Permanent Private Access Bridges and Culverts

General Information and Technical Guidance

Introduction

This document is intended to provide general information and technical guidance to the regulatory process for constructing a permanent private access crossing over a waterway. In the event of a conflict with an adopted regulation, e.g., on some technical detail or procedural question, the adopted regulation shall govern. Section I provides information regarding the overall process as well as important information to keep in mind as the applicant moves through the process. Section II provides technical floodplain modeling guidance.

Section I - Process

Point of Contact Information

Various staff in Boulder County will review and evaluate the applications and engineering documents submitted to obtain permits for a permanent private bridge or culvert. In order to simplify the process for both applicant and staff, a point of contact (POC) will be designated for the applicant to coordinate, monitor and assist in evaluation of the application and supplemental documents. The initial POC will be the Flood Recovery & Permit Information Center (FRPIC) at 303-441-1705. After initial contact, a specific POC for design and permitting will be designated. Because information is often time sensitive and accuracy is important, it is important to maintain contact with the designated POC unless specifically directed to another one.

Engineering Consultants & Permit Applications

In order to obtain a permit for a water crossing located within a regulatory floodplain, the applicant must hire a Professional Engineer with hydraulic and hydrologic engineering expertise (Consultant) that is licensed in the State of Colorado. The Consultant will conduct the hydraulic modeling necessary to obtain a floodplain development permit. This work cannot be completed by the property owner. The hydraulic modeling report and associated certifications must be stamped by a Professional Engineer licensed in the State of Colorado. All bridges, structures, or culverts, whether located in a regulatory floodplain or not, must be designed by a structural engineer licensed in the State of Colorado and must adhere to the current adopted Storm Drainage Criteria Manual.

The following URL provides a link to permit applications, instructions and checklists needed to plan, design, and construct a permanent private bridge or culvert in unincorporated Boulder County: http://www.bouldercounty.org/roads/permits/pages/bridgeconstructionpermit.aspx

Pre-application Conference/Kick-off Meeting

In order to ensure that all parties (applicant, engineer(s), Boulder County personnel) are operating with a shared understanding, a Pre-application Conference or Kick-off Meeting will be held to review any known special or unique requirements for a permanent bridge or culvert in the proposed location and confirm that the proposed location can meet the Multimodal Transportation Standards. Project goals will be discussed, as well as process expectations and timelines. This meeting is the forum to air questions and concerns before work begins. The Consultant should contact the POC to clarify the hydraulic modeling requirements and to receive any new data that may be available to help reduce engineering costs.

Floodplain Modeling

The purpose of the modeling is to demonstrate that any structure placed within the regulatory floodplain will not have a negative impact to that floodplain. This can be an iterative process, with alternative locations, designs and channel work considered in order to meet floodplain regulations.

The Colorado Water Conservation Board, Colorado Department of Transportation, and Boulder County

have some modeling data along streams. The Transportation Department will provide the most current modeling data, if available, for the area of the applicant's crossing, which could be incorporated into their model. Once the proposed private access crossing has been successfully modeled, the final design of the bridge or culvert may begin.

For more technical guidance regarding this process, please see the two technical guidance sections below.

Bridge Permit Checklist Completion and Completeness Check

When the bridge design is complete, review the "Bridge Permit Deliverables Checklist" to ensure all of the requirements have been completed and all necessary supporting documents are complete and accurate. The complete Bridge Application package should be submitted to the POC to review before final submittal to the Building Department to verify that all necessary documents are in order and to prevent possible delays during departmental review. The goal of the completeness check is to reduce the possibility of iterations. The complete packet may be submitted at the counter in the Building Department, which acts as the application for both a Floodplain Development Permit (FDP) and a Building Permit. Please refer to http://www.bouldercounty.org/roads/permits/pages/bridgeconstructionpermit.aspx for the checklist.

Permit Issuance, Construction, Inspection, and Approval

Upon submission of the completed packet, the application will be reviewed by multiple departments for adherence to policy. Please expect at least a 3 week window from application submittal to permit issuance. Once all applicable permits are approved and issued, construction of the bridge or culvert may begin. If all is approved, the FDP and Building Permit will be closed out and the License Agreement and Access Permit will be signed off.

Section II – Technical Guidance

Floodplain Modeling

An applicant seeking a Floodplain Development Permit for construction of a bridge or culvert in the floodway must provide 1) a no-rise comparison between existing and proposed conditions, 2) a no-rise comparison between existing and pre-flood conditions, 3) an approved Boulder County Floodway Review, or 4) receive a Conditional Letter of Map Revision (CLOMR) from FEMA.

