

**CUYAHOGA COUNTY  
DEPARTMENT OF PUBLIC WORKS**

**SUPPLEMENT TO THE 2019 ODOT BRIDGE DESIGN MANUAL**  
February 2019

**SECTION 100 – GENERAL INFORMATION**

101 INTRODUCTION

The Cuyahoga County Department of Public Works (CCDPW) Bridge Design Standards generally follow the Ohio Department of Transportation’s (ODOT) Bridge Design Manual (BDM), except as herein noted or as otherwise defined in the project Scope of Services, or as approved by the CCDPW in the course of project development.

For information regarding CCDPW design standards, computer-aided drafting and design (CADD) standards, general notes, standard drawings and revisions, please visit the CCDPW’s ftp site at [ftp://guest:Public\\_Works@ftp.publicworks.cuyahogacounty.us](ftp://guest:Public_Works@ftp.publicworks.cuyahogacounty.us), and look under the Outgoing > CCDPW Standards folders.

102 PREPARATION OF PLANS

102.2 COMPUTER AIDED DRAFTING STANDARDS

Follow the county’s established CADD standards, which are available on the CCDPW’s website. The county has adopted AutoCAD as its standard CADD software package. All CADD information to be submitted or exchanged shall be in the current version of AutoCAD used by the CCDPW as defined in the project Scope of Services.

CADD deliverables for Final Plans must include all AutoCAD “.dwg” drawing files and associated AutoCAD support files used to create the Final Plans. AutoCAD support files include, but are not limited to, base mapping, XML data, templates, blocks, plot styles, fonts, line types, shape files, and “xref” or other reference files.

Name “.dwg” files so it can be determined which Final Plan sheet(s) are included in each “.dwg” file. Provide a sequential list of all Final Plan sheets and the corresponding “.dwg” files from which the plan sheets were derived.

Final Plan submittals must also include “.pdf” digital file(s), saved in full size (22”x 34”) format, compatible with Adobe Reader 10. In general, submit individual Final Plan sheets in one single “.pdf” digital file with pages in sequential order. Projects with large plan sets may be separated into multiple “.pdf” digital files if necessary to reduce file size or for other reasons acceptable to the CCDPW.

If approved by the CCDPW, “.tif” image files or “.plt” plot files may be substituted for “.pdf” files. Separate “.tif” or “.plt” files must be made for each individual Final Plan sheet and be named so that all “.tif” or “.plt” files can be listed in sequential order. In order to reduce file size, “.tif” image files may use CCITT Group 3 (Fax 3) or CCITT Group 4 (Fax 4) compression. LZW compression is not acceptable. “.plt” plot files must be compatible with Océ TDS600 plotters and Repro Desk Server 1.6 plotting software.

#### 102.4 TITLE BLOCK

The Title Block given in Figure 102.4 entitled “Example Plan Sheet Title Block” shall be used for all structure project plan sheets. Use this Title Block in conjunction with the structure plan sheet layout given in Figure 102.3.

The leftmost block (directly above the page no.) shall consist of the following information:

- 1) Name of the road, e.g., “*SMITH ROAD*”.
- 2) County route number, e.g., “*C.R. 100*”.
- 3) PID No. (for federally funded projects only).

The largest block shall contain three lines of information:

Title of sheet, e.g., “*SITE PLAN*”. Any sheet title given as “Miscellaneous” or “Miscellaneous Details” shall include a supplemental description(s) indicating what is shown on the sheet, e.g., “*MISCELLANEOUS DETAILS – DRAINAGE MODIFICATIONS*”.

County bridge number or culvert number designation, e.g., “*BRIDGE 01.10*” or “*CULVERT C-03.78*”. Any bridge or culvert structure newly programmed by the CCDPW for rehabilitation or replacement shall be identified by its straight line mileage (SLM) number. The proper bridge or culvert number will be supplied either in the project’s Scope of Services or during preliminary design.

Name of waterway, roadway, railroad, etc., that bridge is crossing, e.g., “*OVER BIG CREEK*” or “*OVER CSX RAILROAD*”.

A new Structure File Number (SFN) is required when an existing bridge, culvert or bridge superstructure is being replaced. The CCDPW will assign a new SFN for the proposed structure and supply this information either in the project’s Scope of Services or during preliminary design.

A sample CCDPW structure plan sheet is available on the CCDPW’s FTP site.

#### 102.5 ESTIMATED QUANTITIES

On large scale projects (e.g., major rehabilitations and projects with appreciable roadway work) all structure quantities shall be listed in an Estimated Quantities table separate from the General Summary and included with the structure plans. The “Structures” subsection of the General Summary must reference the Estimated Quantities table by plan sheet number.

The left-most column of the Estimated Quantities table shall be labeled “Ref. No.” and contain reference numbers for all line items given in the table. Reference numbers shall be assigned in consecutive order beginning with the number following the one given to the last line item of the subsection immediately preceding the “Structures” subsection in the General Summary. For example, if the last line item of the subsection preceding the “Structures” subsection in the General Summary is Ref. No. 53, then the first line item in the Estimated Quantities table will be Ref. No. 54. All reference numbers thereafter shall continue in consecutive order.

The “Maintenance of Traffic” subsection typically follows the “Structures” subsection in the General Summary. The first maintenance of traffic line item shall be assigned the reference number following the one given to the last structure line item in the Estimated Quantities table. Reference numbers for the remaining line items in the General Summary shall then continue in consecutive order.

On projects of limited scope (e.g., culvert replacements, minor rehabilitations and structure maintenance) all work items need only be listed in one Estimated Quantities table. A General Summary table is not necessary.

It is essential that all structure and non-structure quantities be accurately calculated, accurately carried to the General Summary and/or Estimated Quantities table, and that substantiating data for all calculated items be included with the Final Plan submittal. All structure and non-structure quantity computations shall be completed on 8½” x 11” sheets and may be handwritten or computer generated (e.g., spreadsheets). Additionally, roadway and pavement calculations shall be included in the project plans. Computations shall clearly show how all quantities are derived. Irregular areas should be noted as CADD generated or planimetered areas. Lump sum items should be reasonably estimated or quantified to substantiate the estimated engineer’s cost associated with these items.

## 102.6 STANDARD BRIDGE DRAWINGS

The CCDPW issues bridge construction drawings in addition to those available from ODOT. These drawings are available on the CCDPW’s website. Drawings and miscellaneous details not yet accessible through the website are available upon request.

The designer shall assure that all CCDPW bridge construction drawings are referenced in the Structure General Notes and on the project Title Sheet.

## 102.8 PROPOSAL NOTES

The CCDPW issues Proposal Notes in addition to those available from ODOT. Please follow the BDM for directions on applying Proposal Notes.

## 103 BRIDGE PLAN SHEET ORDER

The plan sheets anticipated for a particular project should be preliminarily defined in the Scope of Services (SOS) outline. The plan sheet order will generally follow the BDM, but can be varied as agreed upon in the SOS or during the course of plan development.

## SECTION 200 – PRELIMINARY DESIGN

### 201 STRUCTURE TYPE STUDY

For federally funded bridge projects locally administered by the CCDPW, the provisions of the BDM regarding Structure Type Study submittal requirements shall be followed. For locally funded projects, the necessity for and the complexity of a structure type study, retaining wall justification, noise wall justification and/or pedestrian overpass justification shall be defined in the Scope of Services outline jointly prepared by the consultant and the CCDPW for the project. Plan review submissions and number of plan sets or report copies to be submitted at each review stage shall also be defined in the SOS outline for the project.

