CUYAHOGA COUNTY
DEPARTMENT OF PUBLIC WORKS

CUYAHOGA COUNTY ENGINEER
SUPPLEMENT TO THE 2007 ODOT BRIDGE DESIGN MANUAL
July 2013

SECTION 100 – GENERAL INFORMATION

101 INTRODUCTION

The Cuyahoga County Engineer's (CCE) 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 CCE in the course of project development.

For information regarding CCE design standards, CAD standards, general notes, standard drawings and revisions, please visit the Cuyahoga County Department of Public Works' (CCDPW) website at: http://publicworks.cuyahogacounty.us.

102 PREPARATION OF PLANS

102.3 COMPUTER AIDED DRAFTING STANDARDS

Follow the Cuyahoga County Engineer's established CAD standards, which are available on the County's website. The County has adopted AutoCAD as its standard CAD software package. All CAD information to be submitted or exchanged shall be in the current version of AutoCAD used by the CCE as defined in the project Scope of Services.

CAD deliverables for Final Design Plans must include all AutoCAD ".dwg" drawing files and associated AutoCAD support files used to create the Final Design 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 Design Plan sheet(s) are included in each ".dwg" file. Provide a sequential list of all Final Design Plan sheets and the corresponding ".dwg" files from which the plan sheets were derived.

Final plan submittals must also include full size (22"x 34") ".pdf" digital file(s) compatible with Adobe Reader 10. In general, submit individual Final Design 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 County.

If approved by the County, ".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 Design 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. Current Océ Windows Printer Driver (WPD) for a TDS600 can be downloaded from the Océ website, http://www.oceusa.com.

102.5 TITLE BLOCK

The Title Block given in Figure 102.5-3 entitled "Example Plan Sheet Title Block" shall be used for all bridge and culvert project plan sheets. Use this Title Block in conjunction with the structure plan sheet layout given in Figure 102.5-2.

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

1.) Name of the road (e.g., *SMITH ROAD*).
2.) County route number (e.g., *C.R. 100*).

The largest block shall contain three lines of information:

1.) 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*).

2.) County bridge number or culvert number designation (e.g., *BRIDGE 01.10, CULVERT C-03.78*). Any bridge or culvert structure newly programmed by the County for rehabilitation or replacement shall be identified by its straight line mileage (SLM) number. However, if the County has already programmed the structure identified by its original number (e.g., *BRIDGE NO. 36, CULVERT NO. C-21*), then its original number shall be retained to avoid confusion during the legislative and design processes. The proper bridge or culvert number will be supplied either in the project's Scope of Services or during preliminary design.

3.) Name of waterway, roadway, railroad, etc., that bridge is crossing (e.g., *OVER BIG CREEK, OVER CSX RAILROAD*).

A new Structure File Number (SFN) is required when an existing bridge or culvert structure is being replaced in its entirety. The CCE 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 CCE structure plan sheet is available on the CCDPW's website.

102.6 ESTIMATED QUANTITIES

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.

It is essential that all structure and non-structure quantities be accurately calculated, accurately carried to the General Summary and Estimated Quantities table, and that substantiating data for all calculated items be included with the final design 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 CAD generated or planimetered areas. Lump sum items should be reasonably estimated or quantified to substantiate the estimated engineer's cost associated with these particular items.

102.7 STANDARD BRIDGE DRAWINGS

The CCE 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 CCE bridge construction drawings are referenced in the Structure General Notes and on the project Title Sheet.

102.9 PROPOSAL NOTES

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

104 OHIO REVISED CODE SUBMITTALS

ODOT only reviews federally funded projects locally administered by the CCDPW.

105 BRIDGE PLAN SHEET ORDER

The plan sheets anticipated for a particular project should be 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 CCE, 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 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 "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 HYDRAULIC 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 CCE 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 a maintenance of traffic plan that facilitates 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.

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 County 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.

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. If directed by the County, the designer shall coordinate with the utility company to include the attachment details into the project plans. All costs associated with the design and construction of the attachment system is to be borne by the utility company as required by the Ohio Revised Code. Refer also to Section 301.7 of this supplement for additional information in this regard.

202 BRIDGE PRELIMINARY DESIGN REPORT

202.2.3 FOUNDATION REPORT

202.2.3.3 DRILLED SHAFTS

The CCE may, in certain circumstances, allow the use of welded reinforcing steel cages consisting of spirals and longitudinal rebar in lieu of standard epoxy-coated rebar cages. Factors influencing its use include the length and number of drilled shafts to be used. The CCE will determine its use on a project-by-project basis and, if warranted, will specify its use during plan development.

203 BRIDGE WATERWAY

203.2 HYDRAULIC ANALYSIS

The structure type selection and waterway opening size and geometry for bridges crossing open waterways in Cuyahoga County are 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 build-up under 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.

