and Parapet Reinforcement bar details to "Epoxy Reinforcement". Converted sheet to ORD format.
June 2022	Revised C2 from 5 bars to 3 bars in Elevation to agree with crash test details. Revised reference "roadway plans 612-11" to "standard drawing 612-10 or 612-11". Changed "7'-0" max spacing to end post (typ each post)" to "7'-0" max spacing to end post (typ @ end)". Corrected spelling of "silicone" to "silicon". Changed Plan & Elevation to "NTS". Revised spacing of C1 bars to 18" max. Revised note 2 to add Grade 36. Revised note 3 ASTM F3125 for H.S. bolts. Revised note 5 to add Grade 60. Revised note 7 to galvanize according to ASTM A123 and ASTM A153. Added note for repair of damaged coatings. Revised note 13 to construct railing normal to longitudinal grade and vertical to transverse grade. Revised note 19 to "Furnish and install 3-tube curb mount rail as shown on plans, complete in place." Corrected quantity of structural steel to 66 lb/ft and epoxy reinforcement to 5 lb/ft. Corrected lap length of C2 bars to 30". Revised format of leader lines.
Oct 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide. Added Grade 60 Type S to note 5 Revised reference to shop drawings in note 12 to subsections 504.01F and 105.02 Renumbered sheet from B13.3B-1 to B13.2A
Dec 2024	Raised end post to top of top rail in Partial Elevation. Changed rebar designation from "C" to "R". Revised note 2 to specify ASTM A709 Grade 50 for posts, rail splices, and base plates. Added "without end wall" to title block.

B13.2B Three-Tube Curb Mount Rail Sheet 2 with approach slab

May 2021	Added new sheet.
Jan 2022	Converted sheet to ORD format
June 2022	Added C2 bar in Post Details Elevation and revised to 3 C2 bars in Post details Section. Changed pay limit from last post to end of approach slab. Deleted inch symbol from weld size designation and HSS designation. Added "Transition Connection" title. Revised format of leader lines.
Oct 2023	Renumbered sheet from B13.3B-2 to B13.2B
Dec 2024	Deleted ** on 7" curb height in Post Details.

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Changed rebar designation from "C" to "R".
Added "without end wall" to title block.
Changed name of "Section C-C" to "Section A-A".
Changed name of "Section C-C" to "Section A-A".

B13.2C Three-Tube Curb Mount Rail Sheet 3 with or without approach slab

May 2021 Added new sheet.
Jan 2022 Converted sheet to ORD format
June 2022 Revised HS to HSS in Rail Splice Details.
Deleted inch symbol from weld size designation, angle designation, and HSS designation.
Corrected dimensions in Rail Cap details.
Exchanged location of Detail A and Alternate Post "S".
Revised format of leader lines.
Oct 2023 Renumbered sheet from B13.3B-3 to B13.2C
Dec 2024 Added ASTM A709 Grade 36 note to Anchor Plate Detail, Plate Washer C, Plate A, Connection Angle B, and Guardrail Connection Plate.
Added "without end wall" to title block.
Changed name of "Detail A" to "Detail 1".

B13.2D Three-Tube Curb Mount Rail with End Block Sheet 1 of 3

Dec 2024 Added new sheet.

B13.2E Three-Tube Curb Mount Rail with End Block Sheet 2 of 3

Dec 2024 Added new sheet.

B13.2F Three-Tube Curb Mount Rail with End Block Sheet 3 of 3

Dec 2024 Added new sheet.

B13.3A Combination Railing Sheet 1 with approach slab

May 2021 Added new sheet
July 2021 Added Section C-C details for joint at approach slab/deck.
Jan 2022 Moved rail post from 1.5" to 1" from front of base plate in Section Thru Post and added note to refer to Protective Fence drawing for base plate with fence post.
Converted sheet to ORD format
June 2022 Revised rails to HSS designation.
Revised reference to Thrie beam Connector to "Standard Drawing 612-10 or 612-11".
Deleted inch symbol from HSS designation and weld size designation.
Revised note 6 to galvanize in accordance with ASTM A123 and AA153. Added "Repair damaged coating in accordance with ASTM A780 and A123".
Revised note 12 to construct railing normal to longitudinal grade and vertical to transverse grade.
Revised note 19 to "Furnish and install parapet as shown on plans, complete in place."
Revised format of leader lines.
Oct 2023 Revised notes format for active voice, imperative mood and Writer's Style Guide.
Renumbered sheet from B13.4A-1 to B13.3A
Added ELEVATION for Parapet details.
Moved parapet details from sheet 2 to sheet 1

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Modified Notes for only Parapet Notes.
Dec 2024 Changed "U" & "V" bar designations to R4 & R5.
Revised Note 12.
Changed name of "Detail A" to "Detail 1" and "Detail B" to "Detail 2".

B13.3B Combination Railing Sheet 2 with approach slab

May 2021 Added new sheet
July 2021 Renamed "Intermeduate Wall Joint" to "Wall Joint".
Clarified note 29.
Jan 2022 Changed reinforcement in Parapet Reinforcement bar details to "Epoxy Reinforcement".
Changed distance from back of parapet to base plate from 1" to 2.5".
Changed End Block Plan View dimension from 10½" to 12" to match total width of 14".
Changed rebar sketch U bars A dimension from 8½", 7½", and 6½" to 10", 9" and 8".
Changed rebar sketch V bars A dimension from 8½" to 10".
Added T-2" to B dimension of U bars in sketch.
Converted sheet to ORD format
June 2022 Corrected 3'-6" rail height to top of sidewalk in Typical Section on Bridge.
Extended limits of textured surface to full height in Typical Section at End Block.
Deleted " Construct parapet plumb…" from note 24.
Revised reference to Thrie beam Connector to "Standard Drawing 612-10 or 612-11".
Revised format of leader lines.
Oct 2023 Revised notes format for active voice, imperative mood and Writer's Style Guide.
Modified Notes for only Railing Notes.
Moved railing details from sheet 1 to sheet 2.
Revised reference to shop drawings in note 11 to subsections 504.01F and 105.02
Renumbered sheet from B13.4A-2 to B13.3B

B13.3C Protective fence for Combination Railing Sheet 1

May 2021 Added new sheet
Jan 2022 Changed size of fence anchor bolts from 1" to 0.875" in Section A-A and added 4.25" distance from back face of parapet to fence anchor bolt.
Converted sheet to ORD format
June 2022 Deleted inch symbol from HSS designation and weld size designation.
Revised format of leader lines.
Oct 2023 Renumbered sheet from B13.4C-1 to B13.3C
Dec 2024 Changed name of "Detail a" to "Detail 1", "Detail B" to "Detail 2", and "Detail C" to "Detail 3".

B13.3D Protective fence for Combination Railing Sheet 2

May 2021 Added new sheet
Jan 2022 Added base plate details for fence post at combination rail.
Added dimensions to Base Plate Detail at Fence Post to locate base plate on parapet.
Converted sheet to ORD format
June 2022 Revised HS to HSS and deleted inch symbol.
Added "Repair damaged coating in accordance with ASTM A780 and A123" to note 5.
Revised note 11 to construct railing normal to longitudinal grade and vertical to transverse grade.

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Revised note 18 to "Furnish and install parapet as shown on plans, complete in place."
Revised format of leader lines.

Oct 2023 Revised notes format for active voice, imperative mood and Writer's Style Guide.
Revised reference to shop drawings in note 10 to subsections 504.01F and 105.02
Renumbered sheet from B13.4C-2 to B13.3D

B13.4A Standard Pedestrian/Bicycle Railing

June 2006 Combined the Bicycle and Pedestrian rail drawings using a 3'-6" height to conform to the approved 2006 Ballot Item.
Deleted epoxy reinforcement from the Drilled Concrete Post Base.
Widened the curb to 10" to provide cover for reinforcement around the anchor bolts.
Modified the title block to include "Bicycle".

July 2009 Added ½" V Groove detail 3" from edge of deck.
Changed tube wall thickness to 3/16".

March 2011 Added "Deck Expansion Joint Typical at Abutment & Pier" to Partial Elevation.
Corrected maximum clear opening at expansion joint to 6" to comply with Article 13.8.1.
Added Upper & Lower Splice Connection Elevation to set the distance from the edge of the 2"x2" vertical post to the end of horizontal tube at 1.5" to avoid conflict with the slotted hole tube splice details.

May 2021 Renumbered drawing from B13.4B to B13.5A-1

Jan 2022 Converted sheet to ORD format

June 2022 Deleted inch symbol from HSS designation.
Added ASTM F1554 Grade 36 for anchor bolts.
Revised format of leader lines.

Oct 2023 Corrected spelling of "Bicycle" in title block
Renumbered sheet from B13.5A-1 to B13.4A

Dec 2024 Corrected leader line to the anchor bolts in the Drilled Concrete Post Base Detail.
Added Date panel to Section A-A.
Added Date Panel Elevation.
Labeled R3 & R4 bars in Section B-B.
Changed name of Details A-E to Details 1-5 and added Detail 6.
Revised Lower Splice Connection Elevation to avoid splice insert from hitting post.

B13.4B Pedestrian/Bicycle Railing Details

June 2006 Revised Note 6 to require epoxy reinforcement only in the curb.
Added Note 7 specifying Concrete Class 40A.
Added Notes 16, 17, & 19 for tube ends, vent holes, and alternate splice details.
Increased the top width of bar R2.
Modified the title block to include "Bicycle".

July 2009 Renumbered the Notes
Added additional requirements for powder coating
Changed tube wall thickness to 3/16".
Modified splice tube detail.
Modified note 21 to read, "Each rail section…"

March 2011 Deleted details F & G for the rub rail that has been deleted.
Modified splice tube details.

March 2015 Revised note 17 for electronic shop drawings

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	Revised color reference to RAL 9005 (jet black).
	Increased powder coating thickness to 3 mils minimum.
Nov 2019	Revised Notes to active voice, imperative mood.
	Deleted Note 16 and renumbered notes.
Sep 2020	Revised wording of notes 4, 17, & 23.
	Deleted "All" from notes 8 & 10.
May 2021	Renumbered drawing from B13.4C to B13.5A-2
Jan 2022	Changed reinforcement in Reinforcement bar details to "Epoxy Reinforcement".
	Converted sheet to ORD format
June 2022	Added Grade 60 epoxy reinforcement to note 6.
	Revised note 8 to galvanize in accordance with ASTM A123 and A153.
	Added "Repair damaged coating in accordance with ASTM A780 and A123" to note 10.
	Revised note 17 to construct railing normal to longitudinal grade and vertical to transverse grade.
	Revised note 22 to "Furnish and install parapet as shown on plans, complete in place."
	Revised HS to HSS and deleted inch symbol.
	Deleted inch symbol from weld size designation.
	Revised format of leader lines.
Oct 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide.
	Added Grade 60 Type S to note 6
	Revised reference to shop drawings in note 16 to subsections 504.01F and 105.02
	Renumbered sheet from B13.5A-2 to B13.4B.
Dec 2024	Revised the wording of Notes 11 & 12.
	Deleted Note 23 allowing alternate aluminum rail.
	Changed name of Details A-E to Details 1-5 and added Detail 6.
	Changed rebar designations to "R".

B13.6A 32" Concrete Median Barrier

June 2013	Changed concrete to Class 40AF.
Oct 2017	Revised reference to Roadway Standard Drawing to agree with new numbering system.
Nov 2019	Revised Notes to active voice, imperative mood.
May 2021	Renumbered drawing from B13.5 to B13.6A
Jan 2022	Changed reinforcement in Approximate Median Quantities and Median Reinforcement bar details to "Epoxy Reinforcement".
	Converted sheet to ORD format
June 2022	Added note 12 to "Furnish and install median barrier as shown on plans, complete in place."
	Revised reference to "Concrete Barrier" to "Standard Drawing 612-18".
	Revised note 1.
	Revised format of leader lines.
Oct 2023	Deleted sheet.

B13.5 42" Single Slope Concrete Medians Barrier

May 2021	Added new drawing
July 2021	Changed size of joint in Section B-b from ¼" to ½".
Jan 2022	Changed reinforcement in Approximate Median Quantities and Median Reinforcement bar details to "Epoxy Reinforcement".

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	Converted sheet to ORD format
June 2022	Revised note 13 to "Furnish and install median barrier as shown on plans, complete in place."
	Revised reference to "Concrete Barrier" to "Standard Drawing 612-25".
	Revised format of leader lines.
Oct 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide.
	Renumbered sheet from B13.6B to B13.5
Dec 2024	Changed "M" rebar designations to "R".
	Deleted recess into deck for median barrier to agree with Crash Test.
	Added "Grade 60 Type S" to note 8.
	Changed name of "Detail A" to "Detail 1".

B13.6A W-Beam Railing, Through Bolt Anchorage

June 2006	Added a note in the title block for using roadway standard drawing G-1-L on retrofit projects.
March 2011	Changed height of rail to meet 29" top of rail height.
Dec 2011	Revised note 3 for anchor bolts to F1554 Grade 36 and nuts to ASTM A563.
	Corrected weld symbol in section B-B.
Sept 2012	Revised note 5 for washers to comply with ASTM F436, Type 1.
	Changed Post Height Table note from " down station" to "ahead station".
May 2014	Added note 11 for polyethylene blockouts.
	Corrected reference in note 1 to AASHTO M270, Grade 36
March 2015	Added plate thickness to Section B-B and Section C-C.
	Added maximum 10:1 maximum slope in Section A-A.
	Corrected bid item in note 9 to 612-005A.
	Changed sheet title to "W-Beam Railing, Through Bolt Anchorage.
Oct 2017	Revised reference to Roadway Standard Drawing to agree with new numbering system.
	Changed height to cg of rail from 1"-11" to 2'-1" to agree with new MASH standards in the Roadway Standard Drawings.
Nov 2019	Revised Notes to active voice, imperative mood.
May 2021	Renumbered drawing from B13.6A to B13.7A
Jan 2022	Converted sheet to ORD format
June 2022	Revised format of leader lines.
Oct 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide.
	Corrected reference to 612-1 note 7 to 612-1 note 10 in note 11.
	Renumbered sheet from B13.7A to B13.6A
Dec 2024	Changed name of "Detail a" to "Detail 1".

B13.6B W-Beam Railing, Adhesive Anchorage

March 2015	Added new sheet.
Oct 2017	Revised reference to Roadway Standard Drawing to agree with new numbering system.
	Changed height to cg of rail from 1"-11" to 2'-1" to agree with new MASH standards in the Roadway Standard Drawings.
Nov 2019	Revised Notes to active voice, imperative mood.
May 2021	Renumbered drawing from B13.6B to B13.7B
Jan 2022	Converted sheet to ORD format
June 2022	Revised format of leader lines.

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Oct 2023 Revised notes format for active voice, imperative mood and Writer's Style Guide.
Corrected reference to 612-1 note 7 to 612-1 note 10 in note 10.
Renumbered sheet from B13.7B to B13.6B
Dec 2024 Corrected title block to reference "for rail retrofit projects".
Changed name of "Detail A" to "Detail 1".

B13.7 Date Panel

Oct 2016 Added new sheet.
May 2018 Revised Date Panel Location notes to use 4 digit year built and 5 digit bridge inspection number.
Nov 2019 Changed "Bridge Inspection Number" to "Bridge Key Number".
Added "General Notes".
Added traffic face and back face notes to Date Panel Location.
Jan 2022 Renumbered General Notes to put note for Protective Fence at end to make note easier to delete and not renumber the notes.
Converted sheet to ORD format
June 2022 Added approach slab to "Date Panel Location" and moved date panel to end of approach slab.
Revised format of leader lines.
Oct 2023 Corrected orientation of radius arrows.
Renumbered sheet from B13.8 to B13.7
Dec 2024 Added Date Panel Location and General Notes for a curb/edge beam.
Added "Bridge" designation for Date Panel layout and General Notes.

B13.8 Bridge Name Signage

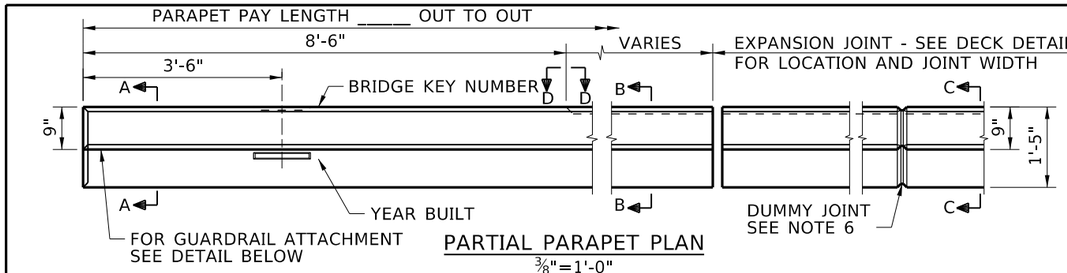
Nov 2019 Added new sheet.
Sep 2020 Revised note 2 to "Align the left edge of the sign 2'-0" to the right of the lane/shoulder stripe".
Combined note 5 & 8 and renumbered notes.
Added Section A-A.
Revised PLAN view to show sign 2' to the right of the lane/shoulder stripe.
Moved Type 1 & 2 Applications from Note to Designer to A13.2.
Added "Refer to Article A13.2 for Detailing Instructions" to Note to Designer.
Jan 2022 Added Type 3 Mounting Bracket & Base Plate detail.
Added min/max distance from sign text area to edge of sign.
Added min/max mounting post spacing and min/typical distance from mounting post to edge of sign in PLAN.
Converted sheet to ORD format.
June 2022 Revised format of leader lines.
Oct 2023 Revised notes format for active voice, imperative mood and Writer's Style Guide.
Renumbered sheet from B13.9 to B13.8
Dec 2024 Changed name of "Detail A" to "Detail 1" and deleted reference to "Section A-A".

B13.9 Temporary Concrete Barrier Anchorage

Oct 2023 Added new sheet.

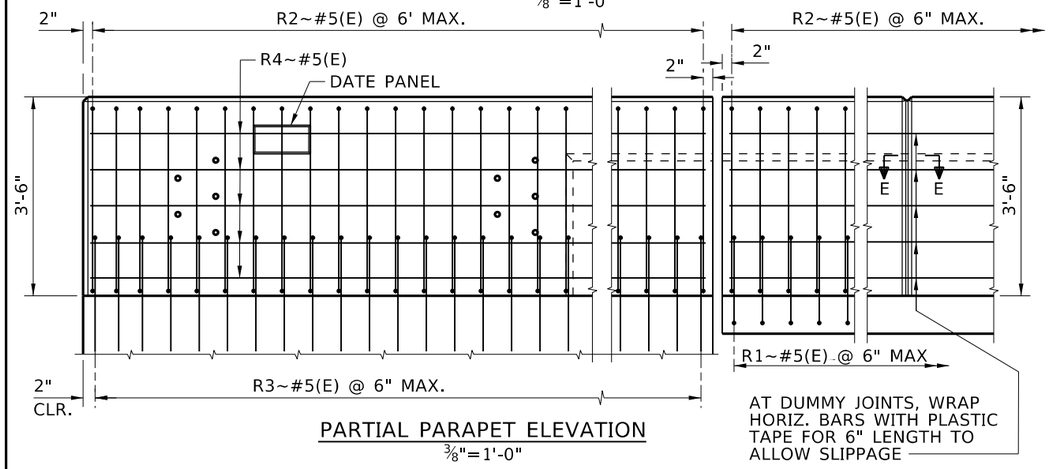
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STANDARD DRAWING REVISION LOG

Dec 2024	Corrected scale factor in Details A, B, & C from 3” = 1’-0” to 1½” = 1”-0”. Revised notes 1, 2, & 3. Changed name of “Detail A”, “Detail B”, and “Detail C” to “Detail 1”, “Detail 2”, and “Detail 3”.



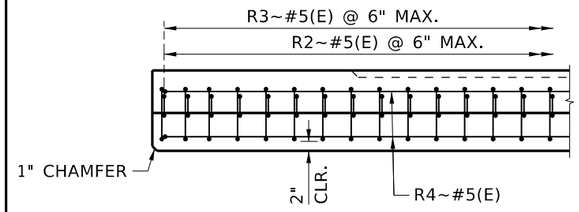
PARTIAL PARAPET PLAN

$\frac{3}{8}$"=1'-0"



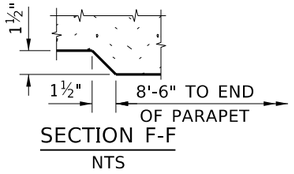
PARTIAL PARAPET ELEVATION

$\frac{3}{8}$"=1'-0"



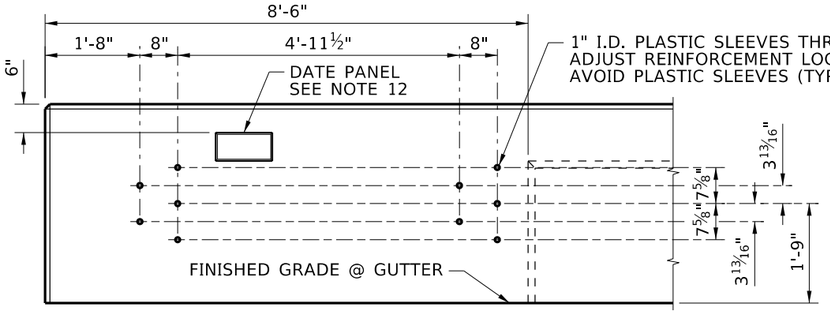
END VIEW - PLAN

NTS



SECTION F-F

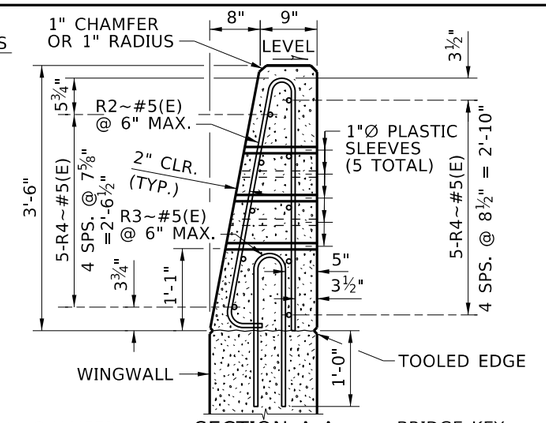
NTS



GUARDRAIL ATTACHMENT

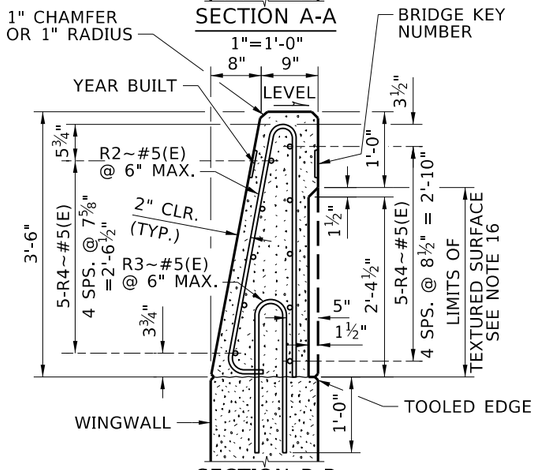
$\frac{3}{8}$"=1'-0"

(SEE NOTE 15)



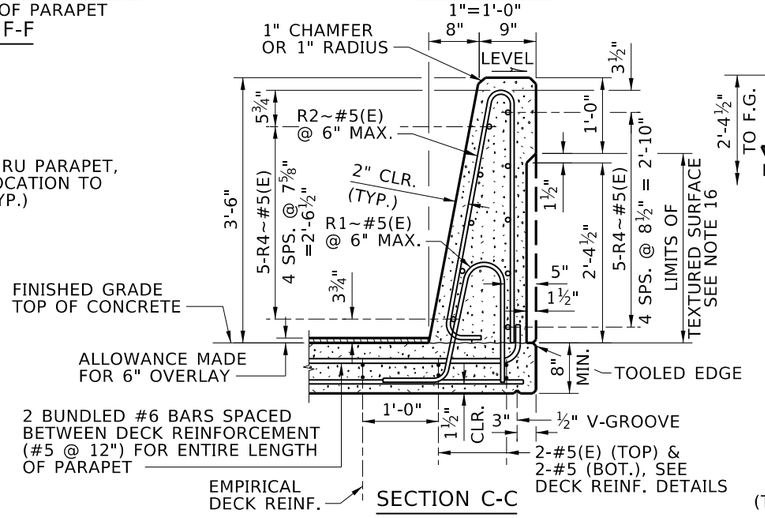
SECTION A-A

1"=1'-0"



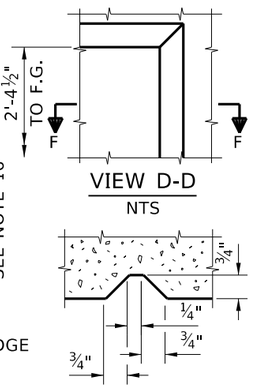
SECTION B-B

1"=1'-0"



SECTION C-C

1"=1'-0"



VIEW D-D

NTS

SECTION E-E
DUMMY JOINT

NTS

(TYP. FOR BOTH SIDES & TOP OF PARAPET)

NOTES

1. a. PROVIDE CLASS 40AF CONCRETE .
   b. PROVIDE EPOXY-COATED REINFORCEMENT GRADE 60 TYPE S IN ACCORDANCE WITH 708.02 .
2. CONSTRUCT PARAPET SO THAT THE OUTSIDE FACE IS PERPENDICULAR TO THE ROADWAY SLOPE. HEIGHT CONTROL IS AT THE INSIDE (TRAFFIC) FACE.
3. CONSTRUCT USING CAST-IN-PLACE METHOD. ADJUST HEIGHT OF PARAPET TO COMPENSATE FOR THE CAMBER AND LOAD DEFLECTION OF THE SUPERSTRUCTURE. CALCULATE THE AMOUNT OF ADJUSTMENT FOR APPROVAL.
4. COMPLETE PARAPET CONSTRUCTION BEFORE PLACING THE DECK OVERLAY.
5. INSTALL REINFORCEMENT BARS R3~#5 & R1~#5 BEFORE ABUTMENT, WING WALL, OR DECK SLAB CONCRETE IS PLACED.
6. SPACE INTERMEDIATE PARAPET DUMMY JOINTS UNIFORMLY THROUGHOUT THE LENGTH OF THE BRIDGE. LOCATE A DUMMY JOINT AT EVERY PIER WHERE THE DECK SLAB IS CONTINUOUS. PROVIDE INTERMEDIATE PARAPET JOINT SPACING NOT LESS THAN 6'-0" NOR GREATER THAN 12'-0".
7. SEE ROADWAY PLANS FOR LOCATION OF DELINEATORS, IF REQUIRED.
8. PLACE PARAPETS AFTER FALSEWORK OR OVERHANG DECK FORMS HAVE BEEN RELEASED. DO NOT PLACE PARAPET CONCRETE UNTIL THE BRIDGE DECK MEETS THE REQUIREMENT OF TABLE 502.03-5 PART 2.
9. CONSTRUCT END FACE, EXPANSION JOINTS AND DUMMY JOINTS PERPENDICULAR TO THE ROADWAY GRADE.
10. PLACE PARAPET IN THE SAME SEQUENCE AS THE DECK PLACEMENT.
11. WATER CURE THE CONCRETE SURFACE OF THE PARAPET IN ACCORDANCE WITH 502.03.
12. SEE DATE PANEL SHEET FOR ADDITIONAL DETAILS.
13. SEE ROADWAY PLANS FOR TERMINAL CONNECTOR AND GUARDRAIL.
14. PAYMENT FOR 42" SINGLE SLOPE CONCRETE PARAPET IS PAY ITEM 502-430A.
15. SEE ROADWAY PLANS FOR TYPE OF APPROACH RAIL.
    a. FOR THRIE-BEAM TERMINAL CONNECTION - SEE STD. DWG. 612-10 OR 612-11. PROVIDE BOTH SETS OF HOLES.
    b. FOR CONCRETE PARAPET CONNECTION - SEE STD. DWG. 612-25. PROVIDE BOTH SETS OF HOLES.
16. PROVIDE TEXTURED CONCRETE SURFACE IN ACCORDANCE WITH 575 WITH PATTERN XXXX.

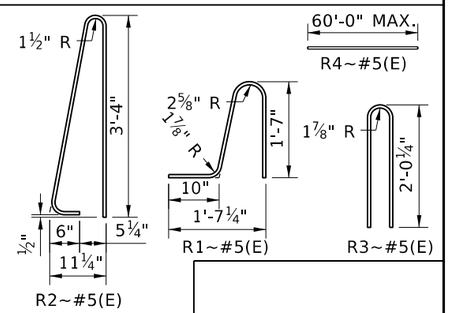
APPROXIMATE PARAPET QUANTITIES

CONCRETE: ..... 3.45 CF/LF

EPOXY REINFORCEMENT: ..... 35 LB/LF

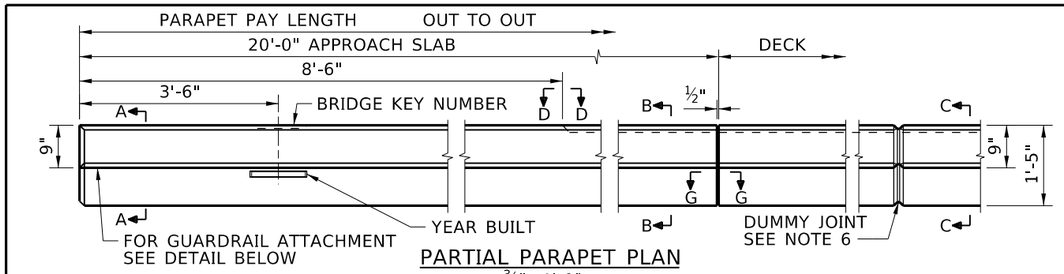
NOTE: CONCRETE QUANTITY DOES NOT INCLUDE CONCRETE AT THE TEXTURED SURFACE.

EPOXY-COATED REINFORCEMENT

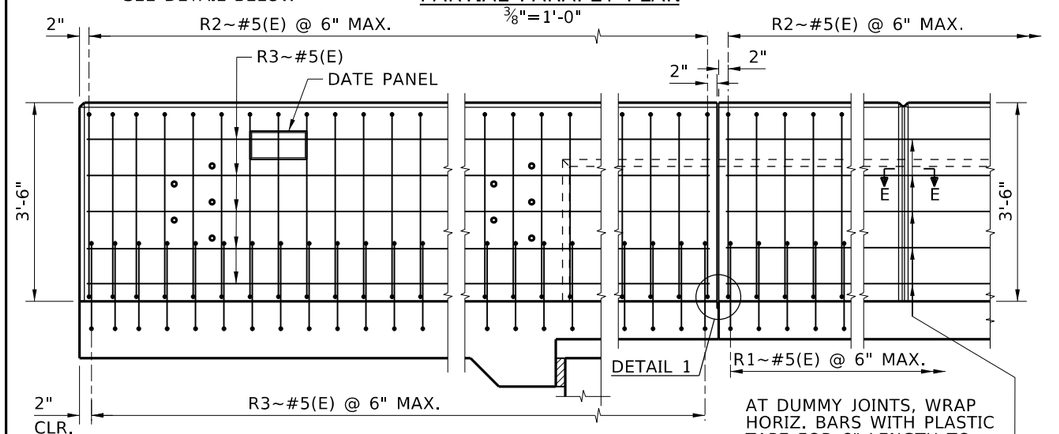


R2 BARS MAY REST ON TOP OF WALL OR DECK

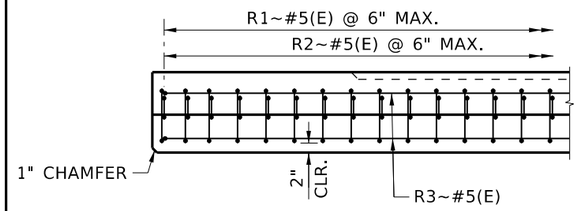
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	42" SINGLE SLOPE CONCRETE PARAPET	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	W/O APPROACH SLAB	BRIDGE KEY NO.
				DETAILED	Standards\Bridge Standard Drawings\ B13_1A.DGN			BRIDGE LRFD DESIGN MANUAL, B13.1A	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



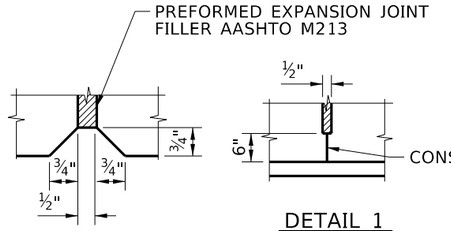
PARTIAL PARAPET PLAN
⅜"=1'-0"



PARTIAL PARAPET ELEVATION
⅜"=1'-0"

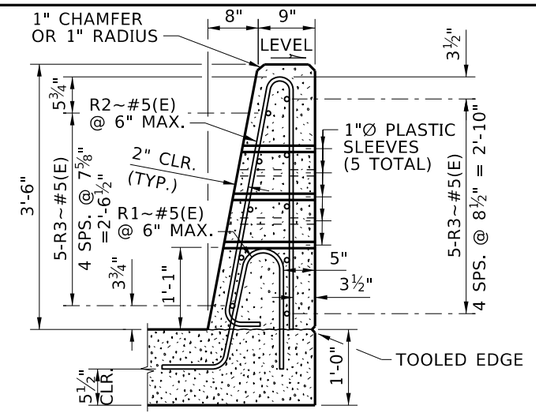


END VIEW - PLAN
NTS

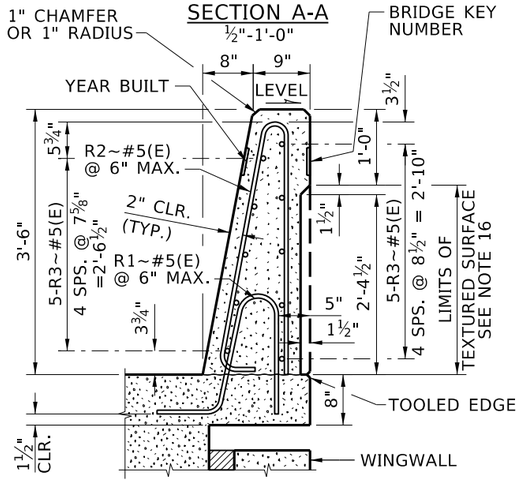


SECTION G-G
3"=1'-0"

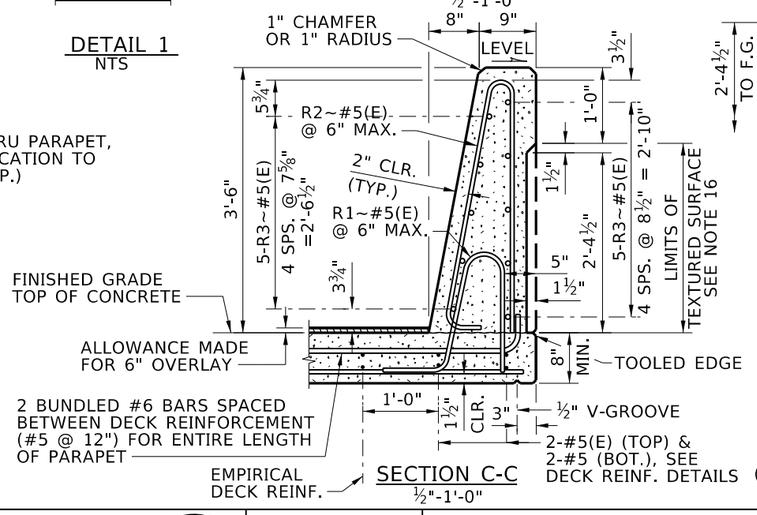
DETAIL 1
NTS



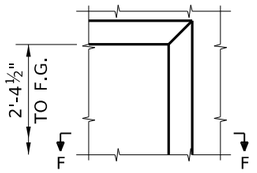
SECTION A-A
½"-1'-0"



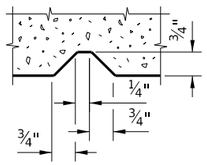
SECTION B-B
½"-1'-0"



SECTION C-C
½"-1'-0"

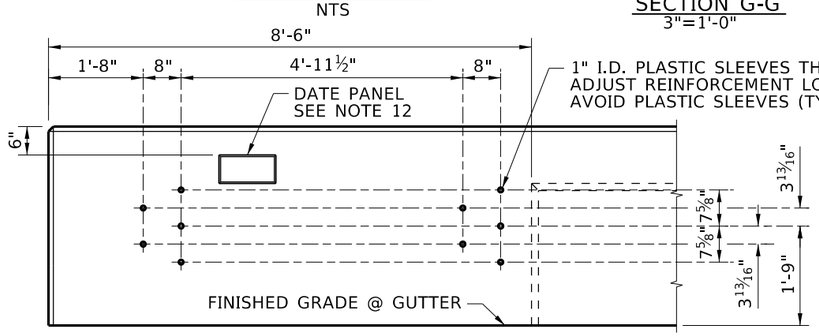


VIEW D-D
NTS



SECTION E-E

DUMMY JOINT
NTS
(TYP. FOR BOTH SIDES
& TOP OF PARAPET)



GUARDRAIL ATTACHMENT
⅜"=1'-0"
(SEE NOTE 15)

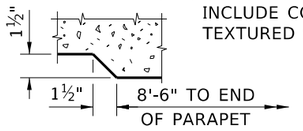
NOTES

1. a. PROVIDE CLASS 40AF CONCRETE .
   b. PROVIDE EPOXY-COATED REINFORCEMENT GRADE 60 TYPE S IN ACCORDANCE WITH 708.02 .
2. CONSTRUCT PARAPET SO THAT THE OUTSIDE FACE IS PERPENDICULAR TO THE ROADWAY SLOPE. HEIGHT CONTROL IS AT THE INSIDE (TRAFFIC) FACE.
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4. COMPLETE PARAPET CONSTRUCTION BEFORE PLACING THE DECK OVERLAY.
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6. SPACE INTERMEDIATE PARAPET DUMMY JOINTS UNIFORMLY THROUGHOUT THE LENGTH OF THE BRIDGE. LOCATE A DUMMY JOINT AT EVERY PIER WHERE THE DECK SLAB IS CONTINUOUS. PROVIDE INTERMEDIATE PARAPET JOINT SPACING NOT LESS THAN 6'-0" NOR GREATER THAN 12'-0".
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8. PLACE PARAPETS AFTER FALSEWORK OR OVERHANG DECK FORMS HAVE BEEN RELEASED. DO NOT PLACE PARAPET CONCRETE UNTIL THE BRIDGE DECK MEETS THE REQUIREMENT OF TABLE 502.03-5 PART 2.
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10. PLACE PARAPET IN THE SAME SEQUENCE AS THE DECK PLACEMENT.
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12. SEE DATE PANEL SHEET FOR ADDITIONAL DETAILS.
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16. PROVIDE TEXTURED CONCRETE SURFACE IN ACCORDANCE WITH 575 WITH PATTERN XXXX.

APPROXIMATE PARAPET QUANTITIES

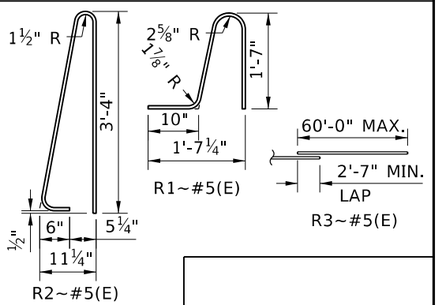
CONCRETE:.....3.45 CF/LF
EPOXY REINFORCEMENT:..... 35 LB/LF

NOTE: CONCRETE QUANTITY DOES NOT INCLUDE CONCRETE AT THE TEXTURED SURFACE.



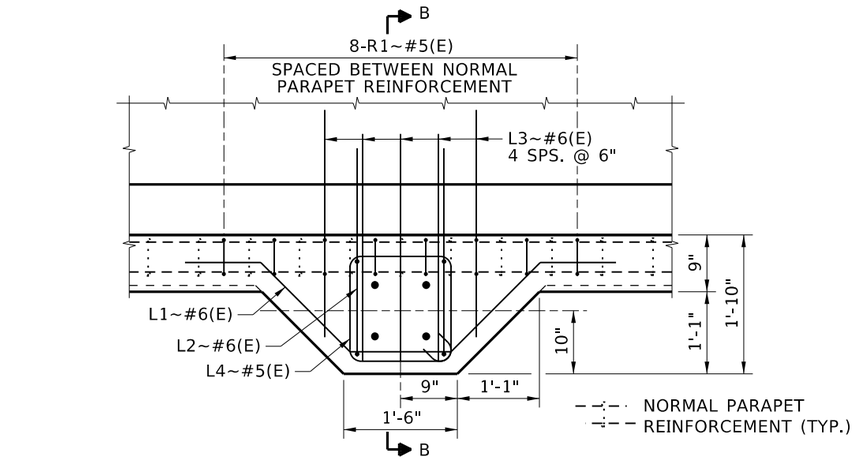
SECTION F-F
NTS

EPOXY-COATED REINFORCEMENT



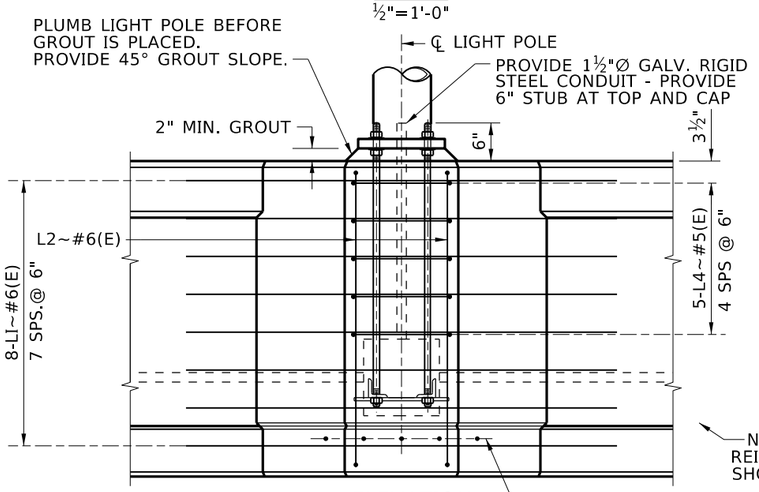
R2 BARS MAY REST ON TOP OF WALL OR DECK

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	42" SINGLE SLOPE CONCRETE PARAPET	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	WITH APPROACH SLAB @ INTEGRAL ABUTMENT	BRIDGE KEY NO.
				DETAILED	Standards\Bridge Standard Drawings\ B13_1B.DGN	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B13.1B	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024				BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



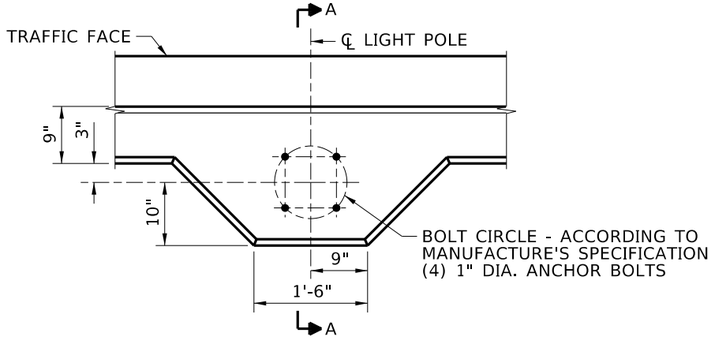
PLAN

½"=1'-0"



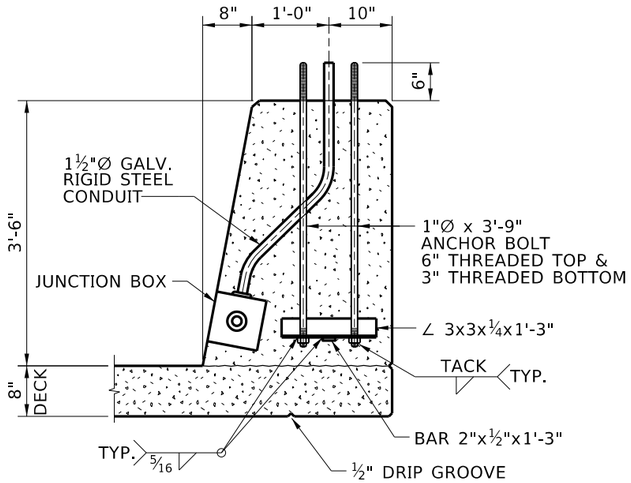
ELEVATION

½"=1'-0"



BOLT CIRCLE PLAN

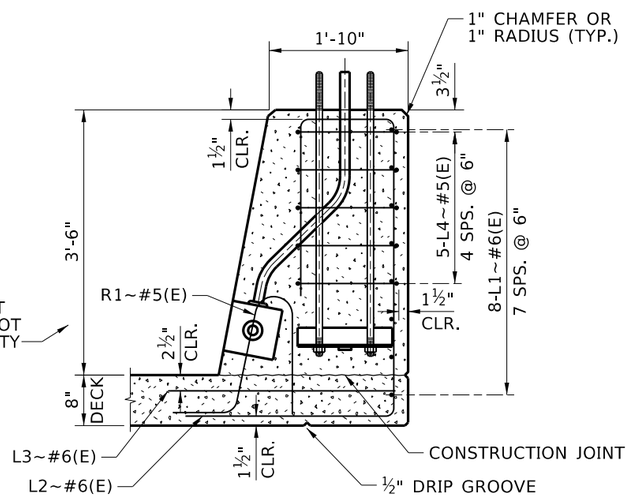
½"=1'-0"



SECTION A-A

ANCHOR BOLT DETAILS

½"=1'-0"

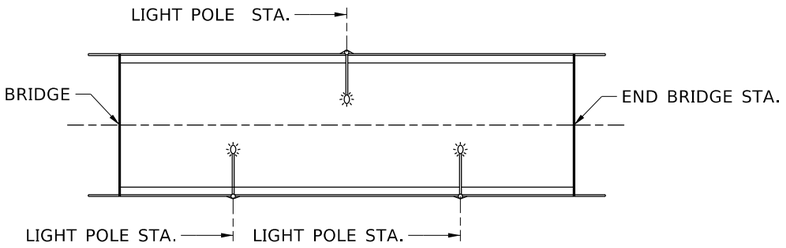


SECTION B-B

½"=1'-0"

NOTES

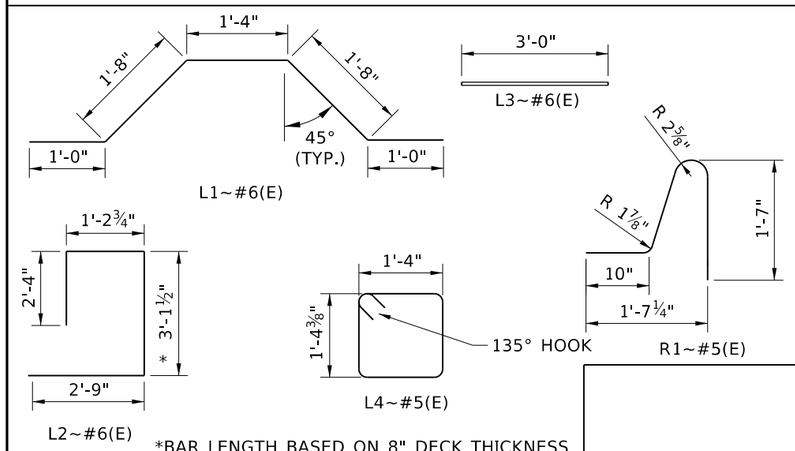
1. a. PROVIDE CLASS 40AF CONCRETE.
   b. PROVIDE EPOXY-COATED REINFORCEMENT GRADE 60 TYPE S IN ACCORDANCE WITH 708.02.
2. PROVIDE ANCHOR BOLTS, NUTS, AND WASHERS IN ACCORDANCE WITH ASTM F1554, GRADE 55 AND ARE GALVANIZED IN ACCORDANCE WITH ASTM A153 UNLESS NOTED OTHERWISE. FURNISH EACH ANCHOR BOLT WITH 2 NUTS AND 2 WASHERS AT LIGHT POLE BASE PLATE AND 1 NUT AT EMBEDDED END.
3. PROVIDE ANGLES AND PLATES IN ACCORDANCE WITH ASTM A709 GRADE 36.
4. PROVIDE GROUT IN ACCORDANCE WITH TYPE B CLASS 1 AS SPECIFIED IN 506.03 PARAGRAPH H.
5. SEE CONCRETE PARAPET DRAWING FOR NORMAL PARAPET REINFORCEMENT.
6. THE LOCATION OF LIGHT POLE SUPPORTS MAY BE FIELD ADJUSTED ± 3 FEET TO AVOID CONFLICT.
7. SEE ROADWAY PLANS FOR LIGHT POLE DETAILS. PROVIDING AND INSTALLING LIGHT POLES AND ELECTRICAL ITEMS IS A ROADWAY PAY ITEM.
8. CONCRETE, REINFORCING STEEL, ANCHOR BOLT ASSEMBLIES, AND GROUT FOR LIGHT POLE SUPPORTS ARE INCIDENTAL TO PAY ITEM 502-430A.
9. MAXIMUM MOUNTING HEIGHT IS 50 FEET. MINIMUM ARM LENGTH IS 15 FEET.



LIGHT POLE LAYOUT

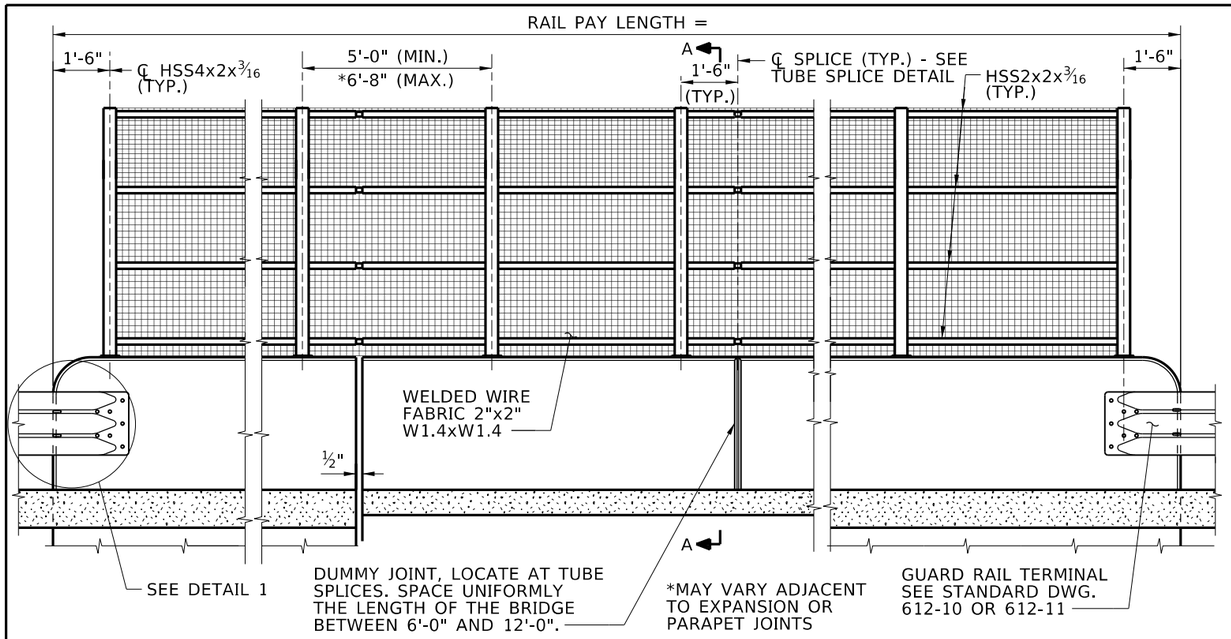
½"=1'-0"

EPOXY-COATED REINFORCEMENT

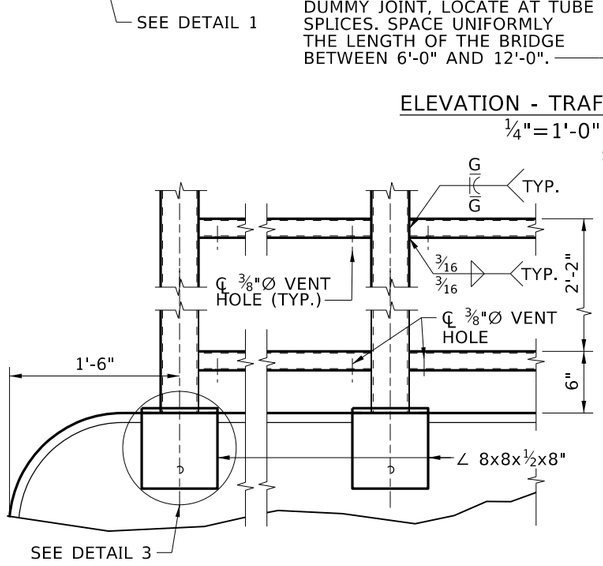


*BAR LENGTH BASED ON 8" DECK THICKNESS

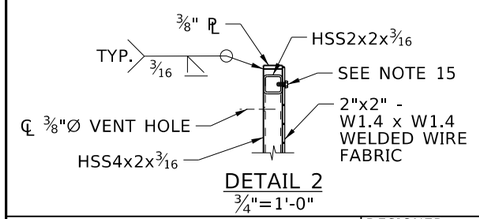
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	42" SINGLE SLOPE CONC.PARAPET LIGHT POLE SUPPORT	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
				DETAILED	Standards/Bridge Standard Drawings/ B13_1C.dgn	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B13.1C	COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024				BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						



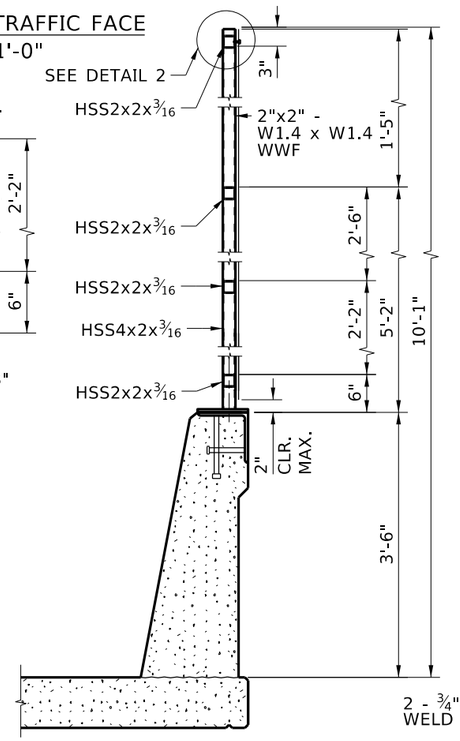
ELEVATION - TRAFFIC FACE
1/4"=1'-0"



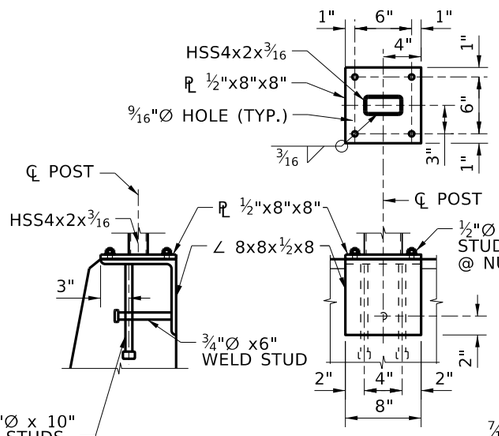
DETAIL 1
(BACK FACE SHOWN)
3/4"=1'-0"



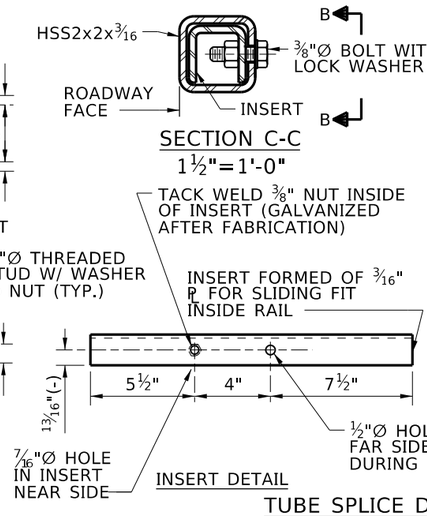
DETAIL 2
3/4"=1'-0"



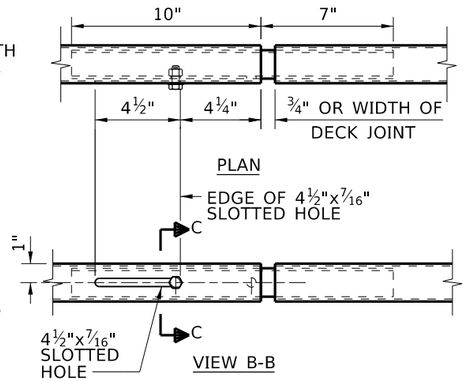
SECTION A-A
1/2"=1'-0"



DETAIL 3
3/4"=1'-0"



SECTION C-C
1 1/2"=1'-0"



TUBE SPLICE DETAILS
1 1/2"=1'-0"

NOTES

MATERIALS

1. PROVIDE STRUCTURAL STEEL TUBING IN ACCORDANCE WITH ASTM A500 GRADE B OR ASTM A501.
2. PROVIDE STRUCTURAL STEEL PLATES AND SLEEVES IN ACCORDANCE WITH ASTM A36.
3. PROVIDE WELDED WIRE FABRIC IN ACCORDANCE WITH ASTM A185 IN SHEET FORM.

GALVANIZING/POWDER COATING

4. GALVANIZE STRUCTURAL STEEL PARTS, RAILING, SLEEVES, AND WELDED WIRE FABRIC AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 AND ASTM A153. THOROUGHLY CLEAN WELDED AREAS PRIOR TO GALVANIZING TO REMOVE SLAG OR OTHER MATERIAL THAT WOULD INTERFERE WITH THE ADHERENCE OF THE ZINC. PROVIDE GALVANIZED SURFACES FREE OF FINS, ABRASIONS, ROUGH OR SHARP EDGES, OR OTHER SURFACE DEFECTS. REPAIR DAMAGED COATING IN ACCORDANCE WITH ASTM A780 AND ASTM A123.
5. POWDER COAT THE RAILING SYSTEM, WELDED WIRE FABRIC, AND FASTENERS AFTER GALVANIZING WITH A MINIMUM THICKNESS OF 3 MILS. PAINT WITH COLOR RAL 9005 (JET BLACK). SUBMIT A COLOR SAMPLE FOR APPROVAL.
6. SUBMIT POWDER COATING SHOP PROCEDURES FOR PREPARATION OF THE GALVANIZED SURFACES AND APPLICATION PROCESS OF THE POWDER COATING FOR APPROVAL.
7. REPAIR SCRATCHES, PITS, AND OTHER DEFECTS IN ACCORDANCE WITH THE POWDER COATING MANUFACTURE'S WRITTEN SPECIFICATIONS.

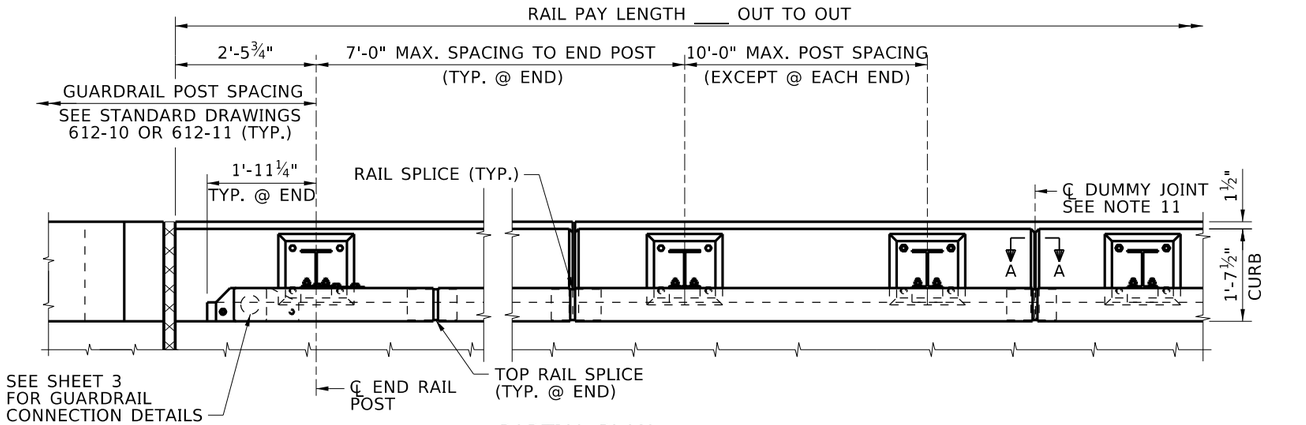
FABRICATION AND ERECTION

8. FABRICATE AND ERECT THE RAILING IN ACCORDANCE WITH THE CURRENT EDITION OF AASHTO SPECIFICATIONS FOR HIGHWAY BRIDGES AND ITD STANDARD SPECIFICATIONS.
9. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 504.01 F AND 105.02.
10. CONSTRUCT RAILING CONFORMING TO THE HORIZONTAL AND VERTICAL ALIGNMENT OF THE STRUCTURE, INSTALL POSTS NORMAL TO GRADE IN LONGITUDINAL DIRECTION AND VERTICAL IN TRANSVERSE DIRECTION.
11. SAW OR MILL ENDS OF TUBE SECTIONS AT SPLICES. PROVIDE CUT ENDS THAT ARE TRUE, SMOOTH AND FREE FROM BURRS OR RAGGED EDGES.
12. PROVIDE VENT HOLES FOR GALVANIZING AS REQUIRED AND SHOWN ON THE SHOP DRAWINGS. DRILL VENT HOLES AWAY FROM TRAFFIC FACE AND NOT ON THE TOP SURFACE OF THE HORIZONTAL TUBES.
13. ATTACH RAIL SECTIONS TO AT LEAST TWO POSTS BUT PREFERABLY THREE OR MORE. PROVIDE RAILING SYSTEM THAT IS CONTINUOUS FROM END TO END. POSITION HORIZONTAL RAIL SPLICES TO ALIGN VERTICALLY FOR EACH RAIL SECTION. SUBMIT ALTERNATE RAIL SLICE DETAILS ON THE SHOP DRAWINGS.
14. CAP OPEN ENDS OF TUBULAR STEEL SECTIONS.
15. SECURE WELDED WIRE FABRIC TO POSTS AND RAILS WITH 3/8"Ø x 1 1/2" TAP-FLEX STRUCTURAL THREAD FORMING SCREWS. SPACE SCREWS AT 12" MAXIMUM CENTERS ON POSTS AND 24" MAXIMUM CENTERS ON RAILS. PROVIDED 3/16" x 3/4" x 1 3/4" STAINLESS STEEL PLATE WASHER OR HOT DIPPED GALVANIZED STEEL PLATE WASHER AT EACH SCREW. SPLICE WELDED WIRE FABRIC ONLY BEHIND POSTS. FABRICATE WELDED WIRE FABRIC WITH BOTTOM WIRE CONTINUOUS AND PARALLEL TO THE RAIL WITH 2" MAXIMUM CLEAR TO THE TOP OF THE PARAPET. SUBMIT ALTERNATE FASTENING METHODS FOR APPROVAL ON THE SHOP DRAWINGS.

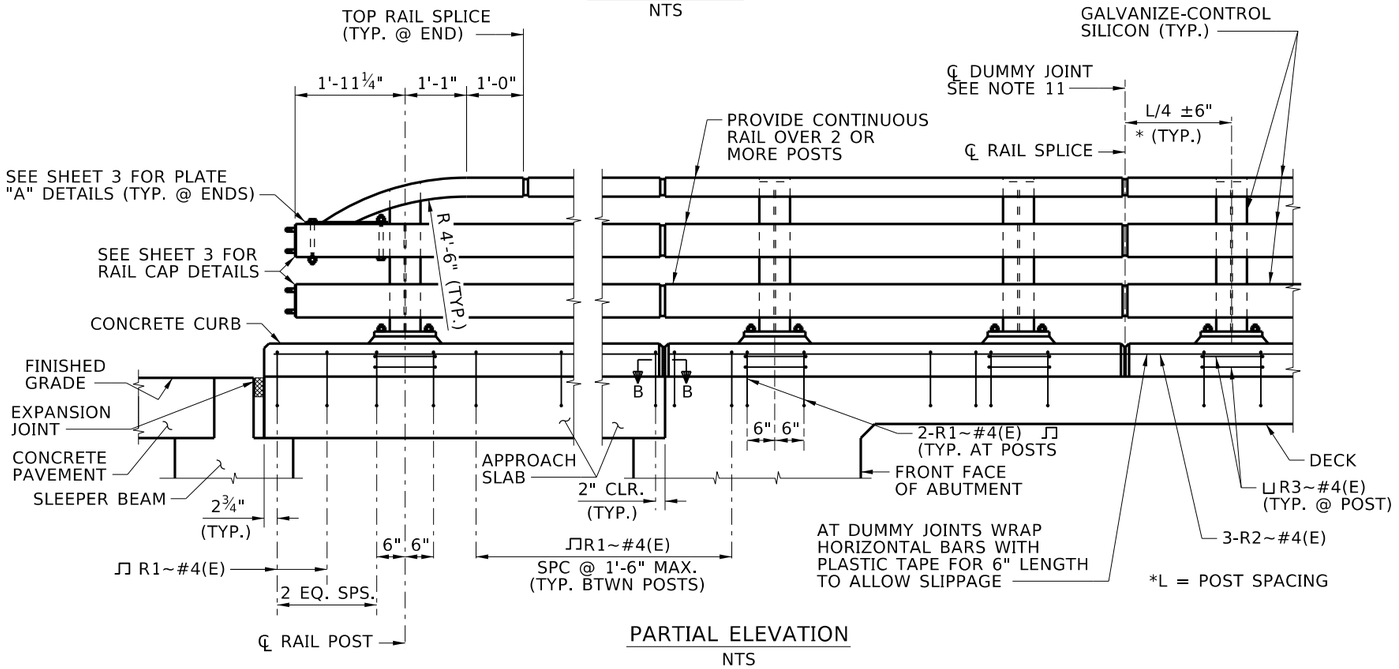
MISCELLANEOUS

16. REFER TO CONCRETE PARAPET SHEET FOR PARAPET DETAILS.
17. PAYMENT FOR "PROTECTIVE FENCE FOR 42" CONCRETE PARAPET" IS PAY ITEM 504-055A.