#### 201.2.2 PRELIMINARY STRUCTURE SITE PLAN

- A. In addition to the vertical and horizontal clearances required for a bridge over a railway, the location and dimension of the “Construction Minimum” vertical clearance as defined in Section 207.1 of this supplement shall also be shown in the plan and profile views.
- B. In addition to the profile information as described in BDM Section 201.2.1, the Preliminary Structure Site Plan shall include estimated fill quantities placed above and below the OHWM. This information is necessary for application of the U.S. Army Corps Nationwide Permit.

#### 201.2.3 HYDROLOGY AND HYDRAULIC (H&H) REPORT

All county bridges crossing waterways are to be designed for a storm having a 25-year frequency. Additionally, they shall be checked for a storm having a 100-year frequency. For culvert design, reference shall be made to the latest version of the county’s Drainage Manual, which can be downloaded from the CCDPW’s website or made available upon request.

#### 201.2.7 PRELIMINARY MAINTENANCE OF TRAFFIC PLAN

The designer is responsible for developing maintenance of traffic plans that facilitate vehicular and pedestrian traffic in a safe and efficient manner. The maintenance of traffic plan shall be as practical as possible to avoid complicated phasing schemes that may add unnecessary construction time and cost to the project. The CCDPW encourages the use of Accelerated Bridge Construction (ABC) techniques to facilitate MOT design.

Special consideration shall be given during the preliminary design stage to avoid anchoring temporary concrete barriers through a new concrete deck during staged construction, whenever possible.

### 201.3 UTILITIES

The CCDPW has developed a system of utility contact and coordination, which is to be utilized by the designer on county projects. The necessary forms and directions are available at the CCDPW's website or upon request. The designer shall abide by these forms and adhere to the coordination and reply procedures throughout the design process.

The county routinely permits attachment of utilities to its structures. A utility company wishing to attach its facilities to a county-owned structure must submit a written request and be granted a permit for attachment from the County Council and/or the County Executive through the Department of Public Works. The request must include detailed drawings of the proposed attachment. Refer to Section 301.7 of this supplement for additional information in this regard.

## 201 BRIDGE PRELIMINARY DESIGN REPORT

### 202.2.2 FINAL MAINTENANCE OF TRAFFIC PLAN

Whenever possible, avoid anchoring temporary concrete barriers through a new concrete deck during staged construction.

### 202.2.3 FOUNDATION REPORT

#### 202.2.3.3 DRILLED SHAFTS

CMS 524.08 and CMS 524.15 require the inspection of drilled shafts as they are constructed. The designer shall include either CCDPW Construction Drawing DS-1C in the project plans or Standard Form CA-S-1 in the contract documents to aid the recording of these inspections.

## 203 BRIDGE WATERWAY

### 203.1 HYDROLOGY

In addition to using StreamStats for estimating peak discharges, at least one other method shall be used to calculate peak discharges for streams located within urbanized watersheds of any size (e.g., USGS Report 2432 "Estimation of Peak-Frequency Relations, Flood Hydrographs, and Volume-Duration-Frequency Relations of Ungauged Small Urban Streams in Ohio", USGS Report 93-135, or similar). The designer shall compare results of each to determine the most realistic discharge values to use for designing the waterway opening of the proposed structure. All calculations and comparisons shall be included with the Preliminary Plan or Stage 1 submission for the CCDPW's review.

## 203.2 HYDRAULIC ANALYSIS

The structure type selection and waterway opening size and geometry for bridges crossing open waterways in Cuyahoga County are in part dependent upon the elevation of the 25-year high water caused by the bridge. If the designer determines that the low point of the proposed bridge superstructure will clear the 25-year high water by less than 5 feet, then a smooth-bottomed structure, such as adjacent box beams, concrete slab or a precast three-sided concrete structure, should be specified. This is to reduce the potential for debris to catch on the underside of the superstructure and build-up beneath the bridge during storm events. If the designer determines that the underside of the bridge will clear the 25-year high water by 5 feet or greater, then precast concrete I-beams, steel beams or girders, or similar bridge types may be considered, as determined during preliminary design. In all cases, it is preferred that a minimum freeboard of 2 feet be provided above the 25-year high water elevation, but this preference may be waived should it not be feasible to achieve because of span length, roadway profile, or other limiting factors.

Unless it is not feasible, bridges shall generally be designed to pass the 100-year storm flow without over-topping the bridge roadway. In no case shall the replacement structure increase the 25-year and 100-year backwater upstream of the bridge, nor shall it increase the risk for other potential damage upstream or downstream resulting from hydraulic considerations.

During review of the Preliminary Plans or Stage 1 Design submission, the CCDPW will notify the Local Flood Plain Coordinator regarding any proposed bridge or culvert work impacting the backwater of the waterway. The CCDPW will apply for the necessary permit should the Local Flood Plain Coordinator require one for the proposed work.

## 203.2 SCOUR

A six-inch (6") filter bed of crushed aggregate shall be specified under the Rock Channel Protection on county projects. The crushed aggregate shall be per CMS 601.09 and 703.19 except that the use of slag in any form is prohibited. In some cases, it may be justifiable to use geotextile fabric in lieu of the crushed aggregate, however its use shall be approved by the CCDPW.

## 203.4 BRIDGE AND WATERWAY PERMITS

The CCDPW generally coordinates directly with the U.S. Army Corps of Engineers, the U.S. Coast Guard and the Ohio EPA to acquire waterway permits for projects administered by the CCDPW. On more complex projects or when there are special considerations to address, the designer may be given alternative direction in this regard, either in the Scope of Services or during preliminary design.

## 203.5 TEMPORARY ACCESS FILLS

In general, the designer will develop and provide the county with all TAF plan details and cross-sections required for waterway permit application purposes. The CCDPW will coordinate and submit the plans to the U.S. Army Corps of Engineers, the U.S. Coast Guard and the Ohio EPA as necessary to complete the application processes.

## 204 SUBSTRUCTURE INFORMATION

### 204.5 PIER TYPES

It is CCDPW policy not to place cap-and-column or capped pile piers in waterways on county bridges.

For a low-level structure where a pier(s) will be located within the waterway or overflow section, the preferred type of pier is wall-type, which is less likely to trap debris underneath the structure and provides more protection against high-velocity impacts by large debris.

For a high-level structure where a pier(s) will be located within the waterway, a wall-and-column pier may be used. The wall portion of the pier shall terminate at a sufficient elevation above the 100-year high water level to protect the columns against high-velocity impacts by large debris.

The designer shall avoid placing a pier in the middle of the channel.

### 204.6 RETAINING WALLS

On county projects with retaining walls, the designer may propose proprietary wall systems for consideration. Direction may be given to the designer in the Scope of Services for each individual project. The feasibility of proprietary walls shall be investigated in the Structure Type Study.

## 205 SUPERSTRUCTURE INFORMATION

### 205.2 SPAN ARRANGEMENTS

The length and weight of beams/girders may be limited by restraints imposed on available haul routes to the bridge site (horizontal and vertical geometry, overhead clearances, structure load carrying capacity, etc.).

### 205.4 PRESTRESSED CONCRETE BOX BEAMS

In general, only composite designs shall be used for county bridges utilizing prestressed concrete box beams.

