(Updated 6/15/2021)

Initial cost is typically the main consideration for bridge structure type selection by City Capital Projects and or developers. Another major consideration that must be paid attention to is the lifecycle cost of maintaining the structure. This document covers guidance on preapproved structure types requiring low life cycle maintenance/replacement cost, general structure requirements, utilities on bridges, design review, construction inspection, traffic on bridges before City acceptance, and a bridge check list.

In accordance with Code of Federal Regulation (23 CFR 650.31): a "bridge is defined as a structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center line of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme end of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening". ***Culverts that qualify as bridges per the Code of Federal Regulation (23 CFR 650.31), are referred to in this document as Qualifying Culverts.***

All hydraulic structures regardless of size must be designed in accordance with the latest edition of the Charlotte-Mecklenburg Storm Water Design Manual.

Structures to be maintained by the City that meet the definition of a bridges as defied in the Code of Federal Regulation (23 CFR 650.31) above will be reviewed by CDOT for compliance with the following criteria.

ROADWAY STRUCTURES

Bridges – Superstructures

The following are preapproved structure types. Any other proposed structure type will require advance approval before starting design. **18-inch Cored Slab**

- **21-inch Cored Slab**
- **24-inch Cored Slab**
- **Box Beam**
- **Pre-Stressed Girders**

If the approach geometry requires the bridge to be horizontally curved, consideration should be given to widening the bridge and striping the deck as needed or splaying prestressed girders. Only when no other option is available should curved weathering steel girders be selected for the superstructure.

Unless preapproved by the City, painted steel or truss type structures will not be taken over and maintained by the City.

Superstructures that contain timber elements will not be taken over and maintained by the City.

Bridge concepts 25 feet or less in length along the centerline of the structure will require discussion/ preapproval to explore the viability of utilizing a reinforced concrete box or 3-side culvert.

Bridges – Substructures

Substructures that contain timber elements will not be taken over and maintained by the City.

Mechanically Stabilized Earth (MSE) wingwalls and/or abutments in the 100-year flood plain of a creek or any body of water will not be taken over and maintained by the City. The AASHTO LRFD Design Specs, Section 11.10.1 states: "*MSE walls shall not be used under the following conditions: Where floodplain erosion or scour may undermine the reinforced fill zone or facing, or any supporting footing."* The commentary provides additional information: *"The potential for catastrophic failure due to scour is high for MSE walls if the reinforced fill is lost during a scour occurrence."*

Qualifying Culverts

Cast-in-place or precast reinforced concrete culverts are preapproved. Bottomless concrete culverts and concrete Con/Span type structures are preapproved when the foundation is on rock. Corrugated metal pipes will not be approved.

PEDESTRIAN STRUCTURES

Pedestrian Bridges – Superstructures

The bridge types and materials listed above for roadway structures are also preapproved for pedestrian structures. Painted steel superstructures will not be taken over and maintained by the City. Weathered or galvanized structural steel (weathering or galvanized) with a minimum of 5-inch concrete deck is preferred. Decks and rails may be constructed of composite plastic material. Prefabricated truss spans like **Continental Bridges (in service in the US for at least the last 30 years)** or similar are acceptable with the use of approved materials such as weathering steel or galvanized steel truss members and concrete or composite plastic deck.

Pedestrian Bridges – Substructures

Substructures with exposed timber will not be taken over and maintained by the City.

UTILITIES ON BRIDGES

All bridges will include two 2-inch conduits stubbed up in a pull-box at each end of the bridge for future CDOT use, (potential signalization or ITS) in addition to any conduits installed relating to the lighting of the bridge. The CDOT Bridge Maintenance Program does not permit utilities other than conduits for bridge lighting and CDOT Fiber Optics to be installed on newly built bridges that will become City-maintained bridges. Such utilities impede the City's ability to expeditiously repair and/or replace structures, as well as cause ongoing maintenance issues. The NCDOT Utilities Accommodation Manual (March 2021) states: *"Utility facilities … attached to or near a highway structure can materially affect the structure, the safe operation of traffic, the efficiency of maintenance and reconstruction, and the appearance. Feasible and reasonable actions are to be taken to locate utility facilities elsewhere."*

REVIEW AND PERMIT PROCESS BY CDOT

Plan Review Submittal

The following is a list of engineering documents that must be submitted for review and approval as part of the commercial/residential plan review process with bridge/qualifying culvert structures.

a. Bridge/qualifying culvert structural plans, details, and specifications following NCDOT format and guidelines.
b. Roadway plans
c. **L**oad and **R**esistance **F**actor **D**esign **(LRFD)** design calculations and load ratings based on NCDOT permit vehicles (roadway structures) following NCDOT format and guidelines.

d. Geotechnical report with foundation recommendations following NCDOT format and guidelines.

e. Bridge hydraulics/survey report (for water crossings) following NCDOT format and guidelines.

f. All related pavement markings and signage must be part of the plans.