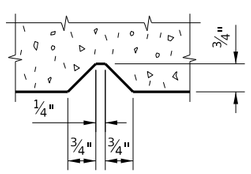
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PROTECTIVE FENCE FOR 42" CONCRETE PARAPET	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME Standards/Bridge Standard Drawings/B13_1D.dgn	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	42" SINGLE SLOPE CONCRETE PARAPET BRIDGE LRFD DESIGN MANUAL, B13.1D	BRIDGE KEY NO.	
				DETAILED					COUNTY	KEY NO.
				DWG. CHECKED					BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:				



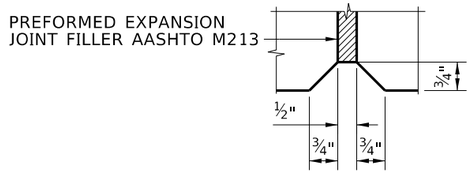
PARTIAL PLAN
NTS



PARTIAL ELEVATION
NTS



SECTION A-A ~ DUMMY JOINT
(TYP. @ BOTH SIDES AND TOP OF CURB)
3"=1'-0"



SECTION B-B
(TYP. @ BOTH SIDES AND TOP OF CURB)
3"=1'-0"

NOTES

MATERIALS

1. PROVIDE STRUCTURAL STEEL TUBING IN ACCORDANCE WITH ASTM A500 GRADE B, OR ASTM A501 STEEL.
2. PROVIDE STRUCTURAL STEEL POSTS, RAIL SPLICES, AND BASE PLATES IN ACCORDANCE WITH ASTM A709 GRADE 50.
3. PROVIDE ANCHOR BOLTS, NUTS, AND WASHERS IN ACCORDANCE WITH ASTM F1554 GRADE 105. PROVIDE H.S. BOLTS IN ACCORDANCE WITH ASTM F3125 GRADE A325.
4. PROVIDE CLASS 40AF CONCRETE.
5. PROVIDE EPOXY-COATED GRADE 60 TYPE S REINFORCEMENT IN ACCORDANCE WITH 708.02.
6. PROVIDE TYPE B CLASS 1 GROUT IN ACCORDANCE WITH 705.02.

GALVANIZING

7. GALVANIZE STRUCTURAL STEEL PARTS, RAILING, AND SLEEVES AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 AND ASTM A153. THOROUGHLY CLEAN WELDED AREAS BEFORE GALVANIZING TO REMOVE SLAG OR OTHER MATERIAL THAT WOULD INTERFERE WITH THE ADHERENCE OF THE ZINC. PROVIDE GALVANIZED SURFACES FREE OF FINS, ABRASIONS, ROUGH OR SHARP EDGES, OR OTHER SURFACE DEFECTS. REPAIR DAMAGED COATINGS IN ACCORDANCE WITH ASTM A780 AND ASTM A123.
8. GALVANIZE-CONTROL SILICON MEANS SILICON CONTENT OF THE BASE METAL WILL BE IN THE RANGE OF 0% TO 0.06% (PREFERABLY 0% TO 0.04%) OR 0.15% TO 0.28% (PREFERABLY 0.15% TO 0.25%)

FABRICATION AND ERECTION

9. FABRICATE AND ERECT THE RAILING IN ACCORDANCE WITH THE CURRENT EDITION OF AASHTO SPECIFICATIONS FOR HIGHWAY BRIDGES AND ITD STANDARD SPECIFICATIONS.
10. CONSTRUCT RAILING WITH TOP OF POST 3'-6" ABOVE FINISHED GRADE. ADJUST HEIGHT OF CURB TO COMPENSATE FOR THE CAMBER AND LOAD DEFLECTION OF THE SUPERSTRUCTURE. CALCULATE THE AMOUNT OF ADJUSTMENT FOR APPROVAL.
11. SPACE CURB DUMMY JOINTS AT RAIL SPLICE LOCATIONS, EXPANSION JOINTS, AND AT THE ABUTMENT/APPROACH SLAB NOTCH ON INTEGRAL ABUTMENTS. SPACE INTERMEDIATE CURB DUMMY JOINTS UNIFORMLY THE LENGTH OF THE BRIDGE WITH SPACING NOT LESS THAT 6'-0" NOR GREATER THAN 12'-0".
12. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 504.01 F AND 105.02.
13. CONSTRUCT RAILING CONFORMING TO THE HORIZONTAL AND VERTICAL ALIGNMENT OF THE STRUCTURE. INSTALL POSTS NORMAL TO GRADE IN THE LONGITUDINAL DIRECTION AND VERTICAL IN THE TRANSVERSE DIRECTION.
14. SAW OR MILL BASE PLATES AND END TUBE SECTIONS AT SPLICES. PROVIDE CUT ENDS THAT ARE TRUE, SMOOTH AND FREE FROM BURRS OR RAGGED EDGES.
15. PROVIDE VENT HOLES FOR GALVANIZING AS REQUIRED AND SHOW ON THE SHOP DRAWINGS. DRILL VENT HOLES AWAY FROM TRAFFIC FACE AND NOT ON THE TOP SURFACE OF THE HORIZONTAL TUBES.
16. PROVIDE EXPANSION JOINT OR SPLICE JOINT IN RAIL AS REQUIRED.
17. ROUND OR CHAMFER EXPOSED EDGES OF STEEL COMPONENTS 1/16" BY GRINDING BEFORE GALVANIZING.

METHOD OF MEASUREMENT

18. PAYMENT FOR "3-TUBE CURB MOUNT RAIL" IS PAY ITEM 504-050A. THE COST OF CONCRETE AND EPOXY-COATED REINFORCEMENT IS INCIDENTAL TO PAY ITEM 504-050A.

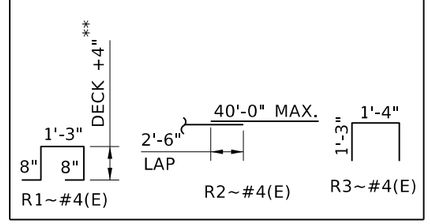
NOTE TO DESIGNER

ADJUST CONCRETE AND REINFORCEMENT QUANTITIES IF A WEARING SURFACE IS APPLIED DURING INITIAL BRIDGE CONSTRUCTION. INCREASE HEIGHT OF CURB TO MATCH OVERLAY THICKNESS AT INITIAL CONSTRUCTION.

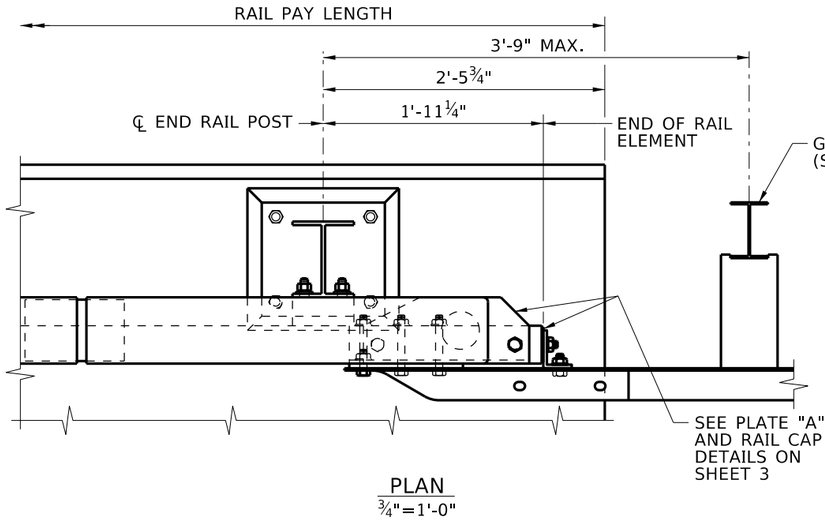
**APPROXIMATE QUANTITIES (10' POSTS SPACING)

CONCRETE	0.92 CF/LF
STRUCTURAL STEEL	66 LB/LF
EPOXY REINFORCEMENT	5 LB/LF

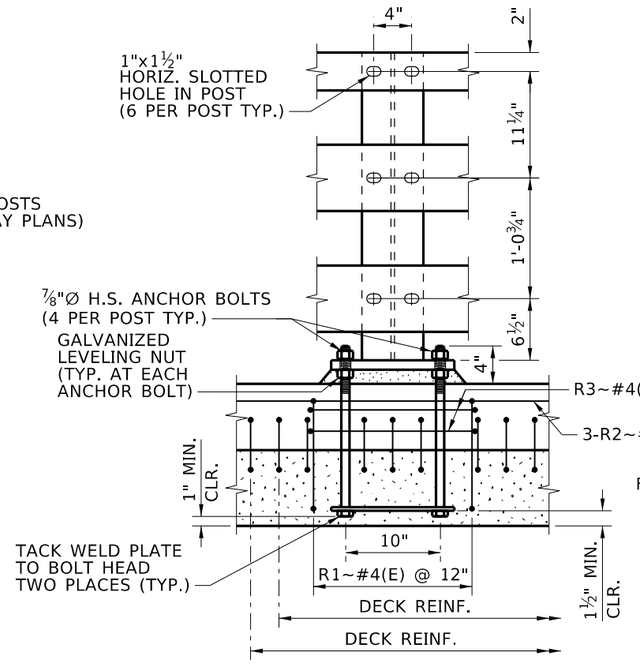
EPOXY-COATED REINFORCEMENT

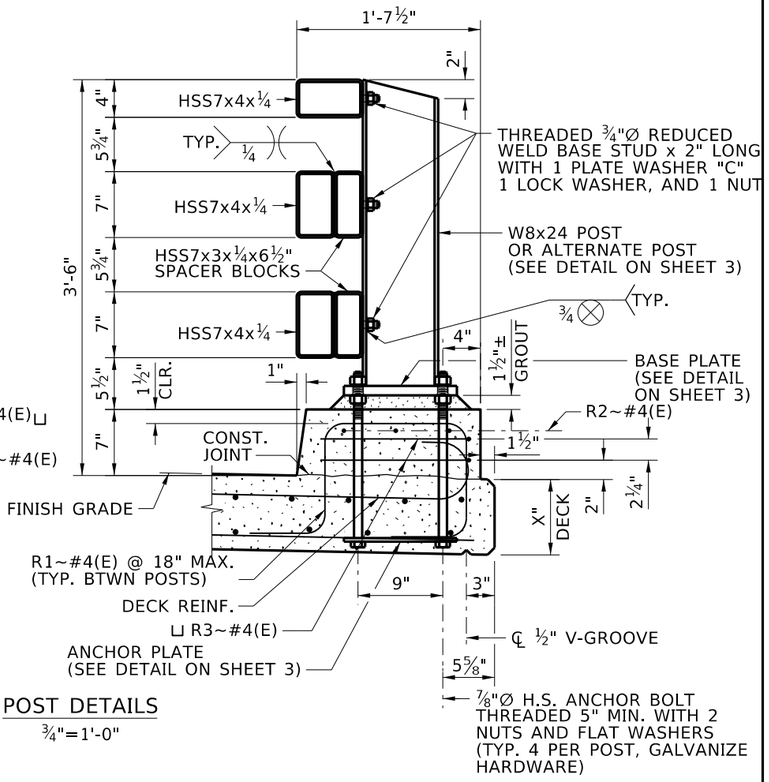


REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	3-TUBE CURB MOUNT RAIL - SHT. 1 OF 3	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	WITHOUT END WALL WITH APPROACH SLAB @ INTEGRAL ABUTMENT BRIDGE LRFD DESIGN MANUAL B13.2A	BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/B13_2A.dgn	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024				BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

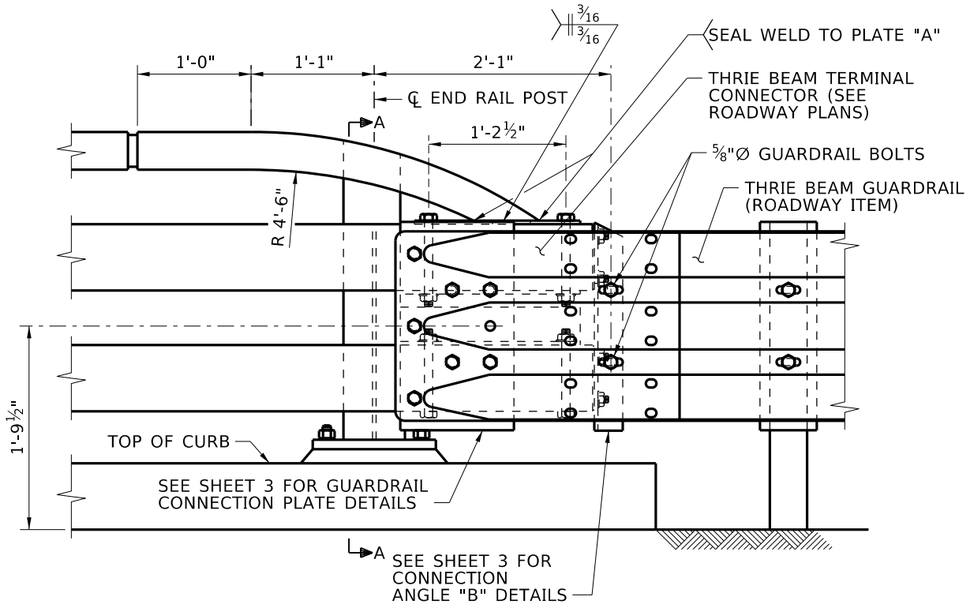


PLAN
¾"=1'-0"

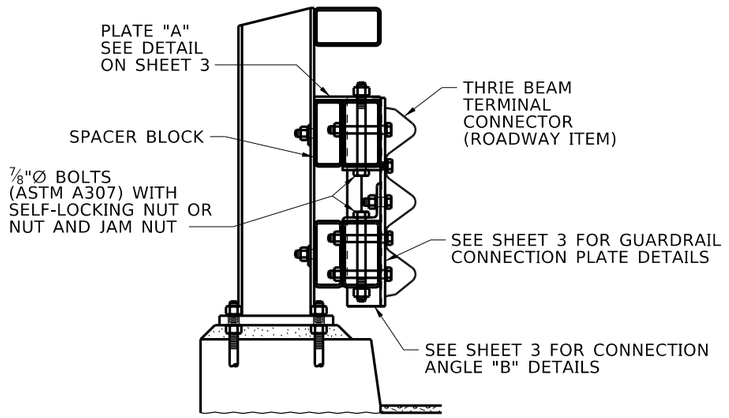




POST DETAILS
¾"=1'-0"



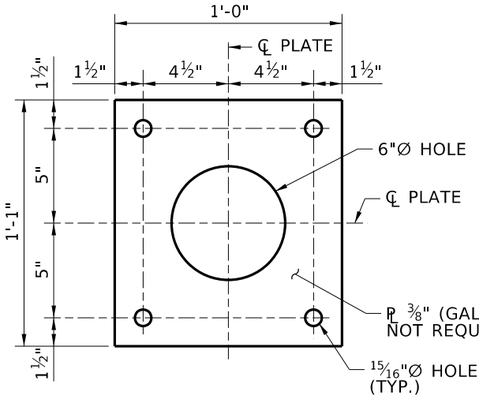
ELEVATION
¾"=1'-0"



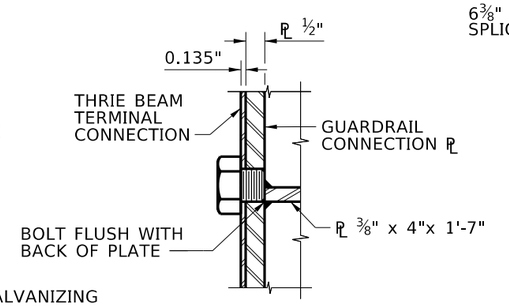
SECTION A-A
¾"=1'-0"

TRANSITION CONNECTION

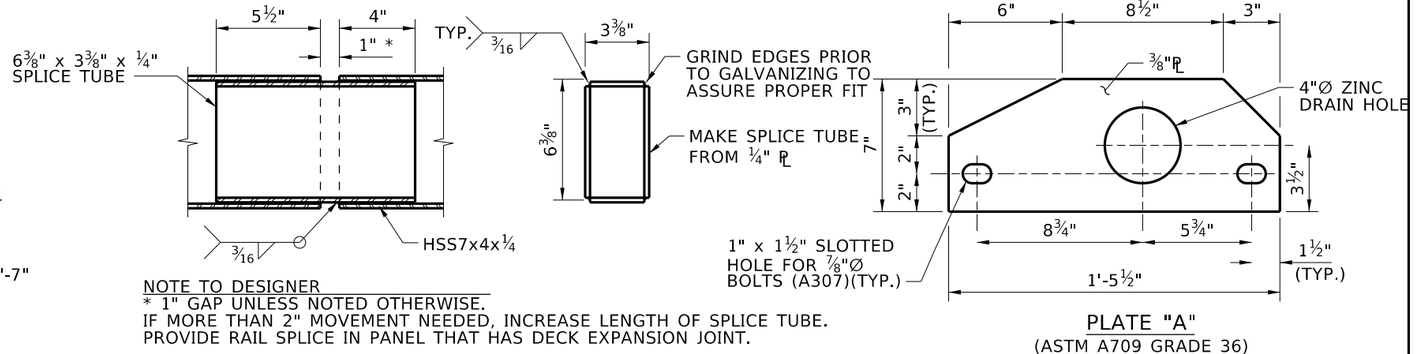
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	3-TUBE CURB MOUNT RAIL - SHT. 2 OF 3	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED					BRIDGE KEY NO.	
				DETAILED	CADD FILE NAME Standards/Bridge Standard Drawings/ B13_2B.dgn	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	WITHOUT END WALL WITH OR WITHOUT APPROACH SLAB BRIDGE LRFD DESIGN MANUAL B13.2B	COUNTY	KEY NO.
				DWG. CHECKED					BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:				



ANCHOR PLATE DETAIL
(ASTM A709 GRADE 36)
1½"=1'-0"



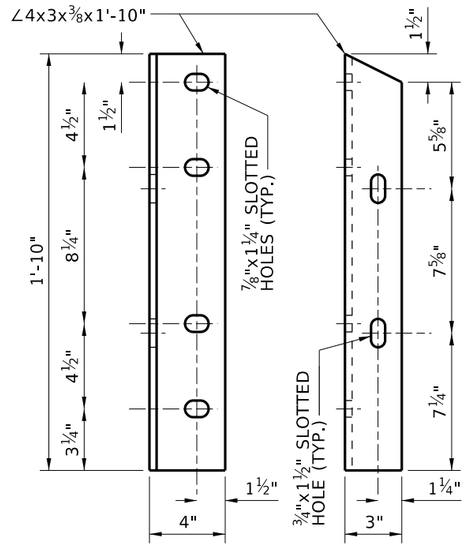
DETAIL 1
3"=1'-0"



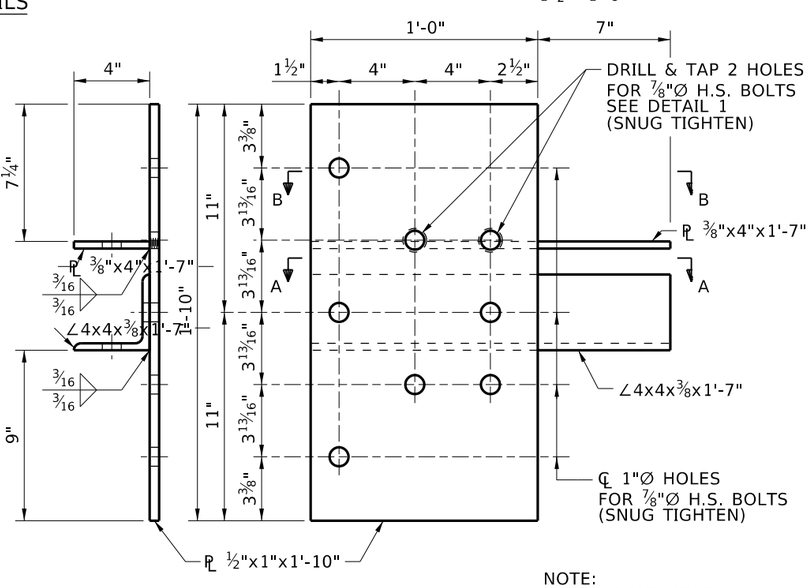
NOTE TO DESIGNER
* 1" GAP UNLESS NOTED OTHERWISE.
IF MORE THAN 2" MOVEMENT NEEDED, INCREASE LENGTH OF SPLICE TUBE.
PROVIDE RAIL SPLICE IN PANEL THAT HAS DECK EXPANSION JOINT.

PLATE "A"
(ASTM A709 GRADE 36)
1½"=1'-0"

RAIL SPLICE DETAILS
1½"=1'-0"

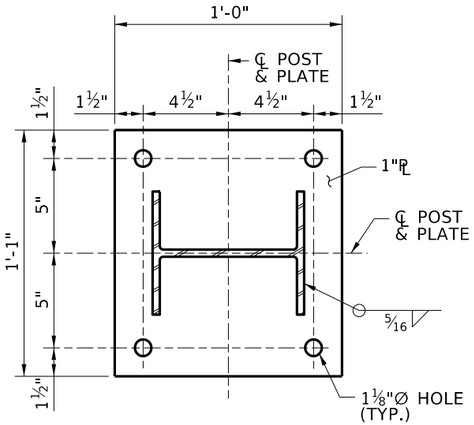


CONNECTION ANGLE "B"
(ASTM A709 GRADE 36)
1½"=1'-0"



GUARDRAIL CONNECTION PLATE
(ASTM A709 GRADE 36)
1½"=1'-0"

NOTE:
VERIFY BOLT HOLE LOCATIONS MATCH THRIE BEAM TERMINAL CONNECTOR



BASE PLATE DETAIL
1½"=1'-0"

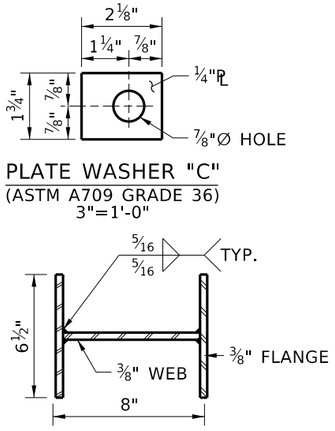
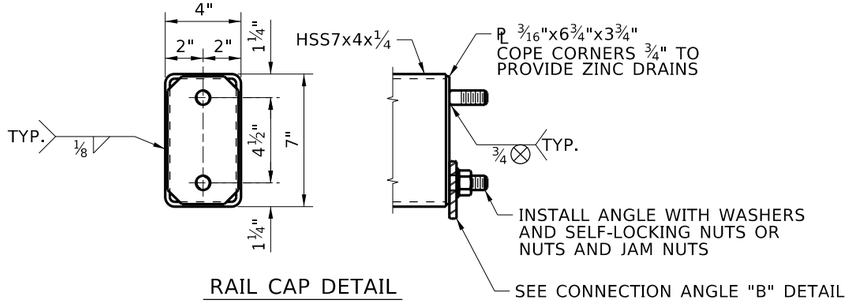
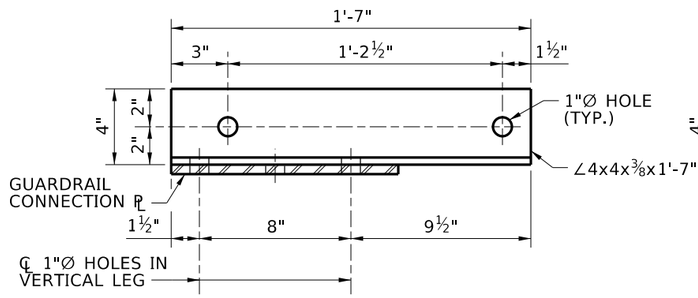


PLATE WASHER "C"
(ASTM A709 GRADE 36)
3"=1'-0"

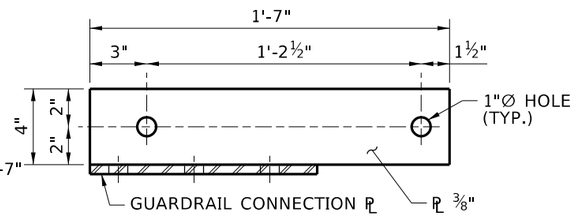
ALTERNATE POST
1½"=1'-0"



RAIL CAP DETAIL
1½"=1'-0"

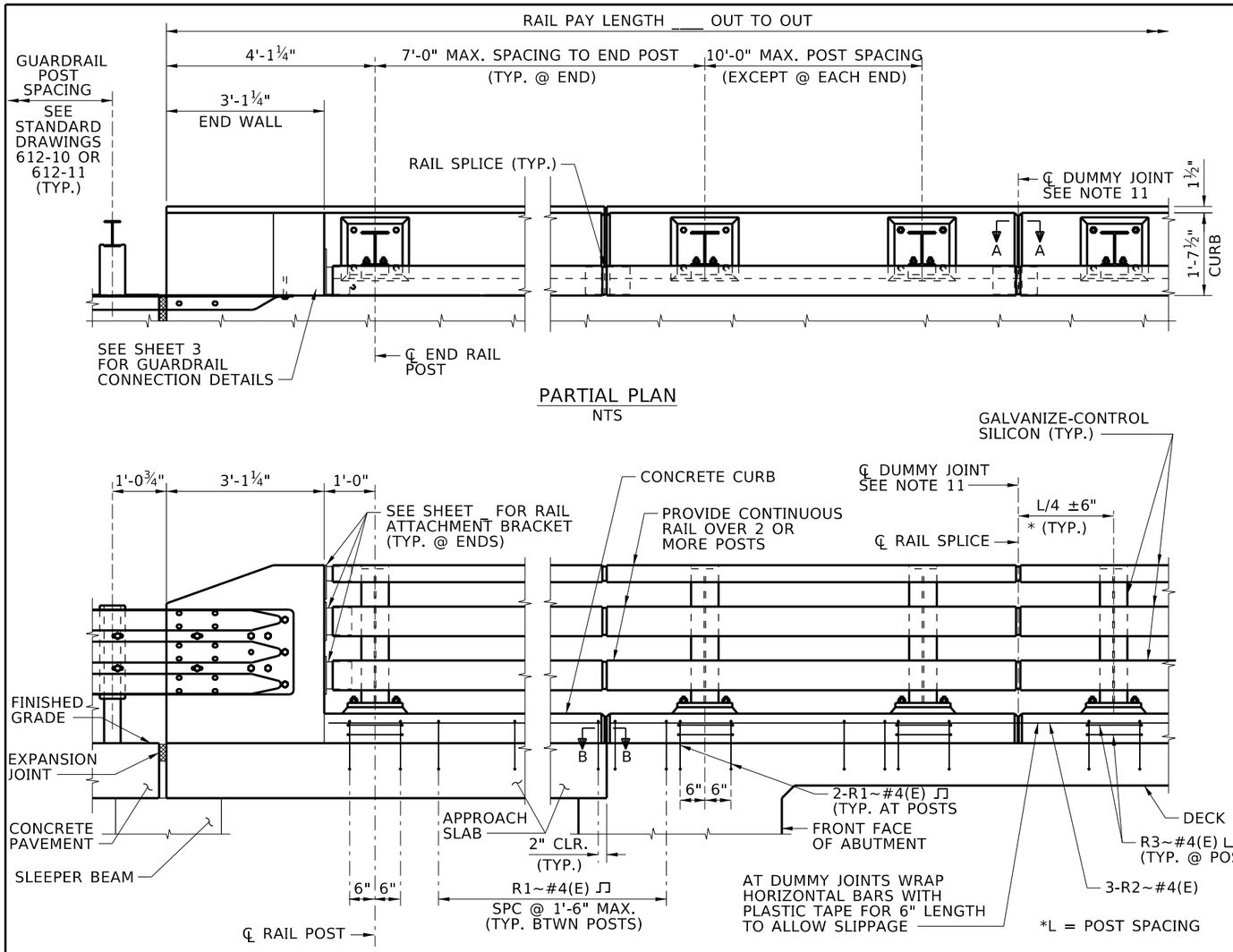


SECTION A-A
1½"=1'-0"



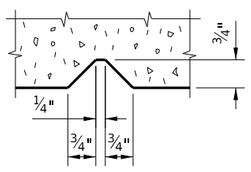
SECTION B-B
1½"=1'-0"

REVISIONS				DESIGNED	1½"=1'-0"	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	3-TUBE CURB MOUNT RAIL - SHEET 3 OF 3	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	WITHOUT END WALL WITH OR WITHOUT APPROACH SLAB BRIDGE LRFD DESIGN MANUAL, B13.2C	BRIDGE KEY NO.
				DETAILED	CADD FILE NAME				COUNTY / KEY NO.
				DWG. CHECKED	Standards/Bridge Standard Drawings/B13_2C.dgn	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS	DRAWING DATE: DEC 2024				

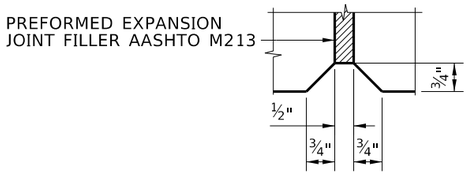


PARTIAL PLAN
NTS

PARTIAL ELEVATION
NTS



SECTION A-A ~ DUMMY JOINT
(TYP. @ BOTH SIDES AND TOP OF CURB)
3"=1'-0"



SECTION B-B
(TYP. @ BOTH SIDES AND TOP OF CURB)
3"=1'-0"

NOTES

MATERIALS

1. PROVIDE STRUCTURAL STEEL TUBING IN ACCORDANCE WITH ASTM A500 GRADE B OR ASTM A501 STEEL.
2. PROVIDE STRUCTURAL STEEL POSTS, RAIL SPLICES, AND BASE PLATES IN ACCORDANCE WITH ASTM A709 GRADE 50.
3. PROVIDE ANCHOR BOLTS, NUTS, AND WASHERS IN ACCORDANCE WITH ASTM F1554 GRADE 105. PROVIDE H.S. BOLTS IN ACCORDANCE WITH ASTM F3125 GRADE A325.
4. PROVIDE CLASS 40AF CONCRETE.
5. PROVIDE EPOXY-COATED GRADE 60 TYPE S REINFORCEMENT IN ACCORDANCE WITH 708.02.
6. PROVIDE TYPE B CLASS 1 GROUT IN ACCORDANCE WITH 705.02.

GALVANIZING

7. GALVANIZE STRUCTURAL STEEL PARTS, RAILING, AND SLEEVES AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 AND ASTM A153. THOROUGHLY CLEAN WELDED AREAS BEFORE GALVANIZING TO REMOVE SLAG OR OTHER MATERIAL THAT WOULD INTERFERE WITH THE ADHERENCE OF THE ZINC. PROVIDE GALVANIZED SURFACES FREE OF FINS, ABRASIONS, ROUGH OR SHARP EDGES, OR OTHER SURFACE DEFECTS. REPAIR DAMAGED COATINGS IN ACCORDANCE WITH ASTM A780 AND ASTM A123.
8. GALVANIZE-CONTROL SILICON MEANS SILICON CONTENT OF THE BASE METAL WILL BE IN THE RANGE OF 0% TO 0.06% (PREFERABLY 0% TO 0.04%) OR 0.15% TO 0.28% (PREFERABLY 0.15% TO 0.25%)

FABRICATION AND ERECTION

9. FABRICATE AND ERECT THE RAILING IN ACCORDANCE WITH THE CURRENT EDITION OF AASHTO SPECIFICATIONS FOR HIGHWAY BRIDGES AND ITD STANDARD SPECIFICATIONS.
10. CONSTRUCT RAILING WITH TOP OF POST 3'-6" ABOVE FINISHED GRADE. ADJUST HEIGHT OF CURB TO COMPENSATE FOR THE CAMBER AND LOAD DEFLECTION OF THE SUPERSTRUCTURE. CALCULATE THE AMOUNT OF ADJUSTMENT FOR APPROVAL.
11. SPACE CURB DUMMY JOINTS AT RAIL SPLICE LOCATIONS, EXPANSION JOINTS, AND AT THE ABUTMENT/APPROACH SLAB NOTCH ON INTEGRAL ABUTMENTS. SPACE INTERMEDIATE CURB DUMMY JOINTS UNIFORMLY THE LENGTH OF THE BRIDGE WITH SPACING NOT LESS THAT 6'-0" NOR GREATER THAN 12'-0".
12. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 504.01 F AND 105.02.
13. CONSTRUCT RAILING CONFORMING TO THE HORIZONTAL AND VERTICAL ALIGNMENT OF THE STRUCTURE. INSTALL POSTS NORMAL TO GRADE IN THE LONGITUDINAL DIRECTION AND VERTICAL IN THE TRANSVERSE DIRECTION.
14. SAW OR MILL BASE PLATES AND END TUBE SECTIONS AT SPLICES. PROVIDE CUT ENDS THAT ARE TRUE, SMOOTH AND FREE FROM BURRS OR RAGGED EDGES.
15. PROVIDE VENT HOLES FOR GALVANIZING AS REQUIRED AND SHOW ON THE SHOP DRAWINGS. DRILL VENT HOLES AWAY FROM TRAFFIC FACE AND NOT ON THE TOP SURFACE OF THE HORIZONTAL TUBES.
16. PROVIDE EXPANSION JOINT OR SPLICE JOINT IN RAIL AS REQUIRED.
17. ROUND OR CHAMFER EXPOSED EDGES OF STEEL COMPONENTS 1/16" BY GRINDING BEFORE GALVANIZING.

METHOD OF MEASUREMENT

18. PAYMENT FOR "3-TUBE CURB MOUNT RAIL" IS PAY ITEM 504-050A. THE COST OF CONCRETE AND EPOXY-COATED REINFORCEMENT IS INCIDENTAL TO PAY ITEM 504-050A.

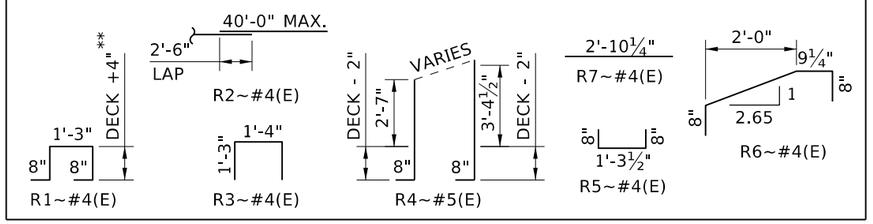
**APPROXIMATE QUANTITIES (10' POSTS SPACING)

CONCRETE	0.92 CF/LF
STRUCTURAL STEEL	66 LB/LF
EPOXY REINFORCEMENT	5 LB/LF

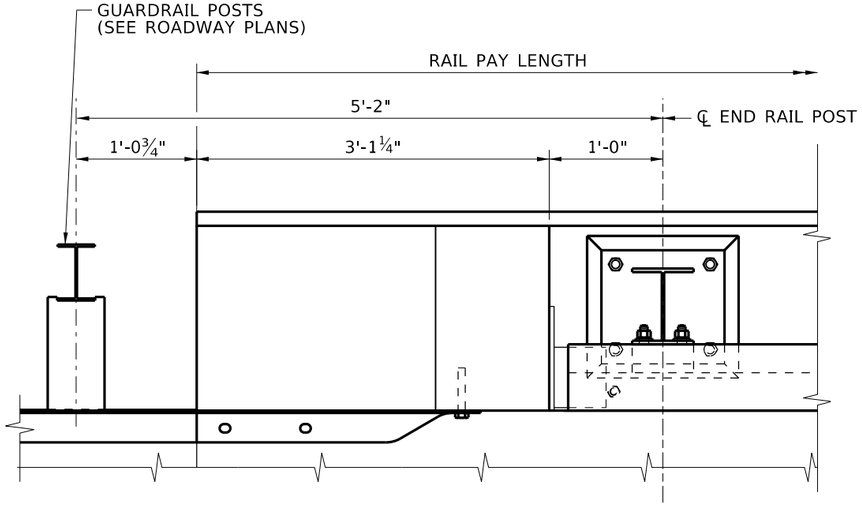
NOTE TO DESIGNER

ADJUST CONCRETE AND REINFORCEMENT QUANTITIES IF A WEARING SURFACE IS APPLIED DURING INITIAL BRIDGE CONSTRUCTION. INCREASE HEIGHT OF CURB TO MATCH OVERLAY THICKNESS AT INITIAL CONSTRUCTION.

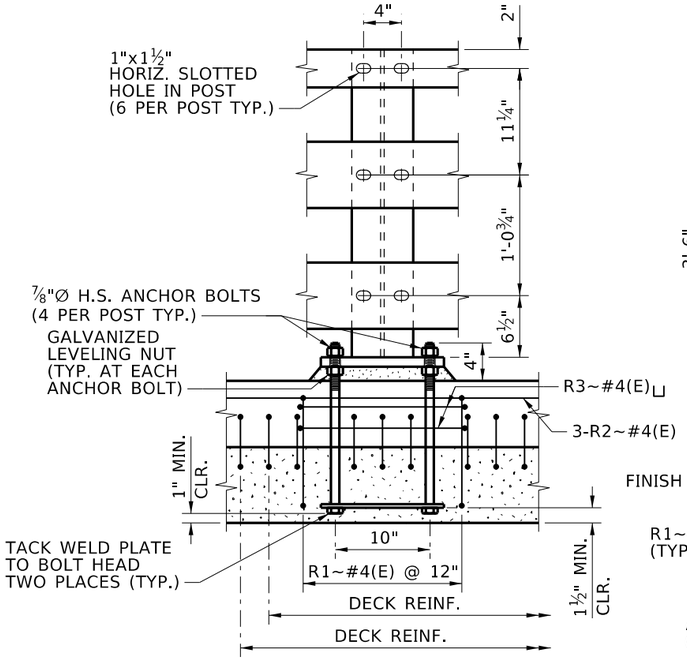
EPOXY-COATED REINFORCEMENT

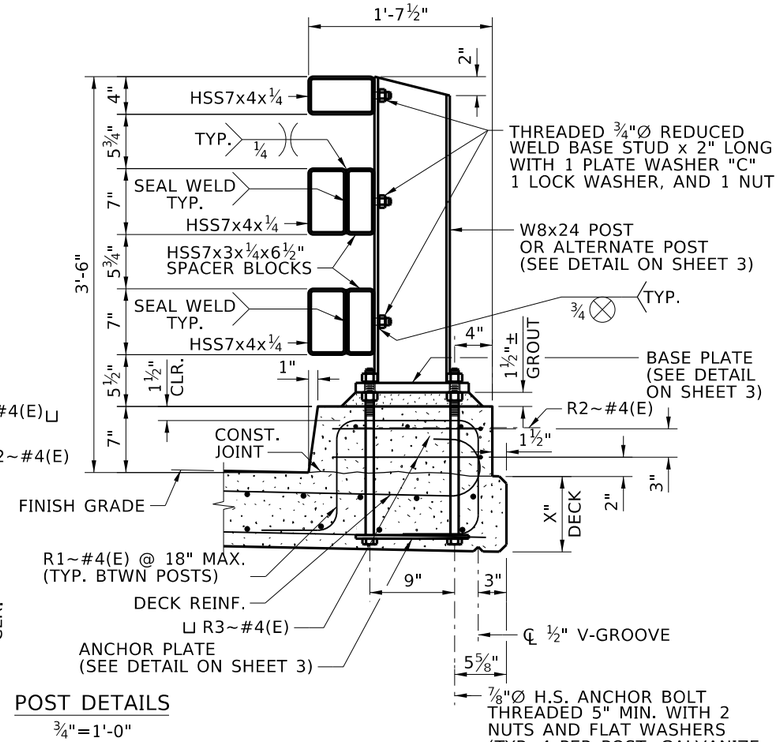


REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	3-TUBE CURB MOUNT RAIL - SHEET 1 OF 3	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	WITH END WALL WITH APPROACH SLAB @ INTEGRAL ABUTMENT BRIDGE LRFD DESIGN MANUAL, B13.2D	BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/B13_2D.dgn				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

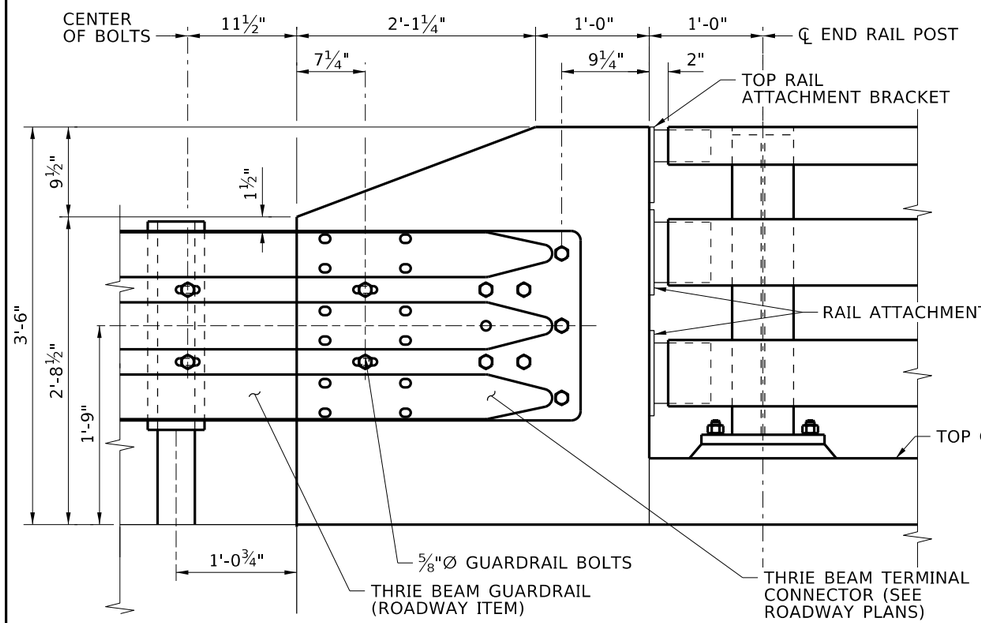


END WALL PLAN
¾"=1'-0"

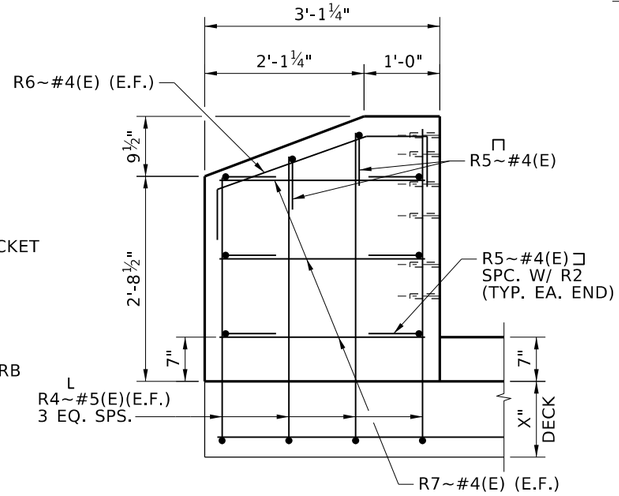




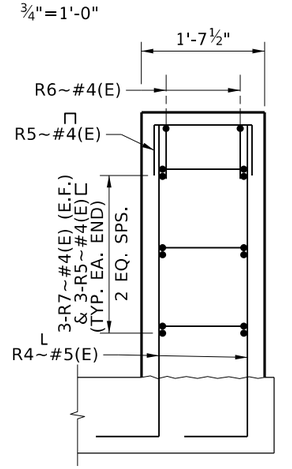
POST DETAILS
¾"=1'-0"



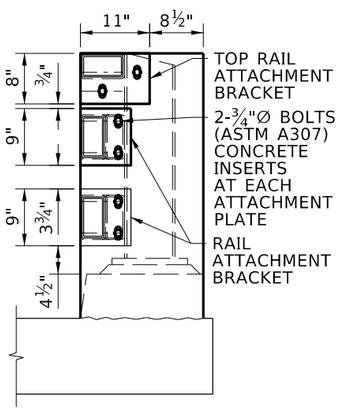
END WALL ELEVATION
¾"=1'-0"



END WALL ELEVATION
½"=1'-0"

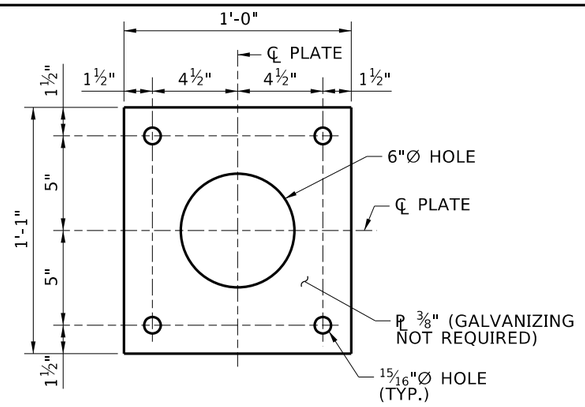


END WALL SECTION
½"=1'-0"



END VIEW
½"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	3-TUBE CURB MOUNT RAIL - SHEET 2 OF 3	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	WITH END WALL WITH OR WITHOUT APPROACH SLABS BRIDGE LRFD DESIGN MANUAL B13.2E	BRIDGE KEY NO.	
△				DETAILED	Standards\Bridge Standard Drawings\B13_2E.dgn				COUNTY	KEY NO.
△				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO.	SHEET OF
△				CORRECTIONS						
△										



ANCHOR PLATE DETAIL

(ASTM A709 GRADE 36)
1½"=1'-0"

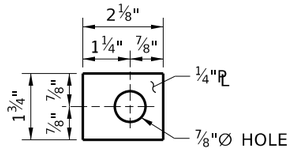
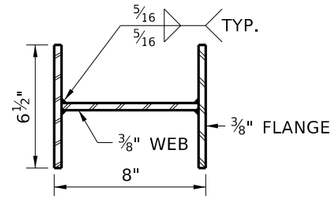


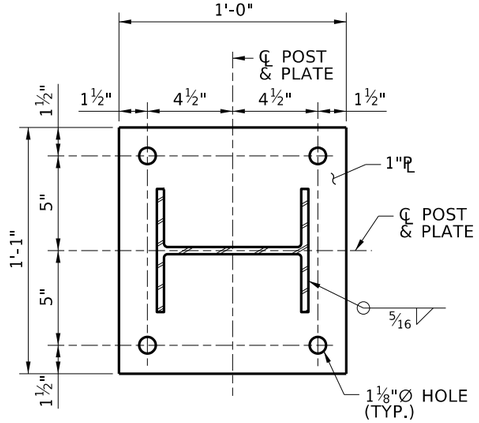
PLATE WASHER "C"

(ASTM A709 GRADE 36)
3"=1'-0"



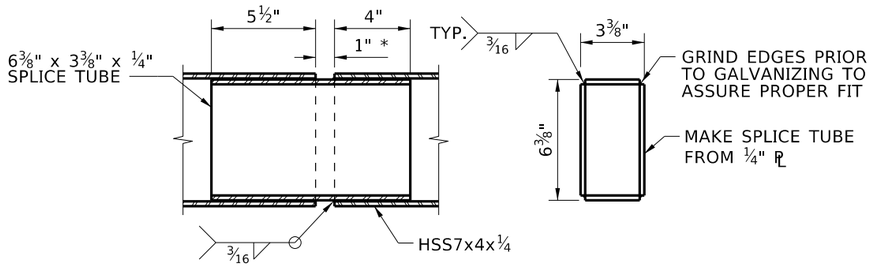
ALTERNATE POST

1½"=1'-0"



BASE PLATE DETAIL

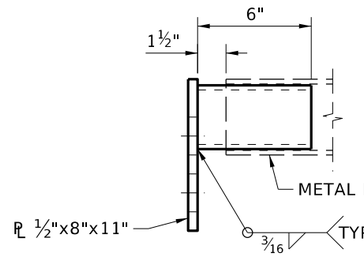
1½"=1'-0"

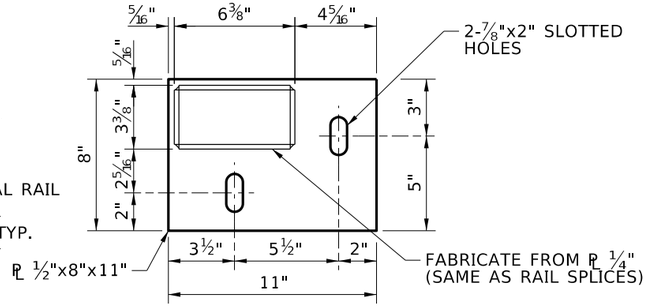


NOTE TO DESIGNER
* 1" GAP UNLESS NOTED OTHERWISE.
IF MORE THAN 2" MOVEMENT NEEDED, INCREASE LENGTH OF SPLICE TUBE.
PROVIDE RAIL SPLICE IN PANEL THAT HAS DECK EXPANSION JOINT.

RAIL SPLICE DETAILS

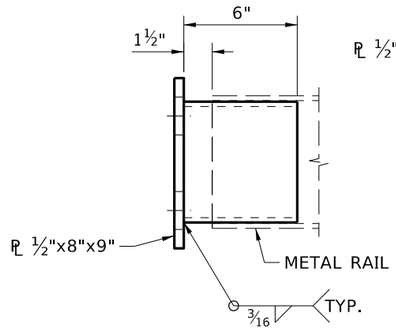
1½"=1'-0"

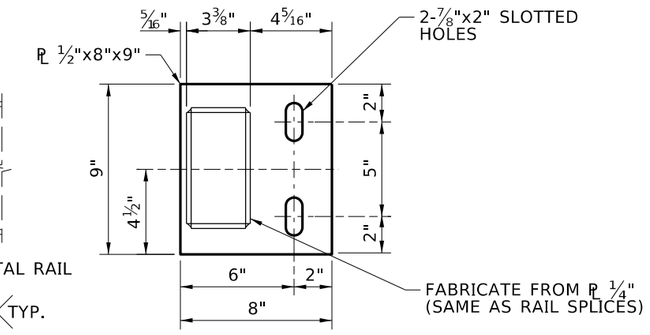




TOP RAIL ATTACHMENT BRACKET

(ASTM A709 GRADE 36)
1½"=1'-0"

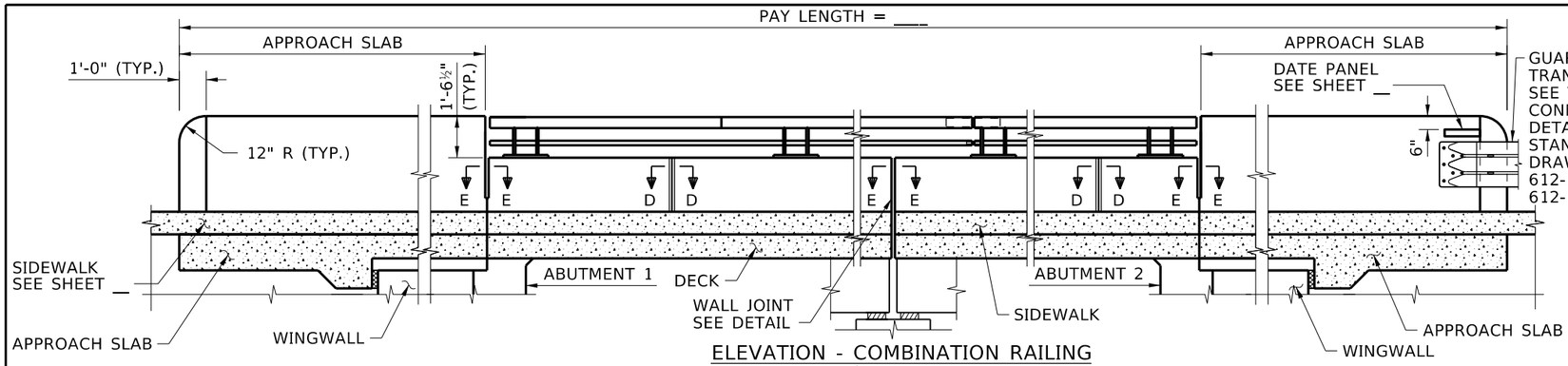




RAIL ATTACHMENT BRACKET

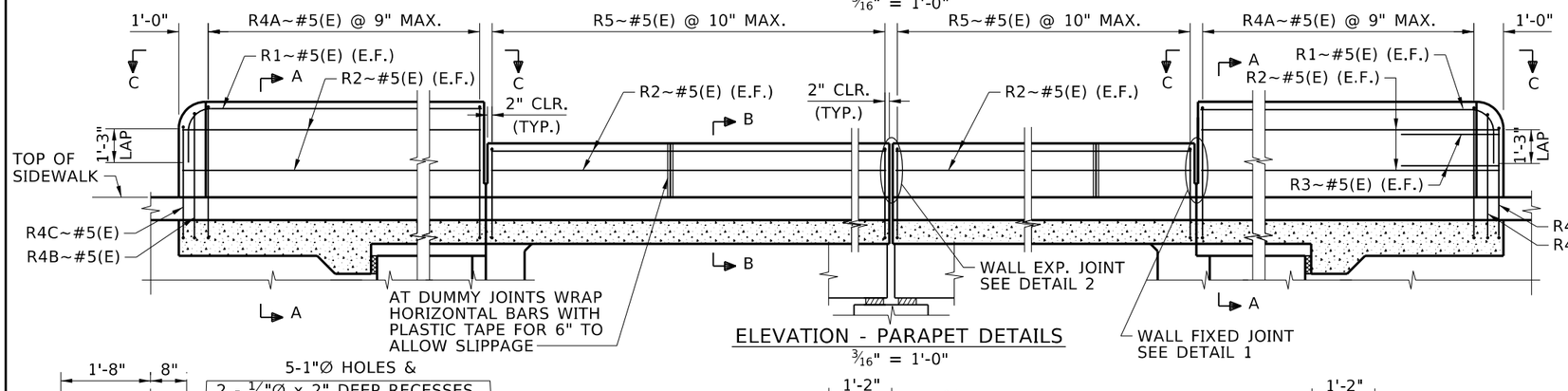
(ASTM A709 GRADE 36)
1½"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	3-TUBE CURB MOUNT RAIL - SHEET 3 OF 3	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED					BRIDGE KEY NO.	
				DETAILED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	WITH END WALL WITH OR WITHOUT APPROACH SLAB BRIDGE LRFD DESIGN MANUAL, B13.2F	COUNTY	KEY NO.
				DWG. CHECKED	Standards/Bridge Standard Drawings/B13_2F.dgn				BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:				



ELEVATION - COMBINATION RAILING

3/16" = 1'-0"



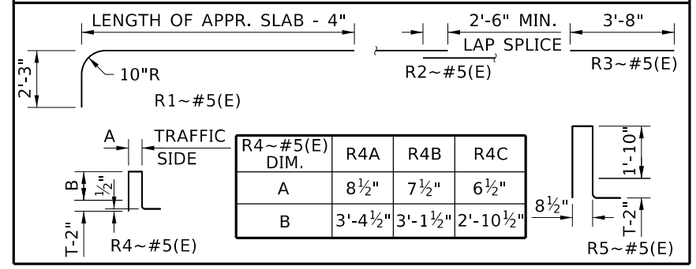
ELEVATION - PARAPET DETAILS

3/16" = 1'-0"

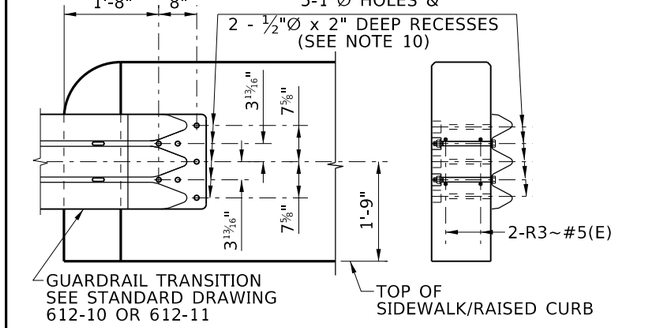
PARAPET NOTES

1. PROVIDE CLASS 40AF CONCRETE.
2. PROVIDE EPOXY-COATED GRADE 60 TYPE S REINFORCEMENT IN ACCORDANCE WITH 708.02.
3. PROVIDE A RUBBED SURFACE FINISH TO THE INSIDE (TRAFFIC) FACE IN ACCORDANCE WITH 502.03 PART I.
4. PROVIDE A TEXTURED SURFACE TO OUTSIDE FACE OF CONCRETE PARAPET. PROVIDE TEXTURED SURFACE IN ACCORDANCE WITH 575, USING PATTERN _____ WITH A MAX. DEPTH OF 1½".
5. CONSTRUCT PARAPET PLUMB, WITH STEEL POSTS SQUARE TO THE TOP OF PARAPET. PROVIDE TYPE B CLASS 1 GROUT IN ACCORDANCE WITH 705.02 UNDER POST BASE IF GAPS GREATER THAN 1/16" EXIST.
6. PLACE PARAPET IN THE SAME SEQUENCE AS THE DECK PLACEMENT. CONSTRUCT USING CAST-IN-PLACE METHOD.
7. WATER CURE THE CONCRETE SURFACE IN ACCORDANCE WITH 502.03 PART J.
8. ADJUST HEIGHT OF PARAPET TO COMPENSATE FOR THE CAMBER AND LOAD DEFLECTION OF THE SUPERSTRUCTURE. CALCULATE THE AMOUNT OF ADJUSTMENT FOR APPROVAL.
9. PROVIDE WALL JOINTS AT INTERIOR BENTS WITHOUT SLAB EXPANSION JOINTS. PROVIDE DUMMY JOINTS UNIFORMLY THE LENGTH OF THE BRIDGE SPACED AT NOT LESS THAN 6'-0" NOR GREATER THAN 12'-0".
10. FORM OR CORE HOLES AND RECESSES IN TERMINAL CONNECTION. PERCUSSION DRILLING IS NOT PERMITTED. ADJUST PLACEMENT OF REINFORCING TO AVOID BOLT HOLES AND RECESSES. PROVIDE BOLT RECESSES ONLY WHEN PEDESTRIAN SIDEWALKS ARE ADJACENT TO BACK OF RAIL. PROVIDE BOLTS OF SUFFICIENT LENGTH TO EXTEND ¾" BEYOND NUT.
11. PROVIDE TEXTURED SURFACE ONLY ON 1 SIDE. INCREASE 1'-2" PARAPET THICKNESS TO 1'-4" FOR TEXTURED SURFACE ON BOTH SIDES.
12. PROVIDE TEXTURED CONCRETE SURFACE IN ACCORDANCE WITH 575 WITH PATTERN XXXX.

EPOXY-COATED REINFORCEMENT



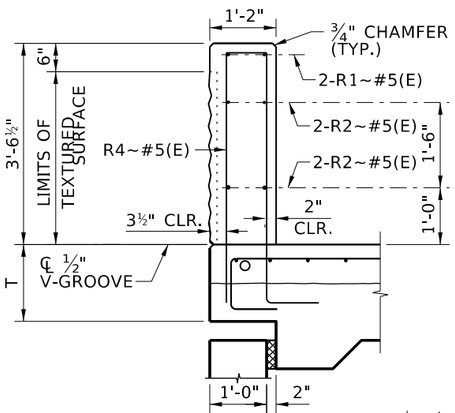
R4~#5(E) DIM.	R4A	R4B	R4C
A	8½"	7½"	6½"
B	3'-4½"	3'-1½"	2'-10½"



ELEVATION SECTION

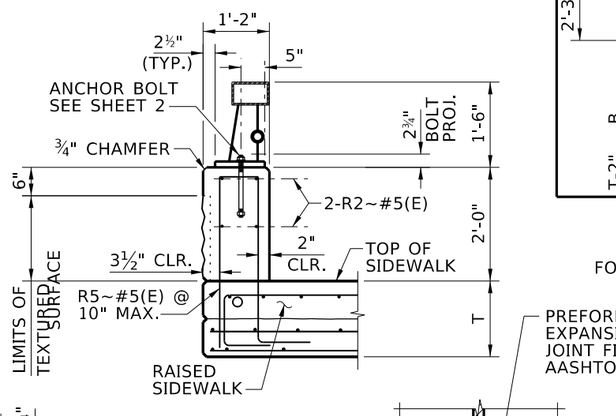
TERMINAL CONNECTION DETAILS

⅜"=1'-0"



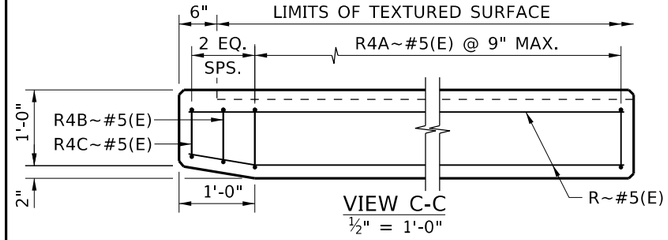
SECTION A-A

⅜"=1'-0"



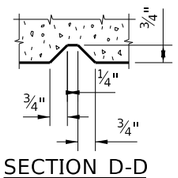
SECTION B-B

⅜"=1'-0"



VIEW C-C

½" = 1'-0"

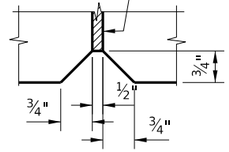


SECTION D-D

DUMMY JOINT

(TYP. @ BOTH SIDES OF WALL AND TOP OF SIDEWALK)

NTS

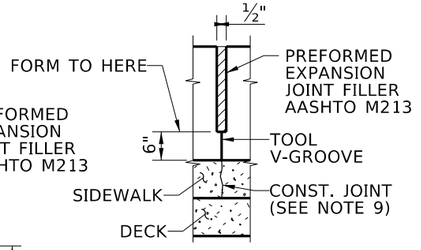


SECTION E-E

WALL JOINT

(TYP. @ BOTH SIDES OF WALL AND TOP OF SIDEWALK)

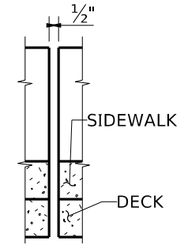
NTS



DETAIL 1

WALL JOINTS WITHOUT DECK EXPANSION JOINTS

NTS

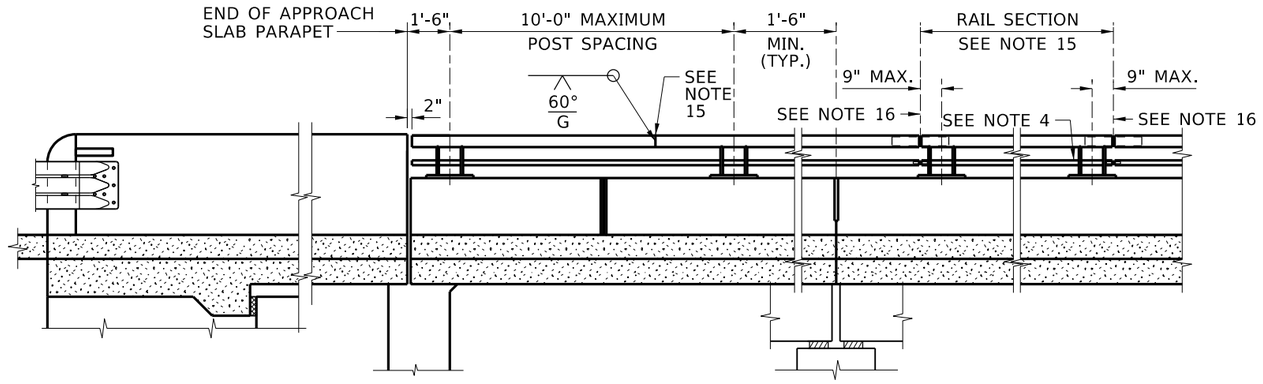


DETAIL 2

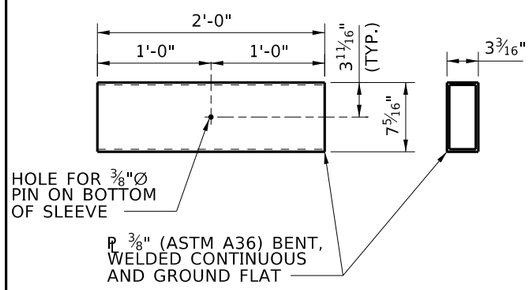
WALL JOINTS WITH DECK EXPANSION JOINTS

NTS

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	COMBINATION RAILING SHEET 1 OF 2	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	WITH APPROACH SLAB @ INTEGRAL ABUTMENT	BRIDGE KEY NO.
				DETAILED	Standrds/Bridge Standard Drawings/ B13_3A.dgn	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B13.3A	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024				BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



ELEVATION - METAL RAILING DETAILS
3/16"=1'-0"

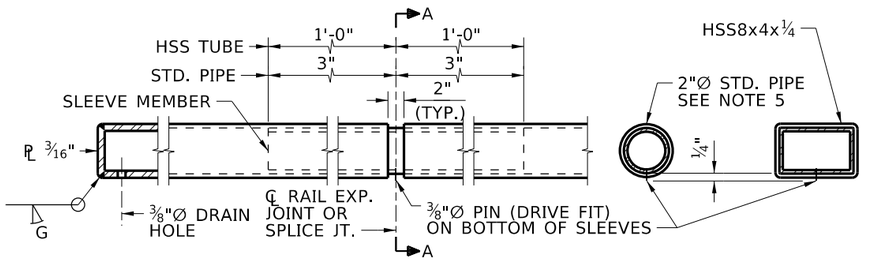


SECTION



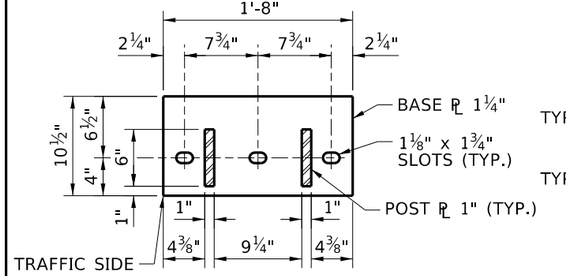
END VIEW

HSS TUBE SLEEVE MEMBER DETAIL
3/4"=1'-0"



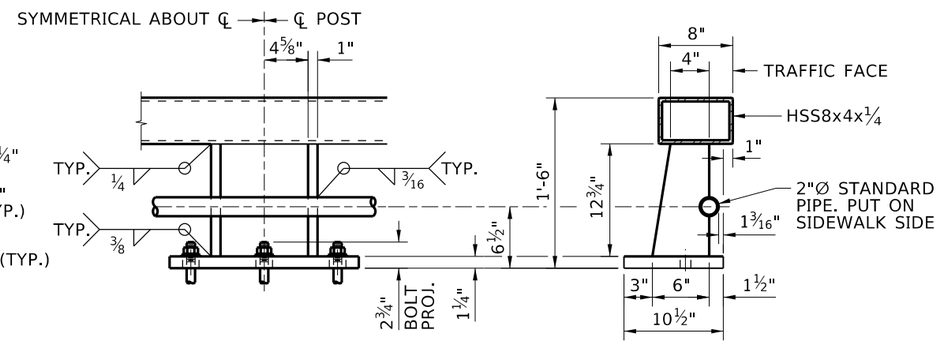
AT RAIL ENDS | AT SPLICE OR EXPANSION JOINTS | SECTION A-A STD. PIPE | SECTION A-A HSS TUBE

HSS TUBE FABRICATION DETAILS
3/4"=1'-0"



POST BASE PLATE
(WITHOUT PROTECTIVE FENCE)

SEE PROTECTIVE FENCE FOR COMB. RAIL FOR BASE PLATE DETAILS WITH PROTECTIVE FENCE



ELEVATION | SECTION THRU RAIL

HSS TUBE WITH RAIL POSTS & ANCHORAGE DETAILS
3/4"=1'-0"

RAILING NOTES

MATERIALS

1. PROVIDE STRUCTURAL STEEL TUBING IN ACCORDANCE WITH ASTM A500 GRADE B.
2. PROVIDE STRUCTURAL STEEL PLATES IN ACCORDANCE WITH ASTM A572 GRADE 50 OR A529, UNLESS NOTED OTHERWISE IN THE DETAILS.
3. PROVIDE ANCHOR BOLTS IN ACCORDANCE WITH ASTM F3125 GRADE A325 OR ASTM A449 OR THREADED RODS IN ACCORDANCE WITH ASTM 1554 GRADE 105. PROVIDE ONE TACK WELDED HEAVY HEX NUT AND ONE 2¼"Ø HARDENED STEEL WASHER AT EACH BOLT. PROVIDE HARDENED STEEL WASHER IN ACCORDANCE WITH ASTM F436. PROVIDE NUTS IN ACCORDANCE WITH ASTM A563.
4. PROVIDE 2"Ø STANDARD PIPE IN ACCORDANCE WITH ASTM A53 GRADE B, ASTM A1085, OR ASTM A500 GRADE B.
5. PROVIDE 1½"Ø STANDARD PIPE SLEEVE MEMBER IN ACCORDANCE WITH ASTM A53 GRADE B OR ASTM A50 GRADE B.