### 205.5 PRESTRESSED CONCRETE I-BEAMS

Precast prestressed concrete I-beams may be used for stream crossings as long as the clearance to the 25-year high water elevation is at least 5 feet. Prestressed concrete I-beams may also be considered for roadway and railroad overpass structures where future maintenance is a concern since they require no painting or containment for applying concrete sealers and other protective coatings.

## 205.6 STEEL BEAMS AND GIRDERS

As part of the Structure Type Study, when considering rolled steel beams as an alternative structure type, the designer must be certain that the specified beams are readily produced and available from a domestic supplier.

For bridges crossing over railroads where the preferred alternative structure type is steel beam or girders, ASTM A588 / A709 50W (weathering) steel should be used. This will prolong the need for painting and other maintenance issues since access to the structure from below is usually limited or restricted by the railroad.

## 205.8 INTEGRAL DESIGN

The use of integral abutment design is most desirable whenever practicable.

## 205.9 SEMI-INTEGRAL DESIGN

Semi-integral abutment design may be considered if integral design is not feasible.

## 207 BRIDGE GEOMETRICS

### 207.1 VERTICAL CLEARANCE

For structures over railroads, in addition to the “Required Minimum” and “Actual Minimum” vertical clearances as defined in BDM Section 207.1, the Preliminary Structure Site Plan shall also show the vertical clearance of the existing structure and the “Construction Minimum” vertical clearance. The “Construction Minimum” vertical clearance is the minimum overhead clearance allowed by the railroad for construction purposes, accounting for any temporary falsework, formwork or other devices that the contractor would most likely install to complete the construction. The “Construction Minimum” vertical clearance will be less than or equal to the vertical clearance provided by the existing structure.

The designer shall be responsible for acquiring the “Required Minimum” and “Construction Minimum” vertical clearances from the railroad during preliminary design as part of the initial coordination efforts with the railroad.

### 207.2 BRIDGE SUPERSTRUCTURE

Bridge superstructure widths shall generally be established in accordance with the ODOT Location and Design Manual and the county’s supplements thereto, unless otherwise specified in the Scope of Services for the project.

Generally, for two-lane structures, the roadway width for bridges with sidewalks shall be 28 feet, measured face-to-face of curbs. For four-lane structures, the width face-to-face of curbs shall generally be 52 feet.



The roadway width on bridges without sidewalks will depend on several factors, including design traffic volume, design speed and the nature and geometry of the approach roadways. In most cases, the ODOT L&D manual will indicate that 10-foot wide shoulders are necessary for the bridge; however, because of the lower design speed on most county roads, a narrower shoulder width will often suffice. The lane widths should follow the ODOT standard of 12 feet per lane.

In cases where the width of the approach roadway is less than the roadway width on the new or reconstructed bridge, the width transition taper shall be made beyond the ends of the approach slabs whenever practicable. ODOT and CCDPW Highway Design criteria for determining taper lengths shall be utilized, unless a taper length is specified in the project scope.

During preliminary design, the designer shall determine whether the bridge falls within the limits of any local or regional proposed bike plan (this information is generally available from the local municipality, the Cuyahoga County Planning Commission or NOACA's bicycle committee). If the bridge falls within the limits of a master bike plan, the proposed superstructure and approach roadways shall be designed in accordance with the current AASHTO "Guide for Development of Bicycle Facilities".

The Cuyahoga County Planning Commission (CCPC) is developing a "Complete and Green Streets Toolkit" to create a comprehensive transportation system throughout the county that will promote walking, bicycling, public transit and driving for people of all ages and abilities. The CCDPW supports the CCPC's efforts in this regard. The designer shall investigate the recommendations of the toolkit for possible inclusion during preliminary design of the project.

On federal projects, design decisions requiring a Design Exception should be carefully considered if it results in a delay in design approval.

## 208 TEMPORARY SHORING

In general, the CCDPW concurs with ODOT BDM Section 208 with the exception that the term "Design Agency" shall be taken to mean the designer.

### 208.1 SUPPORT OF EXCAVATIONS

For certain projects, the CCDPW may choose to have the Contractor design all necessary shoring requirements regardless of the proposed maintenance of traffic scheme and height of retained earth. The CCDPW will evaluate this option on a project-by-project basis and direct the designer accordingly in the Scope of Services.

## 209 MISCELLANEOUS

## 209.2 BRIDGE RAILINGS

In general, traffic railings and the traffic portions of combination railings on new or reconstructed county bridges are to meet the requirements of TL-2 or TL-3, as defined in NCHRP Report No. 350 or the AASHTO “Manual for Assessing Safety Hardware” (MASH). TL-2 railings are considered adequate on most county roads with design speeds of 45 MPH or less, acceptable site conditions (e.g. sight distance, horizontal and vertical alignments) and relatively light volumes of truck traffic. TL-3 railings are considered necessary when the design speed is greater than 45 MPH, site conditions are questionable and higher volumes of truck traffic are expected. In extreme cases, TL-4 or higher railings may be considered when necessary. Please refer to Section 13, Railings, of the current *AASHTO LRFD Bridge Design Specifications* manual for further direction. Acceptable bridge railings may be adopted from certified ODOT standard railing designs or from certified railing designs from the FHWA and other states.

Exceptions to these bridge railing design criteria may be made if the CCDPW directs the designer to pursue an aesthetic railing design either during the Scope of Services phase or during preliminary design of the project. In these instances, non-crash tested railings will be considered adequate so long as the design of the traffic railing component is structurally adequate based on the TL-2 or TL-3 loading conditions as defined in NCHRP Report No. 350 or the AASHTO MASH and the pedestrian railing component satisfies the requirements of the current *AASHTO LRFD Bridge Design Specifications* manual. In addition, the safety of the traveling public must not be compromised by any discernable flaws in the design of the railing.

## 209.3 BRIDGE DECK DRAINAGE

The number of scuppers used for collecting the bridge deck surface drainage shall be minimized, or all scuppers eliminated if possible. The allowable spread shall be computed as outlined in the ODOT Bridge Design Manual, by using the procedures described in Volume 2 of the ODOT Location and Design Manual along with the county’s supplement thereto.

Scupper grates shall be designed to meet the allowable spread criteria, but must also be configured to prevent the intrusion of large debris, such as beverage cans, into the scuppers. All scupper grates must be “bicycle friendly”; the design of county bridges must take bicyclists into consideration since scuppers are a potential hazard. Scupper and grate designs should make use of readily available products, but may be designed specifically on a project-by-project basis. Otherwise, the project plans may, by plan note, define the parameters of design and leave detailing of the scuppers and grates for the Contractor and/or the drainage fabricator.

**Drainage Collection Systems:**

Lateral and downspout pipes shall have a minimum diameter of 10”. The minimum bend radius shall be 18”, with no 90-degree bends permitted. Polyvinyl chloride (PVC) pipe is acceptable, but the CCDPW may consider fiberglass pipe as an alternative. The last 10-feet to 15-feet of pipe above the ground shall be made of galvanized steel to provide protection against vandalism.

Cleanouts shall be configured to allow a waterjet to travel in either direction in the pipe. On vertical downspouts, cleanouts shall be spaced at approximately 40 feet and placed in locations that are readily accessible to maintenance personnel. The lowest cleanouts shall be located approximately 8 feet above ground level to guard against vandalism.