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 the CCE's review of the Stage 1 Design submission, the CCE will notify the Local Flood Plain Coordinator regarding any proposed bridge or culvert work impacting the

backwater of the waterway. Should the Local Flood Plain Coordinator require a permit for the proposed work, the CCE will apply for the permit at this time.

203.3 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 fabric filter in lieu of the crushed aggregate, however its use shall be approved by the CCE.

203.4 BRIDGE AND WATERWAY PERMITS

The CCE 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. There may be instances when the designer will be given alternative direction in this regard, either in the Scope of Services or during preliminary design, but this will be determined on a project-by-project basis.

203.5 TEMPORARY ACCESS FILLS

In general, the CCE will develop and provide all TAF plan details and cross-sections required for waterway permit application purposes. The CCE usually coordinates directly with the U.S. Army Corps of Engineers, the U.S. Coast Guard and the Ohio EPA in this regard.

204 SUBSTRUCTURE INFORMATION

204.3 ABUTMENT TYPES

The County Engineer strongly encourages the use of integral design for abutments. Wall-type abutments may be utilized when warranted by topography/geometry.

204.5 PIER TYPES

It is CCE 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, proprietary wall systems may be considered. 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

205.4 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 when working near the railroad tracks.

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 must 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 CCE supplements thereto, unless otherwise specified in the Scope of Services for the project.

Generally, the roadway width for bridges with sidewalks shall be 28 feet, measured face-to-face of curbs, for two-lane structures. 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 County Highway Design criteria for determining taper lengths shall be utilized, unless a taper length is specified in the project scope.

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

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 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".

208 TEMPORARY SHORING

In general, the CCE 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 CCE 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 CCE will evaluate this option on a project-by-project basis and notify the designer accordingly during preliminary design.

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. TL-2 railings are considered adequate on most County roads with design speeds of 45 MPH or less, favorable site conditions and relatively light volumes of truck traffic. TL-3 railings are considered necessary when the design speed is greater than 45 MPH, sight distances are unfavorable 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 other states.

Exceptions to these bridge railing design criteria may be made if the CCE 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 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 obvious 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 CCE 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 CCE 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 CCE'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 should generally be avoided for all County bridges.

209.4 SLOPE PROTECTION

The CCE 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 CCE'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 is warranted.

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 CCE 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 CCE 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 CCE 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.

209.9 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 CCE Construction Drawing PRF-1C.

The curb height on County bridges shall generally be 8", and steel plate as detailed on CCE 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, or equal) shall be specified to seal the joint between the curb plate and the top of the concrete deck 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. 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 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 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 system, shall be designed with input from County 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.

301.3 DESIGN METHODS

All new County bridge designs shall utilize Load & Resistance Factor Design (LRFD) in accordance with the current *AASHTO LRFD Bridge Design Specifications* manual. For locally funded projects, other design methods may be used only if approved in advance by the CCE.

301.4 LOADING REQUIREMENTS

301.4.1 HIGHWAY BRIDGES

All new County bridge structures shall be designed for HL-93 loading as defined in the current *AASHTO LRFD Bridge Design Specifications* manual. When rehabilitating existing bridge structures, they shall be designed for HS25 and alternate military loading, but if the HS25 and alternate military loading requires significantly greater rehabilitation or strengthening of structural members than originally anticipated, then an alternative loading (i.e. HS20 and alternate military loading) may be used for design purposes if approved by the CCE.

All County bridges shall be designed for a future wearing surface (FWS) of 30 psf, not 60 psf as specified in the ODOT BDM.

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 reinforcing steel or MMFX reinforcing steel may be used if approved by the CCE.

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 the CCE's Supplemental Specification. 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 CCE 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 regarding work around existing utility poles, overhead and underground lines, 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 to remain or be 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 <u>not permissible</u> 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.

Any utility company(ies) requiring facility attachment to a County bridge will require a permit from the County. The utility owner(s) shall submit a written request for the permit to the County once the final plans are complete. The details of the attachment are to be submitted to the County for approval during the design process. If directed by the County, the designer shall coordinate with the utility company(ies) to include the attachment details into the project plans. All costs associated with attachment by the private utility company(ies) are to be borne by the utility owner(s) as justified by the Ohio Revised Code. Refer also to Section 201.3 of this supplement for additional information in this regard.

302 SUPERSTRUCTURE

302.1 GENERAL CONCRETE REQUIREMENTS

302.1.1 CONCRETE DESIGN STRENGTHS

For LRFD Design:

A. Substructure concrete (Class QC 1) shall have a design compressive strength of 4.0 ksi;

B. Superstructure concrete (Class QC 2 or Class HP As Per Plan) shall have a design compressive strength of 4.5 ksi; and

C. Drilled shaft concrete (Class QC 2) shall have a design compressive strength of 4.0 ksi.

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 High Performance Concrete (Class HP) conforming to the County's Supplemental Specification. When Class HP Concrete is specified, the designer shall include the bid item for Class HP Concrete Testing in the project plans. The CCE'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 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 HS25 without necessitating major rehabilitation or strengthening of other structural members. Should HS25 loading prove impractical to achieve, then an alternative loading (i.e. HS20 and alternate military loading) should be investigated.