GALVANIZING/POWDER COATING

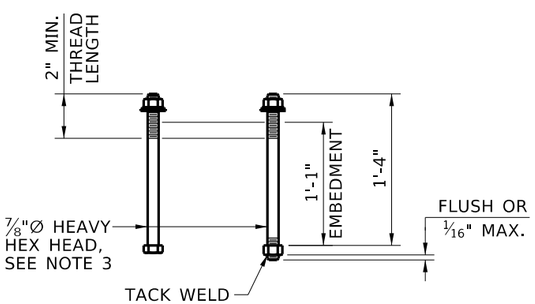
6. GALVANIZE STRUCTURAL STEEL PARTS, RAILING, AND SLEEVES AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 AND ASTM A153. THOROUGHLY CLEAN WELDED AREAS BEFORE GALVANIZING TO REMOVE SLAG OR OTHER MATERIAL THAT WOULD INTERFERE WITH THE ADHERENCE OF THE ZINC. PROVIDE GALVANIZED SURFACES FREE OF FINS, ABRASIONS, ROUGH OR SHARP EDGES, OR OTHER SURFACE DEFECTS. REPAIR DAMAGED COATINGS IN ACCORDANCE WITH ASTM 780 AND ASTM A123.
7. POWDER COAT THE RAILING SYSTEM AFTER GALVANIZING WITH A MINIMUM THICKNESS OF 3 MILS. PAINT WITH COLOR RAL 9005 (JET BLACK). SUBMIT A COLOR SAMPLE FOR APPROVAL.
8. PREPARE THE GALVANIZED SURFACE FOR POWDER COATING IN ACCORDANCE WITH ASTM D7803. SUBMIT POWDER COATING SHOP PROCEDURES FOR PREPARATION OF THE GALVANIZED SURFACES AND APPLICATION PROCESS OF THE POWDER COATING FOR APPROVAL.
9. REPAIR SCRATCHES, PITS, AND OTHER DEFECTS IN ACCORDANCE WITH THE POWDER COATING MANUFACTURER'S WRITTEN INSTRUCTIONS.

FABRICATION AND ERECTION

10. FABRICATE AND ERECT THE RAILING IN ACCORDANCE WITH THE CURRENT EDITION OF AASHTO SPECIFICATIONS FOR HIGHWAY BRIDGES AND ITD STANDARD SPECIFICATIONS.
11. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 504.01 F AND 105.02.
12. CONSTRUCT RAILING CONFORMING TO THE HORIZONTAL AND VERTICAL ALIGNMENT OF THE STRUCTURE, INSTALL POSTS NORMAL TO GRADE IN LONGITUDINAL DIRECTION AND VERTICAL IN TRANSVERSE DIRECTION.
13. SAW OR MILL ENDS OF TUBE SECTIONS AT SPLICES. PROVIDE CUT ENDS THAT ARE TRUE, SMOOTH, AND FREE FROM BURRS OR RAGGED EDGES.
14. PROVIDE VENT HOLES FOR GALVANIZING AS REQUIRED AND SHOWN ON THE SHOP DRAWINGS. DRILL VENT HOLES AWAY FROM TRAFFIC FACE AND NOT ON THE TOP SURFACE OF THE HORIZONTAL TUBES.
15. ATTACH RAIL SECTIONS TO AT LEAST TWO POSTS, BUT NOT MORE THAN FOUR. ONE SHOP SPLICE PER RAIL SECTION IS PERMITTED WITH MAXIMUM 85% PENETRATION. PROVIDE SQUARE GROOVE OR SINGLE V-GROOVE WELD AND GRIND SMOOTH.
16. PROVIDE EXPANSION JOINTS OR SPLICE JOINTS IN RAIL AS REQUIRED.
17. CAP OPEN ENDS OF TUBULAR STEEL SECTIONS.
18. ROUND OR CHAMFER EXPOSED EDGES OF STEEL COMPONENTS 1/16" BY GRINDING BEFORE GALVANIZING.

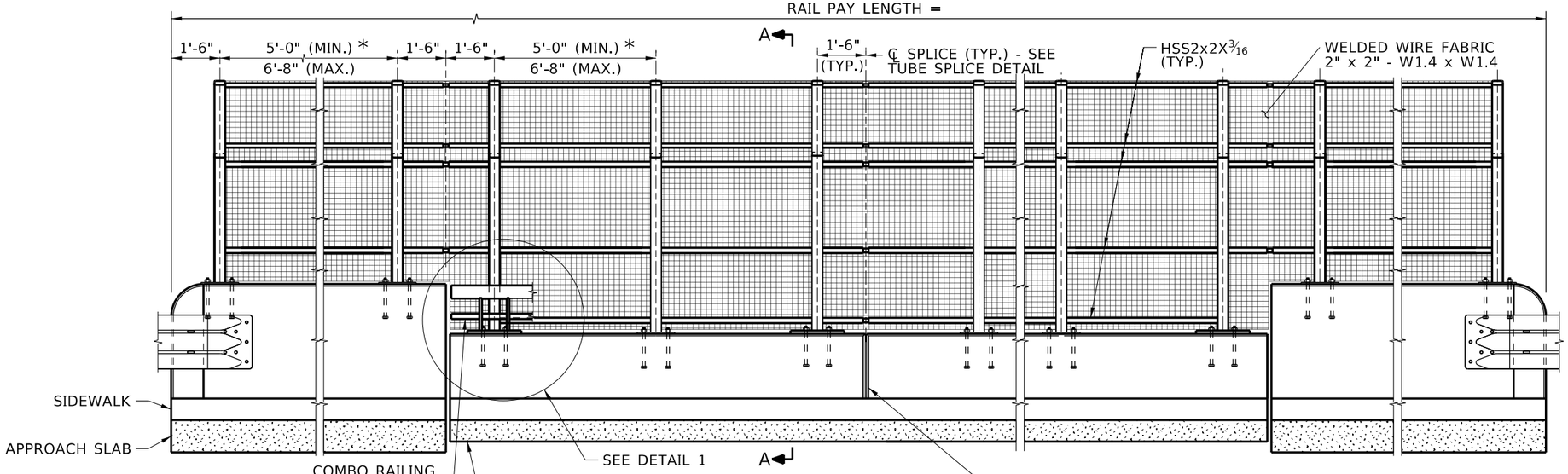
METHOD OF MEASUREMENT

19. PAYMENT FOR "COMBINATION RAILING" IS PAY ITEM 504-040A. CONCRETE AND EPOXY-COATED REINFORCEMENT IS INCIDENTAL TO PAY ITEM 504-040A.



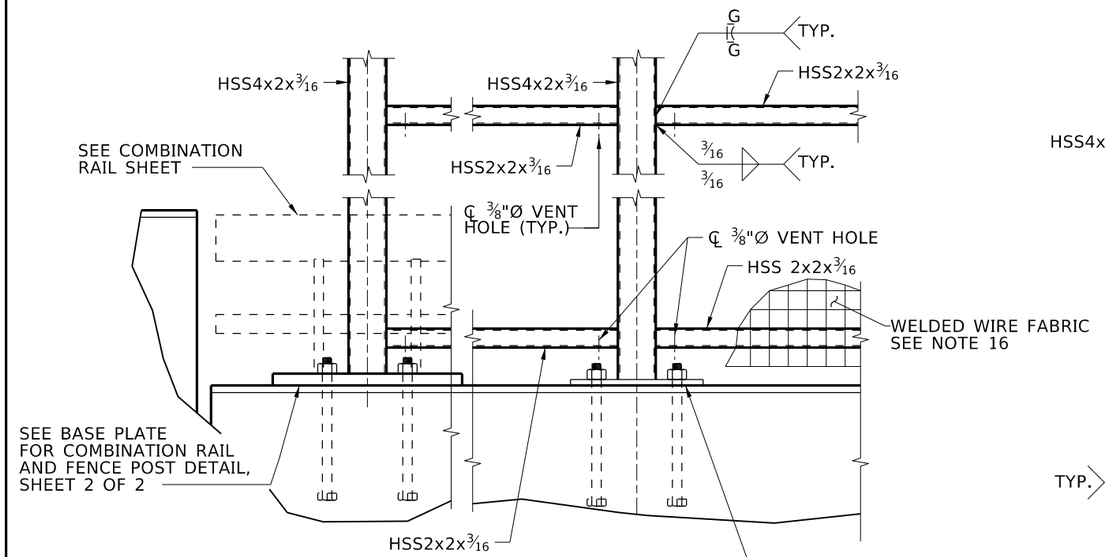
CAST-IN-PLACE ANCHOR BOLT
3/4" = 1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	COMBINATION RAILING SHEET 2 OF 2	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	WITH APPROACH SLAB BRIDGE LRFD DESIGN MANUAL, B13.3B	BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B13_3B.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: OCT 2023	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



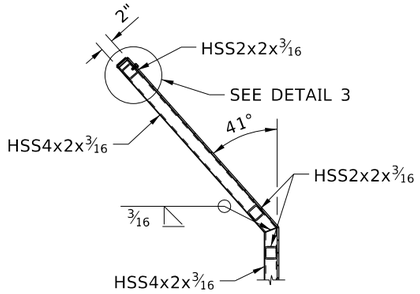
ELEVATION - TRAFFIC FACE

1/4"=1'-0"



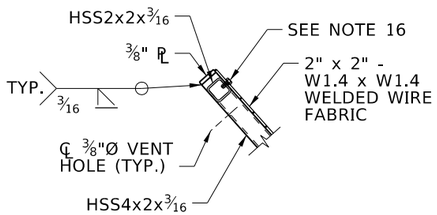
DETAIL 1

1 1/2"=1'-0"



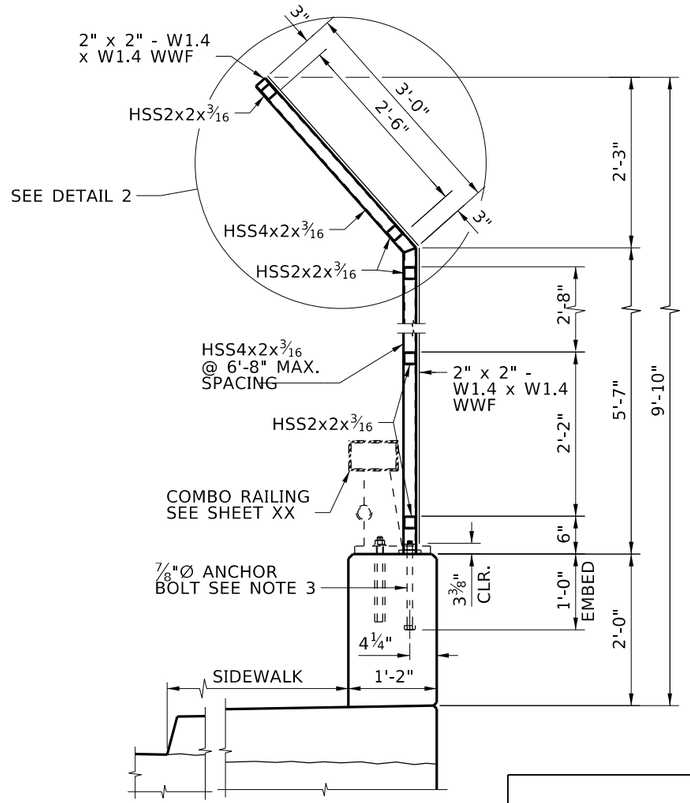
DETAIL 2

1/2"=1'-0"



DETAIL 3

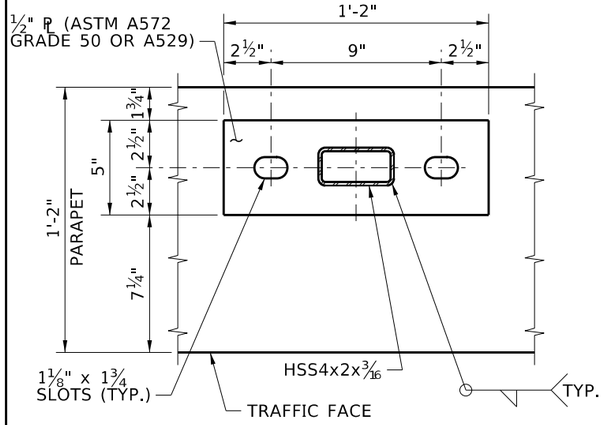
1 1/2"=1'-0"



SECTION A-A

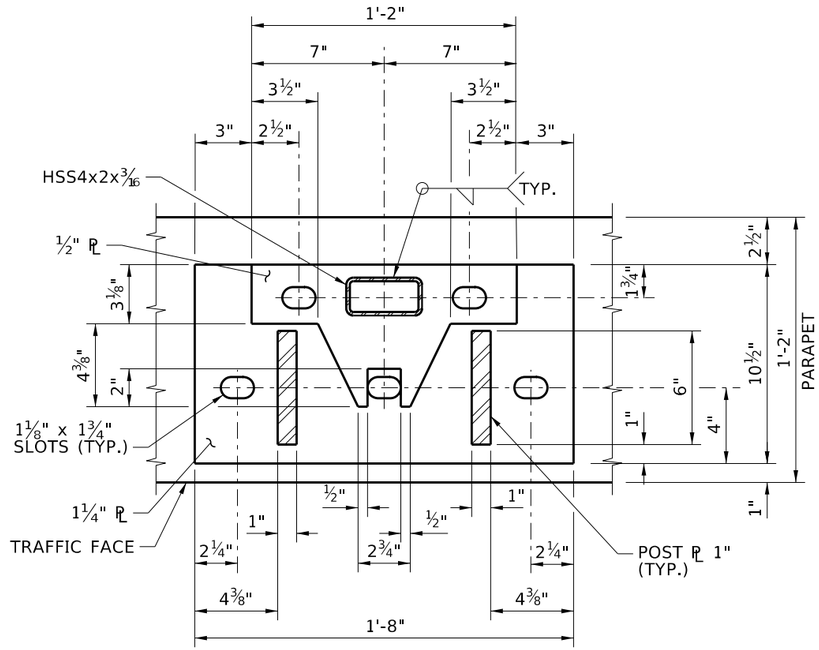
1/2"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PROTECTIVE FENCE FOR COMBINATION RAIL, 1 OF 2	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B13_3C.dgn	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B13.3C	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024				BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



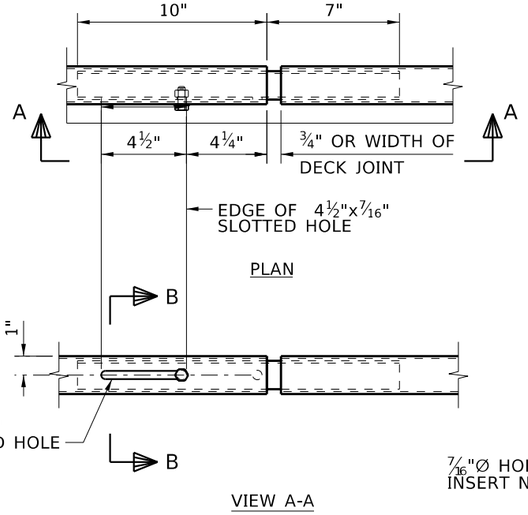
BASE PLATE DETAIL AT FENCE POST

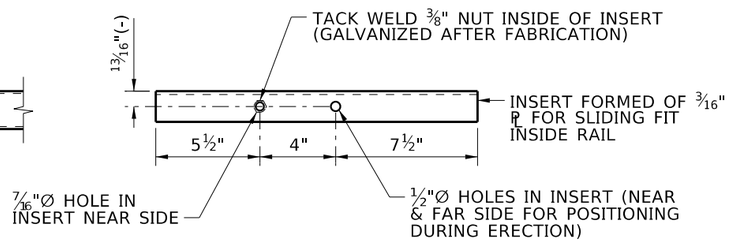
3"=1'-0"



BASE PLATE FOR COMBINATION RAIL AND FENCE POST

3"=1'-0"





INSERT DETAIL

TUBE SPLICE DETAILS

2"x2" TUBES AS SHOWN, 4"x2" TUBES SIMILAR

1½"=1'-0"

RAILING NOTES

MATERIALS

1. PROVIDE STRUCTURAL STEEL TUBING IN ACCORDANCE WITH ASTM A500 GRADE B OR ASTM A501.
2. PROVIDE STRUCTURAL STEEL PLATES AND SLEEVES IN ACCORDANCE WITH ASTM A36.
3. PROVIDE ANCHOR BOLTS IN ACCORDANCE WITH ASTM F1554 GRADE 36 HEADED ANCHOR BOLT. PROVIDE ONE CIRCULAR WASHER AND NUT AT EACH BOLT. PROVIDE HARDENED STEEL WASHER IN ACCORDANCE WITH ASTM F436. PROVIDE NUTS IN ACCORDANCE WITH ASTM A563.
4. PROVIDE WELDED WIRE FABRIC IN ACCORDANCE WITH ASTM A185 IN SHEET FORM.

GALVANIZING/POWDER COATING

5. GALVANIZE STRUCTURAL STEEL PARTS, RAILING, SLEEVES, AND WELDED WIRE FABRIC IN ACCORDANCE WITH ASTM A123 AND ASTM A385. THOROUGHLY CLEAN WELDED AREAS PRIOR TO GALVANIZING TO REMOVE SLAG OR OTHER MATERIAL THAT WOULD INTERFERE WITH THE ADHERENCE OF THE ZINC. PROVIDE GALVANIZED SURFACES FREE OF FINS, ABRASIONS, ROUGH OR SHARP EDGES, OR OTHER SURFACE DEFECTS. REPAIR DAMAGED COATINGS IN ACCORDANCE WITH ASTM A780 AND ASTM A123.
6. POWDER COAT THE RAILING SYSTEM, WELDED WIRE FABRIC, AND FASTENERS AFTER GALVANIZING WITH A MINIMUM THICKNESS OF 3 MILS. PAINT WITH COLOR RAL 9005 (JET BLACK). SUBMIT A COLOR SAMPLE FOR APPROVAL.
7. PREPARE THE GALVANIZED SURFACES FOR POWDER COATING IN ACCORDANCE WITH ASTM D7803. SUBMIT POWDER COATING SHOP PROCEDURES FOR PREPARATION OF THE GALVANIZED SURFACES AND APPLICATION PROCESS OF THE POWDER COATING FOR APPROVAL.
8. REPAIR SCRATCHES, PITS, AND OTHER DEFECTS IN ACCORDANCE WITH THE POWDER COATING MANUFACTURER'S WRITTEN INSTRUCTIONS.

FABRICATION AND ERECTION

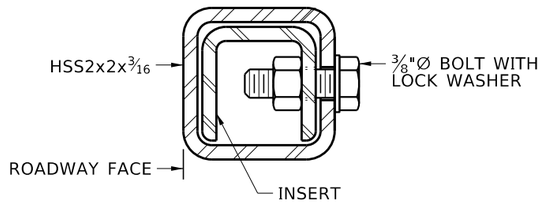
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10. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 504.01 F AND 105.02.
11. CONSTRUCT RAILING CONFORMING TO THE HORIZONTAL AND VERTICAL ALIGNMENT OF THE STRUCTURE, INSTALL POSTS NORMAL TO GRADE IN LONGITUDINAL DIRECTION AND VERTICAL IN TRANSVERSE DIRECTION.
12. SAW OR MILL ENDS OF TUBE SECTIONS AT SPLICES. PROVIDE CUT ENDS THAT ARE TRUE, SMOOTH AND FREE FROM BURRS OR RAGGED EDGES.
13. PROVIDE VENT HOLES FOR GALVANIZING AS REQUIRED AND SHOWN ON THE SHOP DRAWINGS. DRILL VENT HOLES AWAY FROM TRAFFIC FACE AND NOT ON THE TOP SURFACE OF THE HORIZONTAL TUBES.
14. ATTACH RAIL SECTIONS TO AT LEAST TWO POSTS BUT PREFERABLY THREE OR MORE. PROVIDE RAILING SYSTEM THAT IS CONTINUOUS FROM END TO END. POSITION HORIZONTAL RAIL SPLICES TO ALIGN VERTICALLY FOR EACH RAIL SECTION. SUBMIT ALTERNATE RAIL SPLICE DETAILS ON THE SHOP DRAWINGS.
15. CAP OPEN ENDS OF TUBULAR STEEL SECTIONS.
16. SECURE WELDED WIRE FABRIC TO POSTS AND RAILS WITH ⅜"Ø X 1½" TAP-FLEX STRUCTURAL THREADED FORMING SCREWS. SPACE SCREWS AT 12" MAXIMUM CENTERS ON POSTS AND 24" MAXIMUM CENTERS ON RAILS. PROVIDE 3/16" X ¾" X 1¾" STAINLESS STEEL PLATE WASHER OR HOT DIPPED GALVANIZED STEEL PLATE WASHER AT EACH SCREW. SPLICE WELDED WIRE FABRIC ONLY BEHIND POSTS. FABRICATE WELDED WIRE FABRIC WITH BOTTOM WIRE CONTINUOUS AND PARALLEL TO THE RAIL WITH 2" MAXIMUM CLEAR TO THE TOP OF THE PARAPET. SUBMIT ALTERNATE FASTENING METHODS FOR APPROVAL ON THE SHOP DRAWINGS.

MISCELLANEOUS

17. REFER TO COMBINATION RAILING FOR PARAPET DETAILS.

METHOD OF MEASUREMENT

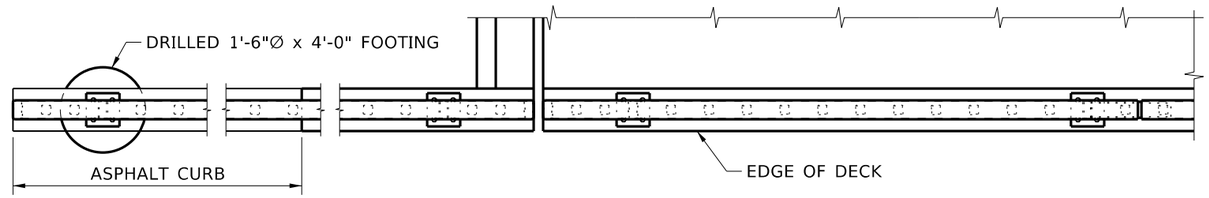
18. PAYMENT FOR "PROTECTIVE FENCE FOR COMBINATION RAIL" IS PAY ITEM 504-041A.



SECTION B-B

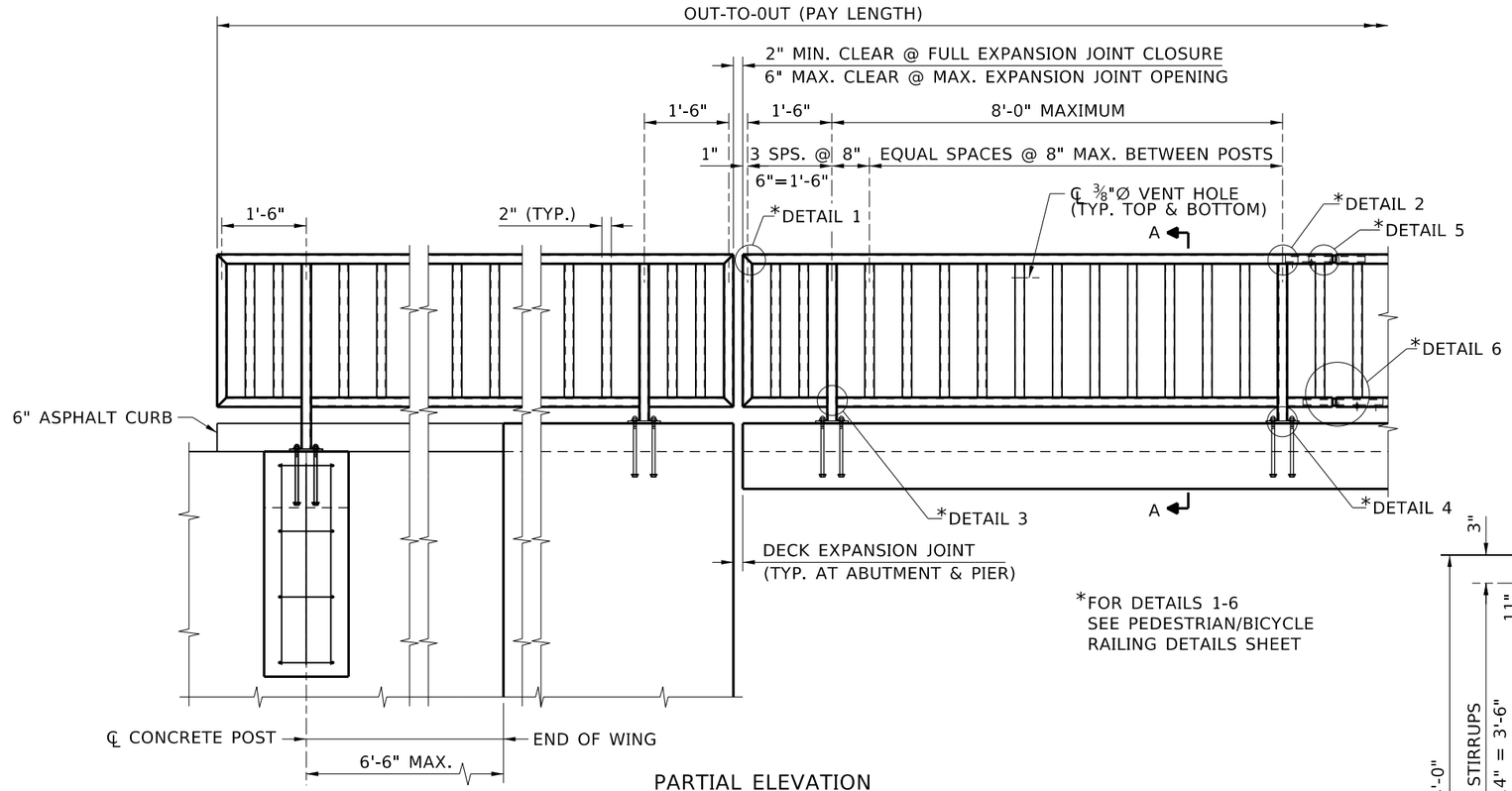
3"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PROTECTIVE FENCE FOR COMBINATION RAIL, 2 OF 2	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
				DETAILED	Standards/Bridge Standard Drawings/ B13_3D.DGN				COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: OCT 2023	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B13.3D	BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						

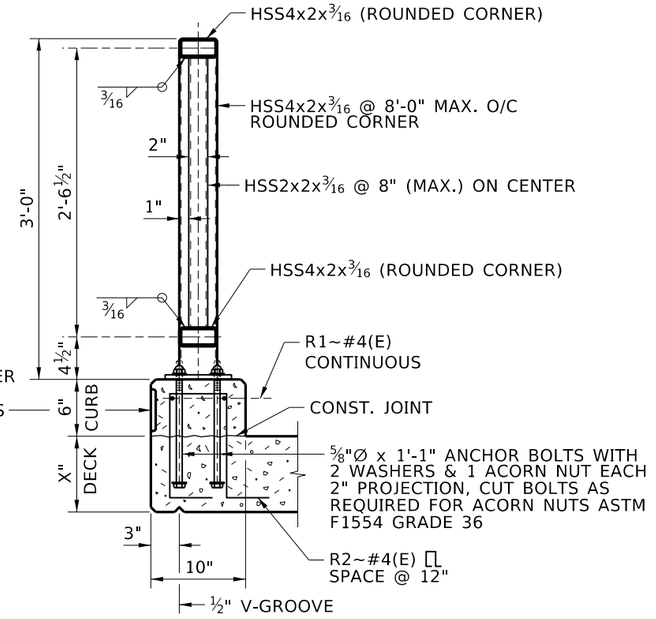


PARTIAL PLAN

$\frac{3}{8}$"=1'-0"

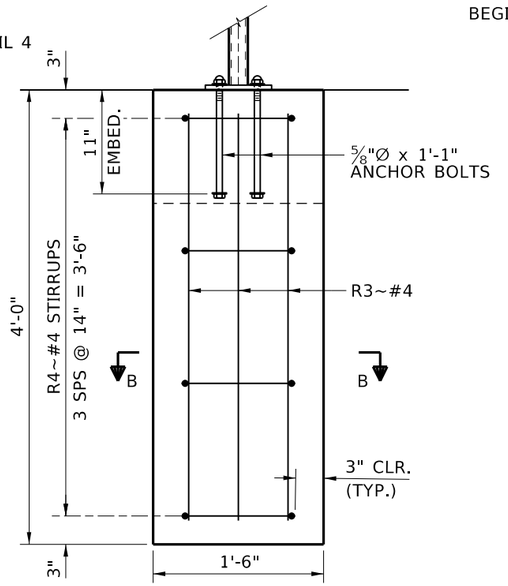


*FOR DETAILS 1-6
SEE PEDESTRIAN/BICYCLE
RAILING DETAILS SHEET

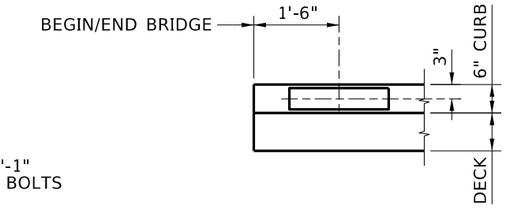


SECTION A-A

$\frac{3}{4}$"=1'-0"



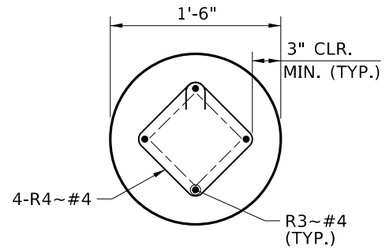
ELEVATION



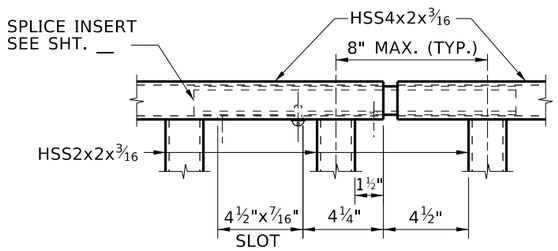
DATE PANEL ELEVATION

(SEE DATE PANEL SHEET)

$\frac{3}{8}$"=1'-0"



SECTION B-B

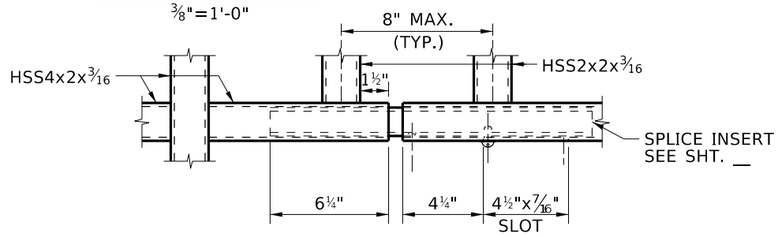


UPPER SPLICE CONNECTION ELEVATION

$1\frac{1}{2}$"=1'-0"

PARTIAL ELEVATION

$\frac{3}{8}$"=1'-0"



LOWER SPLICE CONNECTION ELEVATION

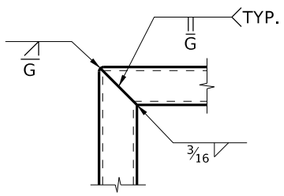
$1\frac{1}{2}$"=1'-0"

NOTE:
SEE SHEET ___ FOR DETAILS, NOTES, AND REINFORCEMENT DETAILS

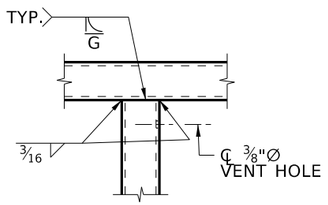
DRILLED CONCRETE POST BASE DETAIL

$\frac{3}{4}$"=1'-0"

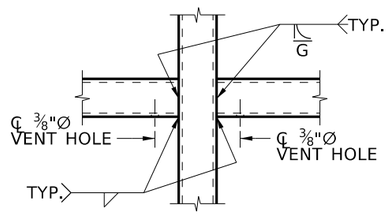
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	STANDARD PEDESTRIAN/BICYCLE RAIL	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards\Bridge Standard Drawings\ B13_4A.dgn				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B13.4A	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



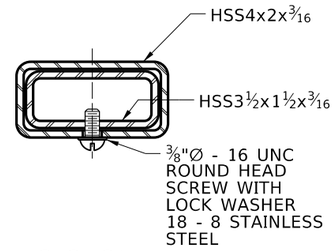
DETAIL 1
1½"=1'-0"



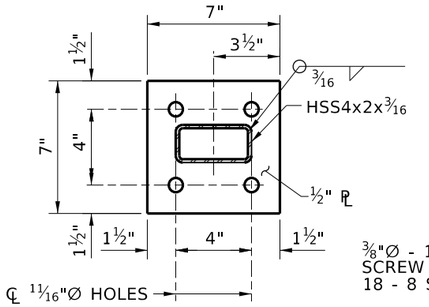
DETAIL 2
1½"=1'-0"



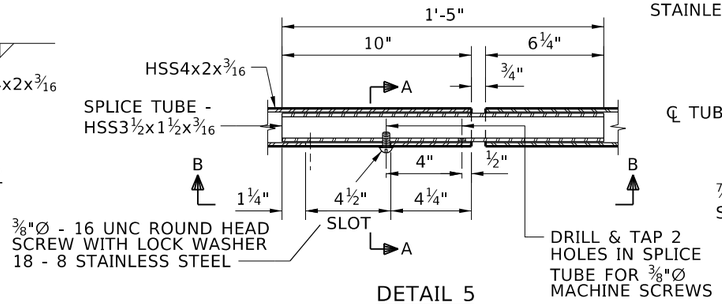
DETAIL 3
1½"=1'-0"



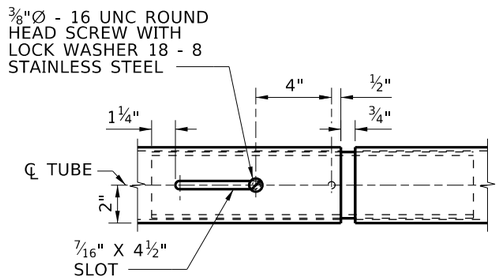
SECTION A-A
3"=1'-0"



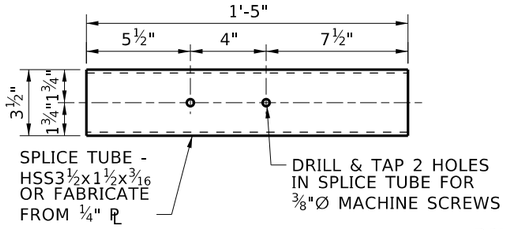
DETAIL 4
1½"=1'-0"



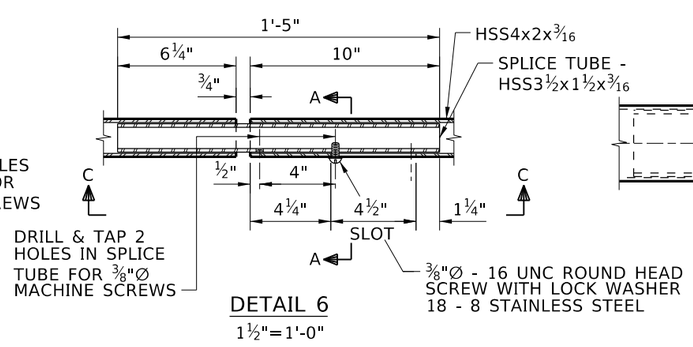
DETAIL 5
1½"=1'-0"



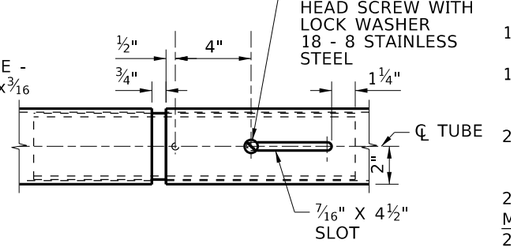
VIEW B-B
1½"=1'-0"



SPLICE INSERT DETAILS
1½"=1'-0"



DETAIL 6
1½"=1'-0"



VIEW C-C
1½"=1'-0"

NOTES

MATERIALS

1. PROVIDE STRUCTURAL STEEL PLATES & SLEEVES IN ACCORDANCE WITH ASTM A709 GRADE 36.
2. PROVIDE STRUCTURAL STEEL TUBING IN ACCORDANCE WITH ASTM A500 GRADE B OR ASTM A501.
3. PROVIDE BOLT, ACORN NUTS, AND WASHER IN ACCORDANCE WITH ASTM A307.
4. PROVIDE HEXAGONAL BOLTS AND NUTS IN ACCORDANCE WITH ANSI B18.2.1 AND B18.2.2.
5. PROVIDE ROUND HEAD MACHINE SCREWS IN ACCORDANCE WITH ANSI B18.6.3.
6. PROVIDE EPOXY COATED GRADE 60 TYPE S METAL REINFORCEMENT IN ACCORDANCE WITH 708.02.
7. PROVIDE CONCRETE CLASS 40AF FOR CURB AND CLASS 40A FOR DRILLED POST HOLE.

GALVANIZING/POWDER COATING

8. GALVANIZE STEEL PARTS AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 AND ASTM A153.
9. GALVANIZE ANCHOR BOLTS, NUTS, AND WASHERS IN ACCORDANCE WITH ASTM A153.
10. THOROUGHLY CLEAN WELDED AREAS BEFORE GALVANIZING TO REMOVE SLAG OR OTHER MATERIAL THAT WOULD INTERFERE WITH THE ADHERENCE OF THE ZINC. REPAIR DAMAGED COATINGS IN ACCORDANCE WITH ASTM A780 AND ASTM A123.
11. PROVIDE GALVANIZED SURFACES FREE OF FINS, ABRASIONS, ROUGH OR SHARP EDGES, AND OTHER SURFACE DEFECTS.
12. POWDER COAT THE RAILING SYSTEM AFTER GALVANIZING WITH A MINIMUM THICKNESS OF 3 MILS. PAINT WITH COLOR RAL 9005 (JET BLACK). SUBMIT A COLOR SAMPLE FOR APPROVAL.
13. PREPARE THE GALVANIZED SURFACES FOR POWDER COATING IN ACCORDANCE WITH ASTM D7803. SUBMIT POWDER COATING SHOP PROCEDURES FOR PREPARATION OF THE GALVANIZED SURFACES AND APPLICATION PROCESS OF THE POWDER COATING FOR APPROVAL.
14. REPAIR SCRATCHES, PITS, AND OTHER DEFECTS IN ACCORDANCE WITH THE POWDER COATING MANUFACTURER'S WRITTEN INSTRUCTIONS.

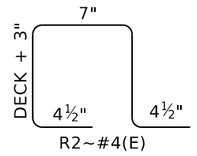
FABRICATION AND ERECTION

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17. CONSTRUCT RAILING CONFORMING TO THE HORIZONTAL AND VERTICAL ALIGNMENT OF THE STRUCTURE. INSTALL POSTS NORMAL TO GRADE IN LONGITUDINAL DIRECTION AND VERTICAL IN TRANSVERSE DIRECTION.
18. SAW OR MILL ENDS OF TUBE SECTIONS AT SPLICES. PROVIDE CUT ENDS THAT ARE TRUE, SMOOTH AND FREE FROM BURRS OR RAGGED EDGES.
19. PROVIDE VENT HOLES FOR GALVANIZING AS REQUIRED AND SHOWN ON THE SHOP DRAWINGS. DRILL VENT HOLES AWAY FROM TRAFFIC FACE AND NOT ON THE TOP SURFACE OF THE HORIZONTAL TUBE.
20. ATTACH EACH RAIL SECTION TO A MINIMUM OF TWO POSTS, BUT PREFERABLY THREE OR MORE. PROVIDE RAILING SYSTEM THAT IS CONTINUOUS. LOCATE EACH JOINT IN A RAIL LENGTH AT THE SAME POSITION IN THE SECTION AND SPLICE AS DETAILED.
21. SUBMIT ALTERNATE SPLICE DETAILS FOR APPROVAL ON THE SHOP DRAWINGS.

METHOD OF MEASUREMENT

22. PAYMENT FOR "PEDESTRIAN/BICYCLE RAILING" IS PAY ITEM 504-035A. CONCRETE, METAL REINFORCEMENT, AND EPOXY-COATED REINFORCEMENT IS INCIDENTAL TO PAY ITEM 504-035A.

EPOXY-COATED REINFORCEMENT

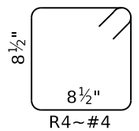


R1~#4(E)
CURB

R2~#4(E)
CURB

METAL REINFORCEMENT

3'-8"
R3~#4
POST

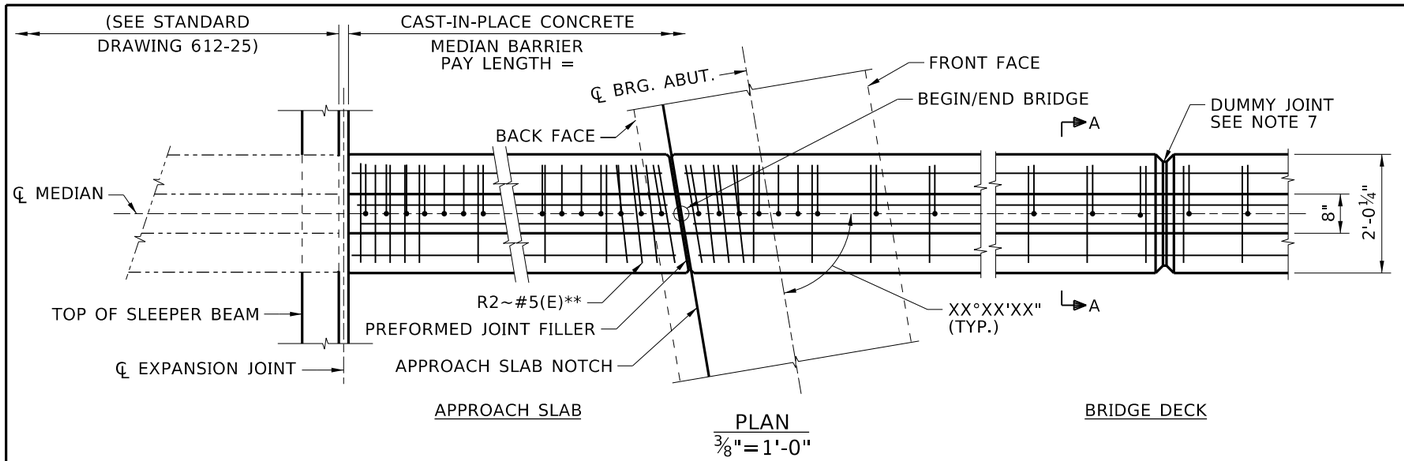


R4~#4
POST

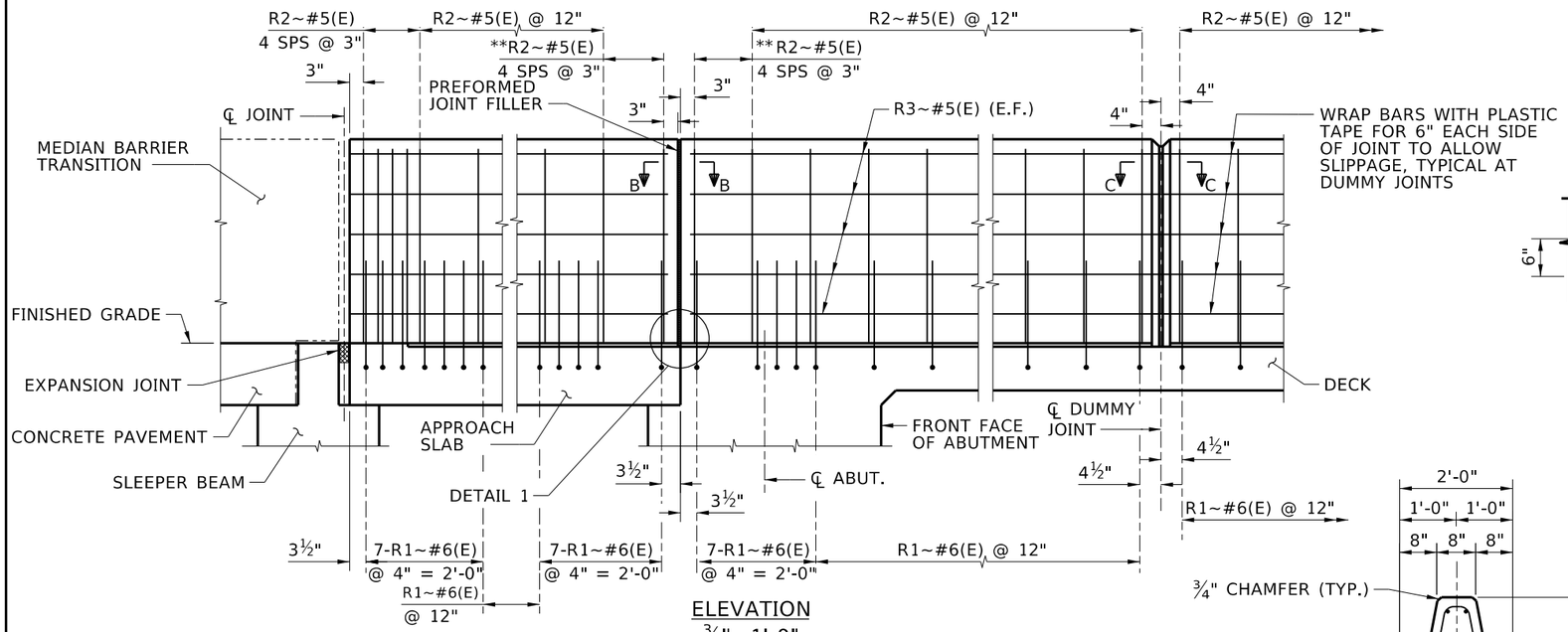
APPROXIMATE QUANTITIES

RAILING (RAILS, POSTS, BALUSTERS, PLATE)	240 LBS. PER 8' SECTION
CONCRETE CURB	0.37 C.F. PER LIN. FT.
METAL REINFORCEMENT CURB (EPOXY)	3.40 LB. PER LIN. FT.
CONCRETE POST BASE	7.07 C.F. PER POST
METAL REINFORCEMENT POST BASE	19.37 LB. PER POST

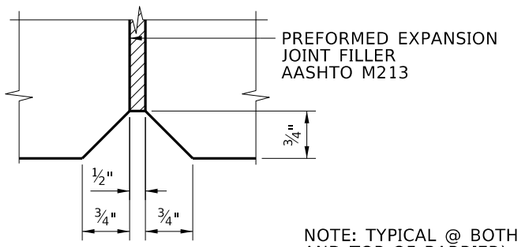
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	PEDESTRIAN/BICYCLE RAILING DETAILS	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards\Bridge Standard Drawings\ B13_4B.dgn				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B13.4B	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



PLAN
⅜"=1'-0"

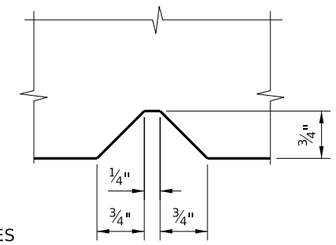


ELEVATION
⅜"=1'-0"

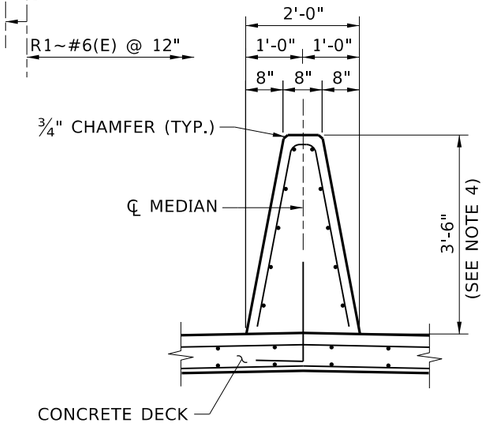


SECTION B-B
NTS

NOTE: TYPICAL @ BOTH SIDES AND TOP OF BARRIER)



SECTION C-C
NTS



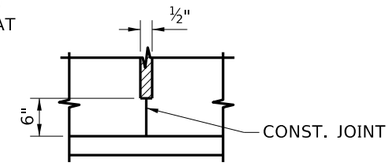
SECTION A-A
⅜"=1'-0"

NOTES

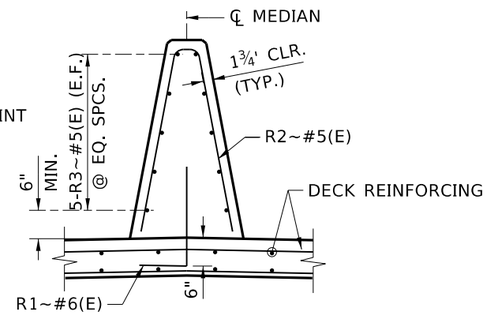
1. PROVIDE CLASS 40AF CONCRETE.
2. CONSTRUCT USING CAST-IN-PLACE METHOD.
3. COMPLETE MEDIAN BARRIER CONSTRUCTION BEFORE PLACING DECK OVERLAY.
4. CONSTRUCT TOP OF MEDIAN BARRIER 3"-6" MIN. ABOVE FINISHED GRADE.
5. CONSTRUCT MEDIAN BARRIER PERPENDICULAR TO THE ROADWAY GRADE.
6. INSTALL REINFORCEMENT BARS R1~#6 BEFORE DECK/APPROACH SLAB CONCRETE
7. SPACE DUMMY JOINTS UNIFORMLY THROUGHOUT THE LENGTH OF THE BRIDGE. PROVIDE DUMMY JOINT SPACING NOT LESS THAN 6'-0" NOR GREATER THAN 12'-0".
8. PROVIDE EPOXY-COATED REINFORCMENT GRADE 60 TYPE S IN ACCORDANCE WITH 708.02.
9. PLACE MEDIAN BARRIER IN THE SAME SEQUENCE AS THE DECK PLACEMENT.
10. WATER CURE THE CONCRETE SURFACE IN ACCORDANCE WITH 502.02 PART J.
11. FLARE R2 BARS AT SKEWED ENDS. SPACING IS AT ℄ MEDIAN UNLESS NOTED OTHERWISE. R2 BARS MAY REST ON TOP OF THE CONCRETE.
12. ADJUST HEIGHT OF MEDIAN BARRIER TO COMPENSATE FOR THE CAMBER AND DEAD LOAD DEFLECTION OF THE SUPERSTRUCTURE. CALCULATE THE AMOUNT OF ADJUSTMENT FOR APPROVAL.

METHOD OF MEASUREMENT

13. PAYMENT FOR "42" SINGLE SLOPE CONCRETE MEDIAN BARRIER" IS PAY ITEM 502-510A.

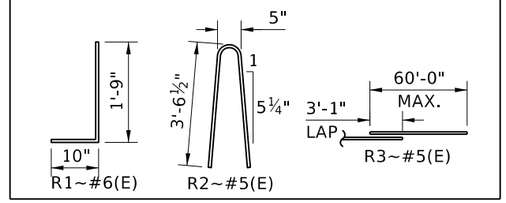


DETAIL 1
½"=1'-0"



REINFORCING SECTION
⅜"=1'-0"

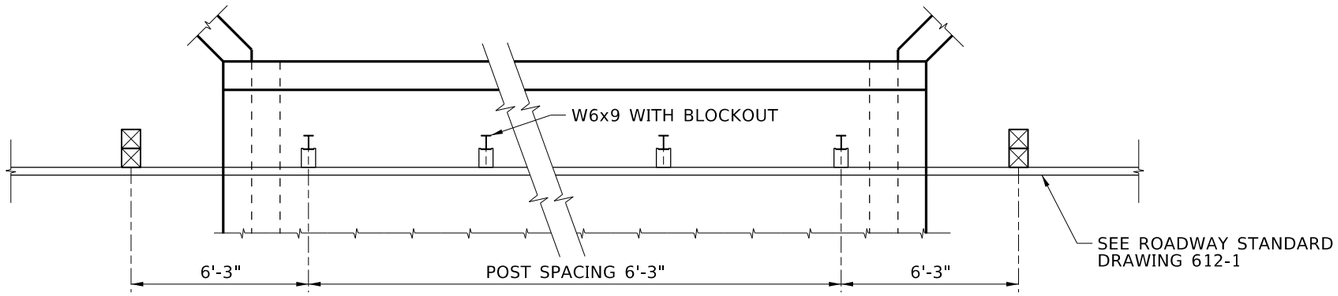
EPOXY-COATED REINFORCEMENT



APPROXIMATE MEDIAN BARRIER QUANTITIES

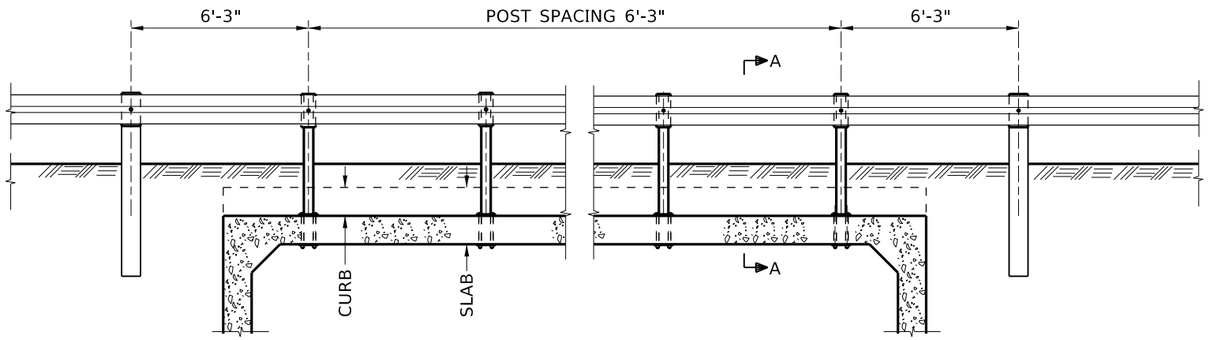
CONCRETE	4.67 CF/LF
EPOXY REINFORCEMENT	18 LB/LF

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	42" SINGLE SLOPE CONCRETE MEDIAN BARRIER	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	CONCRETE PAVEMENT WITH APPROACH SLAB @ INTEGRAL ABUTMENT BRIDGE LRFD DESIGN MANUAL, B13.5	BRIDGE KEY NO.	
△				DETAILED	Standards/Bridge Standard Drawings/B13_5.dgn	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			COUNTY	KEY NO.
△				DWG. CHECKED	DRAWING DATE: DEC 2024				BRIDGE DWG. NO.	SHEET OF
△				CORRECTIONS						
△										



GUARDRAIL PLAN

$\frac{3}{16}$"=1'-0"



GUARDRAIL ELEVATION

$\frac{3}{16}$"=1'-0"

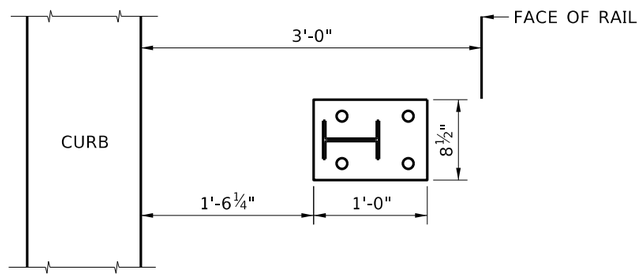
GENERAL NOTES

1. PROVIDE MATERIAL FOR STEEL POST AND PLATES IN ACCORDANCE WITH ASTM A709 GRADE 50.
2. PROVIDE WOOD SPACER BLOCKS IN ACCORDANCE WITH 710.03
3. PROVIDE ANCHOR BOLTS IN ACCORDANCE WITH ASTM F1554 GRADE 55 AND NUTS IN ACCORDANCE WITH ASTM A563 GRADE A, HEX OR HEAVY HEX.
4. GALVANIZE GUARDRAIL POSTS, HARDWARE AND ACCESSORIES AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 OR ASTM A153 EXCEPT AS OTHERWISE NOTED.
5. PROVIDE WASHERS IN ACCORDANCE WITH ASTM F436, TYPE 1.
6. WELD IN ACCORDANCE WITH AASHTO/AWS D1.5 STANDARD SPECIFICATIONS FOR WELDING OF STRUCTURAL STEEL HIGHWAY BRIDGES.
7. PROVIDE 3 COPIES OF CERTIFIED MILL TEST REPORTS COVERING RAIL MATERIAL, POSTS, ANCHOR BOLTS AND OTHER MATERIAL AS REQUESTED.
8. SET RAIL POSTS PLUMB.
9. SEE ROADWAY PAY ITEM 612-005A FOR GUARD RAIL, RAILS, POSTS WITH ATTACHMENTS, AND ANCHORAGES AS SHOWN ON THE PLANS.
10. SEE ROADWAY STANDARD DRAWING 612-1 FOR HOLE LOCATIONS IN POST.
11. SEE ROADWAY STANDARD DRAWING 612-1, NOTE 10 FOR USE OF POLYETHYLENE BLOCKOUTS.