Storm drainage pipe outlets through abutment walls, wingwalls, etc., shall extend a minimum of 6" beyond the face of the structure in order to prevent deterioration due to runoff down the face of the concrete.

Downspouts discharging above ground shall be angled at 45 degrees at their ends and shall outlet approximately 1 foot above the ground. A concrete splash pad shall be provided to catch the discharge, directing it away from all substructure units and toward a catch basin, drainage ditch or watercourse. Downspouts discharging into a catch basin shall terminate 1'-0" above the catch basin grate rather than extending through the grate.

When the deck drainage is to flow off the ends of the bridge, provide a Cuyahoga County Catch Basin No. 3C off the end of each approach slab to collect the surface run-off. Details for Catch Basin No. 3C are shown on the CCDPW's Construction Drawing CB-3C.

Catch basin grates and manhole covers around bridges shall be secured to prevent theft and vandalism.

Over-the-side drainage shall be avoided for all county bridges.

#### 209.4 SLOPE PROTECTION

The CCDPW will consider the use of geotextile fabric, geogrids, articulated revetment systems, etc. on a project-by-project basis. The use of such materials will be addressed either in the Scope of Services or during the Structure Type Study.

Crushed aggregate material per CMS 601.06 shall not be used as slope protection on CCDPW's projects. It has been the county's experience that this material requires frequent and extensive maintenance. As an alternative, the designer may use grout-filled fabric mats in situations where crushed aggregate slope protection would otherwise be specified.

#### 209.5 APPROACH SLABS

Approach slabs shall be used for all county bridge structures except those covered by fill material. The approach slabs shall have integral curbs as described below in Section 209.11 of this supplement. Details for these curbs are given on CCDPW Construction Drawings AS-1C and AS-2C. The approach slabs shall be listed in the plans, estimated quantities, etc. as "Item 526 – Reinforced Concrete Approach Slabs (T=\*), As Per Plan".

A four-inch (4") minimum aggregate base shall be placed below the approach slab. The base material shall be of the same material as used for the approach pavement. Additional details are given on CCDPW Construction Drawings AS-1C and AS-2C. The aggregate base shall not be included with the approach slabs for payment. Instead, it shall be measured and paid for separately per Item 304.

## 209.6 PRESSURE RELIEF JOINTS

It has been the county's experience that Type A pressure relief joints are difficult to construct and maintain. Their use should be limited to only where considered absolutely necessary. Instead, Type B pressure relief joints as per CCDPW Construction Drawings AS-1C, AS-2C and BP-2.4C should be used whenever possible. They shall be listed in the plans, estimated quantities, etc. as "Item Special – Pressure Relief Joint, Cuyahoga County, Type B".

## 209.7 AESTHETICS

In addition to general aesthetic considerations regarding structure lines and forms, the designer may be directed to investigate appropriate enhancements and/or special aesthetic treatments (such as decorative railing, lighting, etc.) either in the Scope of Services or during preliminary design. Such treatments are often added at the request of the local municipality and possibly are not eligible for funding from the primary source for the project. In these instances, the enhancements must be funded 100% locally, either by the county or by agreement with the local municipality.

Selection of aesthetic enhancements should be made prior to the preparation of Stage 3 (Final) plans after coordination with local stakeholders through the use of detailed sketches, computer-generated (digitally enhanced) images and/or other appropriate exhibits required to illustrate the proposed details for informed evaluation and decision-making. Aesthetic details used on prior county projects are available upon request.

## 209.8 RAILWAY BRIDGES

Because the relocation/rearrangement of utilities situated within railroad right-of-way is recompensable, all measures should be taken to avoid impacting existing utilities on projects involving railway crossings.

## 209.9 BICYCLE BRIDGES

In general, concrete decks (wearing surfaces) shall be specified for bicycle bridges under county jurisdiction.

## 209.10 PEDESTRIAN BRIDGES

In general, concrete decks (wearing surfaces) shall be specified for pedestrian bridges under county jurisdiction.

## 209.11 SIDEWALKS ON BRIDGES

The preferred minimum width for sidewalks on county bridges shall be 6'-0", measured from the face of curb to the inside face of the parapet. In some cases, a wider or narrower sidewalk may be proposed, which may be specified in the Scope of Services or identified during preliminary design for that particular project. Sidewalks on county bridges shall be poured monolithically (without a separate wearing surface) using the same concrete as specified for the deck. Sidewalk control joints shall be placed as detailed on CCDPW Construction Drawing PRF-1C.

The curb height on county bridges shall generally be 8", and steel plate as detailed on CCDPW Construction Drawing CP-1C shall be placed at the curb. A silicone sealant (e.g., Dow Corning SL Parking Structure Sealant with Dow Corning 1200 Prime Coat, Bondaflex SIL 728 SL with Bondaflex SIL 2000 Primer, Sikasil-728 SL with Sikasil Primer-2100, or equal) shall be specified to seal the joint between the bottom edge of the curb plate and the top of the concrete bridge deck or approach slab to ensure a watertight seal between the steel and concrete. If circumstances are such that this plate cannot be used, other options may be investigated.

Unless otherwise specified in the project scope, curbs on approach slabs shall also generally be 8" high for the entire length of the slab and shall also include steel curb plate per CCDPW Construction Drawing CP-1C. The transition from the curb height on the bridge and approach slab to the curb height on the approach roadway should occur beyond the ends of the approach slabs, whenever possible. If no curb exists on the approach roadway, it may be desirable to transition the curb heights on the approach slab from the bridge end to 4" on the approach end. The back of the approach slab curb and the rear of the abutment backwall in the area of the sidewalk shall include a 6" wide reinforced seat to support the adjacent sidewalk. When a U-type abutment is designed, it shall also include a 6" wide reinforced seat along the inside face of the wingwalls to support the approach sidewalk.

Payment for the steel curb plate on the bridge and approach slabs shall be included for payment under "Item 513, Structural Steel Members, Level UF." All curb plate steel shall be galvanized or metalized.

#### 209.12 MAINTENANCE AND INSPECTION ACCESS

Details relating to maintenance and inspection access for a particular bridge, especially some of the larger and more complex structures in the county's system, shall be designed with input from the CCDPW's bridge inspection and maintenance personnel since they will utilize these features once the bridge is placed into service. Most smaller bridges require no special provisions for access.

## SECTION 300 – DETAIL DESIGN

### 301 GENERAL

#### 301.2 DETAIL DESIGN REVIEW SUBMISSIONS

The designer shall refer to the Scope of Services for project-specific review submission deliverables required by the county.

#### 301.4 LOADING REQUIREMENTS

##### 301.4.2 PEDESTRIAN AND BIKEWAY BRIDGES

Pedestrian/bike bridges constructed directly adjacent to roadway bridges may not require service vehicle design loading even if they are wide enough to accommodate service vehicles. The designer shall exhibit sound judgment in this regard after thoroughly evaluating the needs and objectives of the project.

#### 301.5 REINFORCING STEEL

In general, all reinforcing steel shall be Grade 60 epoxy coated rebar. Galvanized, stainless or MMFX reinforcing steel may be used if approved by the CCDPW prior to their inclusion in the project.

##### 301.5.3 LAP SPLICES

Mechanical splices may be used when required for phased construction under traffic when physical limitations do not allow proper lap lengths for the reinforcing steel. The designer shall exercise caution in the use of mechanical splices in locations where the design concrete cover is minimal.