Predesign or Preconstruction Permits Required by other Regulating Governmental Agencies

It is up to the engineer of record to determine what permits are needed. At a minimum, the following permits should be acquired, or a written report explaining why a particular permit is not needed should be procured.

- **P**reconstruction **N**otification (**PCN)** Is required if the structure is crossing a jurisdictional **D**ivision of **W**ater **R**esources **(DWR)** stream. This notification is submitted to **NC D**epartment of **E**nvironmental **Q**uality **(NCDEQ).**
- If the structure is part of a development **DWR** may require a Storm Water Management Plan, even if no **PCN** is needed. Contact **DWR** and notify them of the project.
- A "No Rise" or LOMR/CLOMR will be required if the bridge is in a **F**ederal **E**mergency **M**anagement **A**gency (**FEMA)** Floodway.
- If the bridge is not crossing a **FEMA** Floodway, then a **F**loodplain **D**evelopment **P**ermit (**FDP)** is required.
- If a CLOMR is required, then an endangered species survey will be required **(NCDEQ)**
- Grading Permit (City)
- Driveway Permits (City)
- Buffer Approval (State/City)
- Erosion Control Permit (City)

DEVELOPER-BUILT STRUCTURES- CONSTRUCTION AND POST CONSTRUCTION REQUIREMENTS

a. Inspection of construction work and materials testing shall be performed by a developer hired NCDOT-prequalified inspector/inspection firm (not the designer firm)

b. Post construction verification of buffer and floodway disturbance

c. Post construction inspection by developer's consultant performing inspection (not the developer designer firm)

d. Post construction Inspection by City or City's authorized representative to include representative from the City's Bridge Program (CDOT-Implementation Section)

e. Developer must correct any deficiencies identified by the post construction inspection

f. Developer's engineer of record certifies that construction has been completed in substantial compliance with the approved plans and specifications with supporting record drawings; and that construction inspection documentation is complete and NCDOT standards haven been met

g. Developer must receive City authorization to open the bridge to public traffic, accept as a City asset and take over maintenance

h. Developer/Developer's contractor issues the City a 12-month warranty

i. City's bridge program staff performs 10-month post acceptance inspection and provide list of needed correction, if any, to developer as part of the warranty.

CITY-BUILT STRUCTURES- CONSTRUCTION AND POST CONSTRUCTION REQUIREMENTS

a. Inspection of construction work and materials testing shall be performed by an NCDOT-prequalified inspector

b. Post construction verification of buffer and floodway disturbance

c. Post construction inspection by an NCDOT-prequalified inspector

d. Post construction Inspection by representative from the City's Bridge Program (CDOT-Implementation Section)

e. City contractor must correct any deficiencies identified by the post construction inspection

f. Engineer of record certifies that construction has been completed in substantial compliance with the approved plans and specifications with supporting record drawings; and that construction inspection documentation is complete and NCDOT standards haven been met

g. The City's construction project manager must receive City authorization to open the bridge to public traffic, accept as a City asset and take over maintenance

h. City's contractor issues the City a 12-month warranty

i. City's NCDOT-prequalified inspector (part of the project construction team) performs 10-month post acceptance inspection and provide list of needed correction, if any, to contractor as part of the warranty

CONSTRUCTION TRAFFIC ON COMPLETED BRIDGE/QUALIFYING CULVERT PRIOR TO CITY ACCEPTANCE

Construction traffic is allowed on bridges prior to City acceptance of the structure. Allowing construction traffic/ load on the bridge /qualifying culvert must be in accordance with the plans and specifications and approved by the construction inspector.

BRIDGE/QUALIFYING CULVERT CHECKLIST FOR REQUIRED DOCUMENTATION FOR STRUCTURE ACCEPTANCE AND TURNOVER TO BRIDGE MAINTENANCE PROGRAM

- ✓ Preapproved structure or documentation of discussion and approval from CDOT
- ✓ Bridge plans, details, and specifications
- ✓ Design calculations and load ratings based on NCDOT Permit Vehicles
- ✓ Geotechnical report with foundation recommendations
- ✓ Bridge hydraulics/survey report
- ✓ Required floodway permits
- ✓ Required buffer permits
- ✓ Endangered species permit if **CLOMR** required
- ✓ Grading permit
- ✓ Erosion control permit
- ✓ Driveway permit
- ✓ Construction inspection forms/notes and diaries per NCDOT

- ✓ Engineers certification of construction
- ✓ Post construction verification of buffer and floodway disturbance
- ✓ 12-month warranty
- ✓ Record (as-built) plans