POST HEIGHT	1ST POST	2ND POST	3RD POST	4TH POST
LEFT SIDE*				
RIGHT SIDE*				

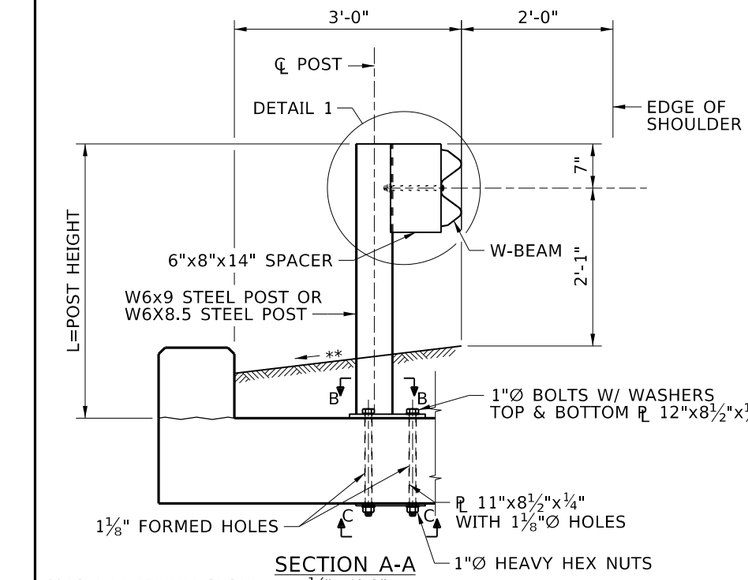
POST HEIGHT

* LOOKING AHEAD ON STATION



ANCHOR BOLT LOCATION

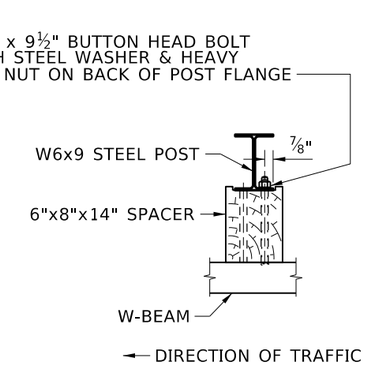
¾"=1'-0"



SECTION A-A

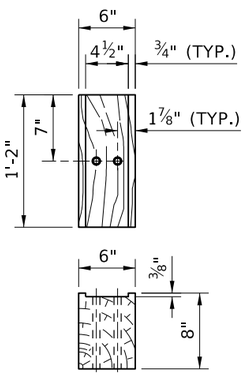
$\frac{1}{2}$"=1'-0"

**10:1 MAXIMUM SLOPE



DETAIL 1

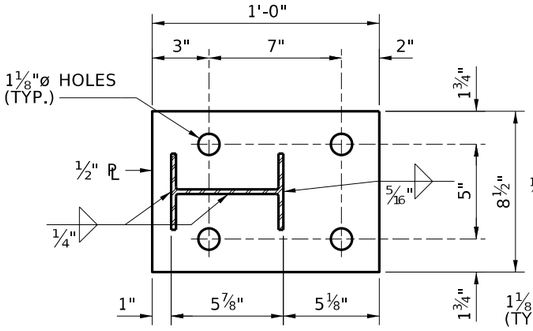
¾"=1'-0"



WOOD BLOCKOUT

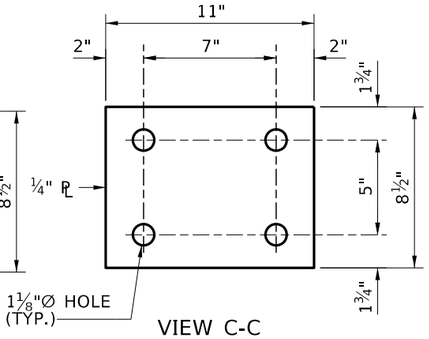
SEE NOTE 11

¾"=1'-0"



SECTION B-B

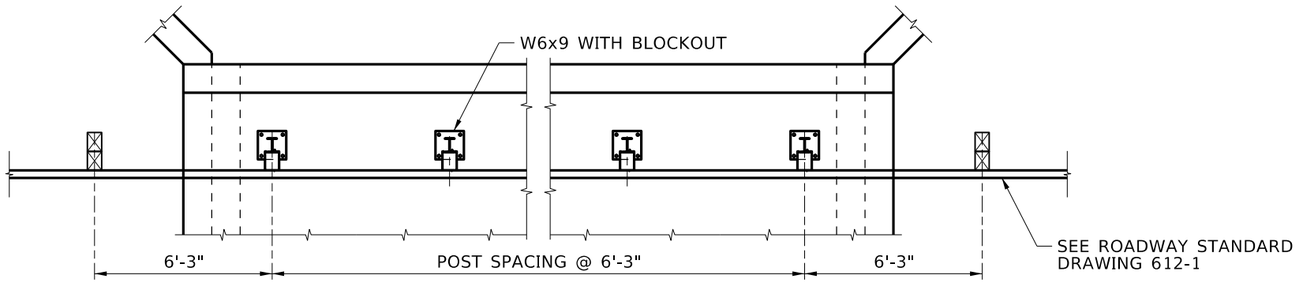
$1\frac{1}{2}$"=1'-0"



VIEW C-C

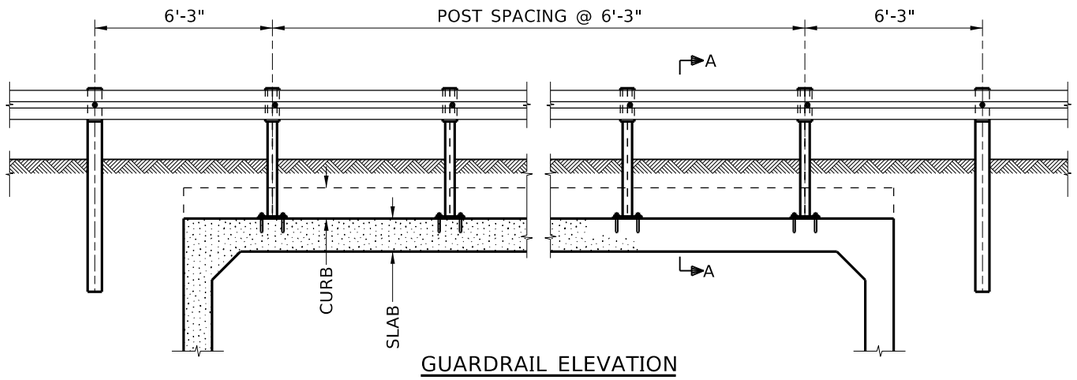
$1\frac{1}{2}$"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	W-BEAM RAILING, THROUGH BOLT ANCHORAGE	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	FOR RAIL RETROFIT PROJECTS, USE STD. DWG. 612-1 DETAILS BRIDGE LRFD DESIGN MANUAL B13.6A	BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/B13_6A.dgn	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024				BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



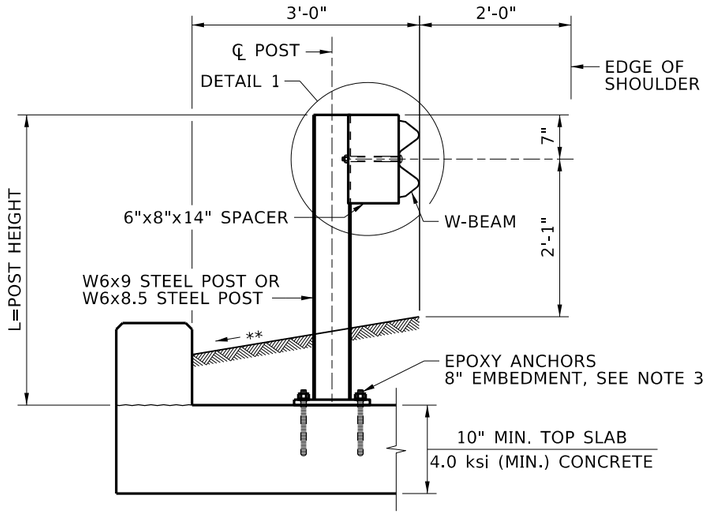
GUARDRAIL PLAN

3/16"=1'-0"



GUARDRAIL ELEVATION

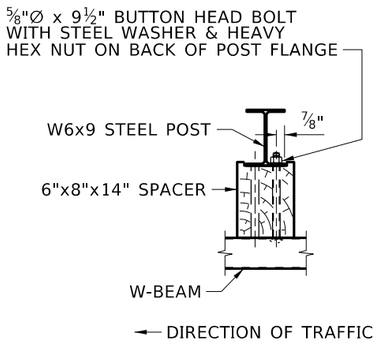
3/16"=1'-0"



SECTION A-A

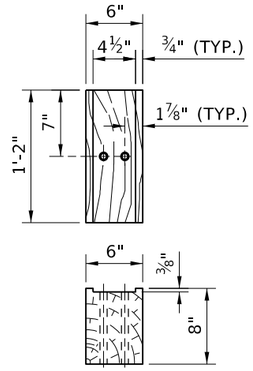
1/2"=1'-0"

**10:1 MAXIMUM SLOPE



DETAIL 1

3/4"=1'-0"



WOOD BLOCKOUT

SEE NOTE 11

3/4"=1'-0"

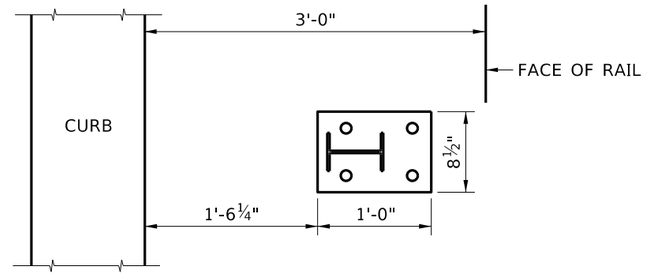
GENERAL NOTES

1. PROVIDE STEEL POST AND PLATES IN ACCORDANCE WITH ASTM A709 GRADE 50.
2. PROVIDE WOOD SPACER BLOCKS IN ACCORDANCE WITH 710.03.
3. PROVIDE EPOXY ANCHORING SYSTEM IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS WITH 1300 psi (MIN.) BOND STRENGTH.
4. GALVANIZE GUARDRAIL POSTS, HARDWARE AND ACCESSORIES AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 OR ASTM A153 EXCEPT AS OTHERWISE NOTED.
5. WELD IN ACCORDANCE WITH AASHTO/AWS D1.5 STANDARD SPECIFICATIONS FOR WELDING OF STRUCTURAL STEEL HIGHWAY BRIDGES.
6. PROVIDE 3 COPIES OF CERTIFIED MILL TEST REPORTS COVERING RAIL MATERIAL, POSTS, ANCHOR BOLTS AND OTHER MATERIAL AS REQUESTED.
7. SET RAIL POSTS PLUMB.
8. SEE ROADWAY PAY ITEM 612-005A FOR GUARD RAIL, RAILS, POSTS WITH ATTACHMENTS, AND ANCHORAGES AS SHOWN ON THE PLANS.
9. SEE ROADWAY STANDARD DRAWING 612-1 FOR HOLE LOCATIONS IN POST.
10. SEE ROADWAY STANDARD DRAWING 612-1, NOTE 10 FOR USE OF POLYETHLENE BLOCKOUTS.

POST HEIGHT	1ST POST	2ND POST	3RD POST	4TH POST
LEFT SIDE*				
RIGHT SIDE*				

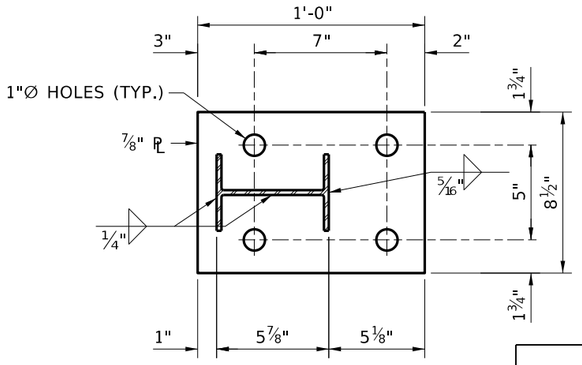
POST HEIGHT

* LOOKING AHEAD ON STATION



ANCHOR BOLT LOCATION

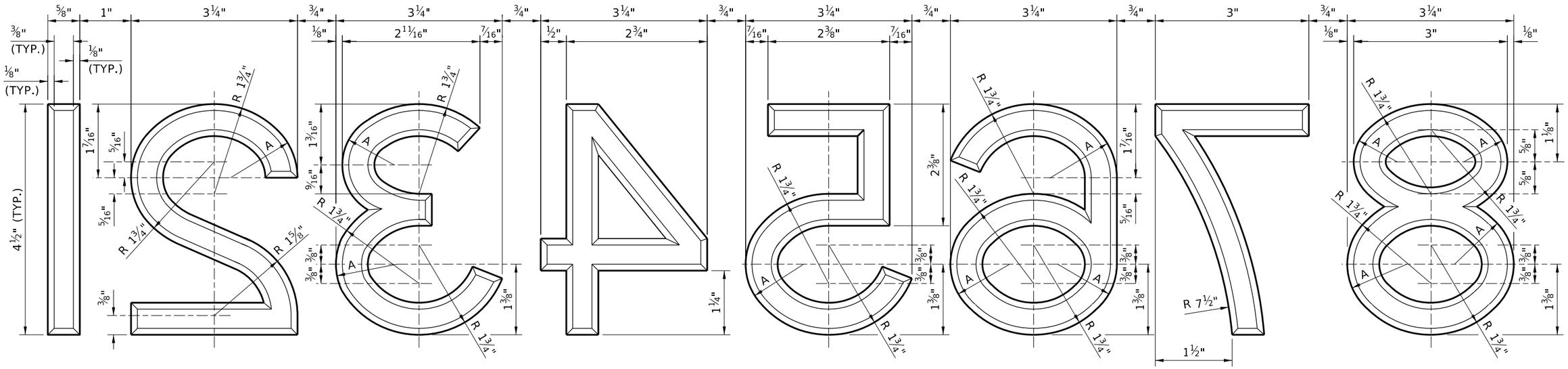
3/4"=1'-0"



BASE PLATE

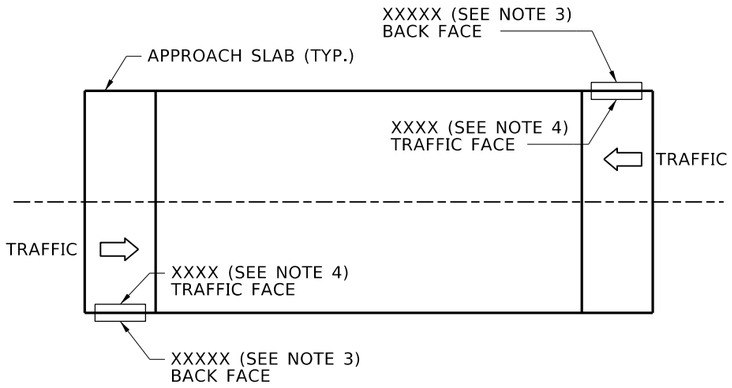
1 1/2"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	W-BEAM RAILING, ADHESIVE ANCHORAGE	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME Standards/Bridge Standard Drawings/B13_6B.dgn	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	FOR RAIL RETROFIT PROJECTS, USE STD. DWG. 612-1 DETAILS BRIDGE LRFD DESIGN MANUAL B13.6B	BRIDGE KEY NO.
				DETAILED					COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

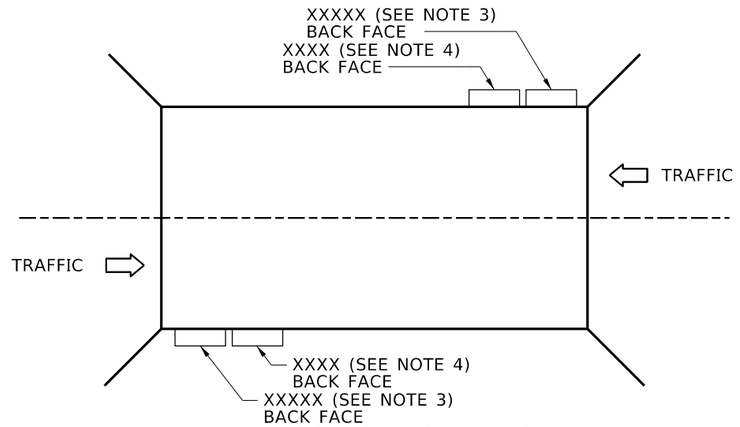


THE NUMBER "9" IS NOT SHOWN, BUT IS SIMILAR TO NUMBER "6".

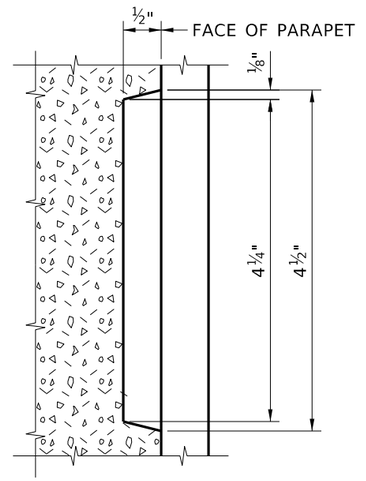
A = RADIUS TO SUIT

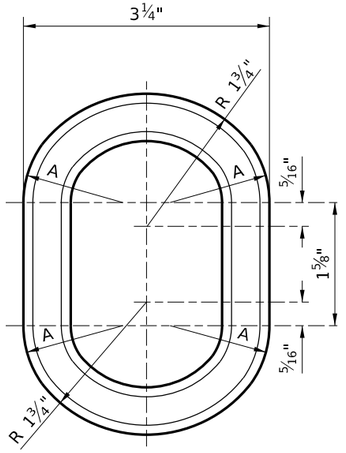


DATE PANEL LOCATION - BRIDGE
NTS
(SEE PARAPET SHEET FOR DETAILS)



DATE PANEL LOCATION - CURB/EDGE BEAM
NTS
(SEE CULVERT SHEET FOR DETAILS)
(SEE PEDESTRIAN/BICYCLE RAILING SHEETS FOR DETAILS)





END VIEW OF NUMERALS
SHOWING ATTACHMENT TO FORMS
NTS

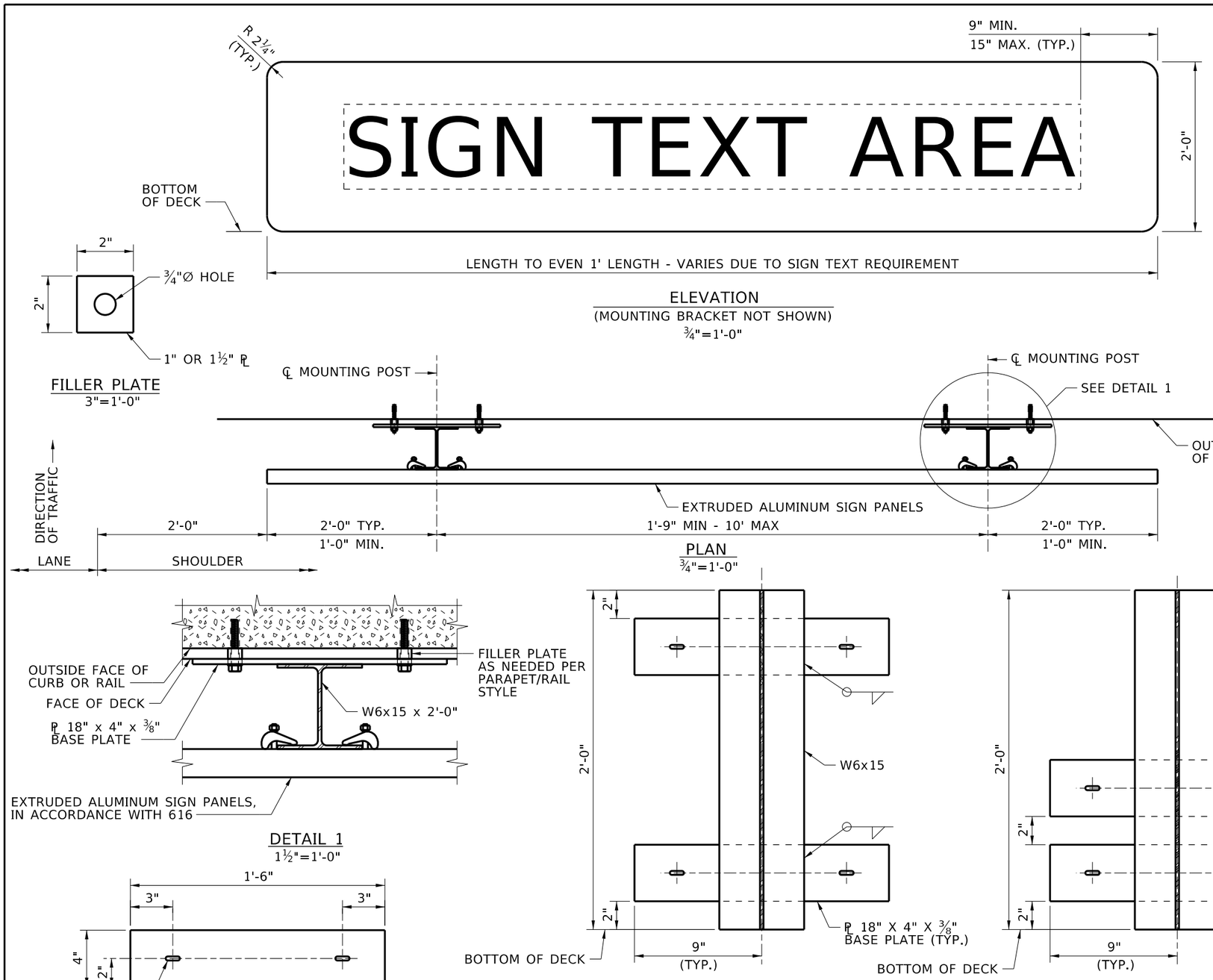
GENERAL NOTES - BRIDGE

1. RECESS NUMBERS INTO THE DATE PANEL.
2. DATE PANEL IS INCIDENTAL TO THE PARAPET PAY ITEM.
3. PLACE THE 5 DIGIT BRIDGE KEY NUMBER ON BACK FACE.
4. PLACE THE 4 DIGIT YEAR CONSTRUCTION COMPLETED ON TRAFFIC FACE.
5. FIELD ADJUST LOCATION OF DATE PANEL ON BACK OF PARAPETS WITH PROTECTIVE FENCE.

GENERAL NOTES - CURB/EDGE BEAM

1. RECESS NUMBERS INTO THE DATE PANEL.
2. DATE PANEL IS INCIDENTAL TO THE FOLLOWING PAY ITEMS:
   a. 578-005A PRECAST CONCRETE CULVERT
   b. 502-025A CONCRETE CLASS 40A FOR CAST-IN-PLACE CULVERT
   c. 504-035A PEDESTRIAN/BICYCLE RAILING
3. PLACE THE 5 DIGIT BRIDGE KEY NUMBER ON BACK FACE.
4. PLACE THE 4 DIGIT YEAR CONSTRUCTION COMPLETED ON TRAFFIC FACE.

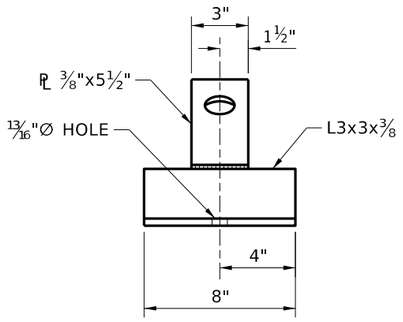
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	DATE PANEL	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B13_7.DGN	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B13.7	COUNTY / KEY NO.
				DWG. CHECKED					BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS	DRAWING DATE: DEC 2024				



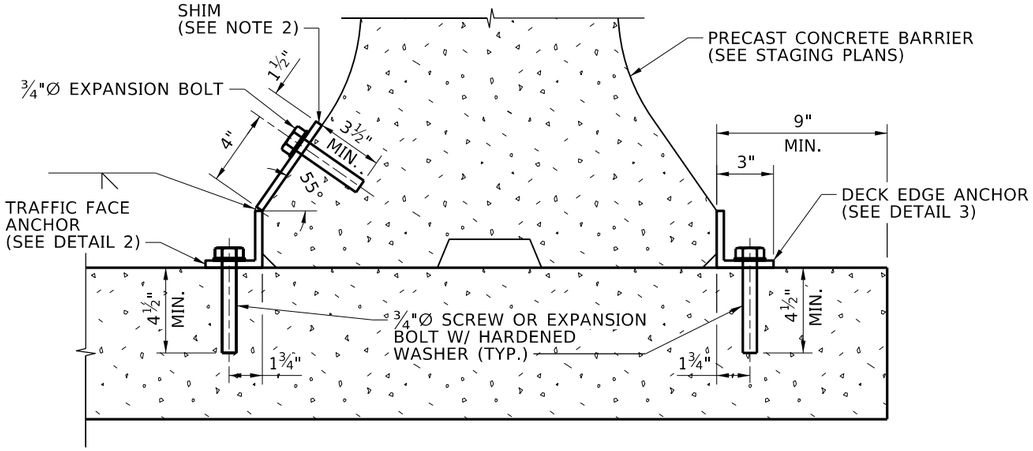
NOTES

1. MOUNT BOTTOM OF SIGN FLUSH WITH THE BOTTOM EDGE OF THE DECK FACING TRAFFIC.
2. ALIGN THE LEFT EDGE OF THE SIGN 2'-0" TO THE RIGHT OF THE LANE/SHOULDER STRIPE.
3. THIS DRAWING WILL BE ACCOMPANIED BY STANDARD DRAWING 616.2, EXTRUDED ALUMINUM SIGNS.
4. PROVIDE STRUCTURAL STEEL PLATES AND SHAPES IN ACCORDANCE WITH ASTM A36 AND GALVANIZE IN ACCORDANCE WITH ASTM A123.
5. SEE ROADWAY PLANS FOR SIGN DETAILS.
6. PROVIDE SIGN IN ACCORDANCE WITH "STANDARD HIGHWAY SIGNS" MANUAL FOR GUIDE SIGN DESIGNATION D3-1 FOR WHITE ON GREEN BACKGROUND.
7. PROVIDE ½" DIA. STAINLESS STEEL SCREW ANCHORS IN ACCORDANCE WITH ACI 318-19, CHAPTER 17 THAT MEET ASSESSMENT CRITERIA OF ACI 355.2. SUBMIT ICC-ES REPORT.
8. PAY FOR EXTRUDED ALUMINUM SIGN PANELS UNDER THE PAY ITEM 616-015A. MOUNTING BRACKET COST INCIDENTAL TO PAY ITEM 616-015A.

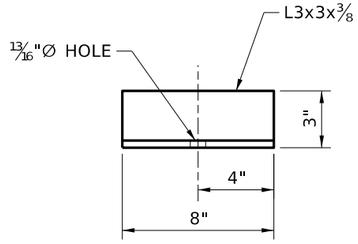
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NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B13_8.DGN	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B13.8	COUNTY / KEY NO.
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				CORRECTIONS					



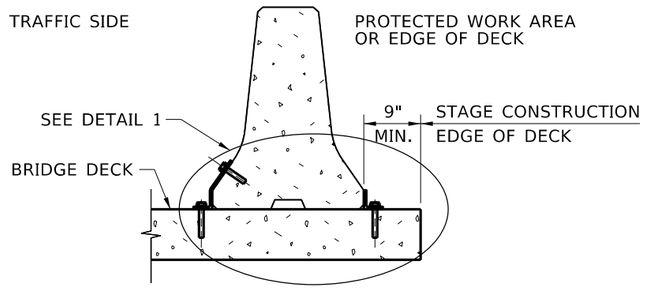
DETAIL 2
1½"=1'-0"



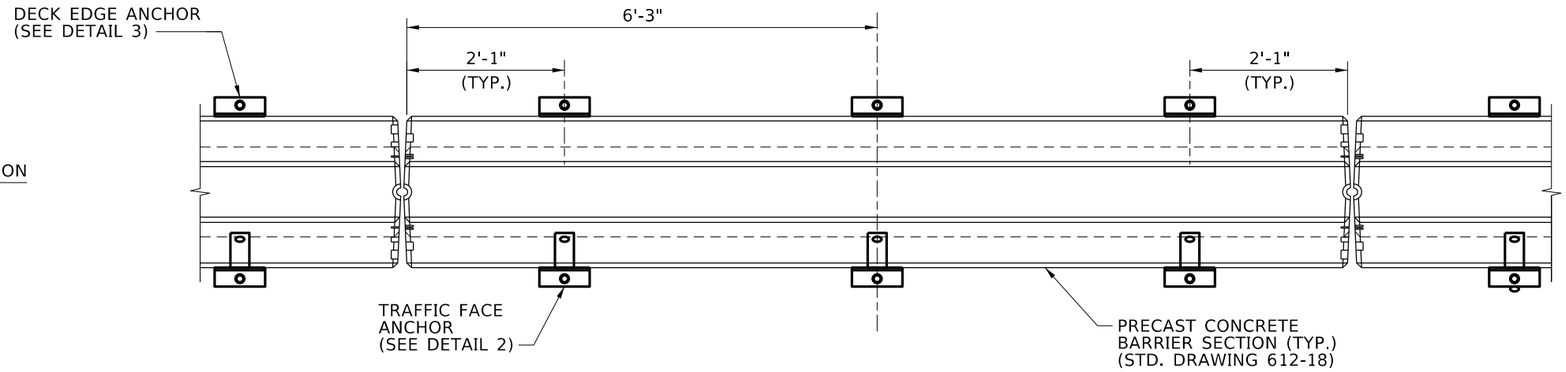
DETAIL 1
1½"=1'-0"



DETAIL 3
1½"=1'-0"



TYPICAL SECTION
½"=1'-0"



PLAN VIEW
½"=1'-0"

NOTES
1. ADJUST THE LOCATION OF THE ANCHORS TO AVOID THE DECK REINFORCMENT AND GIRDER STIRRUPS WHEN DRILLING HOLES.
2. SHIM ANCHOR PLATES FLUSH WITH BARRIER AND DECK SURFACES PRIOR TO INSTALLING BOLTS.
3. AFTER BARRIER REMOVAL, CLEAN AND FILL DECK HOLES WITH GROUT IN ACCORDANCE WITH 705.02.

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	TEMPORARY CONC. BARRIER ANCHORAGE	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/B13_9.dgn				COUNTY / KEY NO.
				DWG. CHECKED				BRIDGE LRFD DESIGN MANUAL B13.9	
				CORRECTIONS	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO. / SHEET OF

CHAPTER 14

JOINTS & BEARINGS

14.5 BRIDGE JOINTS

Expansion joint devices are designed to accommodate structure movement, provide smooth and quiet passage of traffic, prevent water runoff (particularly deicing chemicals) from damaging the supporting structural elements, and provide a long service life.

The following selection criteria cover the expansion joint systems most commonly used in Idaho:

SMALL MOVEMENT JOINTS

Small movement joints can be utilized where the total movement is approximately 1"-2" and the skew is less than 30°. Joint types include compression seals, silicone sealants, and asphalt plug joints. Compression Seals are the preferred joint type for new construction. Silicone Sealant joints should be limited to repair/rehabilitation projects.

- Compression Seals are continuous preformed elastomeric sections with extruded internal web systems and are held in place by mobilizing friction against adjacent vertical faces. They must be sized and installed to always be in a state of compression. The nominal uncompressed width of Compression seals should not exceed 4”and the skew should not exceed 30°.

  Seals should be designed according to the Selection Criteria for Compression Seals in A14.6.

  The following suppliers, or approved equals, should be specified:

MANUFACTURER	STYLE
WATSON BOWMAN ACME	WA Series
D.S. BROWN	CV Series
LYMTAL INTERNATIONAL	ISO-FLEX BC Series

Silicone sealants are poured in place directly over a foam backer rod placed in the expansion gap. The cured silicone sealant joint can accommodate tensile movements of up to 100% and compressive movements of up to 50% of the sealant width at installation. A minimum recess is required from the top of the pavement to the top of the silicone sealant in order to prevent tire traffic from contacting and debonding the sealant from the substrate. The joint sealant shall meet the requirements of ASTM C920 for Type M, Grade P, Class 100/50 and Use T. The joint sealant must meet ASTM C719 for test movements +100% and -50% of the joint width as tested by an independent testing facility.

- Asphaltic plug joints consist of polymer modified asphalt (PMA) installed within a blockout over a steel plate. The steel plate spans across the expansion gap to retain the PMA during its installation. Application guidelines must be carefully followed to assure successful performance. They should not be used for joints having large skew angles, joints subjected to large rotations, joints subjected to differential vertical movements (for example, longitudinal separation joints), or in situations where the total height of the PMA above the steel plate is less than 2”. Asphaltic plug joints should not be used in situations where the adjacent pavement is subjected to significant acceleration or deceleration (off ramps, traffic signals) because the PMA has a tendency to creep out of the blockout and this tendency is amplified by any horizontal loading.

  The following suppliers, or approved equals, should be specified:

MANUFACTURER	STYLE
DYNAMIC SURFACE APPLICATIONS	THORMA JOINT SYSTEM
D.S. BROWN	MATRIX 502 ASPHALTIC EXPANSION JOINT
WATSON BOWMAN ACME	WABO EXPANDEX JOINT SYSTEM
DEERY AMERICAN CORP	DEERY FLEXIBLE JOINT SYSTEM

Polymer concrete headers are recommended at compression seal and silicone sealant joints. Polymer concrete provides tensile strength and toughness to resist traffic impact. Proprietary elastomeric concretes can also be used to further enhance impact resistance.

MEDIUM MOVEMENT JOINTS

Strip Seals are the preferred system for medium movement joints. Maximum allowable joint opening, measured in the direction of traffic, is 4". This is to improve ride and reduce hazard to motorcycles and bicycles.

Strip Seals should be designed according to the Selection Criteria for Strip Seals in A14.6.

The following factors that affect movement should be considered in determining the joint size:

- Creep
- Construction tolerances
- Temperature range
- Bearing type and direction of allowed movements
- Skew
- External restraints

Movement from earthquake is not generally considered.

When designing joint modifications, review past inspection reports for recorded joint movement history. Adjustment of the expansion device to compensate for bridge temperature at time of installation must be possible.

The majority of joint failures have been due to failure of the anchorage system.

Complete full-width units should be shipped to the job site. Lengths up to 60' can normally be shipped without difficulty. No joints in the continuous rubber seal should be allowed. One pre-approved manufacturer's shop vulcanized splice per seal is permitted.

Closely analyze joints at sidewalks and parapets with respect to leakage, constructibility, and maintenance.

At highly skewed locations, an effort should be made to reduce skew to diminish joint complexity.

Structural steel extruded shapes with a minimum thickness of 1" should be used. Aluminum extruded shapes should not be used.

The following suppliers, or approved equals, should be specified:

MANUFACTURER	STYLE	EXTRUSION TYPE
WATSON BOWMAN ACME	SE Series	E or A
D.S. BROWN	A2R Series	SSA2
TECHSTAR	Standard Strip Seal Glands	Standard A3.500

LARGE MOVEMENT JOINTS

Modular Expansion devices are the preferred system for movements in excess of 4". The skew angle should be less than 30°and the movement per sealing element should not exceed 3". The same criteria for Medium Movement Joints apply to modular joints, in addition to the following.

All large expansion devices should be designed for the movements required plus a safety factor of 15%. This excess allowance is intended to prevent destruction of the joint due to unpredictable movements at a given location. Consideration should be given to accommodating some earthquake movement.

All elastomeric sealing components shall be continuous full width of each roadway, including curb treatment. The entire joint device should be shipped completely assembled to the jobsite.

For large expansion joints specify all accepted name brands that provide good performance. Do not specify "OR APPROVED EQUAL". Only manufacturers whose modular expansion joints have met the fatigue resistance characterization requirements stipulated in the Special Provision will be permitted to supply modular expansion joints. The Techstar MEJS modular joint may be specified but the system has not been tested for the fatigue requirements. Any testing required establishing the fatigue resistance of all details of a specific proprietary system shall be completed prior to the contract award date.

The following manufacturers are known to have prequalified modular expansion joint details that completed fatigue testing in accordance with these requirements:

MANUFACTURER	STYLE
WATSON BOWMAN ACME	STM Series
D.S. BROWN	D Series

STANDARD DRAWINGS

The most current data for the RECOMMENDED MANUFACTURERS TABLE should be obtained from the manufacturer's web site.

MANUFACTURER	WEB SITE
WATSON BOWMAN ACME	wbacorp.com
D.S. BROWN	dsbrown.com
TECHSTAR	techstar-inc.com
DYNAMIC SURFACE APPLICATIONS	dsa-ltd.com
DEERY AMERICAN CORP.	deeryamerican.com
LYMTAL INTERNATIONAL	lymtal.com

The following Compression Seal Standard Drawings are located in the Bridge Design Manual:

SKEWS ≤ 10° & SKEWS > 10°

The Strip Seal Standard Drawing is for a skewed bridge and the details should be modified for a square crossing. The adjustment for temperature change in Note 12 must be calculated.

The Modular Joint Standard Drawing is for a square bridge and the details should be modified for a skewed crossing.

Generic details are provided for both the Silicone Sealant and Asphaltic Plug joints.

MAINTENANCE

Consideration should be given to the maintainability of the joints (particularly for movements over 4"), availability and replaceability of parts, and provisions for access to reach these parts.

WIDENING AND REHABILITATION

During the rehabilitation of bridge decks, it is recommended that existing joints and structure layout be studied to determine which joints can be eliminated or what modifications are necessary to revamp those joints that remain to provide an adequate functional system. Some latitude will be necessary on joint type selection for rehabilitation projects.

SNOW PLOWS

Snow plows have a fixed blade angle between 28°- 35°(left-forward). To minimize the possibility of having a snowplow blade drop into a joint, joint skews between 25°-38° (left-forward) should be avoided. If not avoidable, modify the joint so the blade can pass over the joint without snagging.

SUBSTRUCTURE PROTECTION

Concrete surfaces beneath expansion joints should be protected with a penetrating water repellant sealer that conforms to Section 511, Type C system. Faces of backwalls, beam seat surfaces, and exposed faces of the cap should be protected on abutments. Pier surfaces to be protected include the beam seat and pier cap. Areas to be protected should be shown on the contract plans.

SHOP DRAWINGS

Review the shop drawings in combination with the Plans and Special Provisions for the following information

- PLAN and ELEVATION of the expansion joint.
- Complete details of all components and sections showing all materials incorporated into the joint.
- All AASHTO or other material designations.
- Movement rating and load capacity.
- Installation procedures including services of a manufacturer's field representative if required.
- Treatment of sidewalks and parapets with respect to leakage and maintenance.
- Anchorage details including special reinforcement of blockouts.
- Considerations of weld details in areas of stress concentration.

- Opening dimensions at intermediate temperatures.

RECOMMENDATIONS

- Eliminate expansion joints where feasible.
  Use monolithic abutments on smaller bridges.
  Use continuity to reduce the number of joints on larger bridges.

- The following joint types should be used for the range of movement shown:

JOINT TYPE	TOTAL MOVEMENT
Compression Seal	1" - 2"
Silicone Sealant	1" - 2"
Asphaltic Plug	1" - 2"
Strip Seal	2" - 4"
Modular Joints	≥ 4"

- As a guideline, bridges with the following lengths may be designed continuous without expansion joints at end abutments if the skew is less than 30º.

STRUCTURE TYPE	LENGTH
Steel Structures	300'
Post-tensioned Concrete	400'
Cast-In-Place Concrete	400'
Prestressed Girder	400'

- Compression seals should not be used when the skew exceeds 30°. Joints with skews greater than 30° require special consideration - see "Selection Criteria for Strip Seals".

- To prevent snowplow blades from dropping into a joint, left-forward skews of 25°-38° should be avoided.

Commentary

Revisions:

April 2008	Added Commentary.
Feb 2012	Added “Approved Equal” to all joint suppliers. Deleted Linear Dynamics as a supplier of asphalt plug joint Added Dynamic Surface Application as a supplier of asphalt plug joint Added Techstar as a supplier of strip seal and modular joints. Deleted supplier of silicone joints and listed generic criteria.
June 2013	Corrected reference to Watson Bowman Acme.
Mar 2015	Added LymTal International as a supplier of compression seal joints. Deleted Commentary concerning only 2 suppliers of compression seals.

TFE/STAINLESS STEEL EXPANSION BEARING UNITS

GENERAL

The design of TFE/stainless steel bearings shall be in accordance the AASHTO *LRFD Bridge design Specifications,* Section 14. This type of bearing shall be used when elastomeric bearing pads become too large.

The TFE/stainless steel surface shall be designed to accommodate the horizontal movement of the bridge. The elastomeric pad shall be designed for the compressive stresses and rotation.

DESIGN GUIDELINES FOR ELASTOMERIC BEARINGS

Elastomeric bearings shall consist of either plain elastomeric pads or steel-reinforced laminated pads.

The bearings may be designed by either Method A (Article 14.7.6) or Method B (Article 14.7.5) of the AASHTO LRFD Bridge Design Specifications.

Method A is the required design procedure for plain elastomeric pads.

Method B is the preferred method of design for steel-reinforced laminated pads.

In Idaho two grades of elastomer are used: Grade 3 in moderate temperature zones and Grade 4 in cold temperature zones. Grade 4 elastomer should be specified when the bridge is located in AASHTO low temperature Zone D, if Grade 3 is used in Zone D the other components of the bridge must be designed to resist 1.5 times the shear force determined by Article 14.6.3.1 when a low friction sliding surface is used or 4 times this shear force for a non-sliding surface (see Article 14.7.5.2). Zone D for Idaho shall be defined as any area above an elevation of 3800 feet or any location in Bonner or Boundary County regardless of elevation. Grade 3 elastomer may be used in all other areas of the state. When Grade 4 elastomer is used it should be clearly noted in the plans to ensure that the correct testing is performed. In accordance with ITD standard specifications subsection 720.02 Grade 4 elastomer must be tested for low temperature shear modulus and compression stiffness (AASHTO M 251-06 section 8.9.1 & 8.9.2).

When designing by Method A the elastomeric material shall be specified by its hardness and grade. Most bearing designs for Method A should be based on 60 durometer elastomer, Grade 3. The shear modulus for 60 durometer elastomer shall be assumed to range from 130 psi to 200 psi, with the least favorable value being used for the particular design parameter being considered. Typically bearings designed by Method A are used for rotations only and not for horizontal displacement, therefore the provisions requiring increased shear forces on other components, as stated above, do not come into play and the use of Grade 3 in Zone D is acceptable in this case.

When designing by Method B the elastomeric material shall be specified by shear modulus and grade. The shear modulus should be specified as 130 psi with the design value increased or decreased by 15% whichever is the least favorable value for the particular parameter being considered. Grade 3 or 4 may be specified depending on the temperature zone.
Live Load reactions for bearing design shall be based on the girder distribution factor for shear, Article 4.6.2.2.3.

In calculating the live load rotations the whole structure cross-section, acting as a unit, may be used with the same Truck and Lane load combinations presented in Article 3.6.1.3.2 for calculating deflections.

All loads and rotations used in bearing design shall be determined using the Service I limit state including dynamic load allowance (IM).

Bearing Design Criteria for Prestressed/Precast Concrete Girders

For the purpose of simplification all girder reactions may be based on simple span analysis, even if the girders are made continuous for composite loads. However, the live load rotations may still be determined assuming continuous action.

The instantaneous compressive deflection (LL and IM only) shall be less than 1/8”. The long term compressive deflection due to dead load including creep shall be limited to 3/16” (the value of 3/16” for the allowable long term compressive deflection is considered acceptable for smoothness of ride without restricting the design of the bearings unnecessarily).

For expansion bearings without a sliding surface shear deformation shall be determined from the combined effects of thermal, creep and shrinkage movements of the structure. The thermal movement shall be based on 65% of the total design thermal range (LRFD Article 3.12.3.1). A creep and shrinkage factor of 0.0003 may be used in lieu of a more precise calculation. For bearings with a stainless steel TFE sliding surface the shear deformation shall be determined from the shear force calculated by multiplying Dead Load reaction with the coefficient of friction for the appropriate bearing surface type in accordance with Table 14.7.2.5-1 of the LRFD specifications.

Combined compression, rotation and shear shall be checked by assuming Service I reactions are applied to the bearing in combination with Live Load rotation and initial lack of parallelism as defined below. Dead load rotation need not be included since the internal prestress force produces an end rotation that is at least as great as the dead load rotation and in the opposite direction, thereby canceling the effect of the dead load rotation.

Live Load Rotation – shall be taken as the rotation due to all design lanes on the structure being loaded in a manner that produces the maximum rotation and assuming the load is distributed to all girders equally. Dynamic load allowance shall be included. When combining compression and rotation the Live Load reaction may be either the maximum load or the load associated with the rotation.

Initial Lack of Parallelism – a rotation of 0.005 radians shall be assumed due to construction tolerances; this initial lack of parallelism includes the net difference between the dead load girder end rotation and the prestress end rotation. However this is not sufficient in many cases to include the effects of the roadway profile grade, consequently the beam seats of a precast concrete girder should be constructed on the same slope as the girder when the girder slope is less than or equal to 3%. (The slope of the girder is defined here as the difference in bearing seat elevations of the two girder ends divided by the length of the girder; this is not necessarily the same as the roadway grade.) When the girder slope is more than 3% the bearing pad should be placed level and a beveled sole plate should be embedded or attached to the bearing area of the girder.

Bearing Design Criteria for Steel Girders

Compressive stress shall be determined from the combined Service I reactions as determined from the structural model used for the girder design.

The instantaneous compressive deflection (live load and impact only) shall be less than 1/8”. The long term compressive deflection due to dead load including creep shall be limited to 3/16”.

Shear deformation shall be determined based on 65% of the total design thermal range (LRFD Article 3.12.3.1). For bearings with a stainless steel TFE sliding surface the shear deformation shall be determined from the shear force calculated by multiplying Dead Load reaction with the coefficient of friction for the appropriate bearing surface type in accordance with Table 14.7.2.5-1 of the LRFD specifications.

Combined compression and rotation requirements shall be checked by assuming the Dead Load and Live Load reactions, as determined above, are applied to the bearing in combination with the Dead Load rotation (for non-cambered girders only), Live Load rotation and initial lack of parallelism as defined below:

Dead Load Rotations – need only be included for girders constructed of rolled sections that have not been cambered. Cambered girders should have no net dead load rotation.

Live Load Rotation – shall be taken as the rotation due to all design lanes on the structure being loaded in a manner that produces the maximum rotation and assuming the load is distributed to all girders equally. Dynamic load allowance shall be included.

Initial Lack of Parallelism – a rotation of 0.005 radians shall be assumed due to construction tolerances. However this is not sufficient in many cases to include the effects of the roadway profile grade. A beveled sole plate shall be used to compensate for grade. Consequently the bearing surfaces on the abutments and piers should be constructed level for steel structures.

Bearing Details

Steel reinforced elastomeric bearings shall consist of alternating layers of a minimum of 14 gage A36 steel and neoprene bonded together. All internal layers of neoprene shall be of equal thickness, there is no limit on the maximum thickness of internal layers as there was in previous specifications provided all design criteria are met. However, the minimum thickness of internal layers should be 3/16” so that a minimum external layer does not violate the requirement to be no more than 70%

of the thickness of an internal layer (Article 14.7.5.1). Exterior layers shall have a minimum thickness of 1/8” to provide enough cover to protect the reinforcement.

Sole plates for steel girders (and in some cases concrete girders) shall be welded to the bottom flange to provide a level surface for the elastomeric pads to bear against. Sole plates shall be beveled to compensate for the longitudinal grade of the bridge. Sole plates shall be detailed with enough length (in the direction of the span) to accommodate construction tolerances.

Information for Required Testing

All steel reinforced elastomeric bearings are to be tested in accordance with AASHTO M 251-06. In order to perform this test the maximum design load for each bearing size and type is required. Therefore the method (A or B) that was used in design, along with the maximum design load for each size and type of bearing, must be called out on the bearing detail sheet so that all the information for fabrication and testing is available in one place.

Commentary

In most cases Method B will result in significantly smaller and thinner bearing pads and although it requires more rigorous testing it will result in a more practical sized bearing.

Revisions

July 2009	Revision to specify material by shear modulus for Method B and the definition of thermal movement to comply with 2008 interims.
Feb 2012	Revised to include references to AASHTO M 251-06 which was adopted as the acceptance criteria for elastomeric bearings. Also a couple of clarifications were added to make it clear that Grade 3 can be specified in Zone D when no horizontal movement is required and to limit the slope of the bearings on concrete girders to 3% before a beveled sole plate is required.

The following equations closely approximate the AASHTO curves shown in Figure C14.7.6.3.3-1 in the AASHTO LRFD Bridge Design Specifications.

To evaluate the equations, stress should be in psi. The value for strain is in percent.

70 DUROMETER COMPRESSIVE STRAIN EQUATIONS

Shape Factor(SF)≤ 6.0

$$\varepsilon = C\sigma^{x} \qquad C = 0.05 * \left(\frac{\sigma}{600}\right)^{0.15} \qquad x = 0.65^{\left(\frac{SF}{6}\right)^{1.0-0.0004*\sigma}}$$

Shape Factor(SF)> 6.0

$$\varepsilon = C\sigma^{x} \qquad C = 0.5 * \left(\frac{\sigma}{1000}\right)^{0.5} \qquad x = 0.25^{\left(\frac{SF}{12}\right)^{0.4}}$$

60 DUROMETER COMPRESSIVE STRAIN EQUATIONS

Shape Factor(SF)≤ 6.0

$$\varepsilon = C\sigma^{x} \qquad C = 0.065 * \left(\frac{\sigma}{600}\right)^{0.15} \qquad x = 0.60^{\left(\frac{SF}{6}\right)^{0.725}}$$

Shape Factor(SF)> 6.0

$$\varepsilon = C\sigma^{x} \qquad C = 0.65 * \left(\frac{\sigma}{1000}\right)^{0.5} \qquad x = 0.25^{\left(\frac{SF}{12}\right)^{0.15}}$$

50 DUROMETER COMPRESSIVE STRAIN EQUATIONS

Shape Factor(SF)≤ 6.0

$$\varepsilon = C\sigma^{x} \qquad C = 0.10 * \left(\frac{\sigma}{600}\right)^{0.15} \qquad x = 0.60^{\left(\frac{SF}{6}\right)^{0.725}}$$

Shape Factor(SF)> 6.0

$$\varepsilon = C\sigma^{x} \qquad C = 0.6 * \left(\frac{\sigma}{1000}\right)^{0.5} \qquad x = 0.275^{\left(\frac{SF}{12}\right)^{0.15}}$$

Revisions:

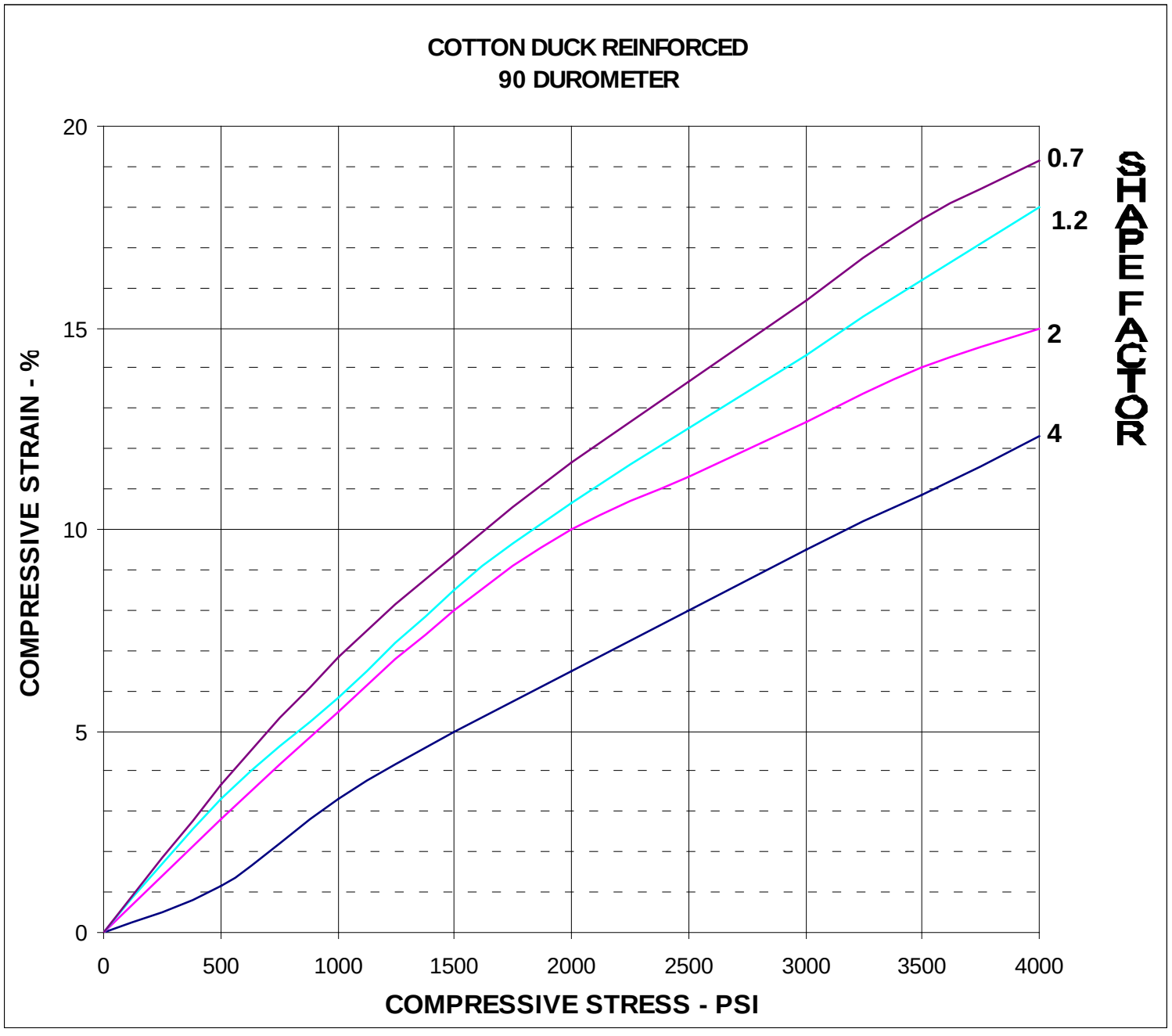
June 2006	Added explanatory notes defining the intent of the equations and the units for stress & strain.
Feb 2012	Revised Figure reference to match 5th Edition Specifications.

COTTON DUCK REINFORCED PAD

The following data may be used for cotton duck reinforced pads in lieu of more precise information.

Hardness (Shore A) ---------- 90

Compressive Stress – psi	Shear Modulus - psi
500	400
1000	850
2000	1150
3000	1325



BEARING TABULATION TABLE

Bridge name or reference.					
Bearing identification mark					
Number of bearings required					
Seating Material		Upper Surface			
		Lower Surface			
Allowable average contact pressure (psi)		Upper Face	Serviceability		
			Strength		
		Lower Face	Serviceability		
			Strength		
Design Load effects	Service Limit State		Vertical	max	
				perm	
				min	
			Transverse		
			Longitudinal		
	Strength Limit State		Vertical		
			Transverse		
			Longitudinal		
Translation	Service Limit State	Irreversible	Transverse		
			Longitudinal		
		Reversible	Transverse		
			Longitudinal		
	Strength Limit State	Irreversible	Transverse		
			Longitudinal		
		Reversible	Transverse		
			Longitudinal		
Rotation (RAD)	Service Limit State	Irreversible	Transverse		
			Longitudinal		
		Reversible	Transverse		
			Longitudinal		
Maximum bearing dimensions (in)	Upper Surface		Transverse		
			Longitudinal		
	Lower Surface		Transverse		
			Longitudinal		
	Overall height				
Tolerable movement of bearing under transient loads (in)			Vertical		
			Transverse		
			Longitudinal		
Allowable resistance to translation under service limit state (kips)			Transverse		
			Longitudinal		
Allowable resistance to rotation under service limit state (k/ft)			Transverse		
			Longitudinal		
Type of attachment to structure			Transverse		

TFE/STAINLESS STEEL EXPANSION BEARING UNITS

ELASTOMERIC PAD

- The elastomeric pad shall be designed as a Pinned Bearing. Refer to the design guidelines of Article 14.7.5 & 14.7.6.
- The width of the elastomeric pad = width of bottom flange of concrete or steel girder – 1".

PTFE

- The PTFE shall be designed in accordance with AASHTO Article 14.7.2.
- The PTFE shall be virgin, unfilled sheets and recessed for one-half its thickness.
- The sheets may be either rectangular or circular. Circular sheets may provide easier fabrication for milling the recess.

STAINLESS STEEL SHEET

- The thickness of the stainless steel mating surface shall meet the requirements of AASHTO Article 14.7.2.3.2.
- Seal weld the stainless steel sheet to a ⅜" steel plate.
- The ⅜" steel plate shall be the same dimension as the sole plate minus ¼" on all sides..
- The ⅜" steel plate/stainless steel sheet unit shall be attached to the sole plate with stainless steel cap screws.
- Length = Width of bottom flange of the girder + 2½" (length of sole plate - ½").
- Width = Elastomeric pad length + total temperature movement + Δ_r + 2".
- Δ_r is increase in the length of the bottom flange due to the girder end rotation under dead load.

Simple Span, One End Pinned: $\Delta_r = 6.4*DL*Y_b/L$

DL = maximum dead load deflection at midspan (inches)
L = span length (inches)
Y_b = distance from the neutral axis of the noncomposite section to the bottom of the girder (inches)

Continuous Span: $\Delta_r = 1.6*DL*Y_b/L$

DL = maximum dead load deflection in the end span (inches)
L = distance from the centerline bearing to point of maximum dead load deflection (inches)
Y_b = distance from the neutral axis of the noncomposite section to the bottom of the girder (inches)

SOLE PLATE

- The minimum thickness shall be ¾".
- The top surface that bears against the girder flange shall be tapered for the longitudinal slope of the girder.
- Length = width of bottom girder flange + 3".
- Width = Elastomeric pad length + total temperature movement + Δ_r + 2½".

STAINLESS STEEL CAP SCREWS

- The cap screws shall be installed parallel to the edge of the bottom girder flange and equally distributed on each side.
- The minimum spacing for the cap screws is 3" and the maximum spacing shall not exceed 5".
- Cap screws shall be ¼"-20 UNC x ¾" 82º hexagon socket flat countersunk head cap screw 18-8SS. The cap screw size is limited to ¼" diameter due to the depth of the countersunk head and the thickness of a 10 gage stainless steel sheet.
- The minimum number of cap screws required is calculated as follows:

$$\text{Number} = \frac{FS * \text{coef friction} * \text{Dead Load}}{\text{Screw thread area} * \text{allow shear stress}}$$

Dead Load = dead load reaction (kips)
FS = factor of safety = 2.0
Coefficient of Friction = value for TFE/stainless steel without silicone grease.
Screw Thread Area = root area for ¼" cap screw = 0.027 in^2.
Allowable Shear Stress = 0.75 * 80 ksi = 60 ksi

ANCHOR BOLTS

- Anchor bolts shall be ASTM F-1554 Grade 36 with a minimum 1" diameter. 1½" diameter anchor bolts are recommended.
- Anchor bolts shall be designed to resist a horizontal seismic force in accordance with AASHTO Article 3.10 for the seismic category at the bridge site.

MASONRY PLATE

- The masonry plate shall be ¾" minimum thickness.
- Length = Length of the restraint angle.
- Width = Width of bottom girder flange plus twice the length of the bottom leg of the restraint angle + ¼".
- Bolt holes shall be the bolt diameter + 1/8".
- The masonry plate is optional for smaller girder reactions; this will need to be determined on a case-by-case basis. When the masonry plate is used, it shall be securely attached to the concrete surface, normally by bolting.

SOLE PLATE CONNECTION

- A 1/4" fillet weld using an E-70 electrode is used to connect the sole plate to the girder.

- The length of weld required = $\frac{\text{Max. Transverse Force}}{3.35 \text{ k/inch}}$

  E-70 ¼" weld strength = ¼"* 0.707 * 70 ksi * 0.27 = 3.34 k/inch

  The maximum transverse force shall include seismic forces.

- If the length of weld required exceeds the available weld length, the weld size must be increased.

KEEPER ANGLE (NOT FOR SEISMIC RESTRAINT)

- The length of the cope can be reduced if the sole plate is designed with a shear tab. This will reduce the required length of the keeper angle.

HORIZONTAL LEG

d_H = Length of horizontal leg of the restraint angle (inches)
t = Thickness of the restraint angle (inches)
P_L = Max. Longitudinal force (kips)
F_T = Allowable tensile stress (ksi)
FS = Factor of Safety
C_W = Width of cope in the horizontal leg = 1 1/2".
$\varnothing$ = Diameter of the anchor bolts (inches)

$$d_{H\ min} \geq \frac{P_L}{FS\ F_T\ t} + C_W + \varnothing$$

Minimum edge distance for anchor bolts must be checked.

VERTICAL LEG (Recommended angle size of 6"x 6" x 3/4" to start design)

d_V = Length of vertical leg of the restraint angle (inches)
t = Thickness of the restraint angle (inches)
P_T = Max. Transverse force (kips)
FS = Factor of Safety
C_H = Height of cope in the vertical leg = Sole P_L + Steel P_L + Stainless steel + PTFE + Pad + 1/4".
C_L = Length of the cope = Soleplate + T + 1".
T = Total temperature movement (inches)
F_B = Allowable bending stress (ksi)

$$d_V \min \geq C_H + \sqrt{\frac{P_T * C_L}{F_B * FS * t}}$$

LENGTH OF ANGLE

L = Length of the restraint angle (inches)
C_L = Length of the cope (inches)
H = The distance from the center of the bottom flange to the beam seat (inches)
t = Thickness of the restraint angle (inches)
P_T = Max. Transverse force (kips)
F_B = Allowable bending stress (ksi)
FS = Factor of Safety

$$W = \frac{6 * P_T * H}{FS * F_B * t^2}$$

$$L_{min} \geq C_L + 2W$$

GUSSET PLATES

When length and/or thickness of the vertical leg of the keeper angle becomes too large, gusset plates shall be designed for the keeper angle to resist bending in the vertical leg due to the transverse loading.

Revisions:

June 2006	Revised article to agree with details on standard drawings B14.7A & B14.7B.

/

EXPANSION JOINTS

NOTATIONS

θ = Skew angle.

α = Coefficient of thermal expansion
0.0000060/°F for concrete
0.0000065/°F for steel

β = Shrinkage Coefficient for reinforced concrete on new construction, 0.0003.
For rehabilitation projects, assume all shrinkage has occurred and use a value of 0.0.

γ_{TU} = Load factor due to temperature on new construction designed using LRFD, 1.20.
For rehabilitation projects not designed using LRFD, consider using a value of 1.0.

μ = Factor accounting for the restraining effect imposed by superstructure elements installed before the concrete slab is cast.
1.0 for flat slabs
0.8 for cast-in-place box girders and t-beams
0.5 for prestressed girders
0.25 for deck bulb-tee girders (no cast- in- place slab)
0.0 for steel girder bridges

T_c = Structure temperature during construction of joint opening.

L = Length of structure contributing to expansion or contraction of the joint (feet).

W = Nominal uncompressed width of expansion seal (inches)

A = Joint opening normal to joint at the time of deck placement (inches).

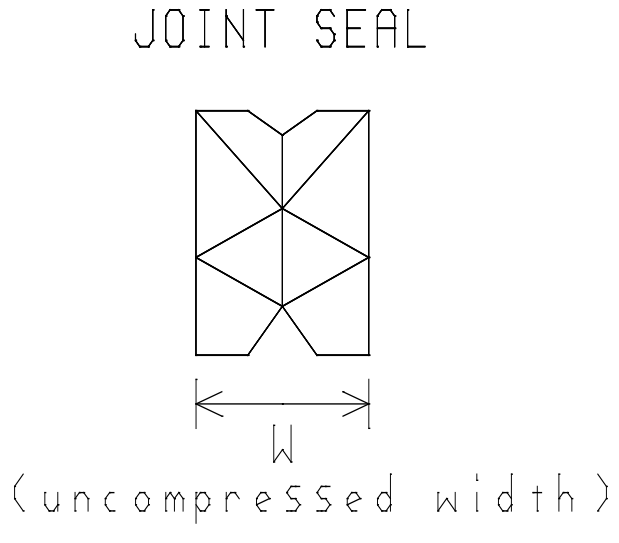
K = Temperature drop below the installation temperature divided by temperature range.
Assume installation temperature equals 60°F

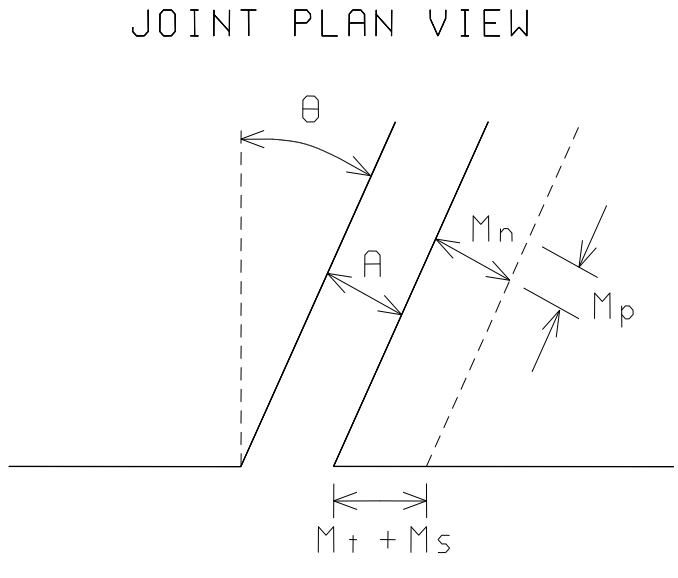
M_t = Movement due to temperature (inches).

M_s = Movement due to shrinkage after construction (inches)

M_p = Movement parallel to joint (inches).

M_n = Movement normal to joint (inches).





SELECTION CRITERIA FOR COMPRESSION SEALS

Design Limitations

A. Total anticipated movement of the expansion joint, $M_t + M_s$, should not exceed 2". When the nominal seal width computed by the following procedure exceeds 2", a joint system with greater movement capacity is required.

B. The maximum joint opening shall not be greater than 0.85W. The minimum joint opening shall not be less than 0.40W. The minimum joint opening at installation of the seal shall not be less than 0.60W.

C. The skew angle should not exceed 30°.

D. Temperature Range

Concrete structures.....… 0° to 80°F
Steel structures.....…….. -30° to 120°F

Design Procedure

A. Movement Calculations

1. Calculate the joint opening movement due to temperature drop from the installation temperature and shrinkage.

$M_t = 12*L*\alpha*(\text{Installation Temp} - \text{Minimum Temp})* \gamma_{TU}$
$M_s = 12*L*\beta*\mu$

2. Calculate the total closing movement due to temperature rise from the installation temperature.

$M_t = 12*L*\alpha*(\text{Maximum Temp} - \text{Installation Temp})* \gamma_{TU}$

3. The total movement along the centerline of bridge is equal to (1) + (2).

Movement parallel to joint $M_p = (M_t + M_s) \sin \theta$
Movement normal to joint $M_n = (M_t + M_s) \cos \theta$

B. Selection of Seal Width

1. The maximum joint opening is equal to the minimum installation opening plus the movement due to temperature drop and shrinkage, therefore:

$0.85W = 0.60W + (\cos \theta)(KM_t + M_s)$, or
$W = 4(\cos \theta)(KM_t + M_s)$

2. The seal width to accommodate M_p:

$W = M_p \div 0.22$

3. The seal width to accommodate M_n:

$W = M_n \div 0.45$

4. The nominal seal width, W, shall be the largest of the values calculated in steps 1 thru 3 above.

C. Select manufacturer's seal style and check for minimum gap and maximum gap normal to joint. The maximum gap along centerline of bridge at maximum movement shall not exceed 4" in accordance with AASHTO Article 14.5.3.2.

D. Adjustment in joint opening for a 10°F change in temperature.

SELECTION CRITERIA FOR SILICONE SEALS

Design Limitations

A. Sealant designed to accommodate 100% tension and 50% compression.
B. Use on rehabilitation projects.
C. Temperature Range

Concrete structures.....… 0° to 80°F
Steel structures.....……. -30° to 120°F

Design Procedure

A. Movement Calculations
1. $M_t = 12(L)(\alpha)(\text{temp range})\ (\gamma_{TU})$

2. $M_s = 0$
3. $M_{normal} = (M_t + M_s)(\cos\theta)$
4. $M_{10F} = 12(L)(\alpha)(10°F)$

B. Expansion gap widths at assumed extreme installation temperatures
1. $G_{min} = G_{exist} + (T_{normal}\text{-}Install_{min})/10(M_{10F})$
2. $G_{max} = G_{exist} - Install_{max}\text{-}T_{normal})/10(_{M10F})$

C. Check sealant capacity if installed at assumed minimum temperature
1. Closing movement
$M_c = (T_{max}\text{-}Install_{min})/10(M_{10F})$
2. Check 50% compression
$Mc/Gmin < 0.50$
3. Opening Movement
$M_o = (Install_{min} - T_{min})/10(M_{10F})$
4. Check 100% tension
$M_o/G_{min} < 1.00$

D. Check sealant capacity if installed at assumed maximum temperature
1. Closing movement
$M_c = (T_{max}\text{-}Install_{max})/10(M_{10F})$
2. Check 50% compression
$Mc/G_{max} < 0.50$
3. Opening Movement
$M_o = (Install_{max} - T_{min})/10(M_{10F})$
4. Check 100% tension
$M_o/G_{max} < 1.00$

SELECTION CRITERIA FOR STRIP SEALS

Design Limitations

A. Total anticipated movement of the expansion joint should not exceed 4". When the nominal seal width computed by the following procedure exceeds 4", a joint system with greater movement capacity is required. The movement is measured along centerline of bridge.

B. The minimum joint opening at installation of the seal shall not be less than 1.5" normal to the joint.

C. Skewed joints are classified as follows:

TYPE	SKEW ANGLE
1	≤30°
2	>30° ≤ 45°
3	>45°

For skews greater than 45° also contact the manufacturer's representative for help in selecting both the joint type and size.