##### 301.5.7 MINIMUM CONCRETE COVER FOR REINFORCING

A monolithic deck shall be poured with either Class QC 2 Concrete conforming to ODOT CMS 511 or High Performance Concrete conforming to CCDPW specifications. A clear cover of 3" shall be provided over the top reinforcing steel in the bridge deck and in the sidewalk. This will allow for scarification and replacement with a separate wearing surface in a future rehabilitation.

#### 301.7 UTILITIES

The CCDPW has developed a system of utility contact and coordination, which is to be utilized by the designer on county projects. The necessary forms and directions are available at the CCDPW's website or upon request. The designer is expected to abide by these forms and adhere to the coordination and reply process throughout design.

During Stage 1 Preliminary Design, the designer shall consider all possible constructability issues (e.g., construction phasing, location and depth of excavations, crane locations and swing zones) regarding work around existing utility poles, overhead and underground lines, structure attachments, etc. within the limits of the project. The designer shall determine which utilities will likely require relocation, protection, etc. and include this information with the initial utility correspondence. The designer is expected to coordinate the disposition of all utilities as needed throughout the design process.

The project plans (site plan, plan & profile sheets, cross-sections, etc.) must show a clear disposition of all utilities located within the limits of the project. Utilities that are to remain or abandoned in place shall be labeled “TO REMAIN” or “TO BE ABANDONED”. Those that are to be relocated or removed shall be labeled “TO BE RELOCATED BY \_\_\_\_\_” or “TO BE REMOVED BY \_\_\_\_\_”. The party responsible for the relocation or removal operation must be stated specifically (“BY CONTRACTOR”, “BY AT&T”, etc.); it is not permissible to simply state “... BY OTHERS”. For projects where there is much utility involvement, the designer should consider including a separate Utility Relocation plan sheet in the project plans.

The county routinely permits utility attachment to its structures. Details of the attachment are to be submitted to the county for approval during the design process. If directed by the county, the consultant shall coordinate with utility company(ies) to incorporate details of the attachment into the project plans. In general, for beam and girder-type superstructures, utilities shall be supported on cross-frames/diaphragms between adjacent longitudinal members or suspended on hangers anchored to the superstructure. For precast concrete box beams and cast-in-place concrete slabs, utilities may be attached to the deck/sidewalk slabs overhanging the superstructure. Utilities should not extend, hang, or otherwise be supported below the lowest level of the superstructure, nor should they be encased within concrete sidewalks or deck slabs via conduit, sonovoids etc.

Utility companies will require a permit from the county in order attach to a county-owned structure (refer to Section 201.3 of this supplement for additional information in this regard). Utility owner(s) shall submit a written request for the permit once the final plans are complete. All costs associated with the design and construction of the attachment system is to be borne by the utility owner(s) as required by the Ohio Revised Code.

- 302 SUPERSTRUCTURE
- 302.1 GENERAL CONCRETE REQUIREMENTS
- 302.1.1 CONCRETE DESIGN STRENGTHS

*B. Superstructure Concrete:* In addition to Class QC 2 concrete, the CCDPW allows Class HP concrete ( $f'c = 4.5$  ksi) to be used for its superstructures. The CCDPW will determine its use on a project-by-project basis and, if desired, will provide all pertinent design specifications, plan notes, etc. in the Scope of Services for the project.

### 302.1.2 SELECTION OF CONCRETE FOR BRIDGE STRUCTURES

In general, the desired concrete for bridge decks, sidewalks and parapets shall be Class QC 2 Concrete conforming to ODOT CMS 511 or Class HP conforming to the CCDPW's specifications. When Class HP Concrete is specified, the designer shall include the bid item for Class HP Concrete Testing in the project plans. The CCDPW's construction personnel require these tests to verify that the HP concrete meets all county specifications.

For each concrete type, a clear cover of 3" shall be provided over the top reinforcing steel in the bridge deck to accommodate scarification and placement of a wearing surface in a future rehabilitation. The surface of the concrete deck shall be grooved by saw cutting.

For a deck replacement project, the use of light-weight concrete in the bridge deck may be considered where 1) the load rating of the bridge would be increased significantly as a result of reducing the superstructure dead load, 2) the amount of structural repairs needed to maintain the required load rating can be minimized, and/or 3) the load rating of the rehabilitated bridge could be increased to HL-93 without necessitating major rehabilitation or strengthening of other structural members. Light-weight concrete shall conform to the CCDPW's specifications.

### 302.1.3 WEARING SURFACE

#### 302.1.3.1 TYPES

All new county structures shall be designed with a 1¼" monolithic concrete wearing surface, unless otherwise specified. This 1¼" thickness at the top of the concrete deck is included as part of the 3" clear cover over the top layer of reinforcing steel, but it shall not be considered as contributing to the structural design of the deck slab or as part of the composite section.

All new wearing surfaces placed on existing county bridge decks shall be Latex Modified Concrete per Supplemental Specification 847 or 848 unless otherwise specified in the Scope of Services or during preliminary design.

In general, wearing surfaces composed of asphalt material should not be used on county bridge structures unless approved by the CCDPW.

#### 302.1.3.2 FUTURE WEARING SURFACE

All county bridges shall be designed for a future wearing surface (FWS) of 60 psf as specified in the ODOT BDM.

### 302.1.4 CONCRETE DECK PROTECTION



#### 302.1.4.1 TYPES

The county prefers the following types of concrete deck protection:

- A. Epoxy Coated Reinforcing Steel (CMS 709.00), Galvanized, Stainless or MMFX Reinforcing Steel.
- B. Minimum concrete clear cover of 3 inches.
- C. Class QC 2 Concrete.
- D. Class HP Concrete, As Per Plan.

#### 302.1.4.2 WHEN TO USE

Generally, all reinforcing steel shall be epoxy coated. The CCDPW will evaluate the use of galvanized, stainless, or MMFX reinforcing steel on a project-by-project basis and, if warranted, its use will be defined either in the Scope of Services or during preliminary design.

All cast-in-place concrete decks shall have a minimum concrete top cover of 3 inches.

Over-the-side drainage shall be avoided for all county bridges.

In general, asphaltic concrete wearing surfaces should not be used on county bridge structures.

#### 302.1.4.3 SEALING OF CONCRETE SURFACES SUPERSTRUCTURE

An elastomeric coating conforming to the county's proposal note entitled "Item Special – Sealing, Misc.: Elastomeric Protective and Decorative Concrete Coating" shall be applied to all exposed concrete surfaces unless specified otherwise. The limits of coating the concrete surfaces on the superstructure shall start at the base of the inside face of the parapet and extend up, over and around the parapet and deck fascia to the limits as adjusted below:

- A. Include the entire exterior and bottom faces of the exterior box beams on prestressed concrete box beam bridges.
- B. Extend the limits on the underside of the deck to the top flange of the exterior beam/girder on a precast concrete I-beam or steel beam/girder structure.
- C. On concrete slab bridges, the limits of sealing shall extend beneath the superstructure one foot (1'-0") onto the underside of the slab to include the drip groove rustication.
- D. For prestressed concrete I-beam superstructures, the exterior I-beams shall be sealed as per the BDM and/or ODOT standard drawing PSID-1-13.

The surface of the sidewalk shall be sealed with a non-epoxy sealer and have sand broadcast over its surface to provide added traction for pedestrians.