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 CCE.

302.1.3.2 FUTURE WEARING SURFACE

All County bridge structures shall be designed for a future wearing surface (FWS) of 30 psf, not 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 Reinforcing Steel 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 CCE will evaluate the use of galvanized 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 should generally 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 CCE'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 CCE prefers that the color be chosen based on input from all stakeholders involved with the project. The CCE 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 rehabilitation projects, the existing bridge structure shall be checked for HS25 and alternate military loading. If the structure is found incapable of supporting the load, or if major modifications to the structure are needed to accommodate the load, then an alternative loading (i.e. HS20 and alternate military loading) may be used for checking purposes if approved by the CCE.

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 HS25 without necessitating major rehabilitation or strengthening of other structural members. Should HS25 loading prove impractical to achieve, then an alternative loading (i.e. HS20 and alternate military loading) should be investigated.

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 CCE 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.

302.2.6 STAY IN PLACE FORMS

The use of stay in place deck forms should generally be avoided, but may be specified or proposed by the designer on particular projects if warranted for constructability reasons (e.g., over railroads).

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 plates 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 painting. The use of integral or semi-integral abutments should be investigated to eliminate the need for any 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 used, the use of integral or semi-integral abutments is strongly encouraged to eliminate the need for any painting of the weathering steel. 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 CCE 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 CCE.

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 CCE 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 CCE.

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 CCE 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.

302.5 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.

302.5.2.5 DECK SUPERSTRUCTURE AND PRECAST DECK PANEL

The CCE may consider the use of partial depth precast concrete deck panels for prestressed concrete I-beam bridges if significant savings in construction time and cost can be realized. The designer would be required to adopt best practices of states or jurisdictions having significant experience in the use of these systems. In general, deck panels will not be considered for structures that are highly visible to the public from below.

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 CCE'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 CCE'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 CCE 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, 36" wide centered on the joint.

303.2.2 TYPES OF ABUTMENTS

303.2.2.1 FULL HEIGHT ABUTMENTS

If formliners are used for aesthetic reasons, the pattern shall be selected by consensus among the County, the local municipality(ies), or other interested 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 36", 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

The CCE may, in certain circumstances, allow the use of welded reinforcing steel cages consisting of spirals and longitudinal rebar in lieu of standard epoxy-coated rebar cages. Factors influencing its use include the length and number of drilled shafts to be used. The CCE will determine its use on a project-by-project basis and, if warranted, will specify its use during plan development.

303.5 DETAIL DESIGN REQUIREMENTS FOR PROPRIETARY RETAINING WALLS

303.5.1 WORK PERFORMED BY THE DESIGN AGENCY

The CCE 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

Unless prevented by unavoidable or unmovable obstacles (i.e., drive aprons, etc.), sufficient lengths of approach guardrail and bridge terminal assemblies shall be required to protect all corners of the structure. The AASHTO Roadside Design Guide and input from the CCE'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, 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 assemblies.

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. 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 or a 42" (3'-6") high single slope deflector parapet type railing per ODOT Standard Bridge Drawing SBR-1-99 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 the requirements of NCHRP Report 350 TL-2 or TL-3 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-2-98. The total railing height is 3'-6". Refer to CCE 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) topped by a 1'-6" structural tubing railing (as illustrated on BR-2-98) 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 some cases, a decorative railing treatment may be specified in the Scope of Services or requested 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 in this regard.

In cases where the structural steel tubing or decorative steel railing is to be finished with a specific color, the CCE prefers that the steel not be galvanized and powder coated as is typically recommended. It has been the CCE'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 CCE 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 CCE 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) or 3'-6" single slope deflector type parapet (per ODOT Standard Drawing SBR-1-99) 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-2-98) 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.

306 EXPANSION DEVICES

306.1 GENERAL

When expansion and/or fixed deck joints are considered necessary (other than construction joints), some type of sealed joint shall be provided. Strip seal 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 CCE 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 CCE'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 lead 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-1-81, 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 CCE 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 & REPAIR

(Note: The following subsections correspond to those in the 2004 ODOT Bridge Design Manual)

401 GENERAL

STRENGTH ANALYSIS

In analyzing the strength of existing superstructures, substructures and foundations for bridges that are to receive a new deck, a future wearing surface of 30 psf shall be included in the dead load.

403 CONCRETE REPAIR/RESTORATION (OTHER THAN DECK REPAIR)

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.

404 BRIDGE DECK REPAIR

404.2 OVERLAYS

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 CCE.

411 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.