D. Temperature Range

Concrete structures.....… 0° to 80°F
Steel structures.....……. -30° to 120°F

Design Procedure

A. Movement Calculations

1. Calculate the joint opening movement due to temperature drop from the installation temperature and shrinkage.

$$M_t = 12*L*\alpha*(\text{Installation Temp} - \text{Minimum Temp})*\gamma_{TU}$$

$$M_s = 12*L*\beta*\mu$$

2. a. Calculate the total closing movement due to temperature rise from the installation temperature.

$$M_t = 12*L*\alpha*(\text{Maximum Temp} - \text{Installation Temp})*\gamma_{TU}$$

b. Convert the 1.5" minimum installation width normal to the joint to a length along centerline of bridge.

c. Use the larger value obtained from (a) or (b).

3. The total movement along the centerline of bridge is equal to (1) + (2).

B. Joint Size

1. Type 1 Joints: The joint size required equals the total movement along the centerline of bridge.

2. Type 2 Joints: The joint size required equals the larger of:
   - The total movement along the centerline of bridge,
   - The movement parallel to the joint centerline divided by 0.60.

3. Type 3 Joints: The joint size required equals the larger of:
   - The total movement along the centerline of bridge,
   - The movement parallel to the joint centerline divided by 0.50.

C. Select manufacturer's seal style and check for minimum gap and maximum gap normal to joint. The maximum gap along centerline of bridge at maximum movement shall not exceed 4" in accordance with AASHTO Article 14.5.3.2.

D. Calculate the adjustment in joint opening for a 10°F change in temperature.

SELECTION CRITERIA FOR MODULAR JOINTS

Design Limitations

A. Maximum movement of 3” per each seal element.
B. Maximum gap between adjacent center beams should be limited to 3”.
C. Temperature movements should be increased for the load factor of 1.20 for new construction.
D. Temperature Range
   Concrete structures.....… 0° to 80°F
   Steel structures.....……. -30° to 120°F
E. The maximum gap along centerline of bridge at maximum movement shall not exceed 3” in accordance with AASHTO Article 14.5.3.2.

Design Procedure

A. Movement Calculations
   1. Calculate the joint opening movement due to temperature drop from the installation temperature and shrinkage.
      $M_t = 12*L*\alpha*(\text{Installation Temp} - \text{Minimum Temp})* Y_{TU}$
      $M_s = 12*L*\beta*\mu$
   2. Calculate the joint closing movement due to temperature rise from the installation temperature.
      $M_t = 12*L*\alpha*(\text{Maximum Temp} - \text{Installation Temp})* Y_{TU}$
   3. Total movement (M_t) along centerline of bridge is the sum of (1) & (2).
   4. Total movement normal to joint is $M_t(\cos\theta)$.

B. Joint Size
   1. Total movement range (MR) should be a multiple of 3” based upon A3.

C. Installation Gaps
   1. Compute the minimum distance face-face of edge beams (G_{min}).
      Number of seals (n) = MR/3
      Number of center beams = (n-1)
      w = Center beam top flange width
      g = Minimum gap per seal at full closure
      $G_{min} = (n-1)(w) + (n)(g)$
   2. Compute the maximum distance face-face of edge beams (G_{max}).
      $G_{max} = G_{min} + MR$
   3. Compute gaps at different temperatures.

D. Center Beam Spacing
   1. Check spacing between center beams at minimum temperature.
      $G_{0F} = G_{60F}$ + total opening movement
      Spacing = $[G_{0F} - (n-1)(w)]/n$
   2. Check spacing between center beams at 60°F for seal replacement.
      Spacing = $[G_{60F} - (n-1)(w)]/n$

Revisions:

July 2009 Added definition of μ on Page 1 and revised 0.8 factor to include c-i-p box girders & t-beams
Added Selection Criteria for modular Joints
Added Selection Criteria for silicone sealant joints

March 2011 Changed coefficient of shrinkage for concrete β to 0.0003 to agree with the value used for bearing design. 0.0003 is the average of the values in Article 5.4.3.2.1.
Added temperature load factor of 1.20
Deleted the 15% modular joint size increase due to adding the temperature load factor

Feb 2012 Deleted shrinkage from rehabilitation projects.
Deleted design examples.
Added requirement that the maximum gap along centerline of bridge at maximum movement shall not exceed 4" in accordance with AASHTO Article 14.5.3.2

July 2015 Added Restraining effect of 0.25 for deck bulb tees with no cast in place slab to account for the fact that most of the shrinkage has occurred by the time the expansion joint is installed in these types of bridges. The net effect is to reduce the shrinkage since there is no restraint.

Added equations for calculating opening/closing movement and shrinkage movement to the Selection Criteria for Compression Seals, Strip Seals, and Modular Joints.

Nov 2019 Corrected equation for modular joint installation gap in C. 1. From (n-1)*w + (n-1)*g to (n-1)*w +n*g.
Changed the maximum gap along centerline from 3.5" to 3" to agree with the LRFD Specifications for modular joints.
For modular joints, clarified that the 1.2 temperature factor is only used for new construction.

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B14.1A Compression Seal Expansion Joint skew ≤ 10°

June 2006	Revised Note 11 reference to AASHTO M-297. AASHTO M-220 applies to pavement joints.
May 2014	Added galvanizing of armor angles to note 1.
March 2015	Revised note 12 for electronic shop drawings. Added names of recommended manufacturers to Table.
June 2018	Added "or approved equal" to recommended manufacturers Table.
Nov 2019	Revised format of Notes to active voice, imperative mood. Deleted installation width from Table and changed "depth" to "height". Deleted seal coat from section A-A and Detail A.
Jan 2022	Changed Jersey Parapet to Single Slope Parapet in Typical Curb Seal detail. Converted sheet to ORD format.
June 2022	Deleted inch symbol from angle designation and weld size designation. Revised format of leader lines.
Oct 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide Revised reference to shop drawings in note 11 to subsection 105.02
Dec 2024	Changed name of "Detail A" to "Detail 1".

B14.1B Compression Seal Expansion Joint skew > 10°

June 2006	Revised Note 11 reference to AASHTO M-297. AASHTO M-220 applies to pavement joints.
May 2014	Added galvanizing of armor angles to note 1.
March 2015	Revised note 12 for electronic shop drawings. Added names of recommended manufacturers to Table.
June 2018	Added "or approved equal" to recommended manufacturers Table.
Nov 2019	Revised format of Notes to active voice, imperative mood. Deleted installation width from Table and changed "depth" to "height". Deleted seal coat from section A-A and Detail A.
Jan 2022	Changed Jersey Parapet to Single Slope Parapet in Typical Curb Seal detail. Converted sheet to ORD format.
June 2022	Deleted inch symbol from angle designation and weld size designation. Revised format of leader lines.
Oct 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide. Revised reference to shop drawings in note 11 to subsection 105.02
Dec 2024	Changed name of "Detail A" to "Detail 1".

B14.2 Strip Seal Expansion Joint

June 2006	Added reference in Note 2 for ASTM D-5973.
July 2010	Revised note 4 to add Federal Standard 595 color 36492.
June 2013	Deleted Note 4 for painting of exposed surfaces and specified galvanizing of extrusion in Note 1.
May 2014	Revised note 1 reference for galvanizing from ASTM A123 to AASHTO M111.
March 2015	Revised note 4 for electronic shop drawings. Added names of recommended manufacturers to Table. Corrected field weld symbol.

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Aug 2016	Changed welded splice to partial penetration groove weld in notes 5 & 8.
June 2018	Added "or approved equal" to recommended manufacturers Table.
Nov 2019	Revised format of Notes to active voice, imperative mood. Deleted installation width from Table. Changed ELEVATION to SECTION B-B.
Jan 2022	Changed Jersey Parapet to Single Slope Parapet in Section B-B. Converted sheet to ORD format.
June 2022	Deleted inch symbol from weld size designation. Revised format of leader lines.
Oct 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide Revised reference to shop drawings in note 4 to 105.02
Dec 2024	Removed the parentheses from the weld symbol in Section B-B and added "See Note 8" Changed the profile of the seal in Section A-A to match the recommended styles. Deleted "See Table (G)" from Section Thru Parapet since (G) is no longer shown in the Table. Added Style designation and Extrusion Type designation in Recommended Manufacturers Table.

B14.3 Modular Joint

Feb 2012	Added reference in Note 3 for Techstar MEJS joint.
May 2014	Revised note 7 to paint system A to agree with 2012 Standard Specifications. Added reference to Federal Standard Number 595.
March 2015	Revised note 9 for electronic shop drawings.
June 2018	Revised Note 3 for Techstar MEJS joint to meet fatigue test requirements to be approved.
Nov 2019	Revised format of Notes to active voice, imperative mood.
Jan 2022	Changed Jersey Parapet to Single Slope Parapet in Section B-B. Converted sheet to ORD format.
June 2022	Revised format of leader lines.
Oct 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide Revised reference to shop drawings in note 9 to 105.02

B14.4A 42" Single Slope Concrete Parapet Cover Plates

May 2014	Revised note 3 to paint system A to agree with 2012 Standard Specifications. Added reference to Federal Standard Number 595.
March 2015	Added note 5 for parapet cover plate assembly included in bid item S501-06A. Changed page number to B14.4A. Revised note 4 for electronic shop drawings.
Nov 2019	Revised format of Notes to active voice, imperative mood. Revised paint standard to AMS-STD-595.
Jan 2022	Changed sheet number from B14.4A to B14.4A-1 to create sheet B14.4A-2 for single slope parapet. Converted sheet to ORD forma
June 2022	Deleted inch symbol from weld size designation. Revised format of leader lines.
Oct 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide Revised details for 42" single slope concrete parapet from 32" jersey parapet

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Renumbered sheet from B14-4A-1 to B14.4A

B14.4B-1 Two-Tube Curb Mount Rail Cover Plates

March 2015 Added new sheet for 2-tube curb mounted rail.
Nov 2019 Revised format of Notes to active voice, imperative mood.
Jan 2022 Changed sheet number from B14.4B to B14.4B-1 to create sheet B14.4B-2 for 3-Tube rail.
Converted sheet to ORD format.
June 2022 Deleted inch symbol from weld size designation.
Changed name in title block from "Two-Tube" to "2-Tube".
Revised format of leader lines.
Oct 2023 Deleted sheet.

B14.5 Silicone Sealant Joint

Nov 2019 Changed ELEVATION to SECTION A-A.
Added Note for silicone sealant meeting ASTM C920.
Replaced reference to Dow-Corning 902 RCS to silicone sealant.
Jan 2022 Converted sheet to ORD format
June 2022 Revised format of leader lines.

B14.6 Asphaltic Plug Expansion Joint

April 2008 Clarified note for sealing top of joint.
Sept 2012 Added Section B-B for a curb.
Added Note 1 to delete concrete waterproofing in plug joint area or provide a method to easily remove the waterproofing prior to placing the plug joint material.
Added Note 2 listing the requirements of ASTM C920 for the silicone sealant.
Nov 2019 Revised format of Notes to active voice, imperative mood.
Jan 2022 Changed Jersey Parapet to Single Slope Parapet in Section B-B w/Concrete Parapet.
Converted sheet to ORD format
June 2022 Revised format of leader lines.

B14.7A TFE/Stainless Steel Expansion Bearing – steel girder

June 2006 Revised Note 1 for anchor bolts to conform to ASTM F-1554 Grade 36.
Revised Note 5 for stainless steel sheets to conform to ASTM A240. ASTM A167 moved the grades of steel to ASTM A-240.
Revised the minimum thickness of PTFE and minimum recess to conform to AASHTO Article 14.7.2.3.1.
Revised the temperature in the Expansion Bearing Plan to 60°F to be consistent with expansion joint temperature.
Added Note 14 for temperature adjustment.
April 2008 Intermediate steel plate thickness changed to "X" to match required design thickness.
Added requirement for dimpled lubricated PTFE sheets and certification testing.
March 2011 Changed silicone grease specification in Note 10 to SAE-AS8660 to conform to the 2010 LRFD Interim Revisions to Art. 14.7.2.1.
Changed Note 8 from "… to ensure that the minimum coefficient of friction for the bearing

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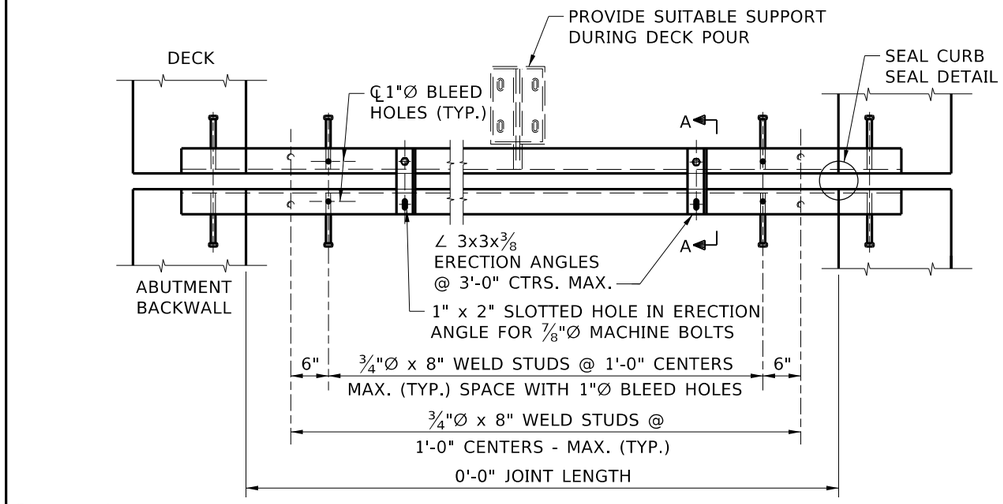
	meets the AASHTO Specifications" to "… to ensure that the friction actually achieved in the bearing meets the assumed design value xxx".
June 2013	Corrected ± symbol in Section A-A. Changed the pay item in Note 6 to S501-55A. Corrected reference to grout in Note 11 to 705.02.
March 2015	Revised note 12 for electronic shop drawings.
Nov 2019	Revised format of Notes to active voice, imperative mood. Specified topcoat color 20122 of AMS-Std-595 in Note 9. Changed reference in Note 7 from AASHTO LRFD Bridge Construction Section 18 to 720.02.
Jan 2022	Converted sheet to ORD format
June 2022	Deleted inch symbol from weld size designation. Revised format of leader lines.
Oct 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide Revised reference to shop drawings in note 12 to 05.02 Split note 13 into notes 13 & 14
Dec 2024	Changed name of "Detail A" to "Detail 1".

B14.7B TFE/Stainless Steel Expansion Bearing – concrete girder

June 2006	Revised Note 1 for anchor bolts to conform to ASTM F-1554 Grade 36. Revised Note 5 for stainless steel sheets to conform to ASTM A240. ASTM A167 moved the grades of steel to ASTM A-240. Revised the minimum thickness of PTFE and minimum recess to conform to AASHTO Article 14.7.2.3.1. Revised the temperature in the Expansion Bearing Plan to 60°F to be consistent with expansion joint temperature. Added Note 14 for temperature adjustment.
April 2008	Intermediate steel plate thickness changed to "X" to match required design thickness. Added requirement for dimpled lubricated PTFE sheets and certification testing.
March 2011	Changed silicone grease specification in Note 10 to SAE-AS8660 to conform to the 2010 LRFD Interim Revisions to Art. 14.7.2.1. Changed Note 8 from "… to ensure that the minimum coefficient of friction for the bearing meets the AASHTO Specifications" to "… to ensure that the friction actually achieved in the bearing meets the assumed design value xxx".
June 2013	Corrected ± symbol in Section A-A. Changed the pay item in Note 6 to S501-55A. Corrected reference to grout in Note 11 to 705.02.
March 2015	Revised note 12 for electronic shop drawings.
Nov 2019	Revised format of Notes to active voice, imperative mood. Specified topcoat color 26492 of AMS-Std-595 in Note 9. Changed reference in Note 7 from AASHTO LRFD Bridge Construction Section 18 to 720.02.
Jan 2022	Converted sheet to ORD format
June 2022	Deleted inch symbol from weld size designation. Revised format of leader lines.
Oct 2023	Revised notes format for active voice, imperative mood and Writer's Style Guide

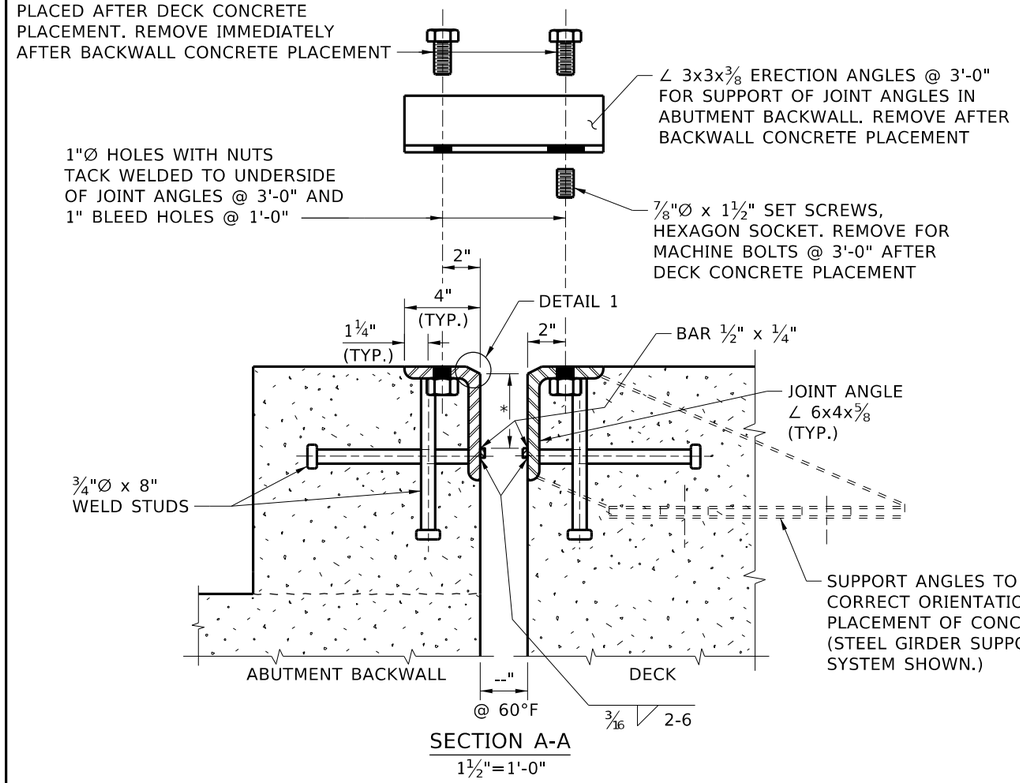
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	Revised reference to shop drawings in note 12 to 105.02
	Split note 13 into notes 13 & 14
Dec 2024	Changed name of “Detail A” to “Detail 1”.



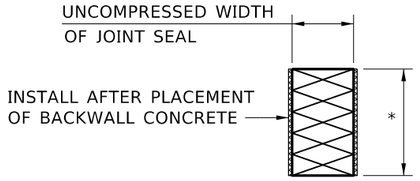
PLAN

½"=1'-0"



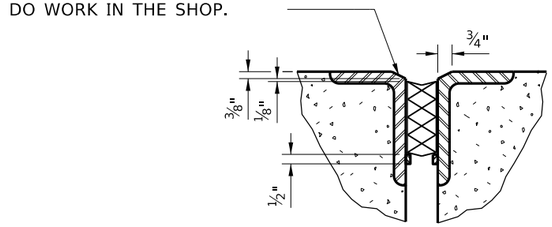
SECTION A-A

1½"=1'-0"



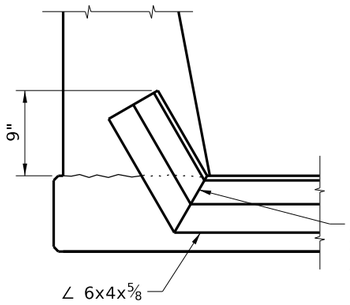
JOINT SEAL DETAIL

1½"=1'-0"



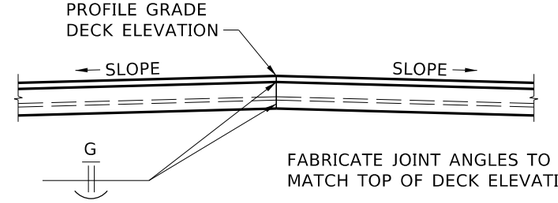
DETAIL 1

1½"=1'-0"



TYPICAL CURB SEAL DETAIL

NTS



CROWN DETAIL

1½"=1'-0"

NOTES

1. PROVIDE STRUCTURAL STEEL IN ACCORDANCE WITH ASTM A709 GRADE 36, AND GALVANIZE IN ACCORDANCE WITH ASTM A123.
2. INSTALL THE TOP OF THE JOINT ANGLE PARALLEL TO THE PROFILE GRADE.
3. PROVIDE JOINT ANGLES WITH A MINIMUM THICKNESS OF ⅝".
4. PROVIDE SUITABLE SUPPORT DURING DECK POUR AND INCLUDE SUPPORT SYSTEM DETAILS ON SHOP PLANS.
5. DIMENSIONS MARKED * ARE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
6. ADJUST THE EXPANSION JOINT X" FOR EVERY 10°F CHANGE IN TEMPERATURE FROM THE MEDIAN TEMPERATURE OF 60°F AT THE TIME OF INSTALLATION OF THE JOINT.
7. PROVIDE CONTINUOUS JOINT SEAL.
8. WHEN THE JOINT ANGLES EXCEED 60' IN LENGTH, A MAXIMUM OF TWO FIELD SPLICES WILL BE PERMITTED. DO NOT LOCATE THE FIELD SPLICE IN THE WHEEL PATH, AND SHOW THE LOCATION ON THE SHOP DRAWINGS.
9. INSTALL THE SEAL AS IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS USING AN ADHESIVE LUBRICANT. PROVIDE ADHESIVE LUBRICANT IN ACCORDANCE WITH ASTM D4070.
10. PROVIDE PREFORMED EXPANSION JOINT SEAL IN ACCORDANCE WITH AASHTO M297.
11. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 105.02.
12. FABRICATE THE COMPLETED JOINT ASSEMBLY, INCLUDING COMPONENTS AND SUBASSEMBLIES, BY ONE MANUFACTURER.

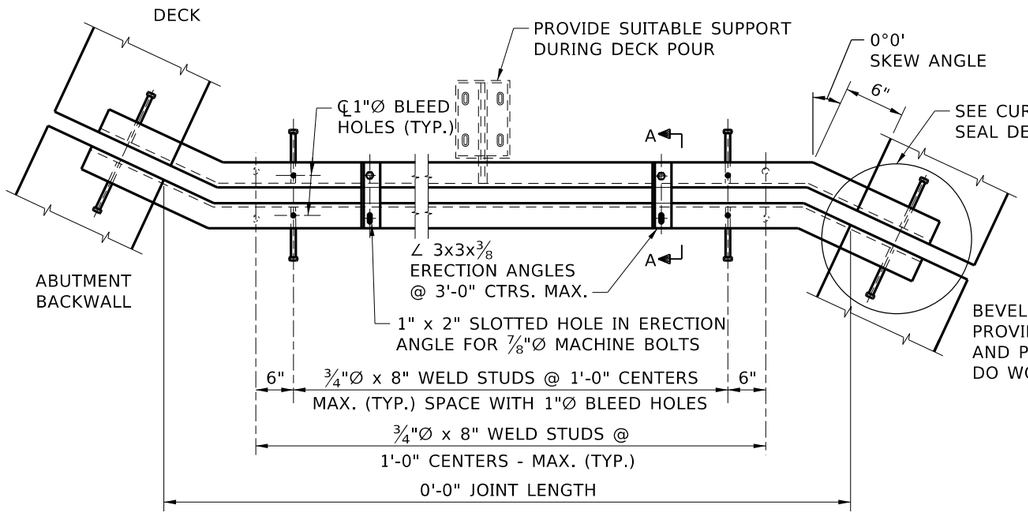
APPROXIMATE STEEL WEIGHT 48 LB/FT.

RECOMMENDED MANUFACTURERS OF THE SHOWN JOINT ASSEMBLY **

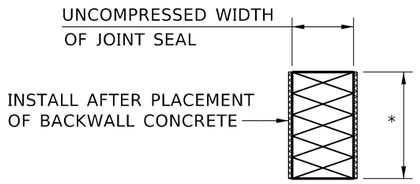
LOCATION	MANUFACTURER	STYLE	NOMINAL SEAL SIZE INCHES	
			WIDTH	HEIGHT
	WATSON BOWMAN ACME			
	D.S. BROWN			
	LYMTAL INTERNATIONAL			

** OR APPROVED EQUAL

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	COMPRESSION SEAL EXPANSION JOINT	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B14_1A.DGN			SKEW <= 10^	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B14.1A	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					

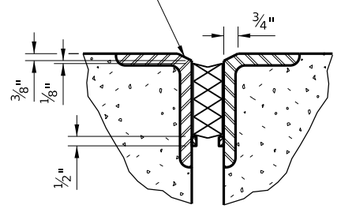


PLAN
½"=1'-0"



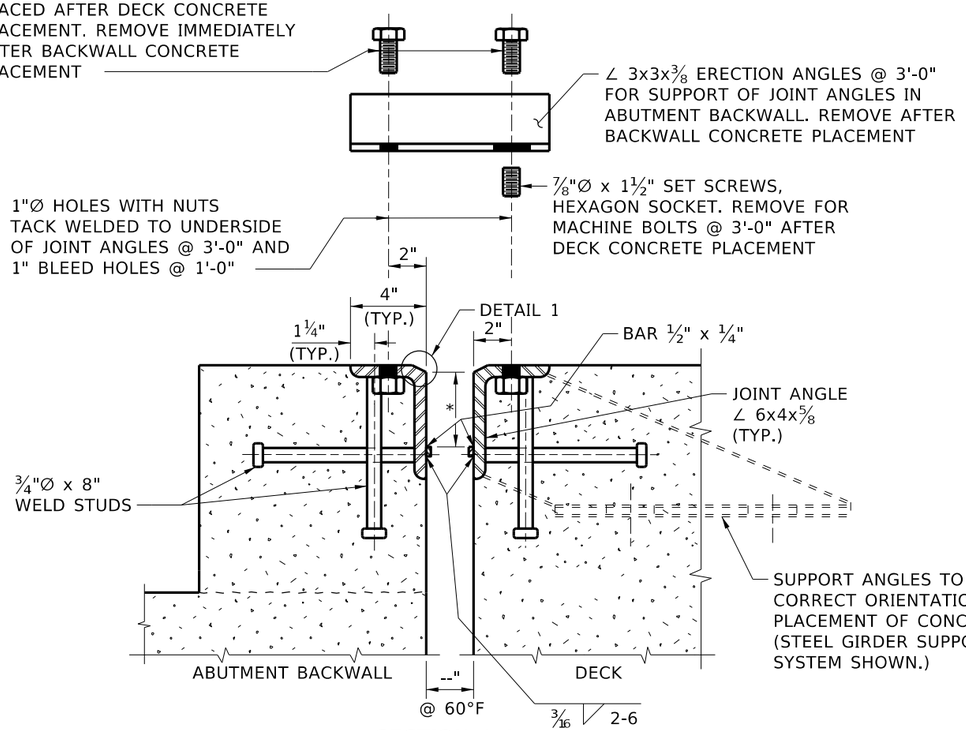
JOINT SEAL DETAIL
1½"=1'-0"

BEVEL MAY BE FLAME CUT PROVIDED THE BURRS, SPATTERS, AND PROJECTIONS ARE GROUND OFF. DO WORK IN THE SHOP.

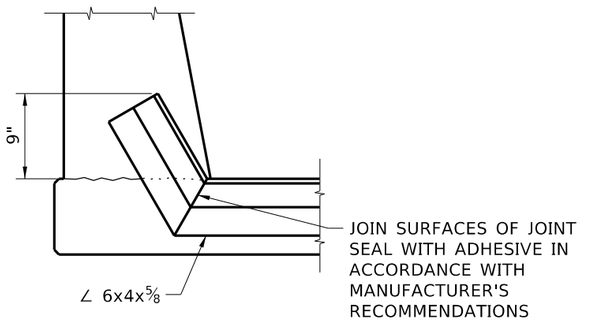


DETAIL 1
1½"=1'-0"

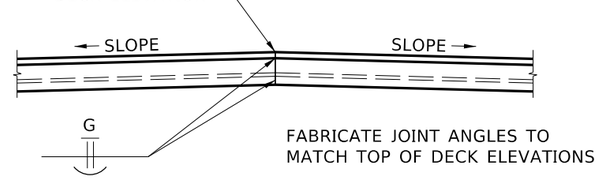
⅞"Ø x 1¾" MACHINE BOLTS, FOR SUPPORT OF ERECTION ANGLES @ 3'-0". BOLTS AND ANGLES TO BE PLACED AFTER DECK CONCRETE PLACEMENT. REMOVE IMMEDIATELY AFTER BACKWALL CONCRETE PLACEMENT



SECTION A-A
1½"=1'-0"



TYPICAL CURB SEAL DETAIL
NTS



CROWN DETAIL
1½"=1'-0"

NOTES

1. PROVIDE STRUCTURAL STEEL IN ACCORDANCE WITH ASTM A709 GRADE 36, AND GALVANIZE IN ACCORDANCE WITH ASTM A123.
2. INSTALL THE TOP OF THE JOINT ANGLE PARALLEL TO THE PROFILE GRADE.
3. PROVIDE JOINT ANGLES WITH A MINIMUM THICKNESS OF ⅝".
4. PROVIDE SUITABLE SUPPORT DURING DECK POUR AND INCLUDE SUPPORT SYSTEM DETAILS ON SHOP PLANS.
5. DIMENSIONS MARKED * ARE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
6. ADJUST THE EXPANSION JOINT X" FOR EVERY 10°F CHANGE IN TEMPERATURE FROM THE MEDIAN TEMPERATURE OF 60°F AT THE TIME OF INSTALLATION OF THE JOINT.
7. PROVIDE CONTINUOUS JOINT SEAL.
8. WHEN THE JOINT ANGLES EXCEED 60' IN LENGTH, A MAXIMUM OF TWO FIELD SPLICES WILL BE PERMITTED. DO NOT LOCATE THE FIELD SPLICE IN THE WHEEL PATH, AND SHOW THE LOCATION ON THE SHOP DRAWINGS.
9. INSTALL THE SEAL AS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS USING AN ADHESIVE LUBRICANT. PROVIDE ADHESIVE LUBRICANT IN ACCORDANCE WITH ASTM D4070.
10. PROVIDE PREFORMED EXPANSION JOINT SEAL IN ACCORDANCE WITH AASHTO M297.
11. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 105.02.
12. FABRICATE THE COMPLETED JOINT ASSEMBLY, INCLUDING COMPONENTS AND SUBASSEMBLIES, BY ONE MANUFACTURER.

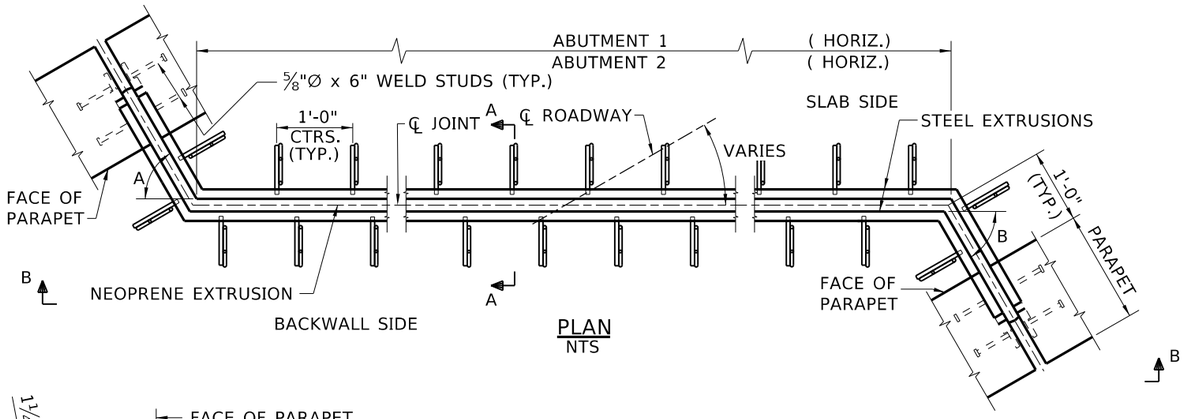
APPROXIMATE STEEL WEIGHT 48 LB/FT.

RECOMMENDED MANUFACTURERS OF THE SHOWN JOINT ASSEMBLY **

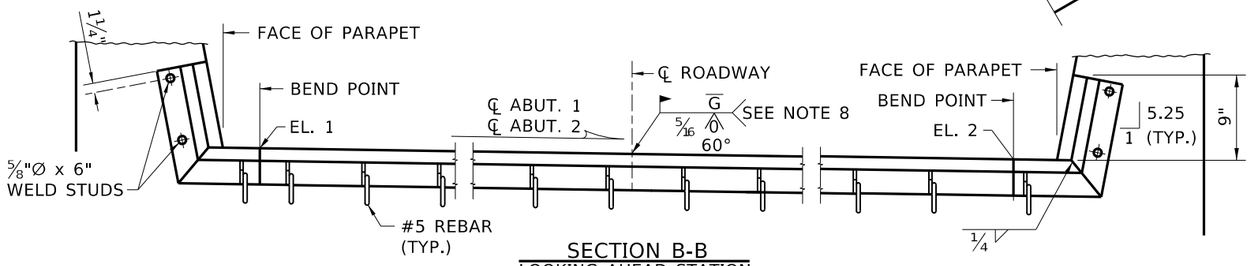
LOCATION	MANUFACTURER	STYLE	NOMINAL SEAL SIZE INCHES	
			WIDTH	HEIGHT
	WATSON BOWMAN ACME			
	D.S. BROWN			
	LYMTAL INTERNATIONAL			

** OR APPROVED EQUAL

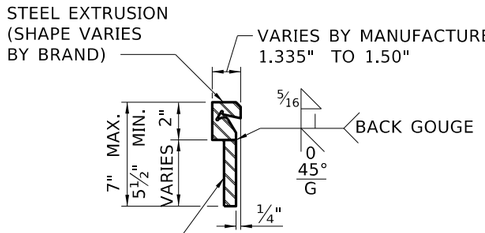
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	COMPRESSION SEAL EXPANSION JOINT	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B14_1B.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B14.1B	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



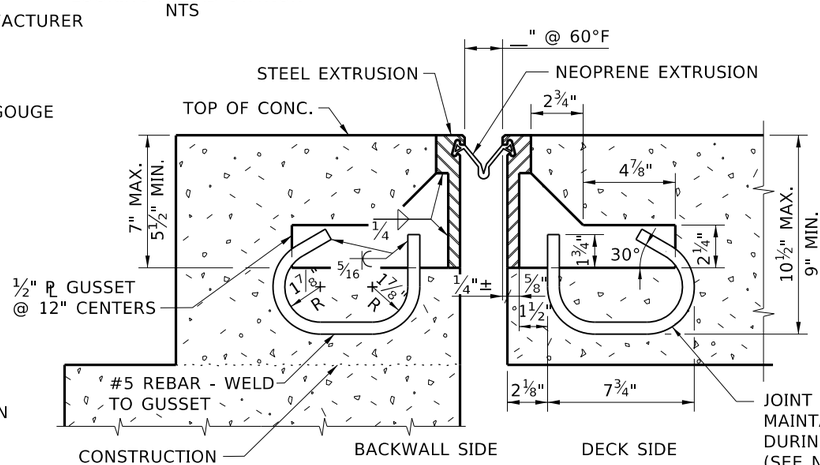
PLAN
NTS



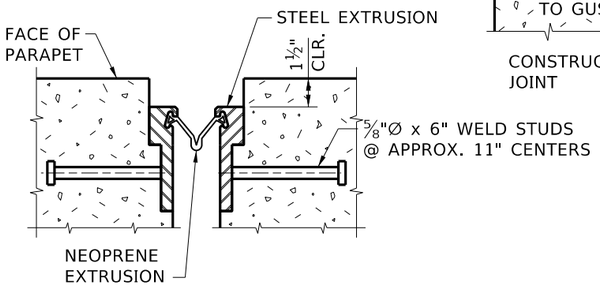
SECTION B-B
LOOKING AHEAD STATION
NTS



BUILT-UP EXTRUSION
3"=1'-0"



SECTION A-A
3"=1'-0"



SECTION THRU PARAPET
3"=1'-0"

NOTES

MATERIALS AND SPECIFICATIONS

1. PROVIDE STEEL PLATE AND EXTRUSION IN ACCORDANCE WITH ASTM A709 GRADE 36, AND GALVANIZE IN ACCORDANCE WITH ASTM A123.
2. PROVIDE STRIP SEALS IN ACCORDANCE WITH ASTM D5973 AND PROVIDE AND INSTALL IN ONE CONTINUOUS PIECE.
3. WELD IN ACCORDANCE WITH CURRENT AASHTO SPECIFICATIONS.

FABRICATION

4. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 105.02.
5. DUE TO THE LENGTH OF STEEL EXTRUSIONS AND THE JOINT PROFILE, PARTIAL PENETRATION GROOVE WELD SHOP SPLICES WILL BE PERMITTED. DO NOT WELD IN THE INTERNAL SECTION OF THE STEEL EXTRUSION WHERE THE NEOPRENE STRIP SEAL IS LOCATED.
6. SHOW THE LOCATION OF SPLICES, THE FINAL LINE AND GRADE OF THE JOINT, NECESSARY WELDING INFORMATION, AND THE METHOD OF SUPPORT DURING THE DECK POURS ON THE SHOP DRAWINGS.
7. THE LINE AND GRADE OF THE JOINT MUST CONFORM TO THAT SHOWN ON THIS SHEET. THE ELEVATION OF THE POINTS SHOWN IN THE JOINT PROFILE DETAIL MAY VARY NO MORE THAN ±.02 FEET FROM THE VALUES SHOWN.
8. WHEN THE JOINT ANGLES EXCEED 60' IN LENGTH, A MAXIMUM OF TWO PARTIAL PENETRATION GROOVE WELD FIELD SPLICES WILL BE PERMITTED. DO NOT LOCATE THE FIELD SPLICE IN THE WHEEL PATH, AND SHOW THE LOCATION ON THE SHOP DRAWINGS.

INSTALLATION

9. INSTALL THE JOINT SYSTEM IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
10. BOND NEOPRENE EXTRUSION TO THE STEEL EXTRUSION WITH AN ELASTIC ADHESIVE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. PROVIDE ADHESIVE LUBRICANT IN ACCORDANCE WITH ASTM D4070.
11. ADJUST THE EXPANSION JOINT X" FOR EVERY 10°F CHANGE IN TEMPERATURE FROM THE MEDIAN TEMPERATURE OF 60°F AT THE TIME OF INSTALLATION OF THE JOINT.
12. FLOOD THE JOINT AREA WITH WATER AND INSPECT FROM BELOW FOR LEAKAGE AFTER THE JOINT IS INSTALLED. REPAIR THE JOINT SYSTEM IF LEAKAGE IS OBSERVED, IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND AS APPROVED.
13. FABRICATE THE COMPLETED JOINT ASSEMBLY, INCLUDING COMPONENTS AND SUBASSEMBLIES, BY ONE MANUFACTURER.

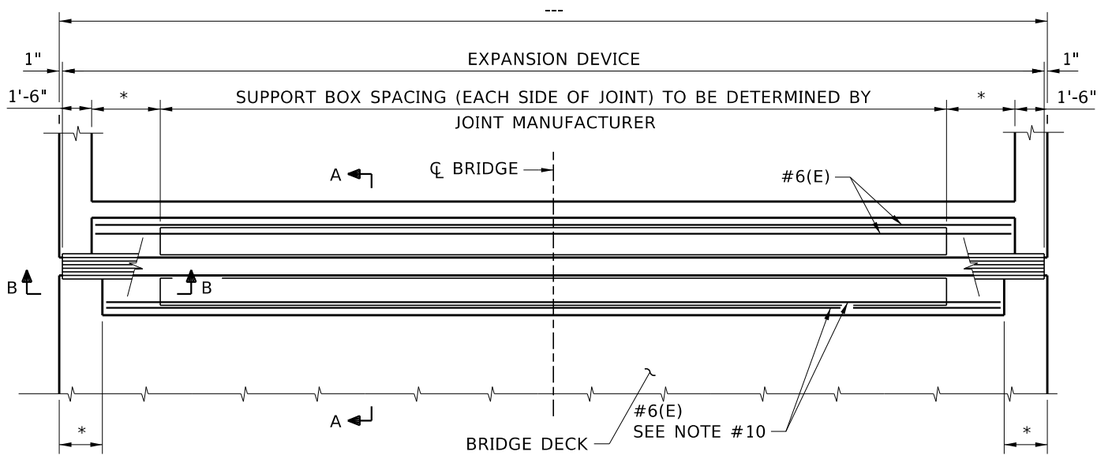
TABLE OF ELEVATIONS				
LOCATION	HORIZONTAL BEND LEFT SIDE 1'-0" FROM TRAFFIC FACE OF PARAPET		HORIZONTAL BEND RIGHT SIDE 1'-0" FROM TRAFFIC FACE OF PARAPET	
	ANGLE A	ELEVATION 1	ANGLE B	ELEVATION 2

RECOMMENDED MANUFACTURERS OF THE SHOWN JOINT ASSEMBLY **

LOCATION	MANUFACTURER	STYLE	EXTRUSION TYPE
	WATSON BOWMAN ACME	SE-400	A
	D.S. BROWN	A2R-400	SSA2
	TECHSTAR	Z-100	TRS-175

** OR APPROVED EQUAL

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	STRIP SEAL EXPANSION JOINT	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards\Bridge Standard Drawings\ B14_2.DGN				COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B14.2	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



* DIMENSION TO BE DETERMINED BY JOINT MANUFACTURER

PLAN

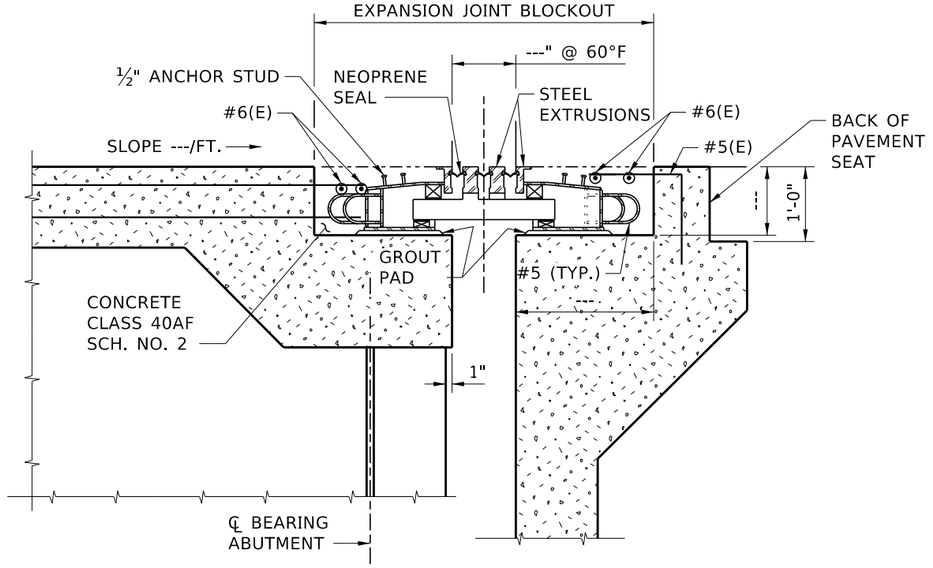
¼"=1'-0"

NOTES

1. PROVIDE EXPANSION JOINT IN ACCORDANCE WITH THE REQUIREMENTS OF S501-30A, EXPANSION JOINT - MODULAR.
2. PROVIDE STEEL PLATES, BARS AND EXTRUSIONS IN ACCORDANCE WITH ASTM A709 GRADE 36 OR A588.
3. PROVIDE EXPANSION JOINTS OF THE FOLLOWING MODULAR TYPES:

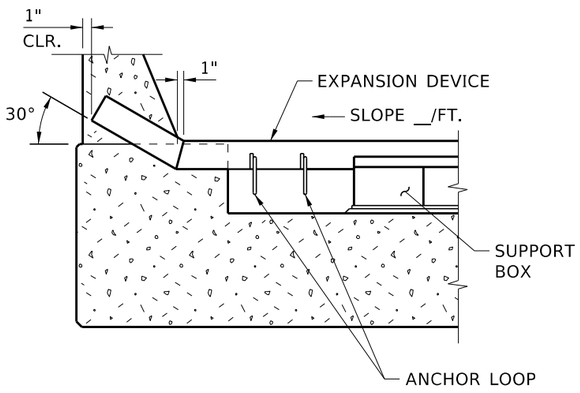
WATSON BOWMAN & ACME	WABO - MAURER
D.S. BROWN	BROWN / MAURER "D" SYSTEM
TECHSTAR	MEJS (MUST MEET FATIGUE TEST REQUIREMENT TO BE APPROVED)

4. PROVIDE A MINIMUM TOTAL MOVEMENT PARALLEL TO THE CENTERLINE OF ROADWAY OF ___.
5. ADJUST THE EXPANSION JOINTS X" FOR EVERY 10°F CHANGE IN TEMPERATURE FROM THE MEDIAN TEMPERATURE OF 60°F AT THE TIME OF INSTALLATION OF THE JOINT.
6. DO NOT INSTALL THE EXPANSION JOINT UNTIL THE ENTIRE SUPERSTRUCTURE, EXCEPT BARRIERS AND CONCRETE OVERLAY, IS COMPLETE.
7. PAINT EXPOSED METAL PARTS IN ACCORDANCE WITH 627 USING PAINT SYSTEM A, EXCEPT THE COLOR OF THE FINAL COAT WILL BE 26492 (GRAY), AMS-STD-595.
8. FOR BARRIER COVER PLATE DETAILS, SEE SHEET ___.
9. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 105.02.
10. PLACE THE TWO SETS OF #6(E) BARS WITHIN EXPANSION JOINT RECESS AT EACH END OF SLAB DURING PLACEMENT OF EXPANSION JOINT CONCRETE.



SECTION A-A

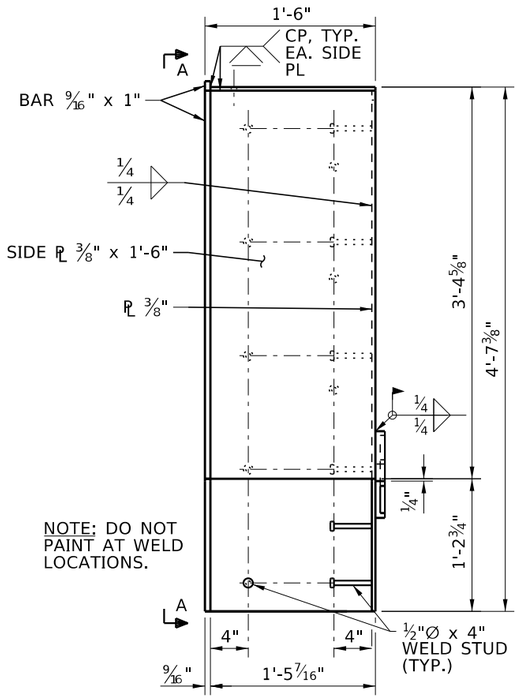
½"=1'-0"



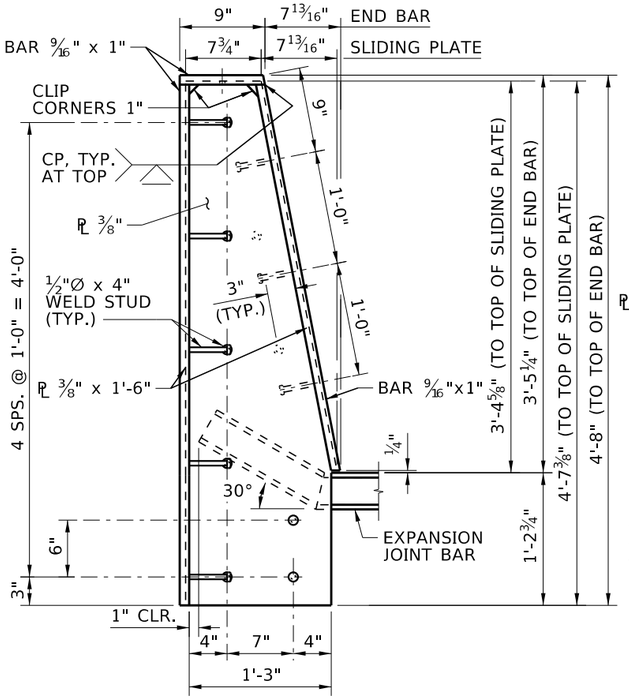
SECTION B-B

½"=1'-0"

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	MODULAR EXPANSION JOINT	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
				DETAILED	Standards/Bridge Standard Drawings/ B14_3.DGN				COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: OCT 2023	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B14.3	BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						

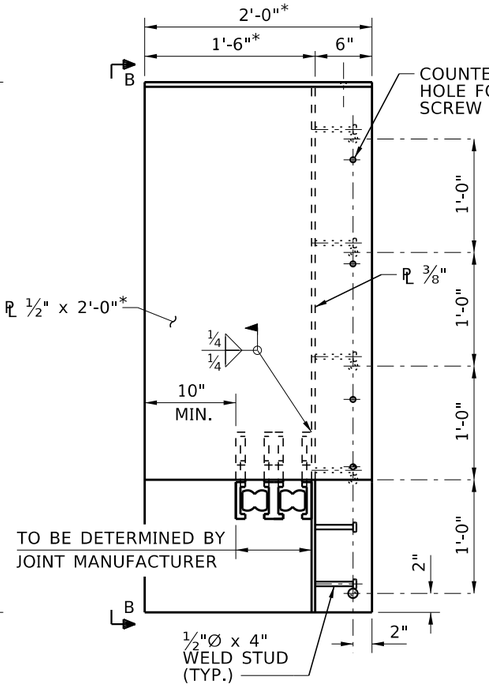


ELEVATION

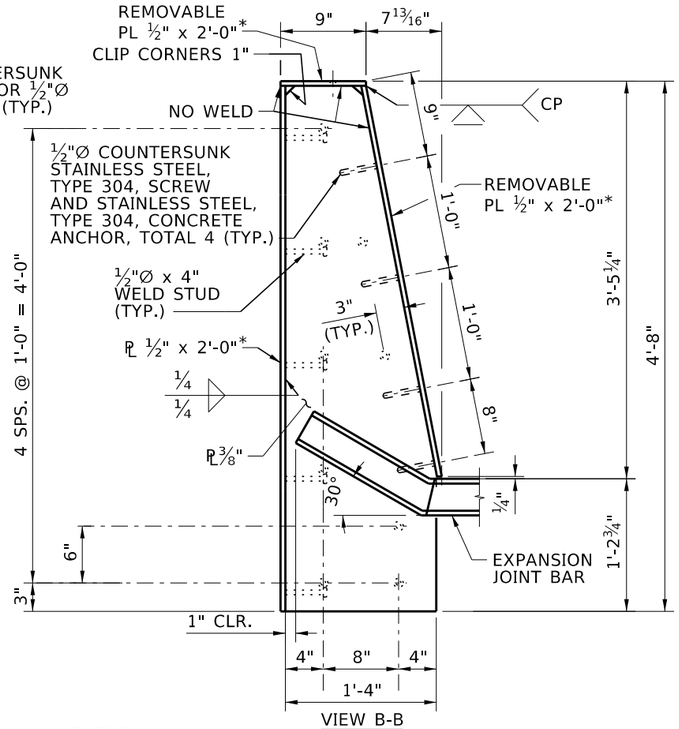


VIEW A-A

PANEL"A"
3/4"=1'-0"



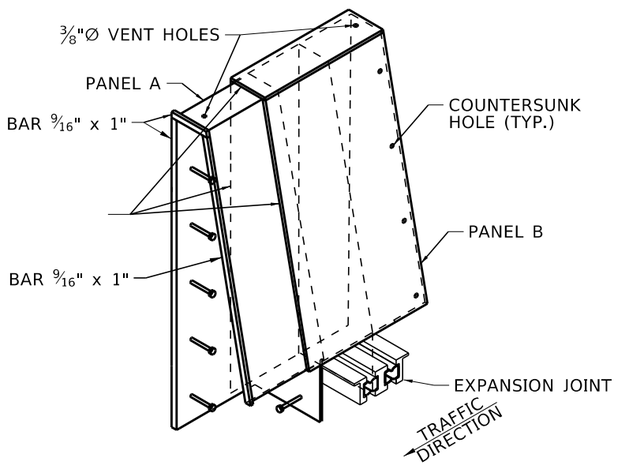
ELEVATION



VIEW B-B

PANEL"B"
3/4"=1'-0"

*NOTE:
PLATE LENGTHS DETERMINED BASED ON TWO CELL MODULAR JOINT. CONTRACTOR TO VERIFY PLATE LENGTHS WITH SELECTED MODULAR JOINT.

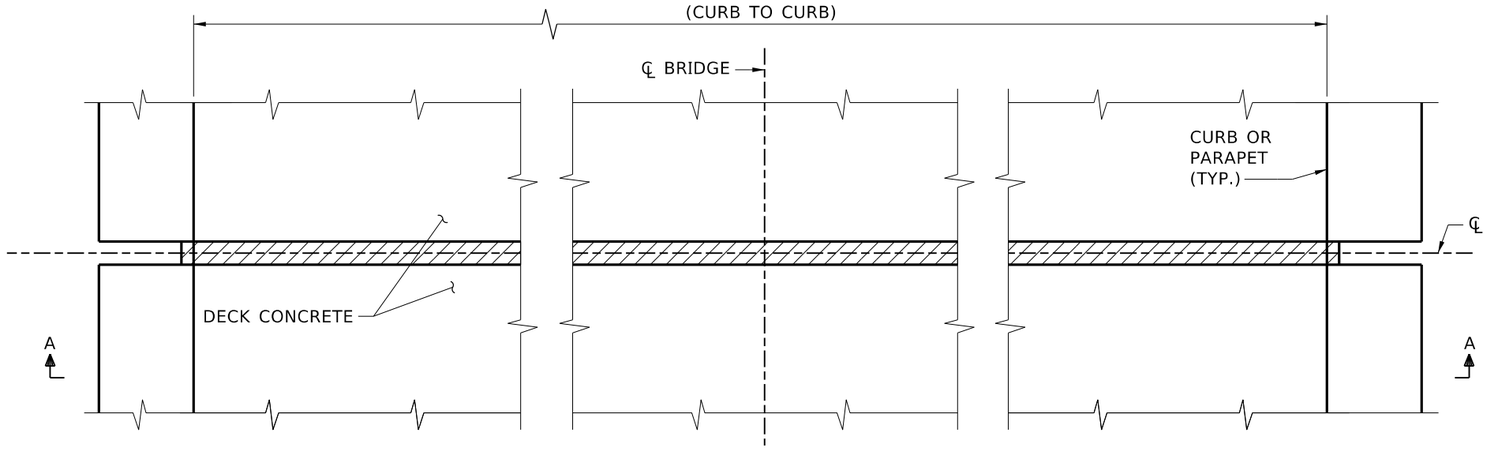


ASSEMBLED PARAPET EXPANSION JOINT
NTS

NOTES:

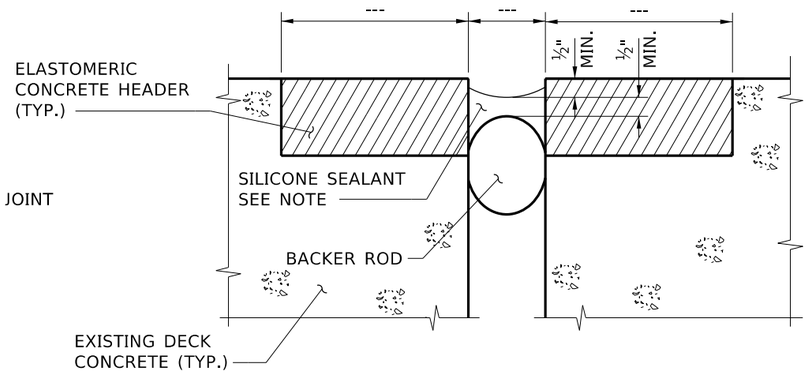
1. PROVIDE STEEL PLATES IN ACCORDANCE WITH ASTM A709 GRADE 36.
2. FOR DETAILS OF EXPANSION JOINT, SEE MODULAR EXPANSION JOINT SHEET.
3. PAINT METAL PARTS IN ACCORDANCE WITH 627 OF THE STANDARD SPECIFICATIONS USING PAINT SYSTEM A, EXCEPT THE COLOR OF THE FINAL COAT WILL BE COLOR 26492 (GRAY), AMS-STD-595.
4. SUBMIT SHOP DRAWINGS ELECTRONICALLY IN PDF FORMAT IN ACCORDANCE WITH 504 AND INCLUDE AN ERECTION DIAGRAM. CLEARLY SPECIFY MATERIALS BEING USED. SUBMIT ELECTRONIC AS-BUILT SHOP DRAWINGS IN PDF FORMAT BEFORE PROJECT COMPLETION.
5. PAYMENT FOR THE PARAPET COVER PLATE ASSEMBLY WILL BE INCLUDED IN THE UNIT PRICE FOR PAY ITEM S501-30A "MODULAR EXPANSION JOINT".

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	42" CONCRETE PARAPET COVER PLATES	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B14_4A.DGN	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B14.4A	COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: OCT 2023				BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



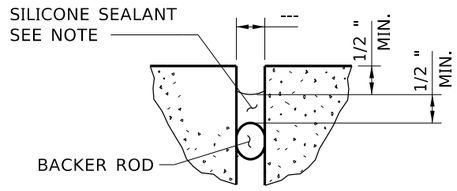
DECK PLAN

¾" = 1'-0"



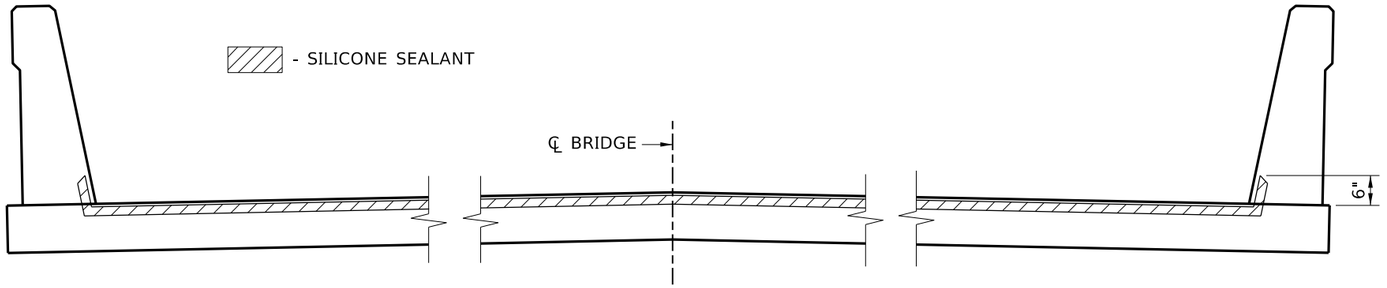
ELASTOMERIC CONCRETE HEADER

3" = 1'-0"



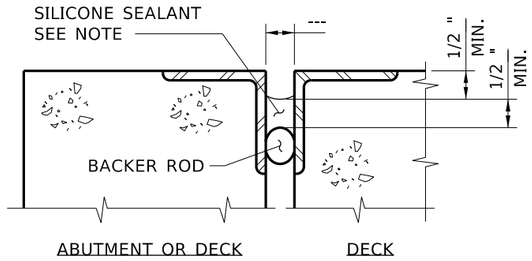
UNARMORED JOINTS

NTS



SECTION A-A

¾" = 1'-0"



ARMOR ANGLES

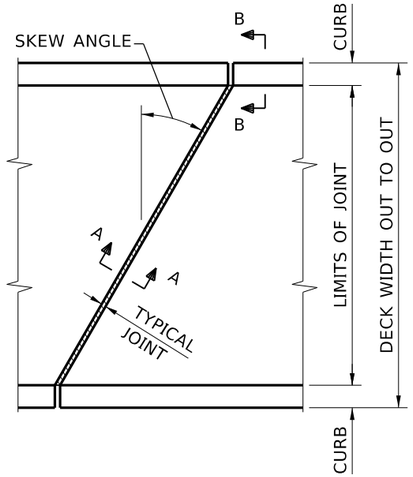
NTS

NOTE

PROVIDE JOINT SEALANT THAT MEETS THE REQUIREMENTS OF ASTM C920 FOR TYPE M, GRADE P, CLASS 100/50 AND USE T, AND MEETS ASTM C719 FOR TEST MOVEMENTS +100% AND -50% OF THE JOINT WIDTH AS TESTED BY AN INDEPENDENT TESTING FACILITY.

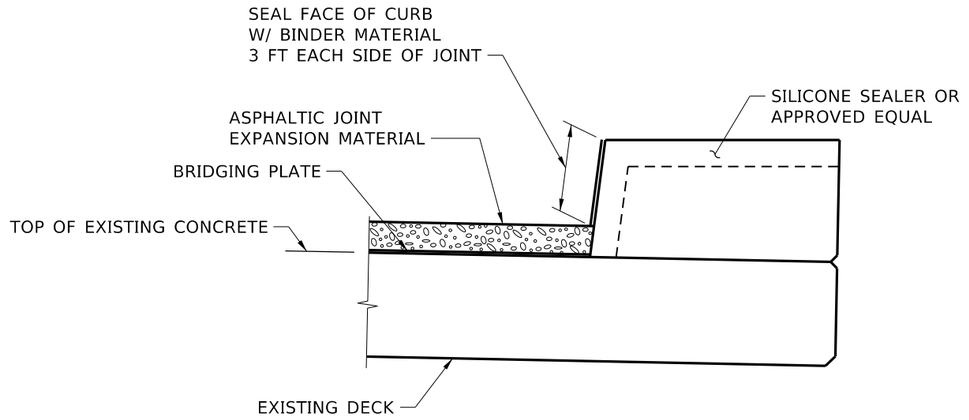
ORIGINAL STORED AT: ITD BRIDGE SECTION - Boise, Idaho

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	SILICONE SEALANT JOINT	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
				DETAILED	Standards\Bridge Standard Drawings\ B14_5.DGN				COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: JUNE 2022	APPROVED BY: BRIDGE ENGINEER _____ DATE: _____		BRIDGE LRFD DESIGN MANUAL, B14.5	BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						

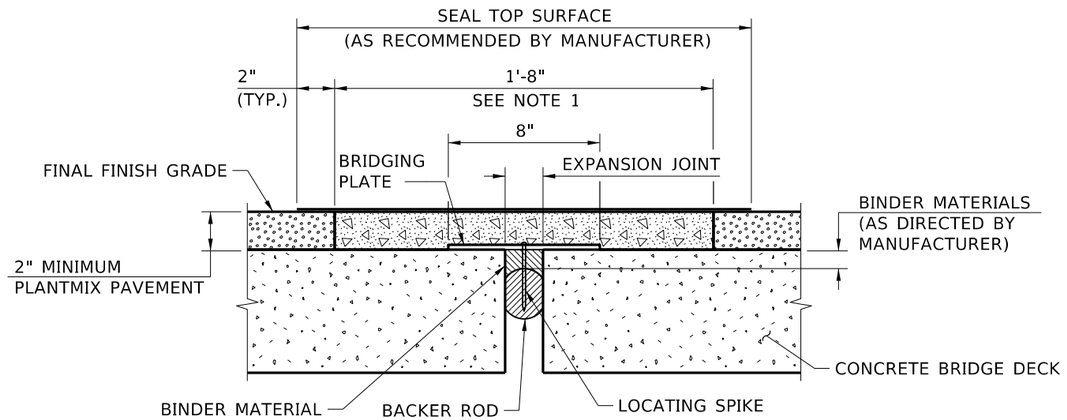


PLAN
1½"=1'-0"

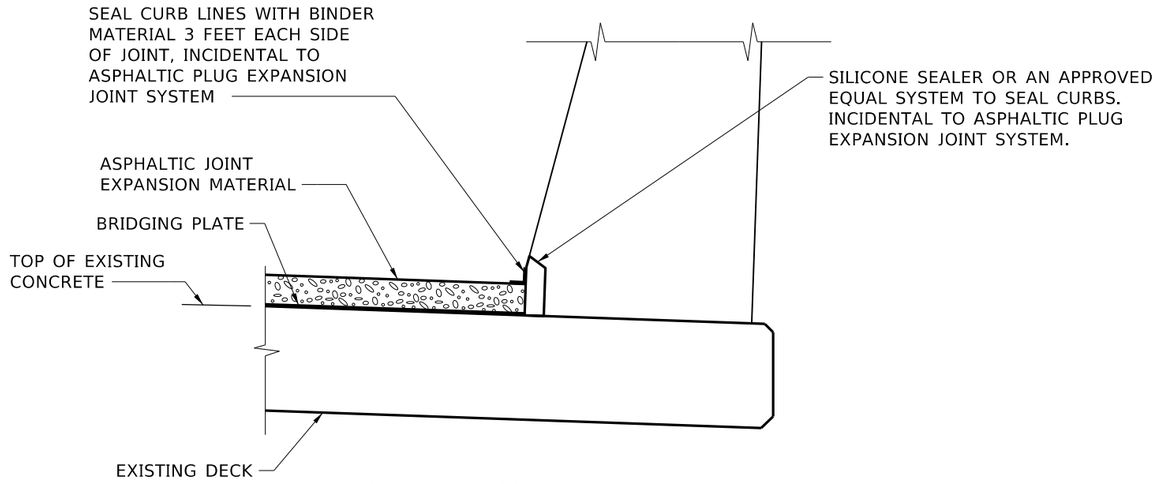
NOTES:
1. DO NOT PLACE CONCRETE WATERPROOFING SYSTEM WITHIN LIMITS OF PLUG JOINT. WATERPROOFING SYSTEM MAY BE PLACED ON TAR PAPER TO ALLOW REMOVAL BEFORE PLACING PLUG JOINT MATERIAL.
2. PROVIDE JOINT SEALANT THAT MEETS THE REQUIREMENTS OF ASTM C920 FOR TYPE M, GRADE P, CLASS 100/50 AND USE T, AND MEETS ASTM C719 FOR TEST MOVEMENTS +100% AND -50% OF THE JOINT WIDTH AS TESTED BY AN INDEPENDENT TESTING FACILITY.