In selecting a color for the coating, the CCDPW prefers that the color be chosen based on input from all stakeholders involved with the project. The CCDPW can suggest a color, however, if there is no input from or consensus among the stakeholders.

## 302.2 REINFORCED CONCRETE DECK ON LONGITUDINAL MEMBERS

### 302.2.2 CONCRETE DECK DESIGN

For a deck replacement project, the use of lightweight concrete in the bridge deck may be considered where 1) the load rating of the bridge would be increased significantly as a result of reducing the superstructure dead load, 2) the amount of structural repairs needed to maintain the required load rating can be minimized, and/or 3) the load rating of the rehabilitated bridge could be increased to HL-93 without necessitating major rehabilitation or strengthening of other structural members. Light-weight concrete shall conform to the CCDPW's specifications.

#### 302.2.3 DECK ELEVATION REQUIREMENTS

##### 302.2.3.1 SCREED ELEVATIONS

Section 302.4.1.8 of the BDM states that the weight of curbs, (sidewalks), railings and parapets may be equally distributed to all beams across the width of the bridge in determining dead load deflections and deck screed elevations. Past experience by the CCDPW indicates that the exterior beams supporting the sidewalk, parapet, etc., may undergo greater deflection than the rest of the beams as a result of these additional dead loads. Therefore, we suggest that the designer analyze the exterior members for camber and deflection, utilizing the heavier loads as outlined in Sec. 302.4.1.7 of the BDM.

## 302.4 STRUCTURAL STEEL

### 302.4.1 GENERAL

#### 302.4.1.1 MATERIAL REQUIREMENTS

Superstructure steel generally shall be ASTM A709 grade 50, including curb plates, expansion joint armor and anchors. Curb plate steel shall be galvanized or metalized. Expansion joint armor shall be metalized in accordance with ODOT standard drawings. All other superstructure steel shall be painted per CMS 514.

ASTM A709 grade 50W weathering steel should be used for the main superstructure steel when the bridge crosses a railroad or when local aesthetics warrants it. It may also be used if approved in advance to realize a time or cost savings for the elimination of significant painting. The use of integral or semi-integral abutments should be investigated to eliminate the need for painting of the weathering steel in the vicinity of deck joints.

The minimum allowable thickness of all structural steel, including bracing and miscellaneous steel, shall be 3/8".

### 302.4.1.5 STRUCTURAL STEEL COATINGS

#### 302.4.1.5.a PRIMARY COATING SYSTEMS

In general, the use of un-coated weathering steel shall be limited to areas where aesthetics are conducive to its use and/or over areas where future access for painting and maintenance is restricted (e.g., over railroads). All aesthetic concerns shall either be defined in the Scope of Services or during preliminary design if a steel beam or steel girder bridge is selected as the preferred alternate.

When un-coated weathering steel is specified, the use of integral or semi-integral abutments is strongly encouraged to eliminate the need for field painting the weathering steel near the ends of the beams. However, the portions of the beams that are embedded within the abutment concrete shall receive a shop-applied three-coat paint system consisting of an inorganic zinc prime coat, an epoxy intermediate coat and a urethane finish coat per CMS 514 to provide additional long-term protection of the steel within the concrete. The cost for this paint protection shall be considered incidental to the pertinent Item 513 associated with the design.

If expansion joints are used, the limits of painting of the weathering steel shall be extended beyond the limits defined in the Bridge Design Manual. The painting limits shall include the entire outsides of the exterior girders, including the webs and the exposed areas of the flanges, for their entire length. The purpose of this is to present a uniform appearance to observers. However, if the bridge crosses a railroad, no field painting of the weathering steel should be specified within the clearance limits of the tracks.

#### 302.4.1.5.b ALTERNATIVE COATING SYSTEMS

For new steel, the CCDPW prefers the following systems:

1. First choice: A three-coat paint system consisting of an inorganic zinc prime coat, an epoxy intermediate coat and a urethane finish coat, as per ODOT CMS 514.
2. Second choice: Galvanizing or metalizing.
3. Third choice: Other premium paint system, if approved by the CCDPW.

The Federal Color Number of the paint color shall be specified in the final bridge plans. The color shall be selected with the input of the county, municipality and any other civic or historical groups who have been identified as stakeholders in the project.

For existing steel, the CCDPW prefers the following systems:

1. First choice: A three-coat paint system consisting of an organic zinc prime coat, an epoxy intermediate coat and a urethane finish coat, as per ODOT CMS 514.
2. Second choice: Galvanizing or metalizing.
3. Third choice: Other premium paint system, if approved by the CCDPW.

The Federal Color Number of the paint color shall be specified in the final bridge plans. The color shall be selected with the input of the county, municipality and any other civic or historical groups who have been identified as stakeholders in the project.

### 302.4.1.8 CAMBER AND DEFLECTIONS

The Bridge Design Manual states that the weight of curbs, (sidewalks), railings and parapets may be equally distributed to all beams across the width of the bridge in determining dead load deflections and deck screed elevations. Past experience by the CCDPW, however, indicates that the exterior beams supporting the sidewalk, parapet, etc., may experience greater deflection than the interior beams since the additional dead loads are typically concentrated above the exterior beams. Therefore, we suggest that the designer analyze the exterior members for camber and deflection utilizing the heavier loads as outlined in Sec. 302.4.1.7 of the BDM.

## 302.5 PRESTRESSED CONCRETE BEAMS

### 302.5.1 BOX BEAMS

#### 302.5.1.3 COMPOSITE

Generally, when prestressed concrete box beams are proposed for the bridge superstructure, composite design shall be used on county bridges. A 6” thick (minimum) composite concrete deck shall be specified, including a nominal 1¼” thick monolithic wearing surface. A total clear cover of 3” shall be provided over the top reinforcing steel in the deck to allow for future scarification and placement of a new wearing surface.

#### 302.5.1.4 NON-COMPOSITE WEARING SURFACE

In general, non-composite design shall not be considered for box beams on county bridges. It is desired that all box beam bridges have a composite deck for strength and durability.

## 303 SUBSTRUCTURE

### 303.1 SEALING OF CONCRETE SURFACES, SUBSTRUCTURE

On new construction projects, the specified limits of sealing shall be expanded to extend 1 foot (1’-0”) below the finished ground surface on substructure units and concrete retaining walls. On rehabilitation projects where the embankment adjacent to the substructure unit is not disturbed, the limits shall extend only to the ground surface.

The concrete sealer shall be an elastomeric coating conforming to the county’s proposal note entitled “Item Special – Sealing, Misc.: Elastomeric Protective and Decorative Concrete Coating”. The color of the coating shall be selected as described above for the superstructure.

## 303.2 ABUTMENTS

### 303.2.1 GENERAL

For bridges with sidewalks, the abutment or the abutment backwall shall include a 6" wide reinforced seat to support the adjacent approach sidewalk. When a U-type abutment is used, it shall include a 6" wide reinforced seat for the entire length of the wingwalls to support the approach sidewalks.

On county bridge projects, Type A waterproofing shall be specified for the back faces of all abutments, wingwalls and retaining walls. The limits of application shall extend from the top of the footing to the approach slab seat, 1'-0" below the finished ground line, or to another appropriate point of termination.