SECTION B-B W/ CURB
1½"=1'-0"



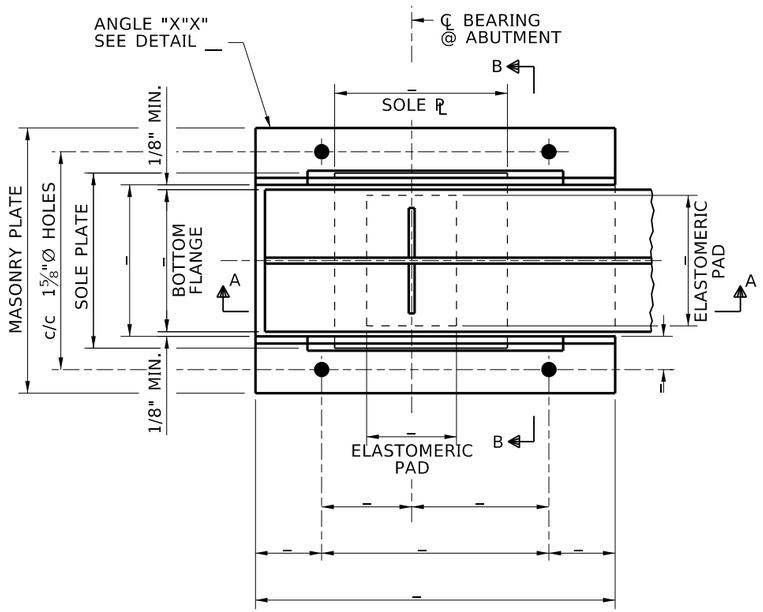
SECTION A-A
1½"=1'-0"



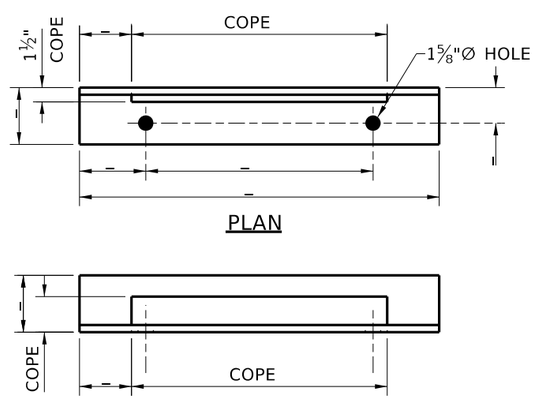
SECTION B-B W/ CONCRETE PARAPET
1½"=1'-0"

ORIGINAL STORED AT: ITD BRIDGE SECTION - Boise, Idaho

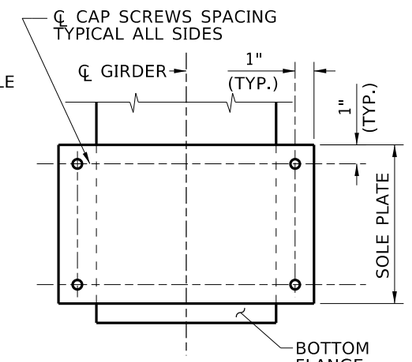
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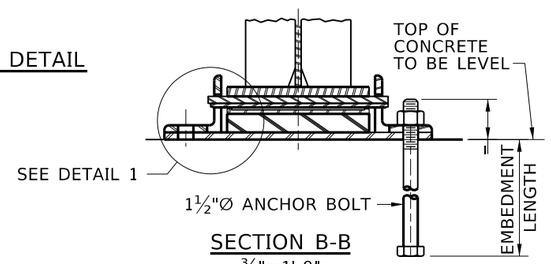
EXPANSION BEARING PLAN @ ABUTMENT
(SHOWN @ 60°F)
¾"=1'-0"



RESTRAINER ANGLE DETAIL
¾"=1'-0"



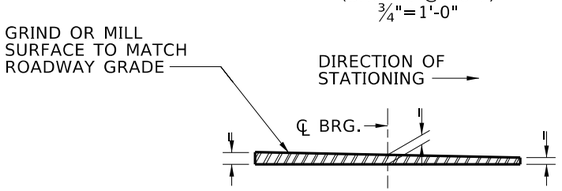
SOLE PLATE
(REFLECTED PLAN VIEW)
NTS



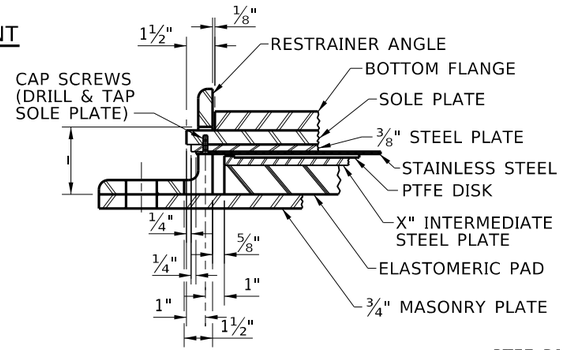
SECTION B-B
¾"=1'-0"

NOTES

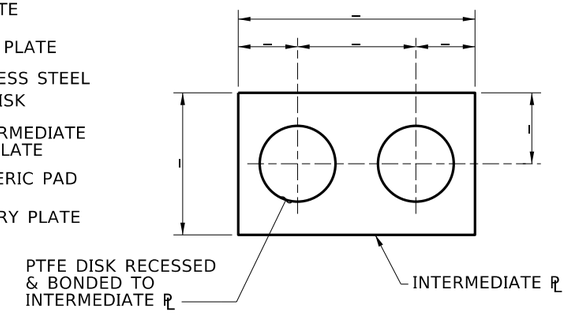
1. PROVIDE ANCHOR BOLTS IN ACCORDANCE WITH ASTM F1554 GRADE 36 AND GALVANIZE IN ACCORDANCE WITH ASTM A153.
2. PROVIDE STEEL, IN ACCORDANCE WITH ASTM A709 GRADE 50 UNLESS OTHERWISE SPECIFIED.
3. AFTER PLACEMENT OF DECK CONCRETE, EACH PAD MUST BEAR ON BOTH TOP AND BOTTOM SEATS THROUGHOUT ITS AREA.
4. PROVIDE STAINLESS STEEL SHEETS IN ACCORDANCE WITH ASTM A240, TYPE 304 WITH A NO. 8 RMS FINISH.
5. PROVIDE ¼"- 20 UNC X ¾" STAINLESS STEEL 82° HEXAGON SOCKET FLAT COUNTERSUNK HEAD CAP SCREWS 18-8 SS.
6. THE COST OF PROVIDING AND INSTALLING BEARING UNITS IS INCIDENTAL TO PAY ITEM 507-015A.
7. PROVIDE ELASTOMERIC PADS IN ACCORDANCE WITH 720.02.
8. PROVIDE PTFE IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS ARTICLE 14.7.2, FOR VIRGIN, UNFILLED DIMPLED LUBRICATED SHEETS AND FABRICATE IN ACCORDANCE WITH AASHTO LRFD BRIDGE CONSTRUCTION SECTION 18. PERFORM CERTIFICATION TESTING FOR THE PTFE TO ENSURE THAT THE FRICTION ACTUALLY ACHIEVED IN THE BEARING MEETS THE ASSUMED DESIGN VALUE xxx.
9. SOLVENT CLEAN AND PAINT METAL SURFACES EXPOSED TO VIEW IN THE COMPLETED WORK, EXCEPT STAINLESS STEEL SURFACE, IN ACCORDANCE WITH 627. PAINT WILL BE 4 - 6 MILS OF INORGANIC ZINC AND WILL BE APPLIED IN THE SHOP. PAINT TOP COAT COLOR 20122 AMS-STD-595. CLEAN AND REPAINT SURFACES DAMAGED DURING INSTALLATION.
10. REMOVE THE TOP OF THE ASSEMBLY DURING INSTALLATION AND APPLY A 1/16" THICK COATING OF SILICONE GREASE TO THE ENTIRE TFE SURFACE AND THE BEARING REASSEMBLED WITHOUT DAMAGE TO THE MATING SLIDING SURFACE. PROVIDE SILICONE GREASE IN ACCORDANCE WITH SPECIFICATION SAE-AS8660.
11. SET THE MASONRY PLATE ON A THIN GROUT PAD IN ACCORDANCE WITH TYPE "B", CLASS 1 AS SPECIFIED IN 705.02.
12. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 105.02.
13. ALIGN THE CENTERLINES OF THE UPPER AND LOWER BEARING ASSEMBLIES AT THE TIME OF GIRDER ERECTION AT THE ASSUMED MEDIAN TEMPERATURE OF 60°F.
14. OFFSET THE CENTERLINE OF THE UPPER BEARING ASSEMBLY WITH WITH RESPECT TO THE CHANGE IN TEMPERATURE FROM 60°F FOR GIRDER ERECTION AT TEMPERATURES OTHER THAN 60°F, BY __" FOR EVERY 10°F CHANGE IN TEMPERATURE FROM 60°F.



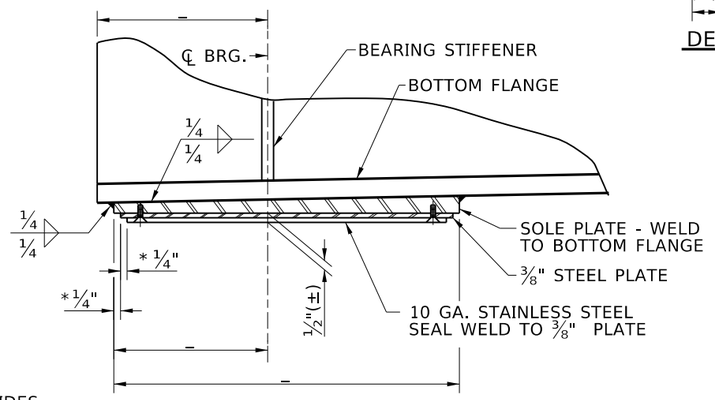
SOLE PLATE ELEVATION
NTS



DETAIL 1
NTS

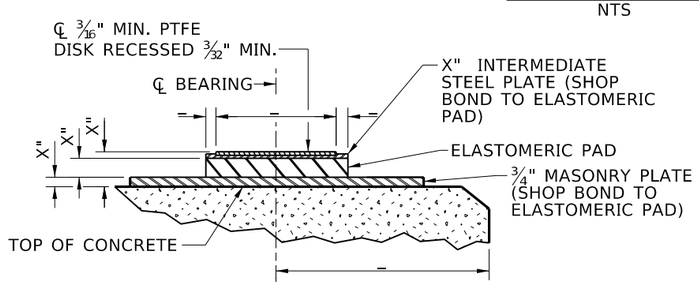


PTFE DISK DETAILS
NTS



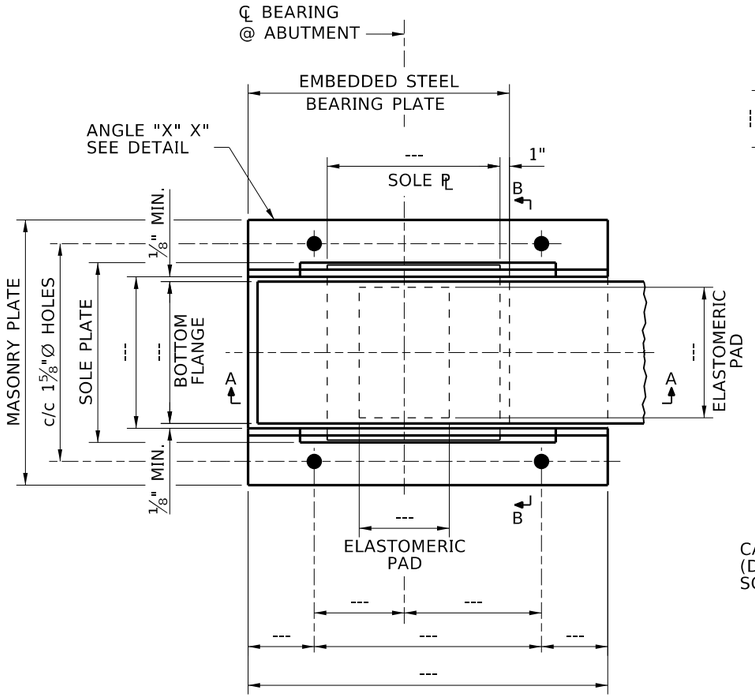
* TYPICAL ALL SIDES

SECTION A-A
POSITION OF UPPER PORTION OF EXPANSION BEARING
NTS

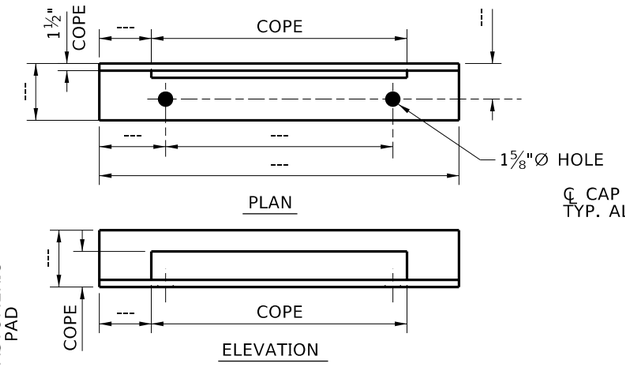


SECTION A-A
POSITION OF LOWER PORTION OF EXPANSION BEARING
NTS

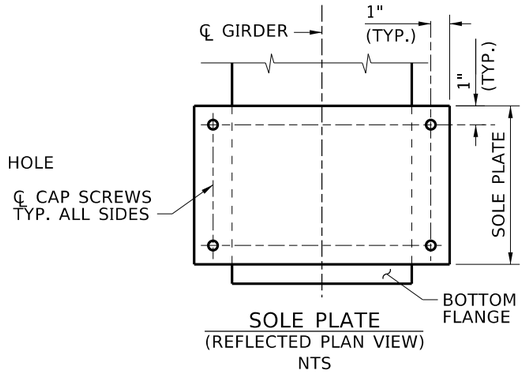
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NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
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				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B14.7A	BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS					



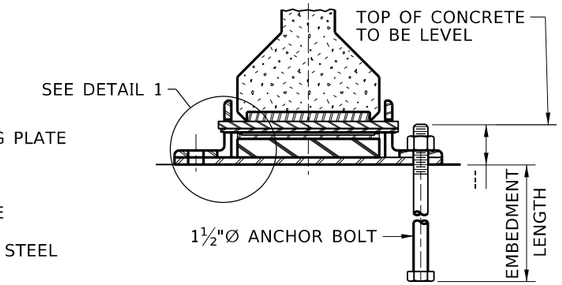
EXPANSION BEARING PLAN & ABUTMENT
(SHOWN AT 60°F
1½" = 1'-0"



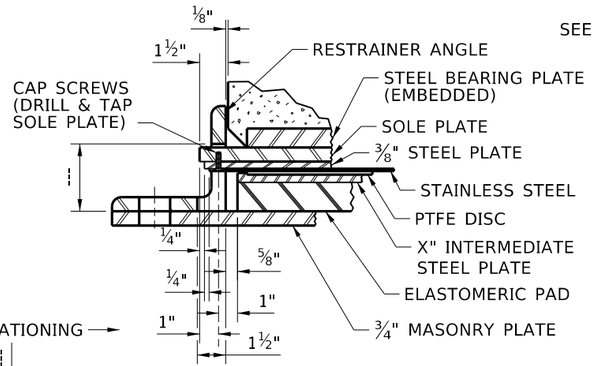
RESTRAINER ANGLE DETAIL
1½" = 1'-0"



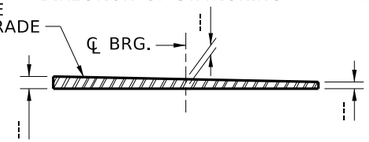
SOLE PLATE
(REFLECTED PLAN VIEW)
NTS



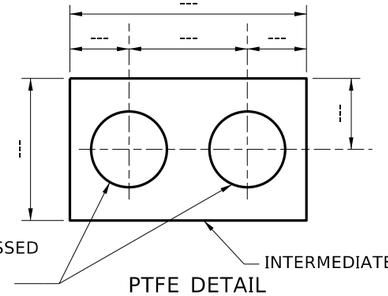
SECTION B-B
1½" = 1'-0"



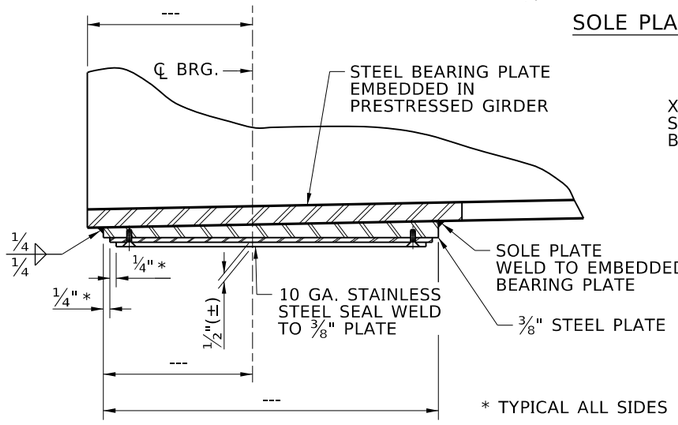
DETAIL 1
NTS



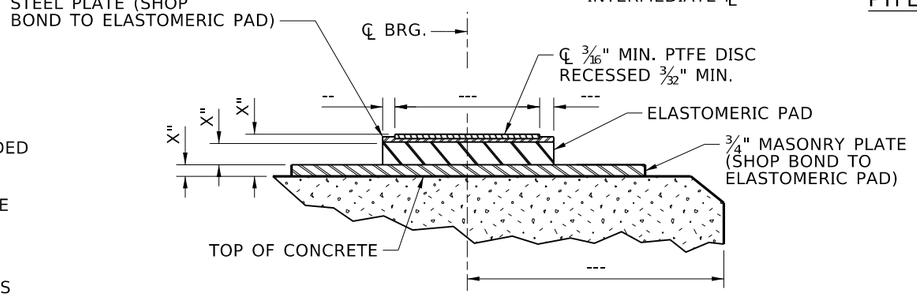
SOLE PLATE ELEVATION
NTS



PTFE DETAIL
NTS



SECTION A-A
POSITION OF UPPER PORTION OF EXPANSION BEARING
NTS



SECTION A-A
POSITION OF LOWER PORTION OF EXPANSION BEARING
NTS

NOTES

1. PROVIDE ANCHOR BOLTS IN ACCORDANCE WITH ASTM F1554 GRADE 36 AND GALVANIZE IN ACCORDANCE WITH ASTM A153.
2. PROVIDE STEEL IN ACCORDANCE WITH ASTM A709 GRADE 50 UNLESS OTHERWISE SPECIFIED.
3. AFTER PLACEMENT OF DECK CONCRETE, EACH PAD MUST BEAR ON BOTH SEATS THROUGHOUT ITS AREA.
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9. SOLVENT CLEAN AND PAINT METAL SURFACES EXPOSED TO VIEW IN THE COMPLETED WORK, EXCEPT STAINLESS STEEL SURFACE, IN ACCORDANCE WITH 627. PAINT WILL BE 4 - 6 MILS OF INORGANIC ZINC AND WILL BE APPLIED IN THE SHOP. PAINT TOP COAT COLOR 26492 AMS-STD-595. CLEAN AND REPAINT SURFACES DAMAGED DURING INSTALLATION.
10. REMOVE THE TOP OF THE ASSEMBLY DURING INSTALLATION AND APPLY A 1/16" THICK COATING OF SILICONE GREASE TO THE ENTIRE PTFE SURFACE AND THE BEARING ASSEMBLED WITHOUT DAMAGE TO THE MATING SLIDING SURFACE. PROVIDE SILICONE GREASE IN ACCORDANCE WITH SPECIFICATION SAE-AS8660.
11. SET THE MASONRY PLATE ON A TIN GROUT PAD IN ACCORDANCE WITH TYPE "B", CLASS 1 AS SPECIFIED IN 105.02.
12. SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 105.02.
13. ALIGN THE CENTERLINES OF THE UPPER AND LOWER BEARING ASSEMBLIES AT THE TIME OF GIRDER ERECTION AT THE ASSUMED MEDIAN TEMPERATURE OF 60° F.
14. OFFSET THE CENTERLINE OF THE UPPER BEARING ASSEMBLY WITH RESPECT TO THE CHANGE IN TEMPERATURE FROM 60°F FOR GIRDER ERECTION AT TEMPERATURES OTHER 60° F, BY __" FOR EVERY 10° F CHANGE IN TEMPERATURE FROM 60°F.

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	TFE/STAINLESS STEEL EXPANSION BEARING	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.
				DETAILED	Standards/Bridge Standard Drawings/ B14_7B.DGN	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		CONCRETE GIRDER DETAIL BRIDGE LRFD DESIGN MANUAL, B14.7B	COUNTY / KEY NO.
				DWG. CHECKED					BRIDGE DWG. NO. / SHEET OF
				CORRECTIONS	DRAWING DATE: DEC 2024				

CHAPTER 15

CONSTRUCTION

CHECKING PROCEDURE FOR PRESTRESSED GIRDER SHOP DRAWINGS

The following is a list of items that should be checked to insure a complete and thorough review of prestressed girder shop drawings.

Submittal Data

Strand Certification

- Strand type (stress relieved or low relaxation)
- Ultimate strength
- Strand Area
- Modulus of elasticity

Jacking Force/Gauge Pressure

- Data from the calibration test and a graph or equation representing the relationship between jacking force and gauge pressure shall be included.

Bed Layout

- Total length of strand being tensioned
- Hold-down point locations with horizontal and vertical dimensions
- Hold-up point locations with horizontal and vertical dimensions

Elongation Calculations

- Elongation of each strand to be measured and the corresponding gauge pressure

Checking Procedure

The tensioning method varies with each fabricator and the method of calculating the elongations varies accordingly.

Jack Data

- Jacking data shall fit the graph or equation submitted and the jack used in the test shall be the jack used for tensioning.

Strand Data

- Strand data shall match the certification sheet. The prestressing manufacturer must be reminded in the review letter that if the actual strand properties being used vary by more than 5% from the assumed values in the calculations then new elongation calculations will have to be made.

Initial Prestress Force

- An initial force and initial gauge pressure shall be given. This is the force in the strand before any elongation measurements are made.

Final Prestress Force

- This is the desired force in the strand after all the elongation losses have occurred.
  Low relaxation strand P_f = 0.75x270xstrand area
  Stress relieved strand P_f = 0.70x270xstrand area

Calculated Elongations

Δi = initial elongation = P_i L/AE
Δf = final elongation = P_f L/AE

Elongation Losses

- Elongation losses are treated differently depending on when they occur. There are three different times an elongation loss can occur:
  a. Before the strand is seated, Δ_B (dead-end seating or abutment deflection due to the jacking in progress).
  b. When the strand is seated, Δ_S (strand slipping in the chuck when released).
  c. After the strand is seated, Δ_A (abutment deflection due to subsequent jacking of other strands).

- The values for the three different losses should be given since they are unique to each prestressing yard.

Gauge Pressure for Straight Strands

- Use the gauge pressure vs. jacking force graph or equation and solve for the gauge pressure.
  Fj = jacking force = $(\Delta f + \Delta_S + \Delta_A)$ AE/L

Elongation for Straight Strands

- Measured before seating $\Delta_M = \Delta f - \Delta i + \Delta_B + \Delta_A + \Delta_S$
- Measured after seating $\Delta_M = \Delta f - \Delta i + \Delta_B + \Delta_A$

Elongation for Harped Strand

- Use the geometry for the hold-down and hold-up points to calculate the increase in the strand length due to harping.
  Δ_H = elongation due to increase in length of harped strand
  Δ_{MH} = elongation of harped strand = $\Delta_M - \Delta_H$

Gauge Pressure of Harped Strand

- Use the gauge pressure vs. jacking force graph or equation and solve for the gauge pressure.
  Fj = jacking force = $(\Delta f - \Delta_H + \Delta_S + \Delta_A)$ AE/L

The above calculations should be made for each strand and a table prepared listing the measured elongation and corresponding gauge pressure for each strand.

Refer to Appendix H of the PCI *Manual for Quality Control for Plants and Production of Structural Precast Concrete Products,* 4th Edition, for sample tensioning calculations.

CHAPTER 16

ESTIMATING

PRELIMINARY STRUCTURE COST ESTIMATE

The preliminary estimate of total structure cost can be determined from the graphs on ProjectWise at:
HEADQUARTERS/BRIDGE/BRIDGE DESIGN/BRIDGE COST DATA/PRELIMINARY STRUCTURE COSTS
Preliminary Structure Costs

The costs apply to ordinary structure types. The preliminary square foot cost should be increased by 30% to account for unknown contingency items. The data is based upon the low bid from projects awarded.

The total cost per square foot includes all the bid items necessary to construct the structure except for the following:

Preliminary Engineering
E & C
Traffic Control

The costs for Repair and Rehabilitation projects require an individual estimate of cost for each project because of the wide diversity of work.

Cost data is available for the following types of structures:
NEW CONSTRUCTION

- Culverts – cast-in-place & precast
- Prestressed girders
- Steel girders
- Voided slabs
- Pedestrian overpass
- Pedestrian underpass

Retaining wall cost per square foot data can be determined from the graphs on ProjectWise at:
HEADQUARTERS/BRIDGE/BRIDGE DESIGN/BRIDGE UNIT PRCE/SPECIAL PROVISIONS/RETAINING WALLS
Retaining Walls

Cost data is available for the following types of walls:
NEW CONSTRUCTION

- Cast-in-place concrete retaining walls
- Block walls
- MSE walls
- Soils Nail walls
- Soldier Pile walls
- Welded Wire walls
- Sound Walls

Revisions:

Sep 2020 Deleted Tables for square foot costs for bridges and miscellaneous structures.
Moved Preliminary Square Foot Cost data to ProjectWise and added link.
Deleted “Consult with the Group Leader/Bridge Engineer to obtain costs from similar projects” from Repair and Rehabilitation Projects.

COST ESTIMATE

GENERAL INSTRUCTIONS

The unit costs can be determined from the trend line curves of the 3 low bids based on quantity located in ProjectWise at: HEADQUARTERS/BRIDGE/BRIDGE DESIGN/BRIDGE COST DATA/BRIDGE UNIT PRICE

Unit costs can also be determined from AASHTOWare Estimation or the Unit Price Report (CSV) located at https://itd.idaho.gov/business/?target=Average-Unit-Price-Reports#average-unit-price-reports

Unit Costs should generally be increased for jobs that are at remote sites.

Do not show Item 629 - Mobilization - on the bridge drawings, but show it on the Cost Estimate. Use 15% of total of all other bridge bid items for estimating purposes, but show as lump sum on the Cost Estimate. Increase mobilization for projects in remote areas.

Plan Quantity items should be denoted on the Quantities list of bid items on the Plans. Consider paying plan quantity for the bid items listed in Article A16.2.

Cost Estimates for all projects (In-house and Consultant) shall be entered into the Bridge Cost Estimate database program by the ITD Bridge Section.

Pay item descriptions and units shall be in accordance with AASHTOWare Estimation and the current Pay Item Catalog on Sharepoint.

Revisions:

Oct 2017	Added Trend Line Curves Added method to compute mobilization.
Nov 2019	Added links to trend line curves and Unit Price report to allow access to most current data. Deleted hard copy trend line curves in A16.2 and A16.3. Added a link to a list of bid items.
Sep 2020	Revised ProjectWise link to Unit Prices. Revised procedure for Plan Quantity Items. Noted that cost estimates are entered into the database program by ITD Bridge Section.
Dec 2024	Added pay item unit costs and description shall be in accordance with AASHTOWare Estimation. Deleted link to Unit Price trend line curves in ProjectWise. Increased mobilization from 10% to 15%. Added mobilization should be increased in remote locations.

BRIDGE IMPROVEMENT TYPE CODE

The bridge improvement type code is a two digit number that is needed on the ITD-2101form, Project Authorization and Agreement, by the FHWA for their approval process. The following codes should be used:

BRIDGE IMPROVEMENT TYPES			
Code	Name	Structure No. Required	Definition FAST Funds
8	New Bridge	No	Construction of a new bridge that does not replace or relocate an existing bridge.
10	Bridge Replacement	Yes	Total replacement of a bridge with a new structure.
13	Bridge Rehabilitation	Yes	Major work required to restore the structural integrity of bridge as well as work necessary to correct major safety defects.
40	Special Bridge	No	Includes low water crossing replacement, application of calcium magnesium acetate, sodium acetate/formate, or other environmentally acceptable, minimally corrosive anti-icing and deicing compositions, and other eligible bridge projects not covered by another type of improvement type code.
47	Bridge Preservation	Yes	Activities that prevent, delay, or reduce deterioration of bridges or bridge elements, restore the function of existing bridges, keep bridges in good condition and extend their life.
48	Bridge Protection	Yes	Includes scour countermeasures, seismic retrofits, impact protection measures, security countermeasures, and protection against extreme events.
49	Bridge Inspection and Related Training	No	Bridge inspection and evaluation activities, including in-depth and special inspections. Bridge inspection related training.
59	Bridge Resurfacing	Yes	Includes installation of deck overlays, asphalt wearing surfaces.

Revisions:
March 2017 FAST Apportionment Improvements Types

QUANTITIES

General

The quantities of the various materials involved in the construction of a project are needed for determining the estimated cost of the project and for establishing a base for the contractor's bid and payment.

Upon completion of structural design and detailing of plans, the quantities of materials in the construction of the project shall be computed. Quantities are to be computed and checked independently. Final quantities to be listed in the Special Provisions and Bid Proposal sheet are to be calculated to have an accuracy of +/- 1 percent for Plan Quantity items and +/- 5 percent for all other items.

Method of measurement for the various materials shall be in accordance with the ITD *Standard Specifications for Highway Construction*, current edition, and Supplemental Specifications.

Section 210 – Structure Excavation and Compacting Backfill

Structure Excavation, Schedule No. 1, shall include excavation for bridges, box and stiffleg culverts, and Structure Excavation, Schedule No. 2, shall include excavation for all other structures.

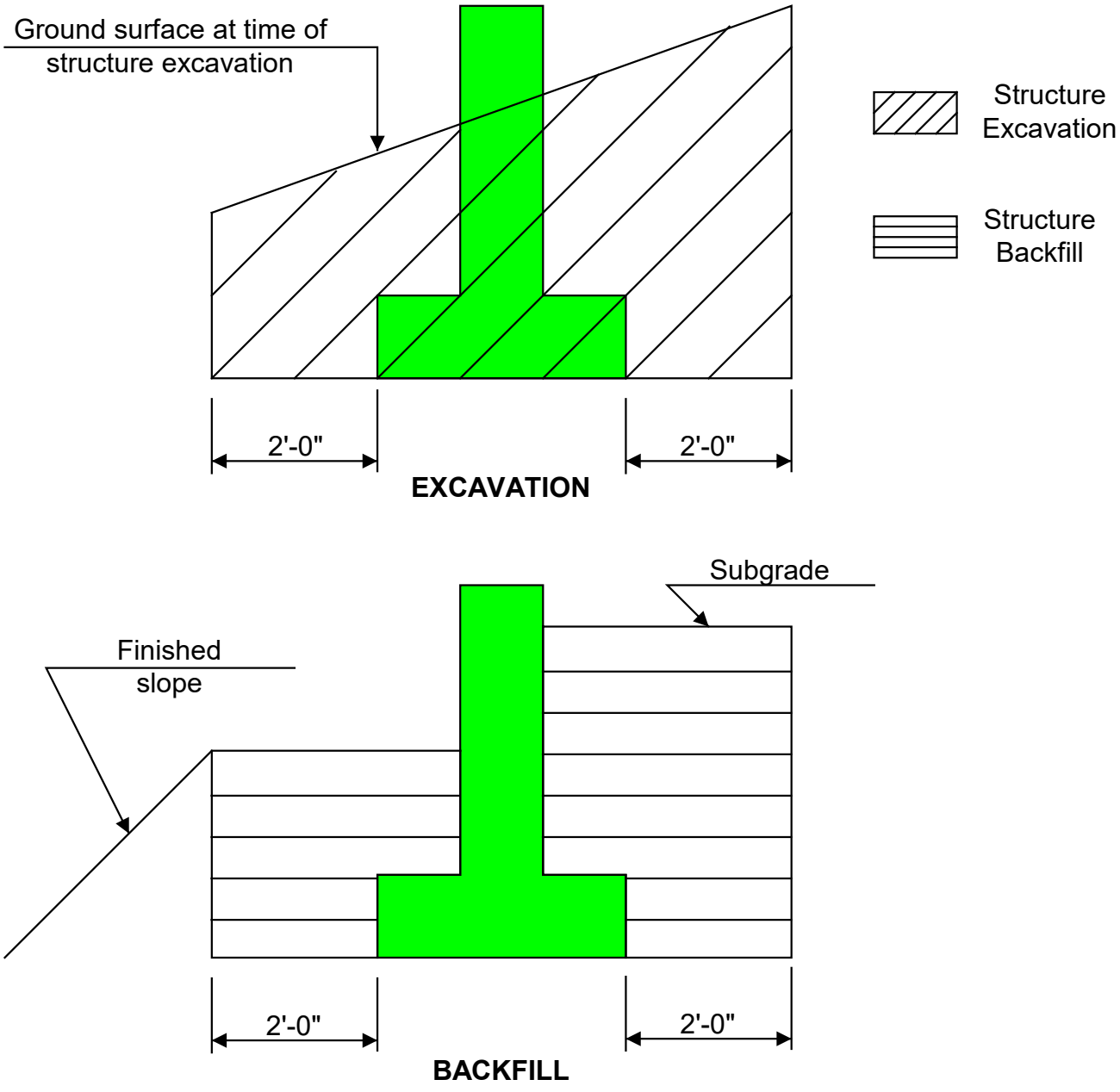
Structure excavation will be measured by the cubic yard of material in its original position, using the average end area method. The volume of material actually removed shall be measured within a prism with limiting planes as follows:

1. Conduit and Structural Plate Pipe: As shown on the plans.
2. Other Structures:
    a. The bottom of the foundation.
    b. The vertical planes 2 ft. outside of and parallel to the outside lines of the structure, in the case of bents with individual column footings, the entire bent shall be considered as one structure.
    c. With upper limits as follows:
        (1) In embankment sections, the existing ground surface as cross sectioned.
        (2) In roadway cut sections or channel changes, the planes of the roadway cut or channel change as excavated.

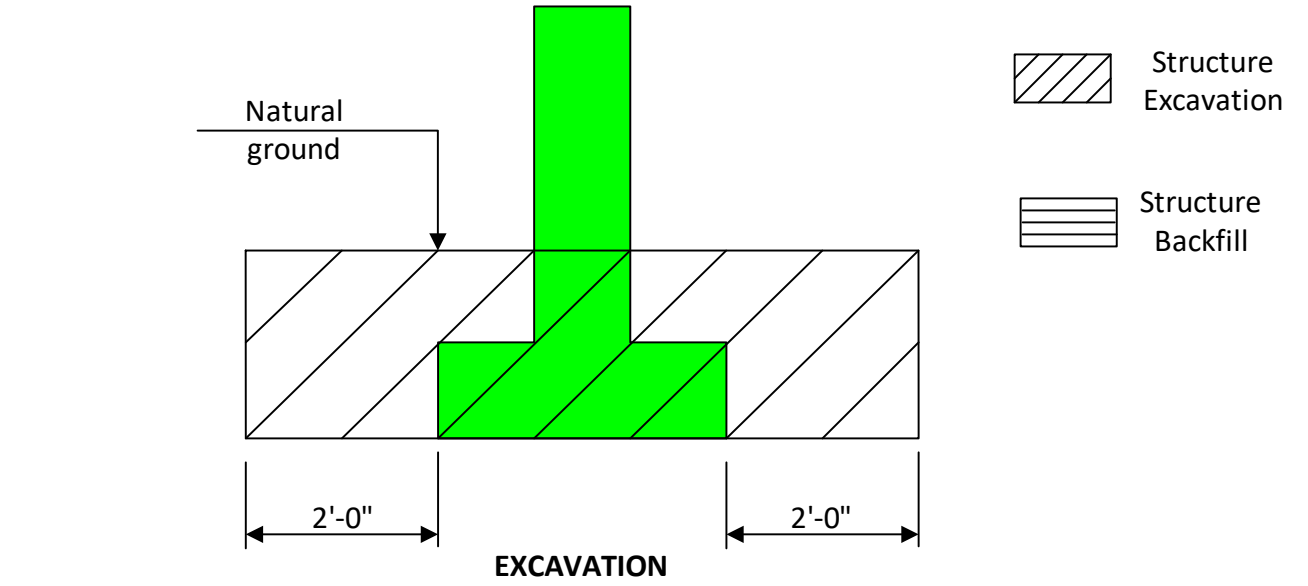
Compacting backfill will be measured by the cubic yard of backfill material placed. The volume will be determined as follows:

1. Conduit: As shown on the plans.
2. Other Structures:
    a. Below the original ground surface: A volume equal to the volume of structure excavation less the volume of the permanent structure including opening, contained within the limits of measurement for structure excavation.
    b. Above the original ground surface: The volume contained between the outside walls of the structure and vertical planes 4 ft. outside thereof; the original ground surface; and a horizontal plane 1 ft. above the top of the structure or of the subgrade, whichever is the lesser.
    c. Volumes of backfill placed through water around abutments, wing walls and piers, will not be included in the measurement of quantities for compacting backfill.

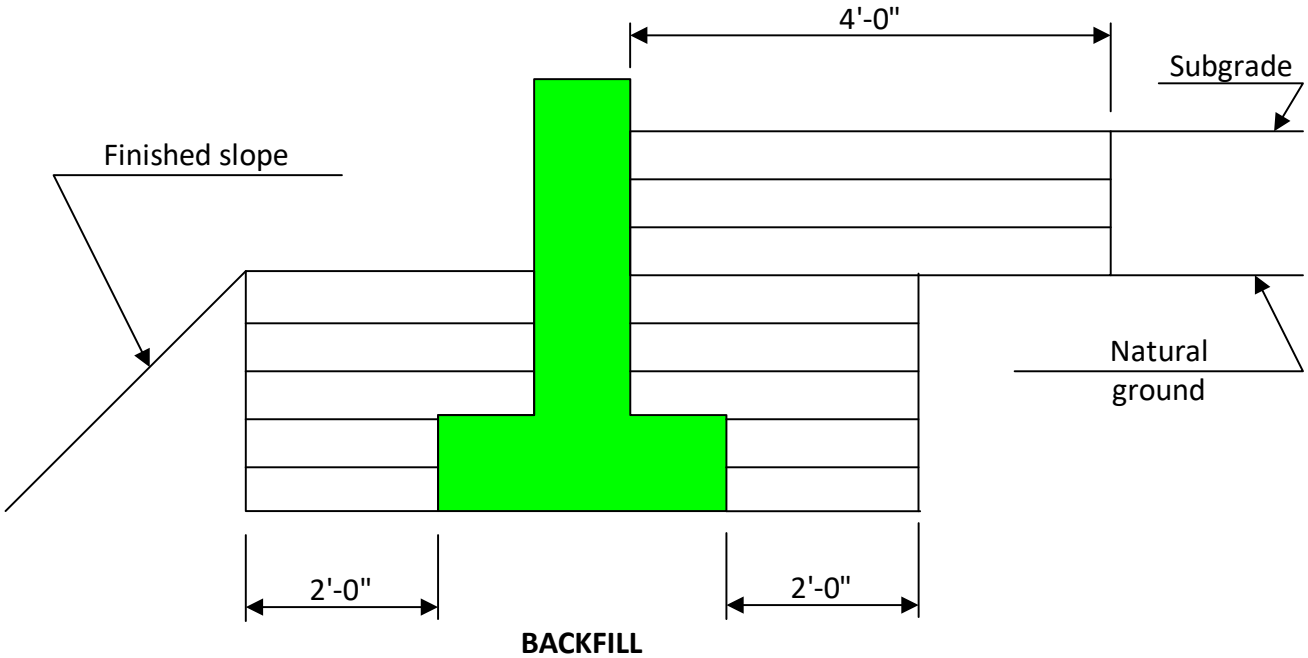
STRUCTURE IN EMBANKMENT



STRUCTURE IN NATURAL GROUND

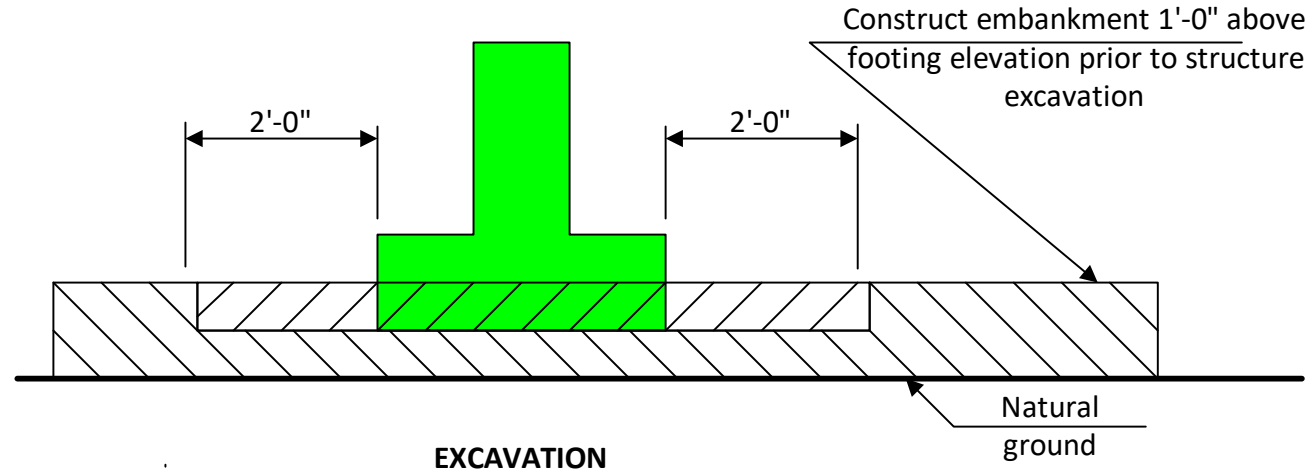


EXCAVATION

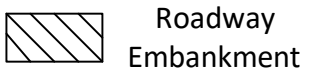


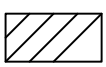
BACKFILL

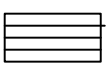
STRUCTURE ABOVE NATURAL GROUND

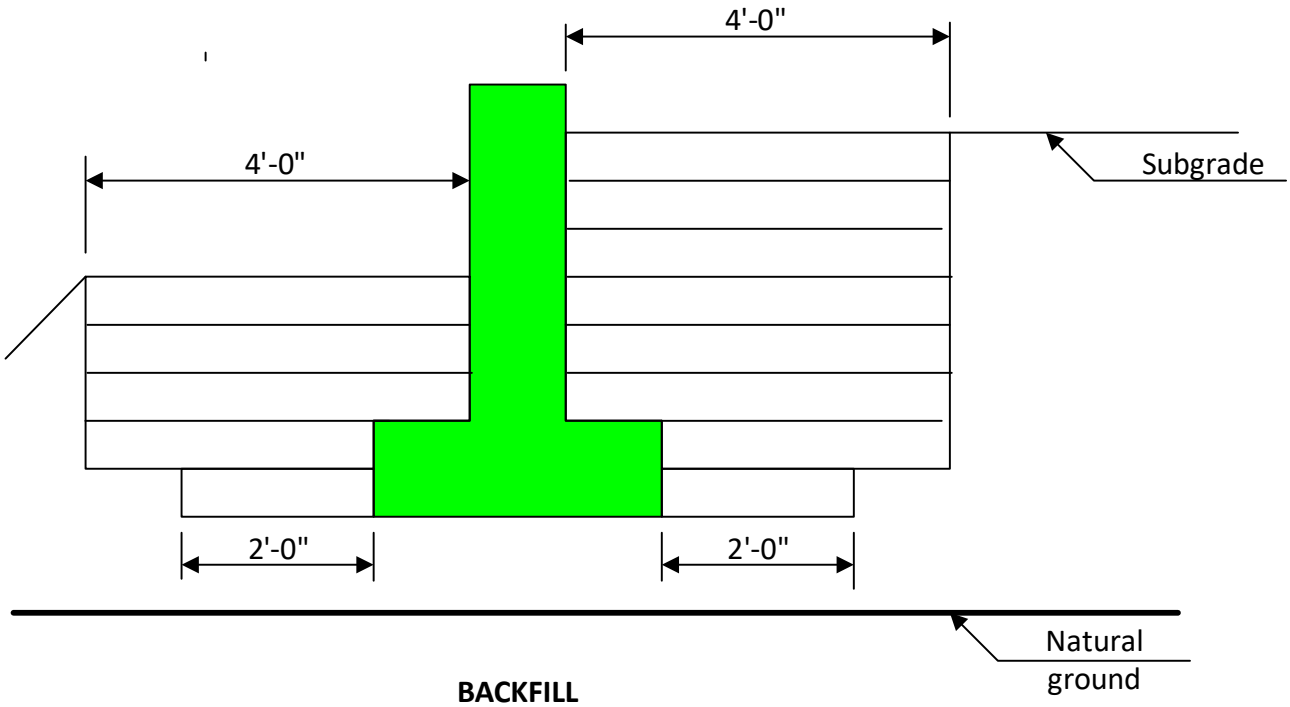


EXCAVATION









BACKFILL

Section 505 – Piling

TEST PILES

Compute the length of test pile by increasing the embedment depth by 50%.

For a predrilled pile, the test pile length would be equal to the length from the cut-off elevation to the bottom of the predrilled hole plus the length from the bottom of the predrilled hole to the estimated pile tip increased by 50%.

Example 1 No predrilling

Estimated pile length from cut-off elevation to estimated pile tip elevation = 50'
Test pile length = 50 x 1.5 = 75'

Example 2 Predrilling

Length from the cut-off elevation to the bottom of the predrilled hole = 20'
Length from the bottom of the predrilled hole to the estimated pile tip = 30'
Test pile length = 20 + 30x1.5 = 65'

PILE SPLICES

Pay items for pile splices shall be calculated for "Before Driving" and "During Driving" in accordance with Section 505.05.

The number of splices calculated is the maximum number anticipated and is used to establish the unit price for the number of splices actually used.

Example 1 No Test Piles

LOCATION	NUMBER PILES	PILE CUT-OFF ELEV	ESTIMATED PILE TIP ELEV	ESTIMATED PILE LENGTH
ABUT 1	10	2322.46	2269.5	53.0
PIER 1	27	2301.50	2238.5	63.0
PIER 2	27	2301.50	2238.5	63.0
ABUT 2	10	2322.14	2269.0	53.0

Before driving: piles > 60' = 27+27 = 54
1 splice per pile = 54 splices
During Driving: piles 60'-100' = (27+27) = 54
1 splice per pile = 54 splices

Example 2 Test Piles

LOCATION	NUMBER PILES	PILE CUT-OFF ELEV	ESTIMATED PILE TIP ELEV	ESTIMATED PILE LENGTH
ABUT 1	7	4579.21	4537.21	42.0
ABUT 1 TEST PILE	1	4579.55	4517.55	62.0 X 1.5 = 93.0
ABUT 2	7	4578.90	4508.90	70
ABUT 2 TEST PILE	1	4580.22	4476.22	104.0 X 1.5 = 156

Before driving: piles > 60' = 1+7+1 = 9
1 splice per pile = 9 splices

During Driving: piles 60'-100' = (1+7) = 8
1 splices per pile = 8 splices
Piles > 100' = (1) = 1
2 splices per pile = 2 splices
Total = 10

Section 510 - Concrete Overlays

When the depth of the concrete overlay is 4¾" or deeper, reinforce the overlay with transverse & longitudinal #5 rebar with 2½" clear cover and 1" minimum clear cover to the existing top mat of reinforcement.

DECKS WITH 2½" COVER ON THE TOP LAYER OF EPOXY REINFORCEMENT
Mean removal depth is 2" with a nominal 1.5" of silica fume concrete.

DECKS WITH LESS THAN 2½" COVER ON THE TOP LAYER OF PLAIN REINFORCEMENT
The new concrete overlay shall provide a minimum 2½" of cover for the top layer of reinforcement and shall have a minimum thickness of 1.5". On the contract plan details, show D_m , S, C_e, T_e, & T_n values.

REMOVAL DEPTH
C_e = existing cover
C_n = new cover
D_m = mean removal depth = C_e
T_e = existing deck thickness
T_n = new deck thickness = $T_e + (C_n - C_e)$
S = ½ the maximum aggregate size

ITD Construction Specifications	Maximum Aggregate Size	S
Up to 1967	2"	1"
Between 1967 & 1976	1.5"	0.75"
1976 & after	1"	0.5"

CONCRETE OVERLAY QUANTITY
Increase the overlay thickness by S to calculate the concrete overlay quantity. This will provide a pay item quantity that should reduce cost over-runs during construction.

EXAMPLE
T_e = 6"
C_e = 1.25"
C_n = 2.5
T_n = 6 + (2.5-1.25) = 7.25"
1957 ITD Construction Specifications = 2" max aggregate
S = 2"/2 = 1"
D_m = 1.25"

Concrete overlay quantity thickness = C_n + S = 2.5" + 1" =3.5"

Section 551 – Polyester Polymer Concrete Overlay

PPC overlays must be a minimum of ¾" thick. Compute the plan quantity by adding ⅛" to the calculated thickness. The calculated thickness shall include the increased thickness over the pier. The additional ⅛" thickness is to allow for surface texture variation.

Section 553 – Epoxy Overlay

The 2020 Supplemental Specifications provide requirements for calcined bauxite aggregate and standard aggregate. Show the type of aggregate on the plans. Refer to Bridge Design Manual Article 5.14 for epoxy overlay use.

Section 581 – Concrete Crack Repair

To provide uniformity for quantity calculations, use the following table as a guide:

CRACK WIDTH	CRACK DEPTH
X	Y
0”	0”
0.016”	0.75”
0.03”	1.5”
1/16”	3”
1/8”	6”
¼”	12”

$Y = 48*X$

AREA $in^2 = X*Y$

Total cubic inches = area * length(inches)

1 gallon of epoxy is equal to total cubic inches of crack divided by 231.

S501-50A - Deck Crack Sealer

Compute the quantity of crack sealer material using 1 gallon per 75 square foot.

Precision of Units
The precision of the units to be shown on the Cost Estimate is shown in the following table.

DESCRIPTION	UNIT	UNIT PRECISION
SECTION 205		
Granular Borrow	CY	1
SECTION 210		
Structure Excavation Sch. No. 1	CY	1
Compacting Backfill	CY	1
SECTION 215		
Geosynthetic Reinforced Abutment Backfill	CY	1
SECTION 502		
Concrete – All classes	CY	0.1
Prestressed Girders	FT	0.1
Concrete Parapet	FT	0.1
Approach Slab	SY	0.1
Prestressed Slabs, T-beams, Box Beams	FT	0.1
SECTION 503		
Metal Reinforcement	LB	1
SECTION 504		
Structural Steel	LB	1
Railing	FT	0.1
SECTION 505		
Provide & Drive Piling, Test Piling	FT	1
SECTION 510		
Concrete Overlay	CY	0.1
SECTION 511		
Concrete Waterproofing System	SY	1
SECTION 520		
Pre-drilling for Piles	FT	1
SECTION 551		
PPC Overlay – Prepare & Place	SY	0.1
PPC Overlay – Furnish Material	CY	0.1
SECTION 553		
Epoxy Overlay	SF	0.1
SECTION 565		
Asphaltic Plug Joint	CF	0.1
SECTION 566 & 567		
Expansion Joints	FT	0.1

DESCRIPTION	UNIT	UNIT PRECISION
SECTION 568		
Elastomeric Concrete Header	CY	0.1
SECTION 569		
Remove Expansion Joint	FT	0.1
SECTION 574		
Anti-Graffiti Coating	SF	1
SECTION 575		
Textured Concrete Surface	SY	1
SECTION 576		
GFRP	FT	0.1
SECTION 577		
Pile sleeves	FT	1
SECTION 580		
Remove Asphalt Overlay	SY	0.1
SECTION 581		
Crack Preparation	FT	1
Crack Injection	GAL	0.1
SECTION 582		
Patch & Repair Concrete Surface	SF	1
SECTION 623		
Concrete Slope Paving	SY	0.1
SECTION 624		
Riprap	CY	1
SECTION 632		
Concrete Bridge Deck Removal	SY	0.1
SECTION 640		
Geotextiles	SY	1
SPECIAL PROVISIONS		
MSE Wall	SF	1
Coping for MSE Wall	FT	1
UHPC	CY	0.01
Paint Concrete	SF	1

Reference: Contract Administration Manual and Standard Specifications for Highway Construction

Revisions:

Nov 2019	Moved Article A5.7 Concrete Overlay quantity calculations to this article under Section 510. Added instructions for Concrete Overlay on decks with epoxy reinforcement. Added quantity calculation instructions for PPC overlays, Section 551. Revised Precision of Units Table for 2018 Specification pay items.
May 2021	Changed unit precision of crack injection from 1.0 to 0.1 gallons.
Sept 2021	Clarified the PPC Overlay plan quantity calculations. Added accuracy of plan quantity items of +/- 1% and all other items of +/- 5%. Added Section 505 for computing test pile length.
June 2022	Reformatted Precision of Units Table and added Sections 215 & Section 574. Added type of aggregate for epoxy overlays should be shown on the plans.
Oct 2023	Corrected the length of pile from cut-off elevation to pile tip elevation rather than from bottom of pile cap. Corrected the test pile length from the cut-off elevation to the bottom of the predrilled hole plus 1.5 times the length from the bottom of the predrilled hole to pile tip elevation. Revised the number of pile splices before driving & during driving to agree with the 2024 Supplemental Specifications. Added Section 581 formula to compute gallons of epoxy injection.
Dec 2024	Revised Concrete Overlay quantity calculations. Added criteria for reinforcing the concrete overlay. Added table to compute crack depth based on crack width Added conversion factor to compute gallons of deck crack sealer.

ELIGIBLE & EXEMPT ITEMS FOR COST ESTIMATE

GENERAL

The bridge construction unit costs are submitted yearly to FHWA. This cost data is used in the apportionment process as described in Title 23, U.S.C. Section 144(e). The unit cost report is for new and replaced highway bridges constructed with Federal funds on Federal-aid highways (highway bridges on the NHS and other Federal-aid highways) and on non Federal-aid highways (highway bridges on local roads and rural minor collectors; off-system highway bridges). Unit costs shall be based on bridge costs only.

To make this data as accurate as possible and uniform nationwide, the following guidelines for eligible costs should be followed when coding the Bridge Cost Estimate database.

EXEMPT ITEMS (Items not to be included in the Unit Cost Calculations)

Mobilization
Demolition of existing bridge
Stream channel work
Riprap
Slope paving
Earthwork (exclusive of structural excavation and structural backfill)
Clearing and grubbing
Retaining walls not attached to the abutment
Guardrail transitions to bridges
Maintenance and protection of traffic
Detour costs
Signing and marking
Lighting
Electrical conduit
Inlet frames and grates
Field office
Construction engineering items
Training
Right-of-way
Utility Relocation
Contingencies
Painting steel or concrete members for aesthetic purposes
Textured concrete surface

ELIGIBLE ITEMS (Items to be included in the Unit Cost Calculations)

As a general rule, if the item is necessary to construct the bridge, it is eligible. The following items have been ruled eligible by FHWA HQ.

Temporary shoring for bridge construction (formwork, falsework, and retention of roadway fill)
Work bridges or platforms
Deck treatments or wearing surface overlays
Deicing systems used for deicing decks for traffic safety
Approach slabs (when paid for as a bridge item, e.g. on integral abutment bridges)
Painting steel members to prevent corrosion

Commentary

The above information is based on FHWA Memorandum for Bridge Construction Unit Costs Attachment C and on information from Greg Kolle, FWWA Nebraska Division Bridge Engineer.

Revisions:

April 2008	Added new article.

PLAN QUANTITY PAY ITEMS

The bid items shown on the Sheet Index, Quantities, and Vicinity Map sheet of the Bridge plans (B17.4) shall denote plan quantity items with a "+" symbol next to the bid item.

The following bid items should be considered for plan quantities with the concurrence of the District. The bid items in red are designated plan quantity items in the Standard Specifications.

BID ITEM	UNIT	DESCRIPTION
210-005A	CY	STRUCTURE EXCAVATION SCHEDULE NO. 1
210-015A	CY	COMPACTING BACKFILL
215-005A	CY	GEOSYNTHETIC REINFORCED ABUTMENT BACKFILL
502-020A	CY	CONC CL 40
502-025A	CY	CONC CL 40-A
502-065A	CY	CONC CL 40 AF
502-140A	CY	CONC CL 40-A SCH NO. 1
502-250A	CY	CONC CL 40-A SCH NO. 2
502-310A	CY	CONC CL 40 AF SCH NO. 2
502-345A	CY	SEAL CONC
502-360A	FT	PRESTRESSED AASHTO GIRDER TYPE 2
502-365A	FT	PRESTRESSED AASHTO GIRDER TYPE 3
502-370A	FT	PRESTRESSED AASHTO GIRDER TYPE 4
502-375A	FT	PRESTR BULB TEE GIRDER
502-380A	FT	PRESTRESSED WF GIRDER
502-385A	FT	PRESTR DECK BULB TEE GIRDER
502-425A	FT	PRESTR STRINGER
502-430A	FT	CONC PARAPET
502-435A	SY	APPROACH SLAB
502-465A	FT	PRESTR SLAB
502-470A	FT	PRESTR "T" BEAM
502-510A	FT	CONC MEDIAN BARRIER 42" SINGLE SLOPE
503-005A	LB	METAL REINF
503-010A	LB	METAL REINF SCH NO. 1
503-015A	LB	METAL REINF SCH NO. 2
503-020A	LB	EPOXY COATED METAL REINF
504-015A	LB	STRUCTURAL STL
504-025A	FT	STRUCTURAL STEEL HANDRAIL
504-035A	FT	PEDESTRIAN / BICYCLE RAILING
504-040A	FT	COMB PED/BICYCLE & TRAF RAILING
504-040B	FT	PROTECTIVE FENCE FOR CONCRETE PARAPET
504-050A	FT	3-TUBE CURB MOUNT RAIL
508-010A	FT	CORRUGATED PLATE PIPE ARCH
508-015A	FT	CORRUGATED PLATE ARCH
509-005A	CY	NON-STRUCTURAL CONC CLASS
509-010A	SY	NON-STRUCTURAL CONC CLASS

511-005A	SY	CONC WATERPROOF SYS TYPE C
511-005A	SY	CONC WATERPROOF SYS TYPE D
511-005A	SY	CONC WATERPROOF SYS TYPE E
551-005A	SY	PREPARE & PLACE PPC OVERLAY
553-005A	SF	EPOXY OVERLAY
565-005A	CF	ASPHALTIC PLUG EXPANSION JOINT SYSTEM
566-005A	FT	COMPRESSION SEAL EXPANSION JOINT
567-005A	FT	STRIP SEAL EXPANSION JOINT
568-005A	CY	ELASTOMERIC CONCRETE HEADER
569-005A	FT	REMOVAL OF EXPANSION JOINT
575-005A	SY	TEXTURED CONCRETE SURFACE
576-005A	FT	GLASS FIBER REINFORCED POLYMER (GFRP) REINFORCEMENT
577-005A	FT	PILE SLEEVES
580-005A	SY	REMOVAL OF ASPHALT OVERLAY
632-005A	SY	CONCRETE BRIDGE DECK REMOVAL CLASS A
SPECIAL PROVISION PAY ITEMS		
BID ITEM	**UNIT**	**DESCRIPTION**
S501-15A	SF	RETAINING WALL
S501-15F	SF	SOLDIER PILE WALL
S501-15I	SF	SOIL NAIL WALL
S501-16B	CF	RETAINING WALL
S501-17A	SF	MSE RETAINING WALL
S501-18A	FT	COPING FOR MSE WALL
S501-19A	SF	SOUND WALL
S501-30A	FT	SP BRIDGE
S501-35A	SY	SP BRIDGE
S501-40A	CY	SP BRIDGE
S501-45A	LB	SP BRIDGE
S501-50A	GAL	SP BRIDGE
S501-51A	SF	SP BRIDGE
S501-70A	SF	PAINTING
S600-45A	FT	WATER LINE
S909-05A	LB	SP
S911-05A	FT	SP
S912-05A	SY	SP
S913-05A	CY	SP
S914-05A	TON	SP
S915-05A	SF	SP

Commentary
Measurement and Payment of pay items is described in Section 109.

Revisions:

Nov 2019	Added new article.
Jan 2022	Deleted Conc Cl 40-A Sch No. 1, Metal Reinf Sch No 1, and Concrete Overlay. Added 632-005A, Concrete Bridge Deck Removal Class A
Oct 2023	Added plan quantity items need concurrence of the District. Added Str Exc Sch No. 1, Compacting Backfill, Geosynthetic Reinforced Abutment Backfill, Concrete Class 40A Sch No. 1, Single Slope Median Barrier, Metal Reinforcement Sch No. 1, 3-tube Curb Mount Rail, Structural Steel Handrail. Deleted 2-Tube Curb Mount Rail, S501-60A Textured Concrete Surface. Denoted bid items in Standard Specifications that are plan quantity items in red.
Dec 2024	Changed bid items for 511-005B and 511-005C to 511-005A. The same bid item can be used if the supplemental description is different.

CHAPTER 16
STANDARD DRAWING REVISION LOG

B16.1A Bridge Summary
Oct 2023 Added new sheet**.**
Dec 2024 Renamed sheet B16.1A for new/replacement projects.
Added Note to Designer “Place this sheet right after the roadway summary sheet”.

B16.1B Bridge Summary
Dec 2024 Added new sheet for rehabilitation projects

B16.1C Bridge Vicinity Map
Dec 2024 Added new sheet for rehabilitation projects

BRIDGE NAME																
STATION																
ITEM NO.	ITEM	UNIT	TOTAL													
XXXX	XXXX	XXXX	XXXX	XXXX												

NOTE TO DESIGNER: PLACE THIS SHEET RIGHT AFTER THE ROADWAY SUMMARY SHEET.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY
DESIGN CHECKED	
DETAILED	CADD FILE NAME B16_1A.DGN
DRAWING CHECKED	DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT

YOUR Safety→YOUR Mobility→YOUR Economic Opportunity

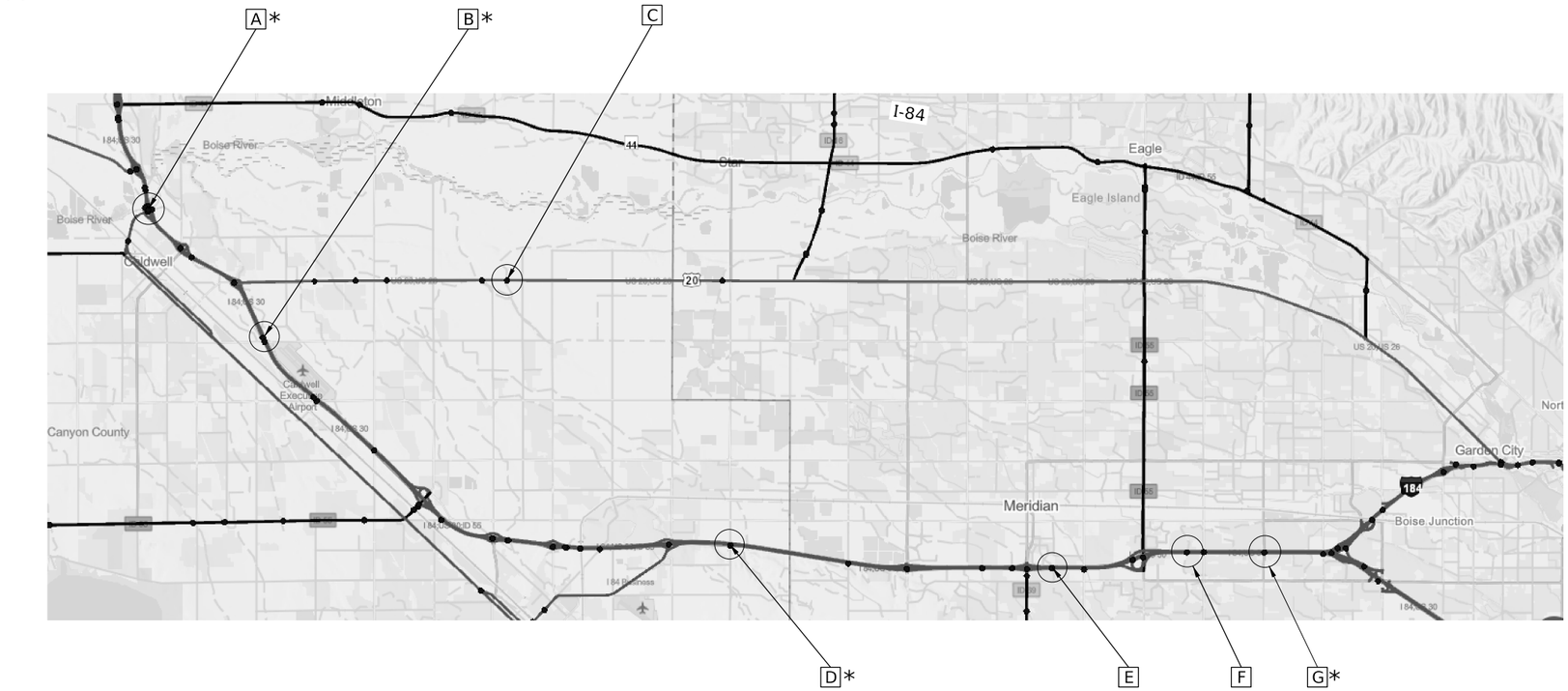
PROJECT NO.	BRIDGE SUMMARY	ENGLISH
	(NEW/REPLACEMENT) BRIDGE LRFD DESIGN MANUAL B16.1A	COUNTY
		KEY NUMBER
		SHEET OF

PROJECT NAME	MAP TAG	A	B	C	D	E	F	G
	ROUTE	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
	MILEPOINT	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
	FEATURE INTERSECTED	XXXXXXX XXXXX	XXXXXXX XXXXX	XXXXXXX XXXXX	XXXXXXX XXXXX	XXXXXXX XXXXX	XXXXXXX XXXXX	XXXXXXX XXXXX
	BRIDGE KEY NUMBER	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
	BRIDGE DRAWING NUMBER	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX

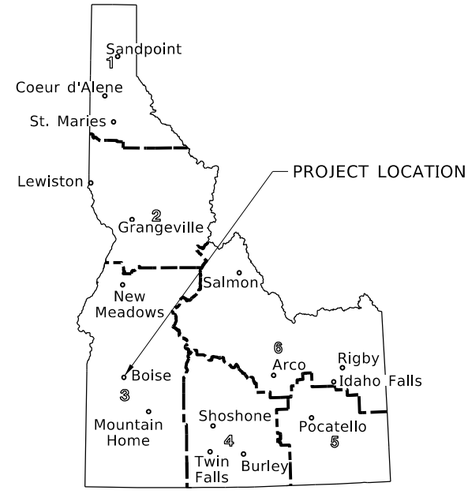
ITEM NO.	ITEM	UNIT	TOTAL	QUANTITY						
XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX

NOTES

1. SEE BRIDGE SUMMARY SHEET FOR MORE BRIDGE INFORMATION.
2. * STRUCTURE SPANS OVER (INTERSTATE/HIGHWAY).



VICINITY MAP
NTS



IDAHO MAP
NTS

NOTE TO DESIGNER: PLACE THIS SHEET RIGHT AFTER THE BRIDGE SUMMARY SHEET FOR REHAB PROJECTS.

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	BRIDGE VICINITY MAP	ENGLISH
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED				(REHABILITATION PROJECTS) BRIDGE LRFD DESIGN MANUAL B16.1C	COUNTY
				DETAILED	CADD FILE NAME B16_1C.DGN				KEY NUMBER
				DRAWING CHECKED	DRAWING DATE: DEC 2024				SHEET OF

CHAPTER 17

PLANS

DETAILING PRACTICES & PLAN PREPARATION

PURPOSE

The purpose of these standards is to enable the Bridge Section to produce consistent and effective plan sheets which will have uniform appearance and information. Engineers and detailers are responsible for ensuring that the criteria are implemented.

DRAWING ORIENTATION & LAYOUT CONTROL

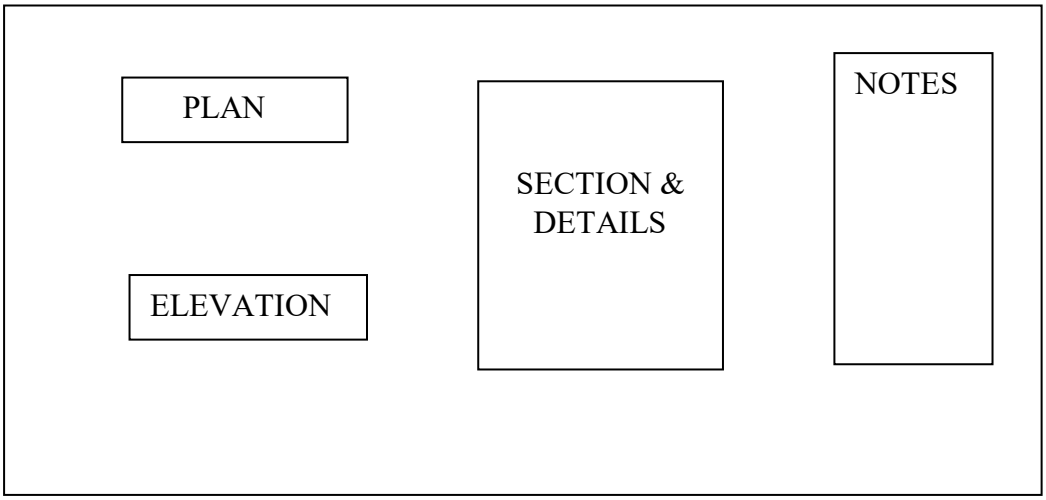
The standard sheet for bridge drawings in ORD format is 17"x11" with the title block as shown on page B17.7.

For ORD format drawings, blue or black ink shall be used for signing 28# (minimum) paper drawings.

Drawings shall be carefully organized so the intent of the drawing can be easily read.

- North arrows shall be shown on Situation Layout and Footing Layout sheets.
- Related details shall be grouped together in an orderly arrangement.
- The drawing should not be overcrowded with details.

The standard sheet configuration should be as follows:



PLAN ORGANIZATION

Plan sheets shall be assembled in the normal order of construction as follows:

Situation and Layout
Sheet Index, Quantities, & Vicinity Map
Design and General Notes
Stage Construction Details
Foundation Investigation Plat
Foundation Plan
Foundation Details
Abutment Plan & Elevation
Abutment Details
Abutment End Diaphragm Details
Wingwall Details
Bent or Pier Plan & Elevation
Bent or Pier Details
Abutment Bearing Details
Bent or Pier Bearing Details
Framing Plan & Intermediate Diaphragm details
Prestressed Girder
Prestressed Girder General Details
Prestressed Girder Details
Optional Prestressed Girder WWF Details

Temporary Diaphragm Details
Deck Typical Section & Details
Deck Plan & Reinforcement Details
Utilities Layout & Details
Bridge Drain Details
Deck Placement Sequence & Details
Expansion Joint Details
Approach Slab Details
Railing/Parapet Details
Date Panel Details
Bridge Name Sign Details (required for bridges in accordance with BDM Article A13.2)
Reinforcement Details

LETTERING & DIMENSIONING

Lettering shall follow the CADDS standards shown in Article 17.4 for ORD format drawings.

Underline all titles with a single line having the same weight as the lettering used with the scale noted beneath the line.

Lettering shall be oriented so as to be read from the bottom or right edge of the sheet.

A dimension shall be shown once on a drawing, unless repeating it is necessary for clarity. All dimensions shall be placed above the dimension line so that they may be read from the bottom or the right edge of the sheet.

Reinforcing bar clearances need not be specified unless different from the General Notes sheet.

When details or structural elements are complex, utilize two drawings; one for dimensions and the other for reinforcement details.

Dimensions shall be shown to the nearest ⅛" for concrete members and the nearest 1/16" for steel members. Skewed dimensions may need to be shown to the nearest 1/16". Dimensions 12" or more shall be shown in feet & inches unless the item dimensioned is conventionally designated in inches; e.g. 16"φ pipe.

Show actual rebar spacing and do not use "equal spaces" to eliminate the need for the construction worker to compute the spacing. Show rebar spacing in inches up to 18" centers. For spacing greater than 18", show the spacing in feet & inches. Show rebar spacing to the nearest ¼". Use a +/- as appropriate after the spacing if the spacing isn't equal to the exact value shown.

Identify rebar by bar mark in three different views (preferred) but no less than two views. Identify the rebar spacing in the view that provides the most information and understanding for the contractor. Only need to show the general bar mark in the other two of the views; e.g. A1~#5 and not A1A~#5.

Dimensions should be placed outside the view. However, in the interest of clarity and simplicity, it may be necessary to place them otherwise.

Breaks are allowable in lines that cross, provided that their intent is clear. Detail or object lines take precedence over dimension lines; dimension lines take precedence over note or information lines.

REINFORCEMENT CALL-OUT FORMAT

Rebar shall be noted as follows: 20 - F1~#6 19 spaces @ 12" = 19'-0"

Rebar sets shall be noted as follows: 1 set W1~#8 9 spaces @ 6" = 4'-6"

Epoxy coated rebar shall be denoted as follows: 25 - S1~# 6(E) 24 spaces @ 12" = 24'-0"

SCALE

An engineering scale shall be used for the Situation Layout sheet and may be used for framing plan sheets. An architectural

scale shall be used for all detail sheets.

All ORD format Plan, Elevation, and Details should be drawn 1 to 1 and scaled appropriately for the selected sheet. Clarity should be a priority when selecting the scale. The use of "not to scale" details should be limited to a minimum and used only on very simple details. Denote these details as "NTS".

Generally, the minimum acceptable scale is as follows:

- Situation and Layout. 1" = 20'
- Section Details with rebar. ⅜" = 1'-0"
- Details for steel sections. ½" = 1'-0"
- Plan View without rebar. ¼" = 1'-0"

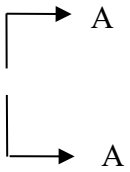
Section, details and views may be enlarged for clarity, but the number of different scales used on a sheet should be kept to a minimum.

SECTIONS, VIEWS, AND DETAILS

A Section cuts through the structure or object; a View is from the outside; a Detail shows part of a structural element in more detail and usually at a larger scale.

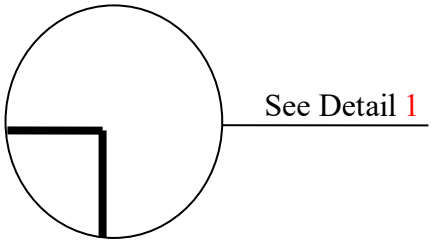
Care shall be taken to ensure that the orientation of a detail is identical to that of the plan, elevation, etc., from which it is taken.

Section or Views are noted by using an arrow with a letter as follows:

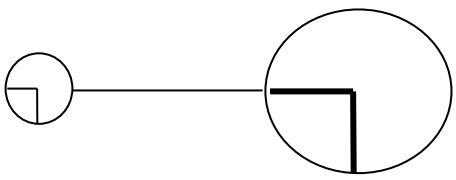


If the section or view can not be placed on the same sheet where it is taken, the following note should be added next to the section/view symbol; "For Section A-A see sheet #_".

Details are noted by using a bubble with a number and a leader line to a bubble around the specific detail or view to be expanded for clarity as follows:



or



Details shall begin with "1" on each sheet. Details may be given a name in lieu of a number: e.g. "Bearing Pad Detail". The letter designation for views and sections shall begin with "A" on each sheet; e.g., on sheet 25 Section A-A, View B-B, Section C-C.

Notes for a leader line should be formatted as follows:



Each structural component (abutment, pier, etc.) shall be detailed separately as a general rule. If similar components are the same except for height, then the details can be shown on a single sheet using a table for the variable dimensions.

REVISIONS

The revision block shall be used to record revisions made after the plans have been signed by the Bridge Engineer.

Minor non-structural revisions to ORD format drawings may be done using ink and erasing or crossing out the items to be changed. Major revisions require the changes being done using the CADD and resigning the drawing.

Revisions shall be noted by a number in a triangle next to the change. A number corresponding to the change shall be placed in the triangle in the revision block, followed by the date, the initials of the person making the change, and a brief description of the changes made on the drawing.

FINAL PLANS

For ORD plans, the 11x17 size plans for bidding with stamped/signed paper drawings shall be stored in the file cabinets in the front of the Bridge Section office. Deliver final plans to the Design Group Leader responsible for the project.

Revisions:

June 2006	Added new article.
July 2009	Revised order of sheets in Plan Organization
Nov 2019	Added "not to scale" details denoted as "NTS".
Sep 2020	Added instructions for ORD drawings.
June 2022	Added dimensions shown to the nearest ⅛". Added new format for notes/leader lines. Deleted references to SS4 format drawings.
Oct 2023	Added dimensional tolerances for concrete and steel members Added format for showing and dimensioning rebar
Dec 2024	Revised list of plan sheets in Plan Organization Clarified where to identify bar marks. Revised Detail designation from a letter to a number Clarified that Sections and Views are designated by a letter Added note that Detail, Section, and View designations begin with an "A" or "1" on each sheet

SITUATION AND LAYOUT FOR HIGHWAY & WATERWAY CROSSINGS

PURPOSE

The purpose of the Situation and Layout sheets is to provide an accurate overview and orientation of the project. The Engineer, checker, and detailer are responsible to ensure this data is correct.

Once the Situation and Layout is approved, it should not be changed and final design should begin.

SITUATION AND LAYOUT

- Refer to the Bridge Design Manual page B17.7 for plan sheet format data.
- An engineering scale should be used for the sheet.
- The Situation and Layout data shall be the first sheet of the structure plans and shall consist of the following plan sheets.

  Sheet 1 of the final plans shall contain the following items:
  - PLAN
  - ELEVATION
  - PROFILE DATA
  - HORIZONTAL ALIGNMENT DATA
  - HYDRAULIC DATA

  Sheet 2 of the final plans shall contain the following items:
  - VICINITY MAP
  - SHEET INDEX
  - QUANTITIES
  - TRAFFIC DATA

  Sheet 3 of the final plans shall contain the following items:
  - DESIGN NOTES
  - GENERAL NOTES

- The PRELIMINARY Situation and Layout data should include a fourth sheet if necessary showing the following data:

  Typical section (Could be put on sheet 3 and then removed on final plan preparation)
  - Curb-curb and out-out widths
  - Sidewalk and curb widths
  - Type of railing
  - Slab thickness
  - Slab reinforcement cover for both mats
  - Overlay type and thickness, as applicable
  - Girder type and spacing
  - Centerline and profile grade point
  - Crown slope

  Design features
  - Show enough details of design features to clarify the concept. This should include abutment and pier/bent elevations and/or sections.
  - Stage construction details

- The Title Block shall be completed as follows:

  Sheet Title: SITUATION AND LAYOUT

  Project Description: The project description shall include the following:
  - Total length of a bridge to the nearest foot and clear span length of a culvert to the nearest foot. (Refer to the Commentary of BDM Article 1.2.)
  - Type of main supporting member
  - Names of features involved in the crossing

  Examples:

  262’ STEEL GIRDER UNDERPASS
  ROBERTS I.C.
  I-15 STA 300+77.51 SH-48 STA 29+46.79

256’ PRESTRESSED CONCRETE BRIDGE
E. BRIDGE ST. OVER WEISER RIVER
STA 8+24.78

15’ CONCRETE BOX CULVERT
US-95 OVER CALF CREEK
STA 289+30.00

24’ STIFFLEG CULVERT BRIDGE
US-20/26 OVER CALDWELL HIGHLINE CANAL
STA 1232+97.29

Station: For structures over waterways, the station at midspan shall be shown.
For bridges crossing a roadway or railroad, the station of the intersecting control lines shall be shown.

Bridge Key Number: Obtain the correct number from Bridge Asset Management. Only those structures on the State Highway System with spans greater than or equal to 10’ that carry highway traffic or cross a highway require a number. Only those structures on the Local/Off Highway System with spans greater than 20’ that carry highway traffic or cross a highway require a number. The number needs to be shown on every sheet.

Signature Block: Show the first name initial and last name of the designer, design checker, detailer, and drawing checker.

SHEET 1

PLAN VIEW

- Title the view PLAN and show the scale factor below the title.
- Show the total length of structure (out -out of backwalls) along the survey line.
- Show the abutment/pier number, station, and finished grade elevation at the intersection of the abutment/pier centerline and the survey line at the following locations:
  - Begin/End of structure
  - Centerline bearing of abutments
  - Centerline of piers/bents
- Show the span lengths along survey line as follows:
  - Single Spans or End Spans: abutment centerline bearing - centerline pier/bent
  - Interior Spans: centerline pier/bent - centerline pier/bent
- Show the total bridge width (out - out). The width should include the parapet, curb or sidewalk.
- Show the curb-to-curb width.
- Show the roadway lane and shoulder widths. Verify conformance with the roadway plans.
- Show the lane direction and name of closest town/geographical feature in that direction.
- Show the North arrow.
- Show the intersection angle if not a 90º crossing.
- Show the horizontal and vertical clearances as follows:
  - Highway Crossings: Show the point of minimum vertical and horizontal clearance for the highway.
  - Stream Crossings: Show the point of minimum clearance above Q_{50} high water elevation.
- Identify the survey and profile lines. Verify conformance with the roadway plans.
- If the new structure is at or adjacent to an existing bridge, show enough details of the existing bridge to insure that all possible conflicts are taken into account in the layout of the new bridge. As-built plans or field measurements should be used to accurately depict the existing bridge.
- If the existing bridge is to be removed, show the drawing number of the existing bridge plans.
- Orientation of the PLAN view shall allow the ELEVATION view to be a direct projection beneath the PLAN view.
- Stationing for bridges shall be along the centerline of structure and shall advance from left to right on the sheet.
- Stationing for culverts shall be along the centerline of roadway and shall advance from bottom to top of the sheet.
- Show the limits of riprap. If riprap is not included in the structure bid items, add a note referencing the roadway pay items.

- Contour lines, if shown, should not project through the structure limits, dimension lines, or notes. Contour lines should be drawn in gray tones so they will not dominate the PLAN view.
- Show any utilities crossing the structure and show the location of any deck drains.
- Show the location of a Survey Cap at the top of the parapet or curb for bridges on the State System and Local System. For State System bridges the note should read, "Survey Cap provided by the Department and installed by the Contractor". See roadway standard drawing 618-1". For Local System bridges the note should read, "Survey Cap provided by LHTAC and installed by the Contractor". See roadway standard drawing 618-1.

ELEVATION VIEW

- Title the view ELEVATION and show the scale factor below the title.
- Show the total length between abutment centerlines of bearing along the survey line.
- Show the abutment/pier number and station at the following locations:
  Centerline bearing of abutments
  Centerline of piers/bents
- Show the span length.
- Show the span number for multi-span bridges.
- Identify the type of fixity between the substructure and superstructure at the abutments and piers/bents using the following designations:
  E Expansion
  P Pinned
  F Fixed
- Show the minimum vertical clearances as follows:
  Highway Crossings: Show the minimum vertical clearance for the highway to the nearest tenth of a foot and locate the point.
  Stream Crossings: Show the minimum clearance above Q_{50} high water elevation to the nearest tenth of a foot and locate the point.
- Show the natural ground line along the centerline of structure.
- Show the abutment slopes and call out the slope perpendicular to the stream or highway.
- The ELEVATION view should be a projection of the PLAN view. Show the end projection only for the abutments and piers. Showing the actual projection for skewed bridges is confusing.
- Show the roadway approach guardrail and reference the roadway plans for details.

PROFILE DATA

- Title the view PROFILE DATA. The view can be drawn "Not to Scale".
- Show the profile grade across the structure.
- Show the location of the structure on the alignment.
- Show the begin/end of bridge station and elevation.
- Show the profile grades for all highways involved in the crossing. Verify conformance with the roadway plans.
- Show the following vertical curve data:
  Stations and elevations at point of curvature, point of intersection, and point of tangency.
  Length of vertical curve
  Incoming and outgoing grades in percent

HORIZONTAL ALIGNMENT DATA

- Title: HORIZONTAL ALIGNMENT DATA.
- Show the stations at point of curvature, point of intersection, and point of tangency on the PLAN view if possible. If not possible, list the stations in the curve data. Verify conformance with the roadway plans.
- Show the following horizontal curve data:
  Δ, T, L, R, S, RL, and Z.
  Horizontal curves shall be described by the degree of curve.
- Show the superelevation transition data if applicable. Cross-sections at the control points are recommended.
- If the structure is on a tangent alignment, show the bearing in the PLAN view.

HYDRAULIC DATA

- Title: HYDRAULIC DATA
  - Show the following hydraulic data for streams and rivers:

FLOOD	DISCHARGE	H.W. ELEVATION	VELOCITY
Design (Q_{50})	cfs	ft	fps
Base (Q_{100})	cfs	ft	fps
Scour (Q_{sc})	cfs	ft	fps

  - Show the following hydraulic data for canals:

Canal Flow	cfs
H.W. Elevation	ft
Velocity	fps

Flow controlled by _____ Canal Company.

Hydraulic data is not required for minor structure rehabilitation or extension projects.

SHEET 2

VICINITY MAP

- A map of the State of Idaho showing location of the project.
- A vicinity map showing the location of the bridge site.
- The milepost shown shall be at the begin of bridge.

INDEX OF SHEETS

- Title: INDEX OF SHEETS
- The bridge plans shall be numbered independently from the roadway plans and shall start with sheet 1.

QUANTITIES

- Title: QUANTITIES.
- Show all the bid items listed on the cost estimate for the structure except Mobilization.
- The quantities do not need to be shown until the final plans are prepared.

TRAFFIC DATA

Show traffic data for the route that is carried by the bridge.

- Title: ONE DIRECTIONAL DATA
- Show AADT(Annual Average Daily traffic – formerly designated ADT) for year of construction and 20 years past construction year.
- Show CAADT(Commercial Annual Average Daily Traffic – formerly designated ADTT) and percent of CAADT for year of construction and 20 years past construction year.

SHEET 3

DESIGN & GENERAL NOTES

The Design Notes shown on page B17.1A – B17.3 of the Bridge LRFD Manual are intended to be used as a checklist for the usual situation and should be modified to fit each individual case.

DESIGN PROCEDURES

Multi-span prestressed girder bridges should include one of the following notes. Refer to Article 5.14.1.4.

a. Girders designed as simple spans and reinforcement added to resist negative moment.
b. Girders designed fully continuous for live load.
c. Girders designed as simple spans; slab reinforcement added to limit cracking.

FOOTING & PILE DESIGN LOADS

- The computed and ultimate values for the Pile/Footing Design Loads should be shown on the final Situation and Layout submittal.
- Values denoted as “X” shall be furnished by the Geotechnical Engineer.
- Values denoted as “xx” shall be furnished by the Bridge designer.

SCOUR DATA

- The scour depth used for the design of the abutments and piers should be shown on the final plans.
- If the scour depth used in design is the same for all abutments or piers, show the maximum depth for each.
- If the scour depth used in design is different at each abutment or pier, show the scour depth at each one.
- The scour depth shown is measured from the bottom of the pile cap or top of drilled shaft.
- For spread footings, the top of the footing should be below the scour elevation. The top of footing and scour elevations should be shown on the final plans.

CONSTRUCTION

- Projects involving rehabilitation or repair should add the following note: "Verify dimensions in the field before ordering material."

Revisions:

June 2006	Article was renumbered to 17.2 to allow for addition of new Article 17.1. Deleted Traffic Data from Situation Layout requirements. Single lane ADTT was added to the Transient Loads on the Design & General Notes sheet.
April 2008	Added paragraph for Vicinity Map, Index, & Quantities Sheet.
July 2009	Revised "Index of Sheets" to "Sheet Index" on page 1.
March 2011	Changed location of stationing for culverts from "centerline of structure" to "centerline of roadway". Added traffic data to sheet 2 to provide one directional data required for load rating. Added Pile//Footing Design Load data and deleted Article A17.2
Feb 2012	Changed the name of "Bridge Inspection Master Key" to "Bridge Key Number". Added clarification when the Bridge Key Number is needed. Required the bridge Key Number be shown on every sheet.
June 2013	Added "Verify conformance with the roadway plans" for lane & shoulder widths, survey & profile lines, profile grades, and horizontal alignment data.
May 2014	Revised notations of ADT & ADTT to AADT & CAADT to agree with notations used by the Planning Section.
Sept 2016	Clarified that a survey cap is only required for bridges on the State System and not on LHTAC projects.
Oct 2017	Clarified that a survey cap will be installed on both State and Local System bridges.
Feb 2018	Added stage construction details to Preliminary Situation Layout fourth sheet design features.
Nov 2019	Added "See roadway standard drawing 618-1" to survey cap note.
Sept 2021	Added instructions for the location of the station shown in the title block. Added instructions for the location of the milepost shown on Sheet 2.
June 2022	Added scour data to the Design and General Notes.
Oct 2023	Added format for the signatures in the title block using first name initial and last name. Revised survey cap note for active voice, imperative mood. Revised Construction rehab/repair note for active voice, imperative mood.

Dec 2024	Added overlay details to the list of details for the Typical Section on the Preliminary S&L. Added example project description for the title block for culverts with spans greater than 20’ Corrected reference to Design & General Notes on B171A – B17.2E to B17.1A – B17.3

SITUATION AND LAYOUT FOR RAILROAD CROSSINGS

GENERAL

The Situation and Layout for Railroad crossings shall be the same as for Highways & Waterways with the addition of the following data.

PLAN VIEW

- Show the railroad milepost at the intersection with the highway and direction of increasing railroad milepost.
- Show the limits of the railroad Right of Way.
- Show the Township, Range, and Section data.
- Identify each track as mainline, siding, spur, etc. and show track spacing dimensions.
- Show all access roadways.
- Show the point of minimum horizontal and vertical clearance and the distance from the nearest track.
- Show any utilities crossing the structure and show the location of any deck drains. No deck drains will be installed over the railroad right of way. Show all utilities in the vicinity of the railroad (if none, a note should state "No known utilities").

ELEVATION VIEW

- Show the minimum vertical clearance taken from the top of rail.
- Distance between the top of pier footings and top of rail.
- Show the abutment slope protection and call out the slope perpendicular to the railroad.
- Show Railroad drainage ditches. (Make sure they are unobstructed by the construction)
- Show existing and future track locations.
- Show limits of fencing and protective railing or splashboards.

TYPICAL SECTION

- Identify superstructure structural members.
- Show type of railing/fencing and height.

RAILROAD CONSTRUCTION CLEARANCES

- Show an Elevation view that has minimum horizontal and vertical construction clearances.

PROFILE DATA

- Show the railroad profile grades at top of rail for 1000' each side of the structure.

DESIGN NOTES & GENERAL NOTES

The Notes shown on pages B17.1A thru B17.1D of the Bridge LRFD Manual are intended to be used as a checklist for the usual situation and should be modified to fit each individual case.

RAILROAD DETAILS

Add page B2.5 that shows Railroad clearances, shoring requirements, and construction clearances.

Revisions:

June 2006	Article was renumbered to 17.3 to allow for new article 17.1.
April 2008	Referenced new Design & General Notes drawings B17.1A – B17.1D.
Sept 2012	Added reference to Railroad Details, page B2.5

CADDS DETAILING STANDARDS – ORD FORMAT

SHEET FORMAT

Bridge plans prepared for ITD shall use the sheet layout format shown on page B17.1 of the Bridge Design Manual.

CADD FILE NAMING CONVENTION

Sheet files will be named using a project key number prefix, four-letter sheet designator code, a three digit sheet number and an alpha character used only if the sheet is being inserted into an existing plan set. The three primary components will be separated by a space in the file name, as shown below:

12345 br**001.dgn

12345	project key number
*	two character alpha code to designate the bridge, eg SR for Snake River
001	page number

12345 br**002a.dgn

002a	adds a sheet between existing sheets 2 & 3

SHEET SCALE GUIDE

To increase the size of an 11" x 17" bordered sheet to fit over the smallest scaled object, set the active scale or "AS=" to the sheet size required.

ACTIVE SCALE	SHEET SCALE	SHEET SIZE
AS = 1200	1" = 100'	1700' x 1100'
AS = 720	1" = 60'	1020' x 660'
AS = 600	1" = 50'	850' x 550'
AS = 480	1" = 40'	680' x 440'
AS = 360	1" = 30'	510 x 330'
AS = 24	1" = 20'	340' x 220'
AS = 10	1" = 10'	170' x 110'
AS = 60	1" = 5'	85' x 55'
AS = 4	3" = 1'	5'-8" x 3'-8"
AS = 8	1 ½" = 1'	11'-4" x 7'-4"
AS = 12	1" = 1'	17'-0" x 11'-0"
AS = 16	3/4" = 1'	22'-8" x 14'-8"
AS = 24	1/2" = 1'	34'-0" x 22'-0"
AS = 32	3/8" = 1'	45'-4" x 29'-4"
AS = 48	1/4" = 1'	68'-0" x 44'-0"
AS = 64	3/16" = 1'	90'-8" x 58'-8"
AS = 96	1/8" = 1'	136'-0" x 88'-0"
AS = 128	3/32" = 1'	181'-4" x 117'-4"

Numbers are valid when Master Unit = US Survey Feet and Sub Unit = US Survey Inches

TEXT & TERMINATOR SCALE GUIDE

Text size based upon selected sheet scale and managed by the selected drawing scale. OpenRoads Designer font is "Engineering Vert Bold" style which is managed by the Bridge Section. These styles are selected through the dimension styles and include styles:

- Bridge 1
- Bridge 1 (arrow)
- Bridge 1 (arrow) mask
- Bridge 2 (area)
- Bridge 2 (area) mask

Various text sizes (styles) are used within the selected drawing scale:

Numbers are valid when Master Unit = US Survey Feet and Sub Unit = US Survey Inches

Styles beginning with 0067 are utilized for dimensioning text – including sheet index, Quantities, general notes, detail notes, etc.

Styles beginning with 0083 are utilized for titles: Views, Lists, Diagrams, Data

Styles beginning with _01_ are utilized for Sheet Title

LEVELS, LINE WEIGHTS, AND COLORS

ITEM	LEVEL	COLOR	LINE CODE	WEIGHT
Object Lines	BRDG_BASE_Obj-Line	0	0	3
Break Lines	BRDG_BASE_Obj-Line	1	0	2
Construction Joints	BRDG_BASE_Obj-Line	3	0	1
Hidden Lines / Reference Lines	BRDG_BASE_Hidden-Line	0	5	0
Rebar	BRDG_BASE_Rebar	6	0	2
Dimensioning Text / Notes	BRDG_ANNO_General-Notes	2 or 9	0	1
Dimensioning Lines	BRDG_ANNO_General-Notes	2 or 9	0	0
Detail Titles	BRDG_ANNO_General-Notes	3 or 9	0	2
Centerlines	BRDG_BASE_Dtlctrln	4	7	1
Roadway Centerlines	BRDG_BASE_Roadway-Center-Lines	4	7	2
Sheet/Plan Block Data	BRDG_ANNO_Anno-Sheet	Varies	0	Varies
Sheet Border	BORDER_ANNO_Cutsheet	0	0	0
Contour Lines (Major)	BRDG_BASE_Idxcontr	26	0	2
Contour Lines (Minor)	BRDG_BASE_Intcontr	30	0	1
Ground Lines in Profile – Existing	BRDG_BASE_Ground-Lines	8	2	1
Ground Lines in Profile - New	BRDG_BASE_Ground-Lines	8	0	2
Riprap / Gabion	BRDG_BASE_Ground-Lines	8	0	1
Cross Hatching Lines	BRDG_BASE_Pattern	10	0	0
Concrete Symbol	BRDG_BASE_Pattern	39	0	0
Active Points	BRDG_BASE_Active-Point	14	0	4
Phantom Lines	BRDG_BASE_Phtline	11	6	1

COLOR	DESCRIPTION
0	White (Plots Black)
1	Blue
2	Chartreuse Green
3	Red
4	Yellow
5	Purple
6	Orange
7	Dark Brown
8	Light Brown
9	Blue-Green
10	Aqua Blue
11	Lavender
12	Lima Bean
13	Dark Blue
14	Faded Red
15	Faded Chartreuse
39	Tan
187	Gold Yellow

LINE CODE	DESCRIPTION
0	Continuous
1	Dot Dash
2	Medium Dash
3	Long Dash
4	Centerline (Long Dash/Short Dash)
5	Hidden Line (Short Dash)
6	Phantom Line (Long Dash/2 Short Dash)
7	Centerline (Long Dash/Medium Dash

PLOT LINE THICKNESS-inches	
WEIGHT	**11”x 17”**
0	0.0035
1	0.0060
2	0.0075
3	0.0110
4	0.0180

EXPANDED LEVELS, LINE WEIGHTS, AND COLORS

ITEM	LEVEL	COLOR	LINE CODE	WEIGHT
Existing Abutments	BRDG_BASE_X_Abutments	5	5	3
Existing Deck	BRDG_BASE_X_Deck	5	0	2
Existing Footings	BRDG_BASE_X_Footings	5	5	0
Existing Piers	BRDG_BASE_X_Piers	5	5	1
Existing Rails	BRDG_BASE_X_Rails	5	0	1
Bearing Miscellaneous	BRDG_BEARINGS_Misc	11	0	2
Bearing Pads	BRDG_BEARINGS_Pads	11	0	2
Bearing Plates	BRDG_BEARINGS_Plates	48	0	2
Concrete - Approach	BRDG_CONCRETE_Approach	38	0	3
Concrete - Deck	BRDG_CONCRETE_Deck	38	0	3
Concrete - Epoxy Coat	BRDG_CONCRETE_EpxyCoat	38	0	1
Concrete - Girder	BRDG_CONCRETE_Girder	38	0	3
Concrete - Miscellaneous	BRDG_CONCRETE_Misc	38	0	3
Concrete – MSE Walls	BRDG_CONCRETE_MSE-Walls	38	0	3
Concrete - Rails	BRDG_CONCRETE_Rail	38	0	1
Concrete - Seal	BRDG_CONCRETE_Seal	38	0	1
Concrete - Sidewalk	BRDG_CONCRETE_Sidewalk	38	0	3
Concrete - Slope Paving	BRDG_CONCRETE_Slope-Paving	38	0	2
Concrete - Substructure	BRDG_CONCRETE_Sub-Structure	38	0	3
Concrete - Superstructure	BRDG_CONCRETE_Super-Structure	38	0	3
Earth - Backfill	BRDG_EARTH_Backfill	11	0	0
Earth - Base Material	BRDG_EARTH_Base-Material	12	0	2
Earth - Excavation	BRDG_EARTH_Excavation	11	0	0
Earth - Geotextile	BRDG_EARTH_Geotextile	11	0	2
Earth - Miscellaneous	BRDG_EARTH_Misc	12	0	2
Earth - Riprap	BRDG_EARTH_Riprap	11	0	0
Earth - Retaining Walls	BRDG_EARTH_Walls-Retaining	11	0	1
Joint - Metal Extrusion	BRDG_JOINTS_Extrusion-Metal	48	0	2
Joint - Neoprene Extrusion	BRDG_JOINTS_Extrusion-Neoprene	1	0	2
Joint - Filler	BRDG_JOINTS_Filler	11	0	2
Joint - Concrete Header	BRDG_JOINTS_Header-Concrete	39	0	3
Joint - Miscellaneous	BRDG_JOINTS_Misc	48	0	3
Joint - Plates	BRDG_JOINTS_Plates	48	0	3
Joint - Seals	BRDG_JOINTS_Seals	3	0	2
Metal – Deck Drains	BRDG_METAL_Deck-Drains	48	0	1
Metal - Fasteners	BRDG_METAL_Fasteners	48	0	1
Metal - Miscellaneous	BRDG_METAL_Misc	48	0	3
Metal - Plates	BRDG_METAL_Plates	48	0	3
Metal - Posts	BRDG_METAL_Posts	48	0	3
Metal - Rails	BRDG_METAL_Rails	48	0	2
Metal - Steel Girder	BRDG_METAL_Steel-Girder	48	0	3
Metal – Steel Shapes	BRDG_METAL_Steel-Shapes	48	0	3
Piles - Concrete	BRDG_PILES_Concrete	39	0	3
Piles - Shafts	BRDG_PILES_Shafts	39	0	3
Piles - Steel	BRDG_PILES_Steel	64	0	2
Rebar - Approach	BRDG_REBAR_Approach	6	0	2
Rebar – Deck Bottom Longitudinal	BRDG_REBAR_Deck-BotL	6	0	2
Rebar – Deck Bottom Transverse	BRDG_REBAR_Deck-BotT	6	0	2
Rebar – Deck Top Longitudinal	BRDG_REBAR_Deck-TopL	6	0	2
Rebar – Deck Top Transverse	BRDG_REBAR_Deck-TopT	6	0	2
Rebar – Epoxy Coated	BRDG_REBAR_EpxyCoat	6	0	2

ITEM	LEVEL	COLOR	LINE CODE	WEIGHT
Rebar - Girder	BRDG_REBAR_Girder	6	0	2
Rebar - Rail	BRDG_REBAR_Rail	6	0	2
Rebar - Substructure	BRDG_REBAR_Sub-Structure	6	0	2
Rebar - Superstructure	BRDG_REBAR_Super-Structure	6	0	2
Render - Buildings	BRDG_RENDER_Buildings	97	0	2
Render - Concrete Diaphragm	BRDG_RENDER_Diaph-Concrete	38	0	3
Render - Steel Diaphragm	BRDG_RENDER_Diaph-Steel	48	0	2
Render - People	BRDG_RENDER_People	97	0	2
Render - Ground Surface	BRDG_RENDER_Surface Ground	23	0	2
Render - Textured Surface	BRDG_RENDER_Surface-Textured	39	0	0
Render - Water Surface	BRDG_RENDER_Surface-Water	97	0	2
Render - Trees	BRDG_RENDER_Trees	97	0	2
Render - Vehicles	BRDG_RENDER_Vehicles	97	0	2
Render - White	BRDG_RENDER_White	97	0	2
Render - Yellow	BRDG_RENDER_Yellow	97	0	2
Utility - Cables	BRDG_UTILITY_Cables	11	0	1
Utility - Conduits	BRDG_UTILITY_Conduits	11	0	2
Utility - Hangers	BRDG_UTILITY_Hangers	11	0	1
Utility - Inserts	BRDG_UTILITY_Inserts	11	0	1
Utility – Luminaires	BRDG_UTILITY_Luminaires	11	0	1

REBAR DESIGNATION

Maintain uniqueness of rebar designation for different components within a plan set.
For components not listed, provide a rebar designation symbol that is unique and logical.
Use different rebar designations for bars that are included in the Schedule No. 1 bid item than those that are included in the Schedule No. 2 bid item for metal reinforcement.

SYMBOL	ITEM
A	Abutment pile cap and integral abutments
AD	Abutment diaphragm
AS	Approach slab
B	backwall
C	Column
D	Intermediate diaphragm
DS	Drilled shaft
F	footing
G	girder
L	light pole support
M	moment slab
P	pier cap
PD	Pier diaphragm
R	Railing, parapet, barrier, rail curb
S	transverse deck reinforcement
SW	sidewalk
T	longitudinal deck reinforcement
W	wingwall

Revisions:

Sep 2020 New Article for OpenRoads Designer standards.

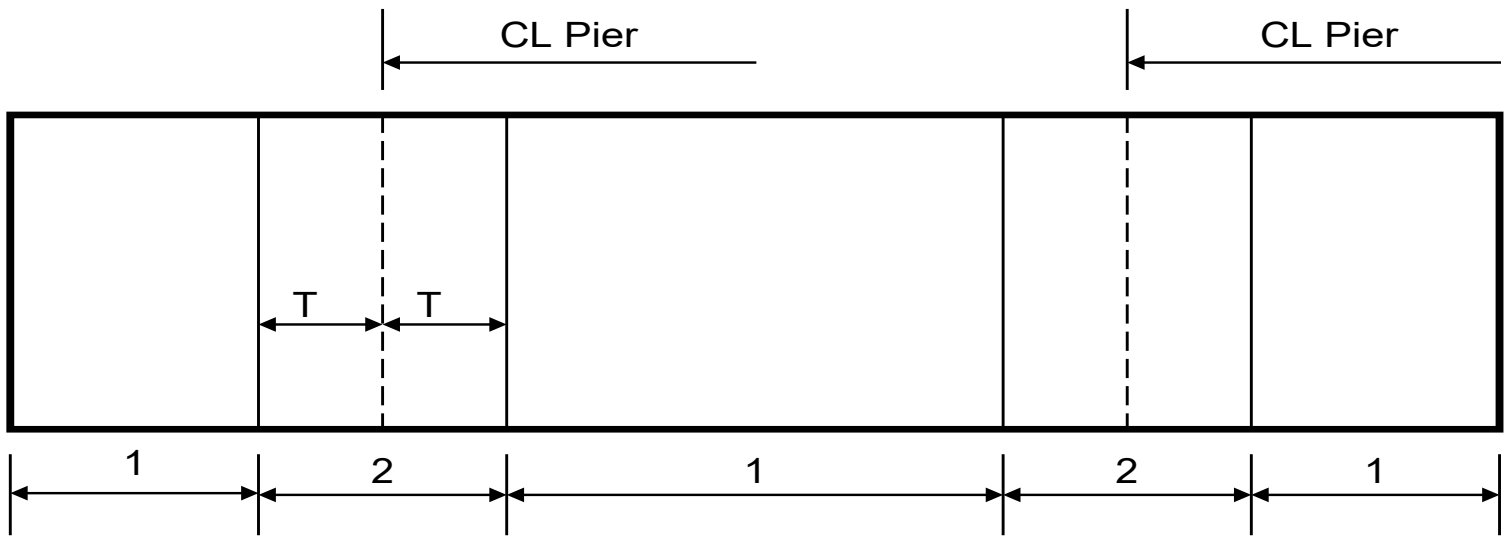
June 2022 Deleted Article 17.4 for SS4 drawings and changed Article 17.4A for ORD drawings to Article 17.4.

Dec 2024 Added CADD File Naming Convention to agree with the ITD CADD Standards Guide.
Added rebar designation table

DECK PLACING SEQUENCE

A deck placing sequence diagram and notes shall be shown on the plans for all multi-span bridges and single-span integral abutment bridges. Continuous placement shall not be allowed.

STANDARD SEQUENCE FOR BRIDGES DESIGNED AS SIMPLE SPANS OR DESIGNED CONTINUOUS FOR LIVE LOAD WHEN GIRDERS ARE AT LEAST 90 DAYS OLD.



T = 20% - 25% of the adjacent span length

NOTES

1. No deviation from the deck placing sequence shown will be permitted.
2. Areas marked 1 shall be placed before areas marked 2, but areas of the same number need not be placed simultaneously.
3. Placement of areas marked 2 shall not commence until at least 48 hours have elapsed after completion of placement of areas marked 1.
4. When the deck slab is continuous over the piers, the pier diaphragm shall be placed simultaneously with the adjacent deck area.

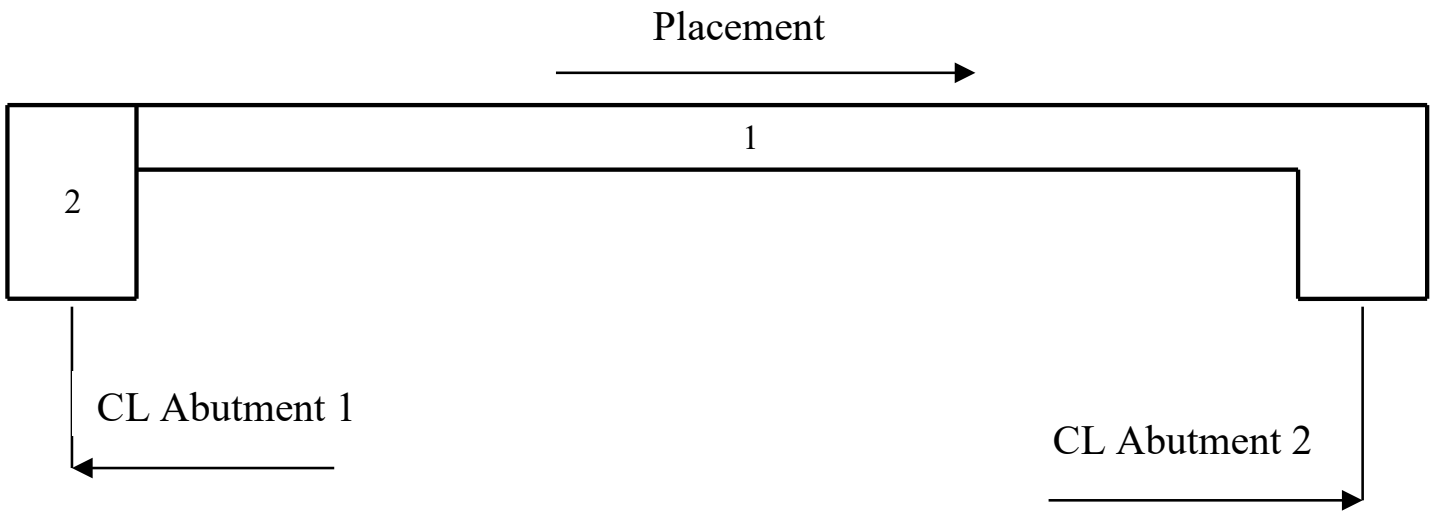
BRIDGES DESIGNED CONTINUOUS FOR LIVE LOAD WHEN GIRDERS ARE LESS THAN 90 DAYS OLD

When the deck is placed on girders that are less than 90 days old from the time they are cast, any rational deck placement sequence (other than continuous placement) may be used provided the girders are designed in accordance with Article 5.14.1.4.3 for the loading, creep and shrinkage that result from the sequence that is chosen.

STANDARD SEQUENCE FOR INTEGRAL ABUTMENT BRIDGES

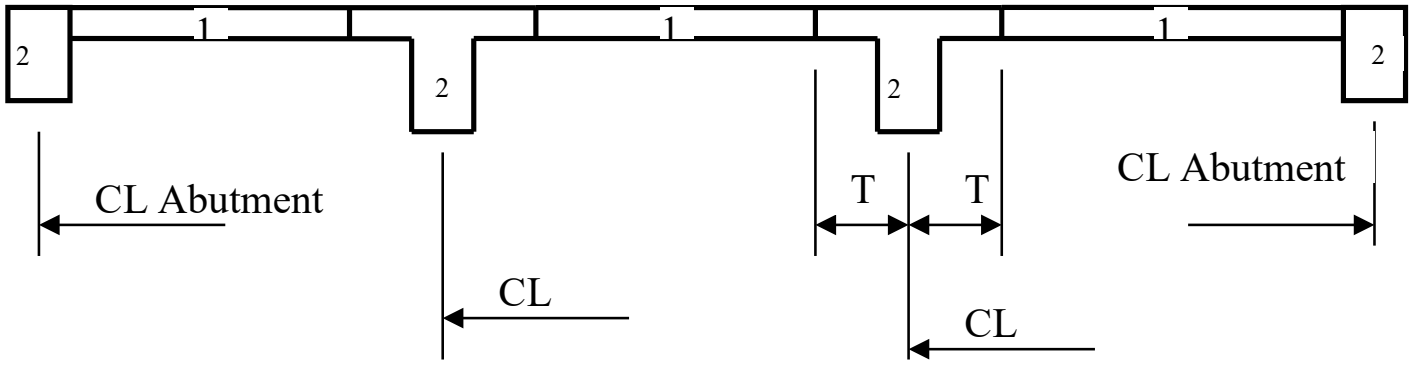
The end diaphragms of integral abutment bridges should be placed only after at least 75% of the adjacent deck has been placed. On single-span bridges this is typically accomplished by placing a bulkhead where the deck meets the end diaphragm at abutment 1 and then starting the deck placement at that bulkhead and proceeding to abutment 2. When the placement reaches abutment 2 the end the diaphragm at abutment 2 can then be placed as a continuation of the deck placement. After 24 hours the bulkhead at abutment 1 can be removed and the abutment 1 end diaphragm can be placed. It should be noted that this last placement at the end diaphragm is only about 3’ long and does not need to be finished with a Bidwell type screed.

SINGLE SPAN INTEGRAL ABUTMENT BRIDGES



NOTES
1. Areas marked 1 shall be placed before areas marked 2.
2. Placement of areas marked 2 shall not commence until at least 24 hours have elapsed after completion of placement of areas marked 1.

MULTI-SPAN INTEGRAL ABUTMENT BRIDGES



T = 20% - 25% of the adjacent span length

NOTES
1. No deviation from the deck placing sequence shown will be permitted.
2. Areas marked 1 shall be placed before areas marked 2, but areas of the same number need not be placed simultaneously.
3. Placement of areas marked 2 shall not commence until at least 48 hours have elapsed after completion of placement of areas marked 1.
4. When the deck slab is continuous over the piers, the pier diaphragm shall be placed simultaneously with the adjacent deck area.

Commentary

Refer to Article 5.12.3.3 Bridge Composed of Simple Span Precast Girders Made Continuous

In order to mitigate the development of positive moments at the piers due to girder creep, the girders are required to mature for 90 days to prevent excessive creep after the deck is placed. In accordance with the AASHTO Specifications this allows the same placing sequence as girders designed as simple spans without the need to calculate the effects of creep as is required for girders less than 90 days old.

Revisions:

June 2006	Article was renumbered to 17.5 to allow for new article 17.1.
August 2006	The deck placement sequence for bridges designed continuous for live load was revised to reflect changes that were adopted by AASHTO 2006 ballot item #13.
March 2011	The deck placement sequence for integral abutment bridges was added.
May 2021	Revised reference in Commentary to agree with the LRFD Bridge Design Specifications 9th Edition.

SITUATION AND LAYOUT CHECKLIST FOR HIGHWAY / WATERWAY CROSSINGS

PROJECT NAME: _____
PROJECT KEY NUMBER: _____
BRIDGE DRAWING NUMBER: _____ **CHECKED BY:** _____

Use pencil to mark items. Use an X or ✓ to indicate completion. Use "INC" to indicate items which are incomplete and "N/A" to indicate items which do not apply. For additional information on the design requirements refer to Chapter 17 of the "LRFD" Manual.

BORDER

- [ ] Designed and Detailed Names
- [ ] Design Checked and DWG Checked Names (required when work has been checked)
- [ ] Corrections Name (need only be completed when corrections have been made)
- [ ] Engineers Stamp
- [ ] Project Number
- [ ] Sheet Title
- [ ] Project Description (Length, Type of Support, Crossing, Station)
- [ ] Bridge Key Number
- [ ] Bridge Drawing Number (required but may not be available during preliminary design)
- [ ] County and Project Key Number
- [ ] Sheet Numbering (required for final design and PS&E submittals)

SHEET 1

PLAN VIEW

- [ ] View Title with scale factor
- [ ] Length of Structure (out to out) along survey line
- [ ] Station and Finished Grade Elevation at the Beginning and End of structure along Centerline.

Abutment / Pier number, Station, and Finished Grade Elevation shown at the Intersection of the Abutment / Pier Centerline and Survey line at the following locations:

- [ ] Centerline of bearing of Abutments
- [ ] Center of Piers / Bents

Span lengths along survey line shown as follows:

- [ ] Single Spans or End Spans: abutment centerline bearing - centerline pier/bent
- [ ] Interior Spans: centerline pier/bent - centerline pier/bent
- [ ] Bridge Width shown (out - out). Width should include the parapet, curb and sidewalk as applicable.
- [ ] Curb-to-Curb Width shown
- [ ] Roadway Lane and Shoulder Widths shown
- [ ] Lane Direction and Name of Closest Town/Geographical Feature in that Direction indicated
- [ ] North arrow shown
- [ ] Intersection Angle shown if not a 90º crossing

horizontal and vertical clearances shown as follows:

- [ ] Highway Crossings: Show the point of minimum vert. and horiz. clearance for the highway
- [ ] Stream Crossings: Show the point of minimum clearance above Q50 high water elevation
- [ ] Identification of Survey and Profile lines
- [ ] Existing Bridge Details shown (as needed)
- [ ] Existing Bridge Drawing Number given (Needed only if existing bridge is to be removed)
- [ ] Plan View Oriented so Elevation View can be placed below Plan View
- [ ] Bridge Stationing at Centerline of Structure shown and runs Left to Right of sheet
- [ ] Culvert Stationing at Centerline of Roadway shown and runs Bottom to Top of sheet
- [ ] Rip Rap Limits shown with pay note (as applicable)
- [ ] Contour lines shown and gray shaded
- [ ] Utilities Crossing the structure shown (as applicable)

- [ ] Deck drains shown (as applicable)
- [ ] Survey Cap shown with installation note

ELEVATION VIEW

- [ ] View Title with scale factor
- [ ] Total length between abutment centerlines along survey line shown

Abutment/Pier Number and Station shown at the following locations:

- [ ] Centerline Bearing of Abutments
- [ ] Centerline of Piers/Bents
- [ ] Span Length Shown
- [ ] Span Number Shown (Multi-Span Structures only)
- [ ] Fixity Shown ("E" Expansion, "P" Pinned, or "F" Fixed) (not required on culverts)

Minimum Vertical Clearances shown as follows:

- [ ] Highway Crossing: Minimum Clearance from roadway
- [ ] Stream Crossing: Minimum Clearance form Q_{50} High Water Elevation

- [ ] Ground Line along the Centerline of Structure Shown
- [ ] Abutment Slopes shown and annotated
- [ ] Abutment / Pier Projection lines shown (Do not show where projection lines may be confusing)
- [ ] Roadway approach Guardrails shown with associated note

PROFILE DATA

- [ ] View Title with scale factor
- [ ] Profile Grade Across Structure Shown (denote top of concrete or top of overlay)
- [ ] Structure Location Shown on Profile
- [ ] Station and Elevation for the Beginning and End of Structure Shown
- [ ] Profile Grades for all Highways involved in Crossing Shown

The following Vertical Curve Data Shown:

- [ ] Stations and Elevations at Point of Curvature, Point of Intersection, and Point of Tangency
- [ ] Length of Vertical Curve
- [ ] Incoming and Outgoing Grades as a percent

HORIZONTAL ALIGNMENT DATA

* Horizontal Alignment Data should be included in the Plan view if possible.

- [ ] View Title
- [ ] Stations at Point of Curvature, Point of Intersection, and Point of Tangency Shown
- [ ] Horizontal Curve data Shown (Δ, T, L, R, S, RL, and Z)
- [ ] Horizontal Curve described in Degree of Curve
- [ ] Super Elevation Transition Data Shown (If applicable)
- [ ] Alignment Bearing (Should be shown in Plan View if possible)

HYDRAULIC DATA

- [ ] View Title

Hydraulic Data for Streams and Rivers shown for the following conditions:

- [ ] Design (Flood, discharge, H.W. Elev., and Velocity)
- [ ] Base (Flood, discharge, H.W. Elev., and Velocity)
- [ ] Scour (Flood, discharge, H.W. Elev., and Velocity)
- [ ] Hydraulic Data for Canals Shown (Canal Flow, H.W. Elev., Velocity, and Flow Controller)

SHEET 2

INDEX OF SHEETS

- [ ] View Title
- [ ] Sheet number and Sheet Title Shown for all Sheets

QUANTITIES

- [ ] View Title
- [ ] Bid Item Number, Description, and Unit Shown for all applicable items
- [ ] Bid Item Quantity Shown (Not Required until Final Design)
- [ ] Bid Item Plan Quantity items denoted

TRAFFIC DATA

- [ ] View Title: One Directional Data
- [ ] Construction Year AADT & CAADT
- [ ] Future Year AADT & CAADT

VICINITY MAP

- [ ] Map of the State of Idaho showing location of the project with view title "IDAHO MAP"
- [ ] Vicinity map showing the location of the bridge site with view title "VICINITY MAP"

Revisions:

March 2011	Revised Checklist to agree with 17.2 Changed location of stationing for culverts from "centerline of structure" to "centerline of roadway". Added traffic data to sheet 2 to provide one directional data required for load rating.
May 2014	Revised notations for ADT & ADTT to AADT & CAADT.
Sept 2021	Deleted reference for engineers stamp on full & half size drawings. Deleted reference to bridge inspection number on first sheet only. Revised "project county and key number" to "county and Project key number" Added "denote top of concrete or top of overlay" to Profile Data. Added "denote plan quantity items" to Quantities.
Dec 2024	Added title of view for Idaho Map and Vicinity Map

DESIGN AND GENERAL NOTES

The notes shown on B17.1- B17.2 are intended as a design and detailing aid. Only those notes required should be shown on the plans. Notes should be modified or added to match the requirements of each structure.

The values required for the Footing & Pile Design Loads are to be furnished as follows:

X	Geotechnical Engineer
xx	Bridge Designer

Revisions:

April 2008	Added new article.

CHAPTER 17
STANDARD DRAWING REVISION LOG

B17.1A Design and General Notes – Sheet 1 (precast, prestressed girder bridge)

April 2008 Added new sheet.

July 2009 Deleted IC from Extreme Event loads

July 2010 Deleted durometer from Method B
Changed Design Specifications reference to 5th Edition

March 2011 Deleted single lane ADTT value from Design Loads.

Sept 2012 Changed Design Specifications reference to 2012 Edition
Set Temperature Range to 0° to 80°
Set Base Temperature to 60°
Changed Vehicular Collision Force to 600k to agree with Article 3.6.5 of the 2012 Specifications

June 2013 Added 2013 Interims to Design Specifications reference.

March 2015 Changed sheet title to "precast, p/s girder bridge" since sheet applies to both highway and railroad bridges.
Changed Design Specifications reference to 7th Edition.

Oct 2017 Revised Design Procedures note from "slab reinforcement added to resist negative moment" to "slab reinforcement added to control cracking over the piers".
Revised reference to 8th Edition in the Design Specifications.
Revised reference for 2017 Standard Specifications.
Added Construction note for GFRP designation.
Added Construction note for NAVD 88 datum.

Nov 2019 Changed Construction Specification reference to 2018 Standard Specifications and 2019 Supplemental Specifications.
Revised Design Procedures note to require MASH railing.
Revised Notes format to active voice, imperative mood.

Sep 2020 Revised Design Specifications to "9th Edition".
Revised Construction Specifications to 2020Supplemental Specification.
Changed reference to GFRP reinforcement from "GFRP' to "G" in the Construction note.
Deleted Pile/Footing Design Load data, MSE Wall Table, and Elastomeric Bearing data and moved it to new sheet B171.C.
Added "Sheet 1" to sheet title.

Jan 2022 Changed reference to 2021 Supplemental Specifications.
Converted sheet to ORD format.

June 2022 Revised Construction Specifications to "2022 Supplemental Specifications".

Oct 2023 Revised Construction Specifications to "2023 Standard Specifications" and changed "Specifications" to "Special Provisions".
Added "Type S" to grade 60 metal reinforcement.
Revised Design Specifications reference to AASHTO LRFD Bridge Design Specifications to "XX" Edition and added (Month)(Year) ITD Bridge Design LRFD Manual.
Revised live load description to "HL-93 including pair of design tandems in accordance with AASHTO LRFD Bridge Design Specifications Article 3.6.1.3".
Revised definition of Incidental Items to match 2023 Standard Specifications.
Revised notes format to active voice, imperative mood and Writer's Style Guide

Dec 2024 Added "42" Single Slope Concrete Parapet" and weight to DC Permanent loads.
Revised format of General Notes to match B17.5
Added Massive Concrete Placement to General Notes.

CHAPTER 17
STANDARD DRAWING REVISION LOG

	Revised concrete and girder strength to 1 decimal place. Revised metal reinforcement and prestress reinforcement strength to 60 ksi & 270 ksi Deleted "Type S" from metal reinforcement designation.
B17.1B	**Design and General Notes - Sheet 1 (weathering steel girder bridge)**
April 2008	Added new sheet
July 2009	Deleted IC from Extreme Event loads
July 2010	Deleted durometer from Method B Changed Design Specifications reference to 5th Edition
March 2011	Deleted single lane ADTT value from Design Loads.
Sept 2012	Changed Design Specifications reference to 2012 Edition Set Temperature Range to -30° to 120° Set Base Temperature to 60° Changed Vehicular Collision Force to 600k to agree with Article 3.6.5 of the 2012 Specifications
June 2013	Added 2013 Interims to Design Specifications reference.
March 2015	Changed sheet title to "weathering steel girder bridge" since sheet applies to both highway and railroad bridges. Changed Design Specifications reference to 7th Edition.
Sept 2016	Revised high strength bolt reference to ASTM F3125 A325 Type 3.
Oct 2017	Revised reference for 2017 Standard Specifications. Revised reference to 8th Edition in the Design Specifications. Added Construction note for GFRP designation. Added Construction note for NAVD 88 datum.
Nov 2019	Changed Construction Specification reference to 2018 Standard Specifications and 2019 Supplemental Specifications. Revised Design Procedures note to require MASH railing. Revised Notes format to active voice, imperative mood.
Sep 2020	Revised Design Specifications to "9th Edition". Revised Construction Specifications to 2020Supplemental Specification. Changed reference to GFRP reinforcement from "GFRP' to "G" in the Construction note. Deleted Pile/Footing Design Load data, MSE Wall Table, and Elastomeric Bearing data and moved it to new sheet B171.C. Added "Sheet 1" to sheet title.
Jan 2022	Changed reference to 2021 Supplemental Specifications. Converted sheet to ORD format.
June 2022	Revised Construction Specifications to "2022 Supplemental Specifications".
Oct 2023	Revised Construction Specifications to "2023 Standard Specifications" and changed "Specifications" to "Special Provisions". Added "Type S" to grade 60 metal reinforcement. Specified Temperature Zone 3 for Charpy V-Notch. Revised Design Specifications reference to AASHTO LRFD Bridge Design Specifications to "XX" Edition and added (Month)(Year) ITD Bridge Design LRFD Manual. Revised live load description to "HL-93 including pair of design tandems in accordance with AASHTO LRFD Bridge Design Specifications Article 3.6.1.3". Revised definition of Incidental Items to match 2023 Standard Specifications.

CHAPTER 17
STANDARD DRAWING REVISION LOG

	Revised notes format to active voice, imperative mood and Writer's Style Guide.
Dec 2024	Added "42" Single Slope Concrete Parapet" and weight to DC Permanent loads.
	Revised format of General Notes to match B17.5
	Added Massive Concrete Placement to General Notes
	Revised concrete to 1 decimal place.
	Revised metal reinforcement and structural steel strength to 60 ksi & 50 ksi
	Deleted "Type S" from metal reinforcement designation.

B17.1C Design and General Notes - Sheet 2

Sep 2020	Added new sheet
Jan 2022	Added Pile Design Loads for Integral Abutments.
	Converted sheet to ORD format.
June 2022	Added scour design data for pile foundations and spread footings.

B17.2A Design and General Notes – cast-in-place concrete culverts

June 2006	Revised Construction Specification note to "Project plans & specifications".
	Revised Design Procedures notes to list only proprietary software programs and added Design Speed.
	Added Fill Depth and Live Load Surcharge to Permanent Loads.
	Revised Footing Design Loads format to show nominal bearing resistance value and the effective footing area/width.
April 2008	Added reference to 2008 Interims
	Modified Footing Design loads
July 2010	Renumbered sheet from B17.2C
	Changed Design Specifications reference to 5th Edition
March 2011	Added Construction Note to put roller in static mode when fill depth is less than 3.0'.
Sept 2012	Changed Design Specifications reference to 2012 Edition
June 2013	Added 2013 Interims to Design Specifications reference.
	Changed barrel walls, footings & wings concrete to Class 40A to agree with January 2012 Supplementals.
May 2014	Deleted Extreme Limit State for Footing Design Loads.
	Added note in title block for "Cast-In-Place".
March 2015	Changed page number from B17.2D to B17.2A.
	Changed Design Specifications reference to 7th Edition.
Oct 2017	Revised reference for 2017 Standard Specifications.
	Revised reference to 8th Edition in the Design Specifications.
	Added Construction note for NAVD 88 datum.
Nov 2019	Changed Construction Specification reference to 2018 Standard Specifications and 2019 Supplemental Specifications.
	Revised Notes format to active voice, imperative mood.
	Changed Construction Note to Concrete Waterproof System Type D to agree with 2018 Standard Specifications.
Sep 2020	Revised Design Specifications to "9th Edition".
	Revised Construction Specifications to 2020Supplemental Specification.
	Revised Design Specification note to "In accordance with".
Jan 2022	Changed reference to 2021 Supplemental Specifications.

CHAPTER 17
STANDARD DRAWING REVISION LOG

	Converted sheet to ORD format
June 2022	Revised Construction Specifications to "2022 Supplemental Specifications".
Oct 2023	Revised Construction Specifications to "2023 Standard Specifications" and changed "Specifications" to "Special Provisions".
	Added "Type S" to grade 60 metal reinforcement.
	Revised Design Specifications reference to AASHTO LRFD Bridge Design Specifications to "XX" Edition and added (Month)(Year) ITD Bridge Design LRFD Manual.
	Revised definition of Incidental Items to match 2023 Standard Specifications.
	Revised notes format to active voice, imperative mood and Writer's Style Guide.
	Deleted Sliding from Footing Design Loads Strength Limit State
Dec 2024	Revised format of General Notes to match B17.5
	Added maximum and minimum fill depth to EV Design Loads.
	Changed "Live load surcharge at abutment" to "Live load surcharge at barrel".
	Revised concrete strength to 1 decimal place.
	Revised metal reinforcement to 60 ksi
	Deleted "Type S" from metal reinforcement designation.