#### 303.2.1.1 PRESSURE RELIEF JOINTS FOR RIGID PAVEMENT

It has been the CCDPW's experience that Type A pressure relief joints are difficult to construct and maintain. Their use should be limited to only where considered absolutely necessary. Instead, Type B pressure relief joints as per CCDPW Construction Drawings AS-1C, AS-2C and BP-2.4C should be used whenever possible. They shall be listed in the plans, estimated quantities, etc. as "Item Special – Pressure Relief Joint, Cuyahoga County, Type B".

#### 303.2.1.4 PHASED CONSTRUCTION JOINTS

Seal the vertical joint between construction phases on the backside of abutment backwalls and breastwalls from the top of the footing to the approach slab seat with Type B waterproofing conforming to CMS 512.08, 3'-0" wide centered on the joint.

## 303.2.2 TYPES OF ABUTMENTS

### 303.2.2.1 FULL HEIGHT ABUTMENTS

If form liners are used for aesthetic reasons, the pattern shall be selected by consensus among the county, the local municipality(ies), or other participating stakeholders in the project. Refer to Section 209.7 of this supplement for information regarding aesthetic enhancements.

#### 303.2.2.1.b SEALING STRIP FOR FULL HEIGHT ABUTMENTS

Type B waterproofing conforming to ODOT CMS 512.08 shall be specified for the back face of all contraction joints and construction joints in abutments and retaining walls. The width of the waterproofing shall be 3'-0", centered on the joint.

### 303.2.3 ABUTMENT DRAINAGE

#### 303.2.3.1 BACKWALL DRAINAGE

The minimum slope of the drainage pipe for abutments, wingwalls, retaining walls, etc., shall be specified on the project plans as 1/8" per foot. This slope shall be shown on the appropriate plan views and elevations. The pipe specified shall be corrugated polyethylene smooth lined pipe, 707.33, having a six-inch (6") minimum diameter. The drainage pipe shall also be of sufficient size to accommodate any roadway drainage collected in the aggregate base material beneath the approach slab.

### 303.3 PIERS

#### 303.3.2 TYPES OF PIERS

It is county policy not to place cap-and-column or capped pile piers in waterways on county bridges.

For a low-level structure where a pier(s) will be located within the stream channel or overflow section, the preferred type of pier is wall-type, which is less likely to trap debris underneath the structure and provides more protection against high-velocity impacts by large debris.

For a high-level structure where a pier(s) will be located within the waterway, a wall-and-column pier may be used. The wall portion of the pier shall terminate at a sufficient elevation above the 100-year high water level to protect the columns against high-velocity impacts by large debris.

The designer shall avoid placing a pier in the middle of the channel.

For all pier types having pier caps, the caps shall be configured to avoid extension beyond the superstructure fascia. Acute corners at the ends of the cap should be chamfered on skewed structures to avoid cracking and spalling of the corners.

### 303.4 FOUNDATIONS

#### 303.4.3 DRILLED SHAFTS

CMS 524.08 and CMS 524.15 require the inspection of drilled shafts as they are constructed. The designer shall include either CCDPW Construction Drawing DS-1C in the project plans or ODOT Standard Form CA-S-1 in the contract documents to aid the recording of these inspections.

### 303.5 DETAIL DESIGN REQUIREMENTS FOR PROPRIETARY RETAINING WALLS

#### 303.5.1 WORK PERFORMED BY THE DESIGN AGENCY

The CCDPW prohibits slag in any form to be used for select granular backfill, engineered fill, backfill drainage, porous backfill, bedding material, etc. as it relates to MSE wall or other proprietary retaining wall construction. The designer must note this in the project plans when such walls are being proposed.

*Section C, Note 9: Limits of wall excavation:* Supplemental Specification 840 requires a minimum one-foot (1'-0") undercut for all MSE walls. If more is required, then all undercutting limits must be defined in the plans. Under no circumstances shall the undercutting limits be left "as directed by the Engineer".

### 304 RAILING

#### 304.1 GENERAL

In deference to Ohio Revised Code Section 5591.36, "Guardrails for Bridge or Steep Embankment", sufficient lengths of approach guardrail and bridge terminal assemblies shall be required to protect all corners of the structure unless prevented by unavoidable or unmovable obstacles (i.e., drive aprons, etc.). The AASHTO Roadside Design Guide and input from the CCDPW's Transportation and Traffic Engineer shall be utilized for determining the necessary run-out lengths of approach guardrail. In cases where unavoidable or unmovable obstacles are encountered, the designer shall consider using guardrail with radius turnbacks or other safety measures to protect the ends of the structure. In general, MGS Type 1 Bridge Terminal Assemblies shall be used at all corners of the bridge structure. Refer to ODOT standards for bridge terminal assembly installations. Standard bridge terminal assemblies and/or anchor assemblies may require modification ("as per plan") to fit where room is not available for standard placement.

#### 304.3 WHEN TO USE

On bridges without sidewalks, the bridge railing shall generally consist of a 36" (3'-0") high deflector parapet

type (New Jersey shape) railing, as illustrated in ODOT Standard Bridge Drawing BR-1-13. If the ADTT in one direction is 2500 or greater for the structure, then a 42" (3'-6") high deflector parapet type (New Jersey shape) railing per BR-1-13 or a 42" (3'-6") high single slope deflector parapet type railing per ODOT Standard Bridge Drawing SBR-1-13 shall be used. Considerations in selecting one shape over the other include weight/loading concerns and opportunities for aesthetic enhancements.

In certain instances, when identified in the project Scope of Services or during preliminary design, the bridge railing may consist of guardrail mounted on steel posts in accordance with ODOT Standard Bridge Drawings DBR-2-73, DBR-3-11, TBR-1-11 or TST-1-99. Unless otherwise specified by the county or decided during preliminary design, the railing must meet or exceed TL-2 or TL-3 design requirements of either NCHRP Report 350 or the AASHTO "Manual for Assessing Safety Hardware" (MASH) as defined in Section 209.2 of this supplement.

On bridges with sidewalks, including new bridges and rehabilitated bridges requiring railing replacement, the bridge railing shall generally consist of a 2'-0" high concrete parapet topped by a 1'-6" high 2-tube railing, as illustrated in ODOT Standard Bridge Drawing BR-2-15. The total railing height is 3'-6". Refer to CCDPW Construction Drawing PRF-1C for additional details.

In some cases where a bikeway crosses the structure, a 3'-0" high New Jersey shape parapet (as per ODOT Std. Dwg. BR-1-13) topped by a 1'-6" structural tubing railing (as illustrated on BR-2-15) may be used. Modifications may be required to this railing design to accommodate bicycle traffic on certain structures. The consultant will be directed to pursue such modifications in the Scope of Services or during the preliminary design stage. In many cases, the designer will be directed to pursue a decorative railing treatment in the Scope of Services or during preliminary design. In these instances, the designer will be directed on how to proceed with coordinating the selection process of a preferred decorative design and the method of payment for the decorative treatment. Items requiring payment from different sources must be marked accordingly in the "Estimated Quantities", and alternate bid items may be utilized in the bid documents. All decorative railing designs must meet the minimum testing level requirements as outlined above for standard railing design. Aesthetic concrete parapet designs shall also meet the requirements of NCHRP 554. Refer to Section 209.7 of this supplement for additional information regarding aesthetics.

In cases where the structural steel tubing or decorative steel railing is to be finished with a specific color, the CCDPW prefers that the steel not be galvanized and powder coated as is typically recommended. It has been the CCDPW's experience that the powder coating begins to flake and separate from the galvanized steel soon after the installation of the railing. Instead, the steel railing shall be primed and painted per ODOT CMS 514 because of the proven durability and maintainability of the three-coat paint system specified therein.

In certain instances, fence may be required on top of the bridge parapet. Fence installations are discussed below.

## 305 FENCING

### 305.2 WHEN TO USE

Generally, the point system criteria for justifying fence installation as outlined in the ODOT Bridge Design Manual shall be followed. The designer may receive alternative direction in the Scope of Services or during preliminary design for the particular project.



### 305.3 FENCING CONFIGURATIONS

On structures with sidewalks where fence is required, the bridge railing shall generally consist of a 2'-8" high, vertically straight, 1'-0" thick concrete parapet topped by a 6'-0" high straight chain link fence. The fence posts shall be mounted to the top of the parapet by use of a base plate bolted into the concrete in general conformance with ODOT Standard Bridge Drawing VPF-1-90. However, the CCDPW standards shall differ from the ODOT standards in the following ways:

- Mount the fence posts nearest the roadway edge of the base plates
- Install the fence fabric along the roadway faces of the fence posts
- Permit a maximum allowable fence post spacing of 10'-0"

Refer to CCDPW Construction Drawing PRF-1C for additional details.

On structures without sidewalks where fence is required, the railing shall generally be a 3'-0" high New Jersey shape parapet (per ODOT Standard Drawing BR-1-13) or 3'-6" single slope deflector type parapet (per ODOT Standard Drawing SBR-1-13) topped by a 6'-0" high straight chain link fence, with the posts and fabric mounted as described above. In cases where a bikeway is crossing the structure, a 3'-0" high New Jersey shape parapet or 3'-6" single slope deflector type parapet topped by a 1'-6" structural tubing railing (as illustrated on BR-2-15) and 6'-0" high straight chain link fence may be used. In this instance, the fence posts shall be mounted behind the bridge railing, in accordance with ODOT's standards, but the fence fabric shall be installed on the roadway side of the fence posts.

In some instances, an aesthetic fence design may be specified in the Scope of Services or be requested during plan development. In these cases, a special design will be pursued.

Fence may also be required on the top of a retaining wall depending upon the treatment of the top of the wall and the nature of the land use in the areas in front of and behind the wall.

In all cases, the edge of the fence base plate should be flush with, but not extend beyond, the top edge of the chamfer along the roadway side of the concrete parapet or retaining wall.

### 305.6 TEMPORARY VANDAL PROTECTION FENCING

Special consideration shall be given during the preliminary design stage to avoid installing temporary vandal protection fencing along the phase construction joint side of a newly constructed deck whenever possible.

If a project requires anchored/unanchored bridge mounted concrete barrier, it is preferred that any temporary vandal protection fencing be attached to the barrier and not the deck.

## 306 EXPANSION DEVICES

### 306.1 GENERAL

A sealed joint shall be provided when expansion and/or fixed deck joints are considered necessary (other than construction joints). Strip seal, low density foam and polymer type expansion joints are preferred over compression seals. Modular expansion joints may be specified on longer bridges. In all cases, however, all joints must be sealed.

The joint seal shall be continuous across the full out-to-out width of the deck, including the sidewalks and parapets. This is to keep any surface run-off from the superstructure members below the deck, bearing devices, bridge seats and substructure units. Additional plan details may be necessary to ensure the best joint installation and to guarantee protection for the joints from snowplow damage.

The CCDPW concurs with ODOT's policy of metalizing exposed steel surfaces of expansion devices with a 100% zinc coating.

Intermediate expansion joints (at piers, etc.) should be avoided at all costs.

In some instances where the anticipated joint movement is minimal, a non-standard expansion joint system may be used, such as a silicon or polyethylene foam expansion joint system with polymer nosings. The county has been installing systems like this on bridge overlay and joint replacement projects and has found advantages in their durability, maintainability and effectiveness.

### 306.1.2 EXPANSION DEVICES WITH SIDEWALKS

When the design opening for the expansion joint is less than 1½", no cover plate should be specified for the sidewalk or curb. Joint openings of this size are not considered a tripping hazard, and the cover plate creates maintenance problems. In all cases on county bridges, no cover plate shall be specified at the curb armor even if a cover plate is present on the sidewalk. This provides access for cleaning and maintenance by county crews.

## 306.2 EXPANSION DEVICE TYPES

### 306.2.5 COMPRESSION SEAL EXPANSION DEVICES

Generally, compression seal expansion joints shall not be specified for county bridges. It is the CCDPW's experience that these types of seals are difficult to install, and they often fail due to poor installation. An alternate type of seal should be considered.

### 306.2.8 TOOTH TYPE, FINGER TYPE OR NON-STANDARD SLIDING PLATE EXPANSION DEVICES

In no case shall sliding plate expansion devices be specified for CCDPW bridge projects. They have proven to be a maintenance problem and in all cases have led to premature deterioration of structural elements located below.

### 306.3 EXPANSION DEVICE USES – BRIDGE OR ABUTMENT TYPE

#### 306.3.1 INTEGRAL OR SEMI-INTEGRAL TYPE ABUTMENTS

Integral or semi-integral types of abutments should be considered to avoid structural expansion joints, when possible. In most cases these types of abutments will have a vertical construction joint between the bridge superstructure and approach slab as per ODOT Standard Drawing AS-1-15, Detail B. When steel curb plate is used on both the bridge superstructure and approach slab, the designer shall provide a joint in the steel curb plate at the location of the construction joint.

### 307 BEARINGS

#### 307.1 GENERAL

The CCDPW concurs with ODOT that laminated elastomeric bearings should be utilized whenever possible and justification must be made to utilize other bearing types.

For rehabilitation projects on county bridges, existing bearings in questionable condition should be replaced with new bearing devices rather than being rehabilitated. Rehabilitation of existing bearings is a problem from a constructability standpoint, and their ability to function in the future and their durability are questionable.

## SECTION 400 – REHABILITATION & MAINTENANCE

### 403 DECK

#### 403.2 PATCHING

For rehabilitation projects on county bridges, patching quantities are generally determined from sounding the structure at the preliminary design stage (Stage 1) of a project. During construction, however, these quantities are almost always found to be underestimated. Therefore, to provide a more accurate patching quantity for bidding purposes, the structure is to be sounded an additional time at the conformance stage (Stage 3) of the plan development process as specified in the project Scope of Services.

#### 403.4 OVERLAY

All overlays placed on existing bridge decks shall be Latex Modified Concrete (LMC) unless otherwise specified in the Scope of Services or during preliminary design. The design plans shall reference ODOT Supplemental Specification 847 or 848. In general, wearing surfaces composed of asphalt material should not be used on county bridge structures unless approved by the CCDPW.

#### 403.7 EXPANSION JOINTS

For rehabilitation and repair of existing Expansion Joint, refer to Section 306.

#### 403.9 BRIDGE DRAINAGE

For rehabilitation and repair of existing drainage systems, refer to Section 209.3.

#### 403.10 RAILING

For rehabilitation and repair of existing railing, refer to Section 304.

#### 403.11 BEARINGS

For rehabilitation projects on county bridges, any existing bearings in questionable condition should be replaced with new bearing devices rather than being rehabilitated. Rehabilitation of existing bearings tends to be a problem from a constructability standpoint, and their ability to function in the future and their durability are questionable.