B17.2B Design and General Notes – precast concrete culverts

May 2014	Created new sheet for precast culverts.
March 2015	Changed page number from B17.2F to B17.2B".
	Changed Design Specifications reference to 7th Edition.
Oct 2017	Revised reference for 2017 Standard Specifications.
	Revised reference to 8th Edition in the Design Specifications.
	Added Construction note for NAVD 88 datum.
Nov 2019	Changed Construction Specification reference to 2018 Standard Specifications and 2019 Supplemental Specifications.
	Revised Notes format to active voice, imperative mood.
	Changed Construction Note to Concrete Waterproof System Type D to agree with 2018 Standard Specifications.
Sep 2020	Revised Design Specifications to "9th Edition".
	Revised Construction Specificationss to 2020Supplemental Specification.
	Revised Design Specification note to "In accordance with".
	Deleted Construction Note for shop drawing submittal since it is included in Section 578.
Jan 2022	Changed reference to 2021 Supplemental Specifications.
	Converted sheet to ORD format
June 2022	Revised Construction Specifications to "2022 Supplemental Specifications".
Oct 2023	Revised Construction Specifications to "2023 Standard Specifications" and changed "Specifications" to "Special Provisions".
	Added "Type S" to grade 60 metal reinforcement.
	Revised Design Specifications reference to AASHTO LRFD Bridge Design Specifications to "XX" Edition and added (Month)(Year) ITD Bridge Design LRFD Manual.
	Revised definition of Incidental Items to match 2023 Standard Specifications.
	Revised notes format to active voice, imperative mood and Writer's Style Guide.
	Deleted Sliding from Footing Design Loads Strength Limit State
Dec 2024	Corrected DC description from "unit" to "unit weight of reinforced concrete".
	Added maximum and minimum fill depth to EV Design Loads.

CHAPTER 17
STANDARD DRAWING REVISION LOG

Changed "Live load surcharge at abutment" to "Live load surcharge at barrel".
Revised format of General Notes to match B17.5.
Revised concrete strength to 1 decimal place.
Revised metal reinforcement to 60 ksi
Deleted "Type S" from metal reinforcement designation.

B17.3 Design and General Notes – metal pipes

June 2006	Revised Construction Specification note to "Project plans & specifications".
	Revised Footing Design Loads format to show nominal bearing resistance value and the effective footing area/width.
April 2008	Added reference to 2008 Interims
	Modified Footing Design loads
July 2010	Renumbered sheet from B17.2D
	Deleted duplicate shop drawing Construction note
	Changed Design Specifications reference to 5th Edition
March 2011	Added Construction Note to put roller in static mode when fill depth is less than 3.0'.
Sept 2012	Changed Design Specifications reference to 2012 Edition
June 2013	Added 2013 Interims to Design Specifications reference.
	Changed head wall concrete to Class 40A to agree with January 2012 Supplementals.
March 2015	Changed page number from B17.2E to B17.3.
	Changed Design Specifications reference to 7th Edition.
Aug 2016	Specified live load as 120k standard gage tridem axle designed for Strength II.
	Changed shop drawing submittal to electronic PDF format.
	Specified load rating required with shop drawing submittal.
Oct 2017	Revised reference for 2017 Standard Specifications.
	Revised reference to 8th Edition in the Design Specifications.
	Added Construction note for NAVD 88 datum.
Nov 2019	Changed Construction Specification reference to 2018 Standard Specifications and 2019 Supplemental Specifications.
	Revised Notes format to active voice, imperative mood.
Sep 2020	Revised Design Specifications to "9th Edition".
	Revised Construction Specificationss to 2020Supplemental Specification.
	Revised reference to shop drawings to "subsection 105.02" in the Construction notes.
May 2021	Added HL93 to Live Load
Jan 2022	Changed reference to 2021 Supplemental Specifications.
	Converted sheet to ORD format
June 2022	Revised Construction Specifications to "2022 Supplemental Specifications".
Oct 2023	Revised Construction Specifications to "2023 Standard Specifications" and changed "Specifications" to "Special Provisions".
	Added "Type S" to grade 60 metal reinforcement.
	Revised Design Specifications reference to AASHTO LRFD Bridge Design Specifications to "XX" Edition and added (Month)(Year) ITD Bridge Design LRFD Manual.
	Changed Live load reference from "tandem axle" to "tridem axle".
	Revised definition of Incidental Items to match 2023 Standard Specifications.
	Revised notes format to active voice, imperative mood and Writer's Style Guide
	Deleted Sliding from Footing Design Loads Strength Limit State

CHAPTER 17
STANDARD DRAWING REVISION LOG

	Revised reference to shop drawings in Construction Notes to 105.02
Dec 2024	Added maximum and minimum fill depths.
	Revised format of General Notes to match B17.5.
	Revised concrete strength to 1 decimal place.
	Revised metal reinforcement to 60 ksi
	Deleted "Type S" from metal reinforcement designation.

B17.4 Sheet Index, Quantities, & Vicinity Map

April 2008	Added new sheet.
July 2010	Modified sheets names in Sheet Index to show sequence for normal bridge.
	Modified bid items in Quantities to show items for normal bridge.
March 2011	Added One Directional Traffic Data for Construction Year & Construction Year + 20 years values for ADT and ADTT.
June 2013	Changed bid item for 40B Sch No.1 to 40A Sch No. 1
	Changed bid item for 40A Sch No. 2 to 40AF Sch No. 2
May 2014	Revised notations for ADT & ADTT to AADT & CAADT.
March 2015	Changed page number from B17.3 to B17.4
Nov 2019	Added "+" symbol to denote plan quantities.
	Revised bid items to agree with 2018 Standard Specifications.
	Added "Date Panel" to sheet index.
Jan 2022	Converted sheet to ORD format.
Dec 2024	Added additional typical drawings to Sheet Index.
	Corrected bid item designations in Quantities to match current pay item catalog.

B17.5 Consultant Plan Sheet

June 2006	Renumbered sheet from B17.1 to B17.3.
	Added Note 7 for electronic stamp note levels.
April 2008	Renumbered sheet from B17.3 to B17.4.
Feb 2012	Added Note 8 changing the name of the block to "Bridge Key Number".
March 2015	Changed page number from B17.4 to B17.5
Aug 2016	Corrected reference in note 6 to Article 17.2.
Jan 2022	Deleted sheet

B17.5 General Notes, Sheet Index, & Quantities – Rehabilitation Projects

Dec 2024	Added new sheet

B17.6 Standard Rehab Details

Dec 2024	Added new sheet

B17.7 Consultant Plan Sheet –ORD Format

Sep 2020	Added new sheet.
Jan 2022	Renumbered sheet to B17.5
Oct 2023	Revised Note 3 to add "using first name initial and last name".
	Revised notes format to active voice, imperative mood and Writer's Style Guide
	Added note 9 for bridge drawing number.
Dec 2024	Renumbered sheet from B17.5 to B17.7.

DESIGN

DESIGN SPECIFICATIONS

"AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS" XX EDITION AND (MONTH)(YEAR) ITD BRIDGE DESIGN LRFD MANUAL.

DESIGN PROCEDURES

GIRDERS DESIGNED AS SIMPLE SPANS AND SLAB REINFORCEMENT ADDED TO CONTROL CRACKING OVER THE PIERS.

DECK SLAB DESIGNED USING EMPIRICAL DESIGN METHOD. RAILING IN ACCORDANCE WITH MASH TL-x. DESIGN SPEED IS ___ MPH.

ABUTMENT/PIER DESIGNED TO RESIST THE VEHICULAR COLLISION FORCE.

PROPRIETARY COMPUTER SOFTWARE PROGRAMS USED TO FACILITATE DESIGN:

NAME	VERSION	RELEASE DATE		NAME	VERSION	RELEASE DATE

DESIGN LOADS

PERMANENT LOADS

DC	UNIT WEIGHT OF REINFORCED CONCRETE	0.150 kcf
	42" SINGLE SLOPE CONCRETE PARAPET	0.518 klf/SIDE
DW	INITIAL WEARING SURFACE	0.028 ksf
	FUTURE WEARING SURFACE	0.028 ksf
	UTILITIES	xxx klf/GIRDER
	FUTURE UTILITIES	x.xx klf/GIRDER
EV	UNIT WEIGHT OF SOIL	xxx kcf
EH	ACTIVE PRESSURE	xxx kcf
	AT REST PRESSURE	xxx kcf

TRANSIENT LOADS

LL	HL-93 INCLUDING PAIR OF DESIGN TANDEMS IN ACCORDANCE WITH "AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS" ARTICLE 3.6.1.3	
IM	DYNAMIC ALLOWANCE APPLIED TO TRUCK & TANDEM	
LS	LIVE LOAD SURCHARGE AT ABUTMENT	x.xx ft
	LIVE LOAD SURCHARGE AT WINGWALL	x.xx ft
TU	UNIFORM TEMPERATURE RANGE	0°F TO 80°F
	BASE SETTING TEMPERATURE	60°F

EXTREME EVENT LOADS

EQ	SITE CLASS	x
	ACCELERATION COEFFICIENT S_{D1}	0.xx g
	SEISMIC PERFORMANCE ZONE	x
CT	VEHICULAR COLLISION FORCE	600 K
IC	ICE CRUSHING STRENGTH	x.xx ksf
	ICE THICKNESS	x.xx feet

GENERAL NOTES

MATERIALS, CONSTRUCTION AND WORKMANSHIP IN ACCORDANCE WITH THE STATE OF IDAHO TRANSPORTATION DEPARTMENT: (YEAR) STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, (YEAR) SUPPLEMENTAL SPECIFICATIONS, SPECIAL PROVISIONS, AND THE PROJECT PLANS.

MATERIALS

CONCRETE:	DECK SLAB AND PARAPET - CLASS 40AF	f'c = 4.0 ksi
	ABUTMENTS AND WINGWALLS - CLASS 40A	f'c = 4.0 ksi
	PRESTRESS GIRDERS	f'c = x.x ksi
METAL REINFORCEMENT: AASHTO M31, GRADE 60		fy = 60 ksi
PRESTRESSING REINFORCEMENT: AASHTO M203, GRADE 270 LOW RELAXATION		fpu = 270 ksi

PLAN DIMENSIONS AND ELEVATIONS

BEVEL EXPOSED EDGES OF CONCRETE ¾" UNLESS NOTED OTHERWISE.

DIMENSIONS TO REINFORCING STEEL ARE TO CENTERLINE OF BAR UNLESS NOTED OTHERWISE.

PROVIDE 2" CONCRETE COVER MEASURED FROM THE FACE OF THE CONCRETE TO THE FACE OF ANY REINFORCING BAR, UNLESS SHOWN OTHERWISE ON THE DRAWINGS.

PROVIDE REINFORCING STEEL SPLICE LENGTHS IN ACCORDANCE WITH AASHTO SPECIFICATIONS.

CONSTRUCTION

EPOXY-COATED REINFORCEMENT IS DESIGNATED BY AN (E) AFTER THE BAR MARK. GLASS FIBER REINFORCED POLYMER REINFORCEMENT IS DESIGNATED BY A (G) AFTER THE BAR MARK.

PROVIDE CONSTRUCTION JOINTS ONLY AT THE LOCATIONS SHOWN ON THE PLANS OR AS APPROVED.

SET THE ROLLER IN THE STATIC MODE FOR COMPACTING THE ASPHALT WEARING SURFACE ON THE BRIDGE.

ELEVATIONS BASED ON NAVD 88 DATUM.

INCIDENTAL ITEMS

WORK NECESSARY TO FULFILL THE CONTRACT THAT IS NOT MEASURED OR PAID FOR SEPARATELY.

MASSIVE CONCRETE PLACEMENT

SUBMIT A THERMAL CONTROL PLAN IN ACCORDANCE WITH 502.03.F.4 FOR THE FOLLOWING MASS CONCRETE ELEMENTS:

XXX
YYY
ZZZ

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	DESIGN AND GENERAL NOTES - SHEET 1	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
				DETAILED	Standards\Bridge Standard Drawings\ B17_1A.DGN			PRECAST, P/S GIRDER BRIDGE BRIDGE LRFD DESIGN MANUAL, B17.1A	COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						

DESIGN NOTES

DESIGN SPECIFICATIONS

"AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS" XX EDITION AND (MONTH)(YEAR) ITD BRIDGE DESIGN LRFD MANUAL, AND AASHTO/AWS "BRIDGE WELDING CODE" D1.5.

DESIGN PROCEDURES

DECK DESIGNED USING EMPIRICAL METHOD. RAILING IN ACCORDANCE WITH MASH TL-x.
DESIGN SPEED IS _ mph.
ABUTMENT/PIER DESIGNED TO RESIST THE VEHICULAR COLLISION FORCE.
PROPRIETARY COMPUTER SOFTWARE PROGRAMS USED TO FACILITATE THE DESIGN:

NAME	VERSION	RELEASE DATE	NAME	VERSION	RELEASE DATE

DESIGN LOADS

PERMANENT LOADS

DC	UNIT WEIGHT OF REINFORCED CONCRETE	0.150 kcf
	UNIT WEIGHT OF STRUCTURAL STEEL	0.490 kcf
	METAL DECK FORMS	xxx ksf
	42" SINGLE SLOPE CONCRETE PARAPET	0.518 klf/SIDE
DW	INITIAL WEARING SURFACE	0.028 ksf
	FUTURE WEARING SURFACE	0.028 ksf
	UTILITIES	xxx klf/GIRDER
	FUTURE UTILITIES	xxx klf/GIRDER
EV	UNIT WEIGHT OF SOIL	xxx kcf
EH	ACTIVE PRESSURE	xxx kcf
	AT REST PRESSURE	xxx kcf

TRANSIENT LOADS

LL	HL-93 INCLUDING PAIR OF DESIGN TANDEMS IN ACCORDANCE WITH "AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS" ARTICLE 3.6.1.3	
IM	DYNAMIC ALLOWANCE APPLIED TO TRUCK & TANDEM	
LS	LIVE LOAD SURCHARGE AT ABUTMENT	xxx feet
	LIVE LOAD SURCHARGE AT WINGWALL	xxx feet
TU	UNIFORM TEMPERATURE RANGE	-30° F TO 120° F
	BASE SETTING TEMPERATURE	60° F

EXTREME EVENT LOADS

EQ	SITE CLASS	x
	ACCELERATION COEFFICIENT S_{D1}	0.xx g
	SEISMIC PERFORMANCE ZONE	X
CT	VEHICULAR COLLISION FORCE	600 k
IC	ICE CRUSHING STRENGTH	xxx ksf
	ICE THICKNESS	x.xx feet

GENERAL NOTES

MATERIALS, CONSTRUCTION AND WORKMANSHIP IN ACCORDANCE WITH THE STATE OF IDAHO TRANSPORTATION DEPARTMENT: (YEAR) STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, (YEAR) SUPPLEMENTAL SPECIFICATIONS, SPECIAL PROVISIONS, AND THE PROJECT PLANS.

MATERIALS

CONCRETE:	DECK SLAB AND PARAPET - CLASS 40AF	f'c= 4.0 ksi
	ABUTMENTS AND WINGWALLS - CLASS 40A	f'c= 4.0 ksi
METAL REINFORCEMENT: AASHTO M31, GRADE 60		fy= 60 ksi
STRUCTURAL STEEL: ASTM A709 GRADE 50W		fy= 50 ksi
	BASE METAL & WELD METAL CHARPY V-NOTCH TEMPERATURE ZONE 3.	
HIGH STRENGTH BOLTS: ASTM F3125 GRADE A325 TYPE 3		
CARBON STEEL BOLTS: ASTM A307		

PLAN DIMENSIONS AND ELEVATIONS

BEVEL EXPOSED EDGES OF CONCRETE ¾" UNLESS NOTED OTHERWISE.
DIMENSIONS TO REINFORCING STEEL ARE TO CENTERLINE OF BAR UNLESS NOTED OTHERWISE.
PROVIDE 2" CONCRETE COVER MEASURED FROM THE FACE OF THE CONCRETE TO THE FACE OF ANY REINFORCING BAR, UNLESS SHOWN OTHERWISE ON THE DRAWINGS.
PROVIDE REINFORCING STEEL SPLICE LENGTHS IN ACCORDANCE WITH AASHTO SPECIFICATIONS.

CONSTRUCTION

EPOXY-COATED REINFORCEMENT IS DESIGNATED BY AN (E) AFTER THE BAR MARK.
GLASS FIBER REINFORCED POLYMER REINFORCEMENT IS DESIGNATED BY A (G) AFTER THE BAR MARK.
PROVIDE CONSTRUCTION JOINTS ONLY AT THE LOCATIONS SHOWN ON THE PLANS OR AS APPROVED.
PERMANENT METAL DECK SLAB FORMS MAY BE USED AT CONTRACTOR'S OPTION.
PROTECT SURFACES OF THE SUBSTRUCTURE EXCEPT WINGWALLS EXPOSED ON THE COMPLETED STRUCTURE TO PREVENT STAINING WITH PLASTIC SHEETS OR OTHER APPROVED METHODS UNTIL DECK PLACEMENT IS COMPLETED AND GIRDERS ARE BLAST CLEANED.
PROVIDE WELDS IN ACCORDANCE WITH AASHTO/AWS D1.5 AND INTERIM REVISIONS.
ELEVATIONS ARE BASED ON NAVD 88 DATUM.

INCIDENTAL ITEMS

WORK NECESSARY TO FULFILL THE CONTRACT THAT IS NOT MEASURED OR PAID FOR SEPARATELY.

MASS CONCRETE PLACEMENT

SUBMIT A THERMAL CONTROL PLAN IN ACCORDANCE WITH 502.03.F.4 FOR THE FOLLOWING MASS CONCRETE ELEMENTS:

XXX
YYY
ZZZ

REVISIONS			
NO.	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			

DESIGNED
DESIGN CHECKED
DETAILED
DWG. CHECKED
CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY
CADD FILE NAME
Standards\Bridge Standard Drawings\B17_1B.DGN
DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT
YOUR Safety→YOUR Mobility→YOUR Economic Opportunity
APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE: _____

ENGLISH
PROJECT NO.

DESIGN AND GENERAL NOTES - SHEET 1

WEATHERING STEEL GIRDER BRIDGE
BRIDGE LRFD DESIGN MANUAL, B17.1B

BRIDGE PLANS
BRIDGE KEY NO.
COUNTY | KEY NO.
BRIDGE DWG. NO. | SHEET OF

FOOTING DESIGN LOADS

STRENGTH LIMIT STATE

BEARING

NOMINAL BEARING RESISTANCE q_n	=	X	ksf
EFFECTIVE FOOTING WIDTH B'	=	X	ft
EFFECTIVE FOOTING LENGTH L'	=	X	ft
RESISTANCE FACTOR Φ_b	=	X	
FACTORED BEARING RESISTANCE $q_n = q_n \Phi_b$	=	X	ksf
FACTORED APPLIED LOAD $\gamma Q/(B'L')$	=	X	ksf

SLIDING

NOMINAL SLIDING RESISTANCE R_n	=	X	kips
RESISTANCE FACTOR Φ	=	X	
FACTORED SLIDING RESISTANCE $R_R = R_n \Phi$	=	X	kips
FACTORED APPLIED LOAD γV	=	X	kips

SERVICE LIMIT STATE

PRESUMPTIVE BEARING CAPACITY q_p	=	X	ksf
BASED UPON FOOTING SETTLEMENT	=	X	inches OR LESS
EFFECTIVE FOOTING WIDTH B'	=	X	ft
EFFECTIVE FOOTING LENGTH L'	=	X	ft
RESISTANCE FACTOR Φ	=	X	
FACTORED PRESUMPTIVE BEARING RESISTANCE Φq_p	=	X	ksf
FACTORED APPLIED LOAD $\gamma Q/(B'L')$	=	X	ksf

EXTREME LIMIT STATE

BEARING

NOMINAL BEARING RESISTANCE q_n	=	X	ksf
EFFECTIVE FOOTING WIDTH B'	=	X	ft
EFFECTIVE FOOTING LENGTH L'	=	X	ft
RESISTANCE FACTOR Φ	=	1.0	
FACTORED BEARING RESISTANCE Φq_n	=	X	ksf
FACTORED APPLIED LOAD $\gamma Q/(B'L')$	=	X	ksf

SLIDING

NOMINAL SLIDING RESISTANCE R_n	=	X	kips
RESISTANCE FACTOR Φ	=	1.0	
FACTORED SLIDING RESISTANCE ΦR_n	=	X	kips
FACTORED APPLIED LOAD γV	=	X	kips

PILE DESIGN LOADS FOR NON-INTEGRAL ABUTMENTS & PIERS

STRENGTH LIMIT STATE

NOMINAL AXIAL RESISTANCE R_n	=	X	kips
AXIAL RESISTANCE FACTOR Φ	=	X	
FACTORED AXIAL RESISTANCE ΦR_n	=	X	kips
MAX. APPLIED AXIAL LOAD Q	=	X	kips
MIN. APPLIED AXIAL LOAD Q	=	X	kips
NOMINAL LATERAL RESISTANCE R_n	=	X	kips
BASED UPON 2" OF HORIZONTAL MOVEMENT			
LATERAL RESISTANCE FACTOR Φ	=	1.0	
FACTORED LATERAL RESISTANCE ΦR_n	=	X	kips
FACTORED LATERAL APPLIED LOAD γV	=	X	kips

SERVICE LIMIT STATE

NOMINAL LATERAL RESISTANCE R_n	=	X	kips
BASED UPON ¼" OF HORIZONTAL MOVEMENT			
LATERAL RESISTANCE FACTOR Φ	=	1.0	
FACTORED LATERAL RESISTANCE ΦR_n	=	X	kips
FACTORED LATERAL APPLIED LOAD γV	=	X	kips

EXTREME LIMIT STATE

NOMINAL AXIAL RESISTANCE R_n	=	X	kips
AXIAL RESISTANCE FACTOR Φ	=	1.0	
FACTORED AXIAL RESISTANCE ΦR_n	=	X	kips
MAX. APPLIED AXIAL LOAD Q	=	X	kips
MIN. APPLIED AXIAL LOAD Q	=	X	kips
LATERAL RESISTANCE FACTOR Φ	=	1.0	
FACTORED LATERAL RESISTANCE ΦR_n	=	X	kips
FACTORED LATERAL APPLIED LOAD γV	=	X	kips

PILE DESIGN LOADS FOR INTEGRAL ABUTMENT

STRENGTH LIMIT STATE

NOMINAL AXIAL RESISTANCE R_n	=	X	kips
AXIAL RESISTANCE FACTOR Φ	=	X	
FACTORED AXIAL RESISTANCE ΦR_n	=	X	kips
MAX. APPLIED AXIAL LOAD Q	=	X	kips
MIN. APPLIED AXIAL LOAD Q	=	X	kips

PILE DESIGN DATA FOR SCOUR

FOUNDATIONS DESIGNED FOR THE FOLLOWING SCOUR DEPTHS BELOW THE BOTTOM OF THE PILE CAP/TOP OF DRILLED SHAFT.

ABUTMENT	=	X	ft
PIER	=	X	ft

SPREAD FOOTING DESIGN DATA FOR SCOUR

TOP OF FOOTING ELEVATION	=	X	ft
SCOUR ELEVTION	=	X	ft

MSE WALLS

THE FOLLOWING TABLE SUMMARIZES THE SOIL INFORMATION TO BE USED IN THE WALL DESIGN. OTHER INFORMATION NEEDED FOR THE WALL DESIGN CAN BE FOUND IN THE ITD GEOTECHNICAL ENGINEERING REPORT AVAILABLE AT THE DISTRICT RESIDENT'S OFFICE.

MSE WALL DESIGN PARAMETERS

SOIL	WET UNIT WEIGHT (pcf)	COHESION (psf)	FRICTION ANGLE (DEGREE)	ALLOWABLE BEARING CAPACITY (ksf)	ULTIMATE BEARING CAPACITY ** (ksf)
WALL BACKFILL	*	*	*	N/A	N/A
RETAINED SOIL				N/A	N/A
FOUNDATION SOIL					

* - TO BE DETERMINED BY THE CONTRACTOR
** - RESISTANCE FACTOR =

ELASTOMERIC BEARINGS

DESIGN PROCEDURE: METHOD A
GRADE 4 (_) DUROMETER POLYISOPRENE
GRADE 3 (_) DUROMETER POLYCHLOROPRENE
DESIGN LOADS: (SERVICE 1)
ABUTMENT..... X kips
PIER..... X kips

DESIGN PROCEDURE: METHOD B
SHEAR MODULUS (_) PSI
GRADE 4 POLYISOPRENE
GRADE 3 POLYCHLOROPRENE
DESIGN LOADS: (SERVICE 1)
ABUTMENT..... X kips
PIER..... X kips

ORIGINAL STORED AT: ITD BRIDGE SECTION - Boise, Idaho

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGNED
DESIGN CHECKED
DETAILED
DWG. CHECKED
CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY
CADD FILE NAME
Standards\Bridge Standard Drawings\
B17_1C.DGN
DRAWING DATE:
JUNE 2022

IDAHO TRANSPORTATION DEPARTMENT
YOUR Safety→YOUR Mobility→YOUR Economic Opportunity
APPROVED BY:
BRIDGE ENGINEER _____ DATE: _____

ENGLISH
PROJECT NO.

DESIGN AND GENERAL NOTES - SHEET 2
BRIDGE LRFD DESIGN MANUAL, B17.1C

BRIDGE PLANS
BRIDGE KEY NO.
COUNTY | KEY NO.
BRIDGE DWG. NO. | SHEET OF

DESIGN

DESIGN SPECIFICATIONS

"AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS" XX EDITION AND (MONTH)(YEAR) ITD BRIDGE DESIGN LRFD MANUAL.

DESIGN PROCEDURES

RAILING IN ACCORDANCE WITH MASH TL - x. DESIGN SPEED IS ___ mph.

PROPRIETARY COMPUTER SOFTWARE PROGRAMS USED TO FACILITATE THE DESIGN:

NAME	VERSION	RELEASE DATE		NAME	VERSION	RELEASE DATE

DESIGN LOADS

PERMANENT LOADS

DC	UNIT WEIGHT OF REINFORCED CONCRETE	0.150 kcf
DW	FUTURE WEARING SURFACE	x.xx ksf
EV	UNIT WEIGHT OF SOIL	xxx ksf
	FILL DEPTH - MAX.	x.xx ft
	FILL DEPTH - MIN.	x.xx ft
EH	ACTIVE PRESSURE	xxx kcf
	AT REST PRESSURE	xxx kcf
	SOIL-STRUCTURE INTERACTION FACTOR (F_e OR F_t)	x.xx
ES	EARTH LOAD SURCHARGE	x.xx ft

TRANSIENT LOADS

LL	HL-93	
IM	DYNAMIC ALLOWANCE APPLIED TO TRUCK & TANDEM	
LS	LIVE LOAD SURCHARGE AT BARREL	x.xx ft
	LIVE LOAD SURCHARGE AT WINGWALL	x.xx ft

FOOTING DESIGN LOADS

STRENGTH LIMIT STATE - BEARING

NOMINAL BEARING RESISTANCE q_n = X ksf

EFFECTIVE FOOTING WIDTH B' = xx ft

EFFECTIVE FOOTING LENGTH L' = xx ft

RESISTANCE FACTOR Φ_b = X

FACTORED BEARING RESISTANCE $q_R = q_n \Phi_b$ = xx ksf

FACTORED APPLIED LOAD $\Upsilon Q/(B'L')$ = xx ksf

SERVICE LIMIT STATE

PRESUMPTIVE BEARING CAPACITY q_p = x ksf

BASED UPON FOOTING SETTLEMENT = X inches OR LESS

EFFECTIVE FOOTING WIDTH B' = xx ft

EFFECTIVE FOOTING LENGTH L' = xx ft

RESISTANCE FACTOR Φ = 1.0

FACTORED PRESUMPTIVE BEARING RESISTANCE Φq_p = xx ksf

FACTORED APPLIED LOAD $\Upsilon Q/B'L')$ = xx ksf

GENERAL NOTES

MATERIALS, CONSTRUCTION AND WORKMANSHIP IN ACCORDANCE WITH THE STATE OF IDAHO TRANSPORTATION DEPARTMENT: (YEAR) STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION,(YEAR) SUPPLEMENTAL SPECIFICATIONS, SPECIAL PROVISIONS, AND THE PROJECT PLANS.

MATERIAL

CONCRETE: DECK SLAB AND EDGE BEAM - CLASS 40A ..... f'c = 4.0 ksi

BARREL WALLS, FOOTINGS AND WINGWALLS - CLASS 40A ..... f'c = 4.0 ksi

METAL REINFORCEMENT: AASHTO M31, GRADE 60 ..... fy = 60 ksi

PLAN DIMENSIONS AND ELEVATIONS

BEVEL EXPOSED EDGES OF CONCRETE ¾" UNLESS NOTED OTHERWISE.

DIMENSIONS TO REINFORCING STEEL ARE TO CENTERLINE OF BAR UNLESS NOTED OTHERWISE.

PROVIDE 2" CONCRETE COVER MEASURED FROM THE FACE OF THE CONCRETE TO THE FACE OF ANY REINFORCING BAR, UNLESS SHOWN OTHERWISE ON THE DRAWINGS.

PROVIDE REINFORCING STEEL SPLICE LENGTHS IN ACCORDANCE WITH AASHTO SPECIFICATIONS.

CONSTRUCTION

PROVIDE CONSTRUCTION JOINTS AT THE LOCATIONS SHOWN ON THE PLANS OR AS APPROVED.

APPLY CONCRETE WATERPROOF SYSTEM TYPE D TO THE TOP SLAB.

DO NOT EXCEED A DIFFERENCE OF 2 FEET IN ELEVATION OF THE BACKFILL MATERIAL ON BOTH SIDES OF THE STRUCTURE DURING BACKFILL OPERATIONS.

SET THE ROLLER IN THE STATIC MODE FOR COMPACTING THE ASPHALT WEARING SURFACE OVER THE CULVERT WHEN THE DEPTH OF FILL IS LESS THAN 3'.

ELEVATIONS BASED ON NAVD 88 DATUM.

INCIDENTAL ITEMS

WORK NECESSARY TO FULFILL THE CONTRACT THAT IS NOT MEASURED OR PAID FOR SEPARATELY.

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	*ENGLISH*	DESIGN AND GENERAL NOTES	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	BOX CULVERT/STIFFLEG BRIDGE (CAST-IN-PLACE) BRIDGE LRFD DESIGN MANUAL, B17.2A	BRIDGE KEY NO.	
1				DETAILED	Standards/Bridge Standard Drawings/ B17_2A.DGN	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			COUNTY	KEY NO.
2				DWG. CHECKED	DRAWING DATE: DEC 2024				BRIDGE DWG. NO.	SHEET OF
3				CORRECTIONS						
4										
5										

DESIGN NOTES

DESIGN SPECIFICATIONS

"AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS" XX EDITION AND (MONTH)(YEAR) ITD BRIDGE DESIGN LRFD MANUAL.

DESIGN LOADS

PERMANENT LOADS

DC	UNIT WEIGHT OF REINFORCED CONCRETE	0.150 kcf
DW	FUTURE SURFACING	X.XX ksf
EV	UNIT WEIGHT OF SOIL	XXX kcf
	FILL DEPTH - MAX.	** ft
	FILL DEPTH - MIN.	** ft
EH	ACTIVE PRESSURE	xxx kcf
	AT REST PRESSURE	xxx kcf
	SOIL-STRUCTURE INTERACTION FACTOR (F_e OR F_t)	**
ES	EARTH LOAD SURCHARGE	** ft

TRANSIENT LOADS

LL	HL-93	
IM	DYNAMIC ALLOWANCE APPLIED TO TRUCK & TANDEM	
LS	LIVE LOAD SURCHARGE AT BARREL	** feet
	LIVE LOAD SURCHARGE AT WINGWALL	** feet

** DETERMINED BY PRECAST CONCRETE BOX CULVERT SUPPLIER BASED ON GEOTECHNICAL ENGINEERING REPORT.

GENERAL NOTES

MATERIALS, CONSTRUCTION AND WORKMANSHIP IN ACCORDANCE WITH THE STATE OF IDAHO TRANSPORTATION DEPARTMENT: (YEAR) STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, (YEAR) SUPPLEMENTAL SPECIFICATIONS, SPECIAL PROVISIONS, AND THE PROJECT PLANS.

MATERIAL

CONCRETE: DECK SLAB AND EDGE BEAM - CLASS 40A ..... f'c = 4.0 ksi
BARREL WALLS, FOOTINGS AND WINGWALLS - CLASS 40A ..... f'c = 4.0 ksi

METAL REINFORCEMENT: AASHTO M31, GRADE 60 ..... fy = 60 ksi

PLAN DIMENSIONS AND ELEVATIONS

BEVEL EXPOSED EDGES OF CONCRETE ¾" UNLESS NOTED OTHERWISE.
DIMENSIONS TO REINFORCING STEEL ARE TO CENTERLINE OF BAR UNLESS NOTED OTHERWISE.
PROVIDE 2" CONCRETE COVER MEASURED FROM THE FACE OF THE CONCRETE TO THE FACE OF ANY REINFORCING BAR, UNLESS SHOWN OTHERWISE ON THE DRAWINGS.
PROVIDE REINFORCING STEEL SPLICE LENGTHS IN ACCORDANCE WITH AASHTO SPECIFICATIONS.

CONSTRUCTION

PROVIDE CONSTRUCTION JOINTS AT THE LOCATIONS SHOWN ON THE PLANS OR AS APPROVED.
APPLY CONCRETE WATERPROOF SYSTEM TYPE D TO THE TOP SLAB.
DO NOT EXCEED A DIFFERENCE OF 2 FEET IN ELEVATION OF THE BACKFILL MATERIAL ON BOTH SIDES OF THE STRUCTURE DURING BACKFILL OPERATIONS.
SET THE ROLLER IN THE STATIC MODE FOR COMPACTING THE ASPHALT WEARING SURFACE OVER THE CULVERT WHEN THE DEPTH OF FILL IS LESS THAN 3'.
ELEVATIONS BASED ON NAVD 88 DATUM.

INCIDENTAL ITEMS

WORK NECESSARY TO FULFILL THE CONTRACT THAT IS NOT MEASURED OR PAID FOR SEPARATELY.

FOOTING DESIGN LOADS

STRENGTH LIMIT STATE - BEARING

NOMINAL BEARING RESISTANCE q_n = X ksf
RESISTANCE FACTOR Φ_b = X
FACTORED BEARING RESISTANCE $q_R = q_n\Phi_b$ = xx ksf

SERVICE LIMIT STATE

PRESUMPTIVE BEARING CAPACITY q_p = X ksf
BASED UPON FOOTING SETTLEMENT = X inches OR LESS
RESISTANCE FACTOR Φ = 1.0
FACTORED PRESUMPTIVE BEARING RESISTANCE Φq_p = xx ksf

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	*ENGLISH*	DESIGN AND GENERAL NOTES	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	BOX CULVERT/STIFFLEG BRIDGE (PRECAST) BRIDGE LRFD DESIGN MABUAL, B17.2B	BRIDGE KEY NO.	
△				DETAILED	Standards/Bridge Standard Drawings/ B17_2B.DGN	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			COUNTY	KEY NO.
△				DWG. CHECKED	DRAWING DATE: DEC 2024				BRIDGE DWG. NO.	SHEET OF
△				CORRECTIONS						
△										

DESIGN

DESIGN SPECIFICATIONS

"AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS" XX EDITION AND (MONTH)(YEAR) ITD BRIDGE DESIGN LRFD MANUAL.

LIVE LOAD DESIGNED FOR STRENGTH II.

DESIGN LOADS

PERMANENT LOADS

DC	UNIT WEIGHT OF REINFORCED CONCRETE	0.150 kcf
DW	FUTURE WEARING SURFACE	0.028ksf
EV	UNIT WEIGHT OF SOIL	xxx kcf
	FILL DEPTH - MAX.	x.xx ft
	FILL DEPTH - MIN.	x.xx ft
EH	ACTIVE PRESSURE	xxx kcf
	AT REST PRESSURE	xxx kcf
ES	EARTH LOAD SURCHARGE AT HEADWALL	x.xx ft

TRANSIENT LOADS

LL	HL-93 AND STANDARD GAGE TRIDEM AXLE LOAD OF 120 k (40 k PER AXLE) WITH 4.5' AXLE SPACING
IM	DYNAMIC ALLOWANCE APPLIED TO TRUCK & TANDEM

FOOTING DESIGN LOADS FOR HEADWALLS

STRENGTH LIMIT STATE - BEARING

NOMINAL BEARING RESISTANCE q_n = X ksf

EFFECTIVE FOOTING WIDTH B' = xx ft

EFFECTIVE FOOTING LENGTH L' = xx ft

RESISTANCE FACTOR Φ_b = X

FACTORED BEARING RESISTANCE $q_R = q_n \Phi_b$ = xx ksf

FACTORED APPLIED LOAD $\Upsilon Q/(B'L')$ = xx ksf

SERVICE LIMIT STATE

PRESUMPTIVE BEARING CAPACITY q_p = x ksf

BASED UPON FOOTING SETTLEMENT = X inches OR LESS

EFFECTIVE FOOTING WIDTH B' = xx ft

EFFECTIVE FOOTING LENGTH L' = xx ft

RESISTANCE FACTOR Φ = 1.0

FACTORED PRESUMPTIVE BEARING RESISTANCE Φq_p = xx ksf

FACTORED APPLIED LOAD $\Upsilon Q/B'L')$ = xx ksf

GENERAL NOTES

MATERIALS, CONSTRUCTION AND WORKMANSHIP IN ACCORDANCE WITH THE STATE OF IDAHO TRANSPORTATION DEPARTMENT: (YEAR) STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, (YEAR) SUPPLEMENTAL SPECIFICATIONS, SPECIAL PROVISIONS, AND THE PROJECT PLANS.

MATERIAL

CONCRETE: HEADWALLS - CLASS 40A ..... f'c = 4.0 ksi

METAL REINFORCEMENT: AASHTO M31, GRADE 60 ..... fy = 60 ksi

PLAN DIMENSIONS AND ELEVATIONS

BEVEL EXPOSED EDGES OF CONCRETE ¾" UNLESS NOTED OTHERWISE.

DIMENSIONS TO REINFORCING STEEL ARE TO CENTERLINE OF BAR UNLESS NOTED OTHERWISE.

PROVIDE 2" CONCRETE COVER MEASURED FROM THE FACE OF THE CONCRETE TO THE FACE OF ANY REINFORCING BAR, UNLESS SHOWN OTHERWISE ON THE DRAWINGS.

PROVIDE REINFORCING STEEL SPLICE LENGTHS IN ACCORDANCE WITH AASHTO SPECIFICATIONS.

CONSTRUCTION

PROVIDE CONSTRUCTION JOINTS ONLY AT THE LOCATIONS SHOWN ON THE PLANS OR AS APPROVED.

DO NOT EXCEED A DIFFERENCE OF 2 FEET IN ELEVATION OF THE BACKFILL MATERIAL ON BOTH SIDES OF THE STRUCTURE DURING BACKFILL OPERATIONS.

SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH 105.02.

FABRICATE AND INSTALL IN ACCORDANCE WITH SECTION 26 OF THE AASHTO LRFD BRIDGE CONSTRUCTION SPECIFICATIONS.

SET THE ROLLER IN THE STATIC MODE FOR COMPACTING THE ASPHALT WEARING SURFACE OVER THE CULVERT WHEN THE DEPTH OF FILL IS LESS THAN 3'.

ELEVATIONS BASED ON NAVD 88 DATUM.

INCIDENTAL ITEMS

WORK NECESSARY TO FULFILL THE CONTRACT THAT IS NOT MEASURED OR PAID FOR SEPARATELY.

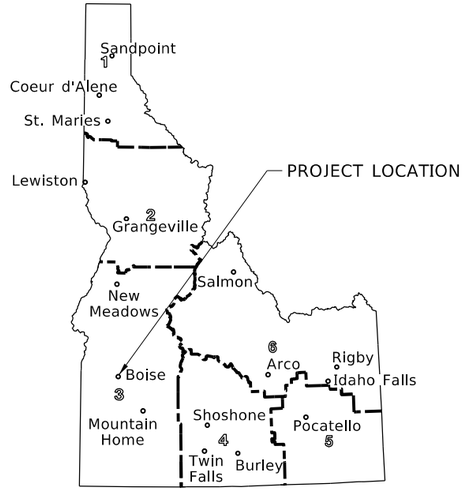
LOAD RATING

SUBMIT THE INITIAL LOAD RATING WITH THE SHOP DRAWINGS. PROVIDE THE LOAD RATING IN ACCORDANCE WITH THE ITD MANUAL FOR BRIDGE EVALUATION AND LOAD RATING SUMMARY FORM.

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	DESIGN AND GENERAL NOTES	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
				DETAILED	Standards/Bridge Standard Drawings/B17_3.DGN			METAL PIPE	COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:		BRIDGE LRFD DESIGN MANUAL, B17.3	BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						

XXX' PRESTRESSED GIRDER BRIDGE
I-15 STA. XXX+XX.XX
M.P. XXX.XX

VICINITY MAP
NTS



IDAHO MAP
NTS

SHEET INDEX

SITUATION AND LAYOUT	1
SHEET INDEX, QUANTITIES & VICINITY MAP	2
DESIGN AND GENERAL NOTES	3
STAGE CONSTRUCTION DETAILS	4
FOUNDATION INVESTIGATION PLAT	—
FOUNDATION PLAN	—
FOUNDATION DETAILS	—
ABUTMENT PLAN & ELEVATION	—
ABUTMENT DETAILS	—
ABUTMENT END DIAPHRAGM DETAILS	—
WINGWALL DETAILS	—
PIER PLAN & ELEVATION	—
PIER DETAILS	—
ABUTMENT BEARING DETAILS	—
PIER BEARING DETAILS	—
FRAMING PLAN & INTERMEDIATE DIAPHRAGM DETAILS	—
WF50G PRESTRESSED GIRDER	—
PRESTRESSED GIRDER GENERAL DETAILS	—
PRESTRESSED WF GIRDER DETAILS	—
OPTIONAL PRESTRESSED GIRDER WWF DETAILS	—
TEMPORARY DIAPHRAGM DETAILS	—
DECK TYPICAL SECTION & DETAILS	—
DECK PLAN & REINFORCEMENT	—
UTILITIES LAYOUT & DETAILS	—
BRIDGE DRAIN DETAILS	—
DECK PLACEMENT SEQUENCE & DETAILS	—
EXPANSION JOINT DETAILS	—
APPROACH SLAB DETAILS, SHEET 1 OF 2	—
APPROACH SLAB DETAILS, SHEET 2 OF 2	—
42" SINGLE SLOPE CONCRETE PARAPET	—
DATE PANEL	—
METAL REINFORCEMENT, SHEET 1 OF 2	—
METAL REINFORCEMENT, SHEET 2 OF 2	—

ONE DIRECTIONAL TRAFFIC DATA

CONSTRUCTION YEAR xxxx
AADT xxxx
CAADT xxxx
xx.x%
FUTURE YEAR (CONSTRUCTION + 20 YRS)
AADT xxxx
CAADT xxxx
xx.x%

QUANTITIES

203-020A	REMOVAL OF BRIDGE - FULL (APPROX. __ SF)	___	EA
+ 210-005A	STRUCTURE EXCAVATION SCH. NO. 1 (SOIL AND GRAVEL)	___	CY
+ 210-015A	COMPACTING BACKFILL	___	CY
301-010A	GRANULAR SUBBASE	___	CY
502-140A	CONCRETE CLASS 40A SCH. NO. 1	___	CY
+ 502-310A	CONCRETE CLASS 40AF SCH. NO. 2	___	CY
+ 502-375A	PRESTRESS BULB TEE GIRDER (37" TOP FLANGE, 42" DEPTH)	___	FT
502-430A	CONCRETE PARAPET (42" SINGLE SLOPE)	___	FT
502-435A	APPROACH SLAB	___	SY
503-010A	METAL REINFORCEMENT SCH. NO. 1	___	LB
+ 503-015A	METAL REINFORCEMENT SCH. NO. 2	___	LB
503-020A	EPOXY-COATED METAL REINFORCEMENT	___	LB
505-045A	PROVIDE AND DRIVE STEEL H-PILE (14 x 117)	___	FT
505-197A	PROVIDE AND DRIVE TEST PILE (HP-14 x 117)	___	FT
505-205C	PROVIDE AND INSTALL PILE SHOES OR TIPS (HP-14 x 117)	___	EA
505-215A	SPLICE STEEL PILE BEFORE DRIVING	___	FT
505-215B	SPLICE STEEL PILE DURING DRIVING	___	FT
507-005A	ELASTOMERIC BEARING PLAIN (0.5"x6"x2'-0")	___	EA
521-005A	DYNAMIC PILE TESTING	___	EA
521-010A	CAPWAP ANALYSIS	___	EA
+ 551-005A	PREPARED & PLACED PPC OVERLAY	___	SY
551-010A	FURNISHED PPC OVERLAY MATERIAL	___	CY
560-005A	DEWATERING FOUNDATION	___	LS
566-005A	COMPRESSION EXPANSION JOINT (1" BONDED PREFORMED)	___	FT
575-005A	TEXTURED CONCRETE SURFACE	___	SY
576-005A	GLASS FIBER REINFORCED POLYMER (GFRP) REINFORCMENT	___	FT
577-005A	PILE SLEEVES (30" DIA.)	___	FT
584-005A	TEMPORARY SHORING (APPROX. __ SF)	___	LS
586-005A	UTILITY CONDUITS (COMPLETE W/ HANGERS (APPROX. __')	___	LS

+ PAID BY PLAN QUANTITY

NOTE TO DESIGNER
PLAN QUANTITY ITEMS SHOWN IN ACCORDANCE WITH STANDARD SPECIFICATIONS. SEE BDM A16.2.

REVISIONS			
NO.	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			

DESIGNED
DESIGN CHECKED
DETAILED
DWG. CHECKED
CORRECTIONS

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY
CADD FILE NAME
Standards\Standard Bridge Drawings\B17_4.DGN
DRAWING DATE: DEC 2024

IDAHO TRANSPORTATION DEPARTMENT
YOUR Safety→YOUR Mobility→YOUR Economic Opportunity
APPROVED BY:
BRIDGE ENGINEER MICHAEL T. JOHNSON DATE: _____

ENGLISH
PROJECT NO.

SHEET INDEX, QUANTITIES & VICINITY MAP

BRIDGE LRFD DESIGN MANUAL, B17.4

BRIDGE PLANS
BRIDGE KEY NO.
COUNTY | KEY NO.
BRIDGE DWG. NO. | SHEET OF

SHEET INDEX

SITUATION AND LAYOUT 1
GENERAL NOTES, SHEET INDEX & QUANTITIES 2
CONCRETE OVERLAY AND WATERPROOFING X
JOINT (REPLACEMENT/REPAIR) X
CONCRETE REPAIR LOCATIONS X
CONCRETE REPAIR DETAILS X
DRAIN REPLACEMENT X
(CURB/PARAPET) REPLACEMENT X
APPROACH SLAB LEVELING X
SNOW PLOW DEFLECTORS X
BEARING REPLACEMENT X
LONGITUDINAL JOINT REMOVAL X
BRIDGE NAME SIGN X
GIRDER REPAIR X
STRUCTURAL STEEL PAINTING X

QUANTITIES

	203-021A	REMOVAL OF BRIDGE - PARTIAL	X.X	EA
+	502-140A	CONCRETE CLASS 40-A SCHEDULE NO. 1	X.X	CY
+	502-310A	CONCRETE CLASS 40 AF SCHEDULE NO. 2	X.X	CY
+	503-010A	METAL REINFORCEMENT SCHEDULE NO. 1	X.X	LB
+	503-015A	METAL REINFORCEMENT SCHEDULE NO. 2	X.X	LB
+	503-020A	EPOXY COATED METAL REINFORCEMENT	X.X	LB
	504-010A	STRUCTURAL STEEL (APPROX. WEIGHT X LBS)	1.0	LS
	510-005A	CONCRETE OVERLAY	X.X	CY
+	511-005A	CONCRETE WATERPROOF SYSTEM (TYPE _)	X.X	SY
	522-005A	CONTROLLED DENSITY FILL	X.X	CY
+	551-005A	PREPARED & PLACED PPC OVERLAY	X.X	SY
	551-010A	FURNISHED PPC OVERLAY MATERIAL	X.X	CY
+	553-005A	EPOXY OVERLAY	X.X	SF
+	565-005A	ASPHALTIC PLUG EXPANSION JOINT SYSTEM	X.X	CF
+	566-005A	COMPRESSION EXPANSION JOINT (X")	X.X	FT
+	567-005A	STRIP SEAL EXPANSION JOINT (X")	X.X	FT
+	568-005A	ELASTOMERIC CONCRETE HEADER	X.X	CY
+	569-005A	REMOVAL OF EXPANSION JOINT	X.X	FT
	579-005A	BONDING REINFORCING STEEL	1.0	LS
+	580-005A	REMOVAL OF ASPHALT OVERLAY	X.X	SY
	581-005A	CONCRETE CRACK REPAIR PREPARATION	X.X	FT
	581-010A	CONCRETE CRACK EPOXY INJECTION	X.X	GAL
	582-005A	PATCH AND REPAIR OF CONCRETE SURFACE	X.X	SF
	582-010A	PATCH AND REPAIR OF CONCRETE DECK	X.X	SF
	583-005A	SUPERSTRUCTURE JACKING	1.0	LS
	587-005A	PAINTING STRUCTURAL STEEL (APPROX. AREA __ SF)	1.0	LS
	616-015A	SIGNS TYPE C-1	X.X	EA
	624-005A	LOOSE RIPRAP	X.X	CY
+	632-005A	CONCRETE BR DECK REMOVAL CLASS A	X.X	SY
	632-010A	CONCRETE BR DECK REMOVAL CLASS B	X.X	SY
	640-010A	RIPRAP/EROSION CONTROL GEOTEXTILE	X.X	SY
+	S501-30A	SP BRIDGE, SILICONE SEALANT JOINT	X.X	FT
+	S501-35A	SP BRIDGE, DECK SEALER PREPARATION	X.X	SY
	S501-50A	SP BRIDGE, DECK CRACK SEALER	X.X	GAL
	S900-50A	CONTINGENCY AMOUNT (DIRECTED REPAIRS)	X.X	CA

+ PAID BY PLAN QUANTITY

GENERAL NOTES

MATERIALS, CONSTRUCTION AND WORKMANSHIP IN ACCORDANCE WITH THE STATE OF IDAHO TRANSPORTATION DEPARTMENT: (YEAR) STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, (YEAR) SUPPLEMENTAL SPECIFICATIONS, SPECIAL PROVISIONS AND THE PROJECT PLANS.

DESIGN SPECIFICATIONS AND DESIGN LOADS

NEW CONSTRUCTION: "AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS" XX EDITION (MM-YEAR) ITD BRIDGE LRFD DESIGN MANUAL.

ELEMENTS STRENGTHENED: X

EXISTING PLANS

EXISTING CONSTRUCTION: DWG. NO. XXXX-XXXX, XXXX-A, XXXX-B, & XXXX-C.

EXISTING PLANS ARE AVAILABLE AT THE BRIDGE DESIGN OFFICE.

PLAN DIMENSIONS

STATIONS, ELEVATIONS, BEARINGS, AND DIMENSIONS SHOWN ARE BASED ON THE EXISTING PLANS AND DO NOT NECESSARILY REPRESENT THE AS-CONSTRUCTED BRIDGE. WHERE DIMENSIONS OF THE PROPOSED WORK DEPEND ON EXISTING CONDITIONS, FIELD VERIFY AND ADJUST CONTROLLING DIMENSIONS TO FIT THE AS-CONSTRUCTED BRIDGE BEFORE ORDERING MATERIALS.

DO NOT SCALE DIMENSIONS FROM THE PROJECT PLANS.

CONSTRUCTION

BEVEL EXPOSED EDGES OF CONCRETE ¾" UNLESS NOTED OTHERWISE.

PROVIDE 2" CONCRETE COVER MEASURED FROM FACE OF THE CONCRETE TO THE FACE OF ANY REINFORCING BAR, UNLESS SHOWN OTHERWISE.

REINFORCING STEEL DIMENSIONS ARE MEASURED TO BAR CENTERLINE UNLESS NOTED OTHERWISE.

PROVIDE REINFORCING STEEL SPLICE LENGTHS IN ACCORDANCE WITH AASHTO SPECIFICATIONS.

EPOXY-COATED REINFORCEMENT IS DESIGNATED BY AN (E) AFTER THE BAR MARK.

PREVENT DAMAGE TO THE PORTIONS OF THE STRUCTURE AND ROADWAY TO REMAIN DURING REMOVAL OPERATIONS. REPAIR OR REPLACE DAMAGE DUE TO CONTRACTOR OPERATIONS AS APPROVED BY THE ENGINEER AND AT NO ADDITIONAL COST TO THE DEPARTMENT.

OPERATE VIBRATORY ROLLERS IN STATIC MODE WHEN COMPACTING ASPHALT ON THE BRIDGE DECK.

PREVENT DEBRIS, RESULTING FROM CONTRACTOR OPERATIONS, FROM ENTERING THE (WATERWAY/RAILROAD TRACKS BELOW AND OPEN TRAFFIC LANES).

DISPOSE OF REMOVED MATERIALS IN ACCORDANCE WITH 106.16.

LOCATE, RETAIN, AND PROTECT UTILITIES WITHIN THE VICINITY OF THE BRIDGE.

STAGE TRAFFIC DURING CONSTRUCTION IN ACCORDANCE WITH THE APPROVED TRAFFIC CONTROL PLAN.

NEW MATERIALS

CONCRETE: DECK SLAB, PARAPET, CURB - CLASS 40AF ..... f'c = 4.0 ksi
WINGWALLS - CLASS 40A ..... f'c = 4.0 ksi

METAL REINFORCEMENT: AASHTO M31, GRADE 60 ..... fy = 60 ksi

PRESTRESSED REINFORCEMENT: AASHTO M2023, GRADE 270 LOW RELAXATION ..... fpu = 270 ksi

STRUCTURAL STEEL: ASTM A709 GRADE XX ..... fy = xx ksi

INCIDENTAL ITEMS

WORK NECESSARY TO FULFILL THE CONTRACT THAT IS NOT MEASURED OR PAID FOR SEPARATELY.

NOTE TO DESIGNERS:

1. DESIGN SPECIFICATIONS:
   A. REMOVE NEW CONSTRUCTION NOTES IF NO STRENGTHENING IS NEEDED.
2. S900-50A USES AN UNIT PRICE OF $1 AND MAKE THE QUANTITY THE DOLLAR AMOUNT.
3. MOVE SCOPE OF WORK TO THE SITUATION AND LAYOUT SHEET.
4. MOVE LEGEND TO SITUATION AND LAYOUT SHEET.

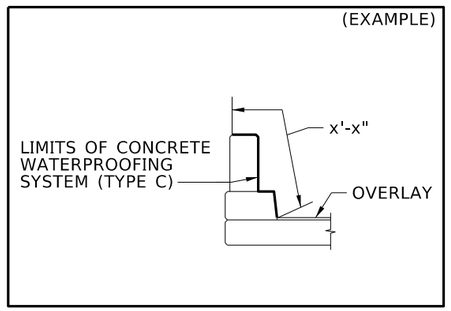
SCOPE OF WORK

X. REMOVE ASPHALT OVERLAY.
X. PREPARE DECK SURFACE AND APPLY DECK CRACK SEALER.
X. PREPARE DECK SURFACE AND APPLY (EPOXY/PPC/ASPHALT) OVERLAY.
X. PERFORM CLASS A AND CLASS B CONCRETE BRIDGE DECK REMOVAL. APPLY CONCRETE OVERLAY.
X. PREPARE AND REPAIR CONCRETE DECK & CONCRETE SURFACES.
X. PREPARE AND EPOXY INJECT CRACKS.
X. REMOVE AND REPLACE JOINTS AND HEADERS.
X. REPLACE JOINT SEAL.
X. APPLY CONCRETE WATERPROOF SYSTEM TYPE C TO _____.
X. APPLY CONCRETE WATERPROOF SYSTEM TYPE (D/E) TO _____.
X. PREPARE AND REPAINT STRUCTURAL STEEL.

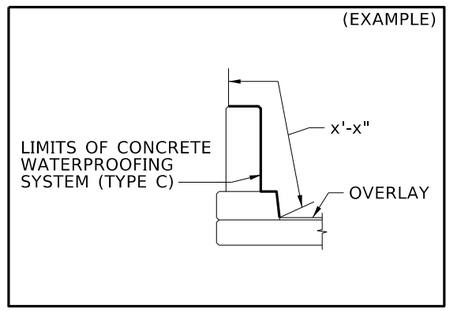
LEGEND

— — — = EXISTING
——— = EXISTING
——— = DENOTES THIS CONTRACT

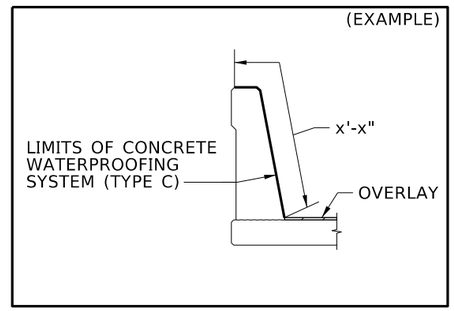
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	GENERAL NOTES, SHEET INDEX & QUANTITIES	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.	(REHAB & RETROFIT PROJECT) BRIDGE LRFD DESIGN MANUAL B17.5	BRIDGE KEY NO.
				DETAILED	Standards\Standard Bridge Drawings\ B17_5.DGN	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			COUNTY / KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024				BRIDGE DWG. NO. XXXXX-A / SHEET OF
				CORRECTIONS					



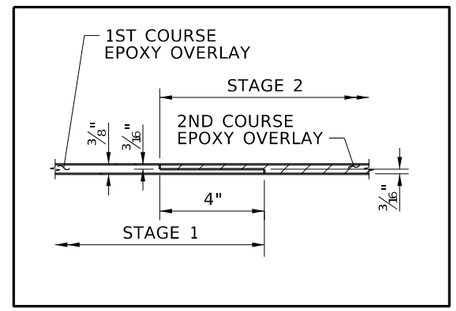
RAIL WATERPROOFING DETAIL
NTS



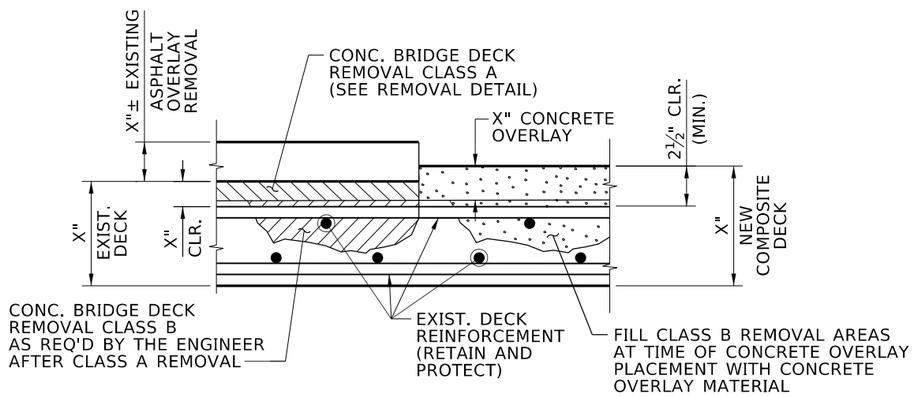
(CURB/ENDBLOCK) WATERPROOFING DETAIL
NTS



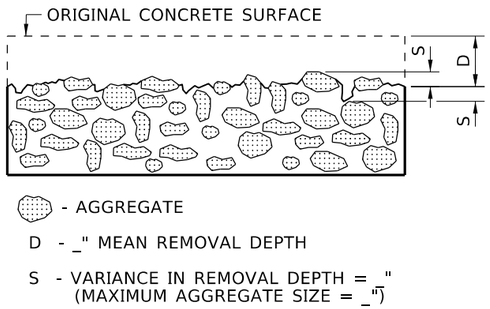
PARAPET WATERPROOFING DETAIL
NTS



EPOXY OVERLAY JOINT DETAIL
NTS

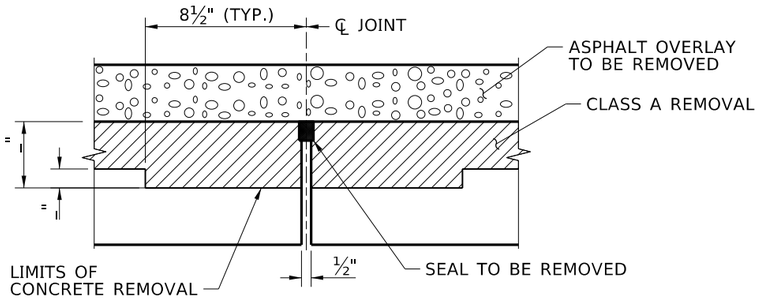


DECK DETAIL
NTS

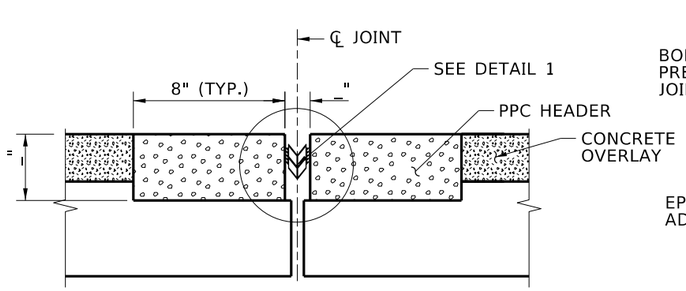


REMOVAL DETAIL
NTS

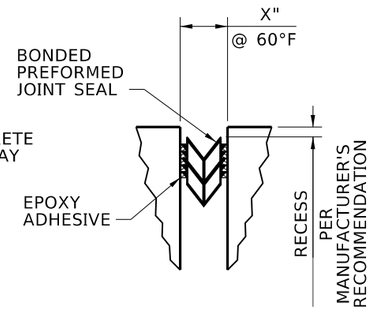
CONCRETE OVERLAY DETAILS
NTS



SECTION A-A - EXISTING
X" = 1'-0"



SECTION A-A - NEW
X" = 1'-0"



DETAIL 1
NTS

TYPICAL JOINT DETAIL EXISTING AND NEW
NTS

NOTE TO DESIGNER: THIS SHEET IS INTENDED ONLY TO PROVIDE STANDARD DETAILS TO PROVIDE UNIFORMITY ON BRIDGE PLANS. MOVE DETAILS AS NECESSARY TO THE APPROPRIATE SHEETS.

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT	ENGLISH	STANDARD REHAB DETAILS	BRIDGE PLANS	
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NAME	YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO.		BRIDGE KEY NO.	
				DETAILED	Standards\Standard Bridge Drawings\B17_6.DGN			(REHAB & RETROFIT PROJECT) BRIDGE LRFD DESIGN MANUAL B17.6	COUNTY	KEY NO.
				DWG. CHECKED	DRAWING DATE: DEC 2024	APPROVED BY: BRIDGE ENGINEER MICHAEL T. JOHNSON DATE:			BRIDGE DWG. NO.	SHEET OF
				CORRECTIONS						

NOTES

1. SHOW CONSULTING ENGINEERING FIRM NAME IN THIS TITLE BLOCK.

2. APPROVE THE PLANS BY AN ENGINEER OF THE CONSULTING FIRM REGISTERED IN IDAHO. PLACE SEAL WITH SIGNATURE AND DATE ON EACH SHEET. ADDITIONAL SEALS MAY BE SHOWN AT THE OPTION OF THE CONSULTANT.

3. THE CONSULTANT ENGINEER'S STAFF WILL SIGN THESE LINES, USING FIRST NAME INITIAL AND LAST NAME.

4. SHOW PRELIMINARY ENGINEERING PROJECT NUMBER. SHOW CONSTRUCTION PROJECT NUMBER IF IT IS DIFFERENT THAN PRELIMINARY ENGINEERING NUMBER.

5. SHOW SHEET TITLE IN THIS BLOCK, REFER TO BRIDGE LRFD MANUAL, ARTICLE 17.2.

6. SHOW PROJECT DESCRIPTION IN THIS BLOCK, REFER TO BRIDGE LRFD MANUAL, ARTICLE 17.2.

7. SHEET DETAILS ARE LOCATED ON LEVEL "BRDG_ANNO_Anno-Sheet".

8. SHOW BRIDGE KEY NUMBER IN THIS BLOCK. CONTACT BRIDGE SECTION FOR THE NUMBER.

9. SHOW BRIDGE DRAWING NUMBER IN THIS BLOCK. CONTACT BRIDGE SECTION FOR THE NUMBER.

ORIGINAL STORED AT: ITD BRIDGE SECTION - Boise, Idaho (7)

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	IDAHO TRANSPORTATION DEPARTMENT (1)	ENGLISH	CONSULTANT PLAN SHEET (5)	BRIDGE PLANS
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED		YOUR Safety→YOUR Mobility→YOUR Economic Opportunity	PROJECT NO. (4)	(6)	BRIDGE KEY NO. (8)
△				DETAILED (3)	CADD FILE NAME D:\prj\XXXXX\Proj\Dev\Bridge\Plans B17_5.DGN				COUNTY / KEY NO.
△				DWG. CHECKED					BRIDGE DWG. NO. (9) / SHEET OF
△				CORRECTIONS	DRAWING DATE: DEC 2024				
△									

BRIDGE LRFD MANUAL, PAGE B17.7