The Transportation Department is also applying for CLOMRs for portions of new road projects. There is a possibility that some bridge or culvert crossings may be included in the County initiated CLOMRs. If a proposed bridge or culvert crossing was included in County initiated CLOMRs, as long as the actual proposed bridge or culvert is designed to conform to the water surface elevations approved in a CLOMR, then additional hydraulic modeling may not be necessary. Please contact the POC to help determine if the proposed bridge or culvert location has already been included in a hydraulic model.

Definitions

Existing Conditions: Pre-project, on-the-ground conditions utilizing best available data such as LiDAR or survey data

Proposed Conditions: Post-project, existing conditions plus the proposed design elements

Effective Conditions: Regulatory conditions shown on most recent FIRM or approved LOMR

Pre-Flood Conditions: 2011 LiDAR data plus other pre-flood data such as washed-out bridges/culverts when available

Boulder County Floodplain: Floodplain and/or flood zones regulated by Boulder County that are not shown on FIRM

CLOMR: Conditional Letter of Map Revision reviewed by Boulder County and then submitted to FEMA for approval

LOMR: Letter of Map Revision reviewed by Boulder County and then submitted to FEMA for approval

Boulder County Floodway Review: Submitted to Boulder County for review when rises are ≤ 0.50 feet in Boulder County regulated floodways

No-Rise: ≤ 0.00 feet

Creating the Model

Hydraulic modeling will be needed for permit approval of permanent bridge or culvert construction in the regulatory floodway. The applicant's engineer is encouraged to work with the POC from Boulder County to ensure that the most current data and regulations will be used for the floodplain modeling and floodplain development permit application.

The hydraulic modeling report will include both an existing condition and a proposed condition simulation. A pre-flood model may also be provided. The hydraulic modeling shall extend the required distance for proposed conditions to tie into the existing conditions water surface elevations, even if no-rise is achieved compared to pre-flood.

1) Existing Conditions Model:
   a) Existing Topography: 2013/2014 LiDAR may be used as a starting point to create the existing conditions geometry. Please use most recent LiDAR dataset. 2013/2014 LiDAR data may be downloaded here: https://geodata.co.gov. Alternatively, survey data may be used to create the existing conditions model.
   b) Existing Conditions Survey: A survey of the bridge or culvert location as well as additional cross-sections upstream and downstream must be completed. The number of additional cross sections will depend upon the given channel geometry, but should be sufficient in number to accurately complete the model. The survey must also include the approved extents of the model where changes to the stream channel have occurred since the 2013/2014 LiDAR collection. Use of other local post-flood surveys or models can be incorporated into the applicant's model with the approval of the Transportation Department.
   c) Existing Crossing: The dimensions of existing permanent or temporary bridges and culverts and any other existing improvements need to be included in the existing conditions model.
   d) Flow Rates: The proposed conditions model shall use the recent CWCB/CDOT hydrology. Hydrology reports can be downloaded here: http://cwcb.state.co.us/water-management/flood/Pages/2013FloodResponse.aspx.
   e) Roughness: Roughness coefficients shall be assigned based on site specific conditions and justified in the submitted report.
   f) Guard rails must be included in modeling if present.
   g) Existing Conditions modeling must always be submitted regardless if no-rise is demonstrated compared to pre-flood conditions.

2) Proposed Conditions Model:
   a) Proposed Conditions Topography: 2013/2014 LiDAR data may be used as a starting point to create the proposed conditions model. Please use the most recent LiDAR dataset. 2013/2014 LiDAR data may be downloaded here: https://geodata.co.gov.
   b) Proposed Conditions Survey: A survey of the bridge or culvert location as well as additional cross-sections upstream and downstream must be completed. The number of additional cross sections will depend upon the given channel geometry, but should be sufficient in number to accurately complete the model. The survey must also include the approved extents of the model where changes to the stream channel have occurred since the 2013/2014 LiDAR collection. Use of other local post-flood surveys or models can be incorporated into the applicant's model with the approval of the Transportation Department.
   c) Proposed Crossing: The dimensions of the proposed bridge or culvert and any other proposed improvements including channel and driveway grading need to be included in the proposed conditions model.
   d) Flow Rates: The proposed conditions model shall use the recent CWCB/CDOT hydrology. Hydrology reports can be downloaded here: http://cwcb.state.co.us/water-management/flood/Pages/2013FloodResponse.aspx.
   e) Roughness: Roughness coefficients shall be assigned based on site specific conditions and justified in the submitted report.
   f) Guard rails must be included in modeling.
   g) If drops in water surface elevation of 0.30 ft or greater compared to existing conditions for streams being re-mapped or compared to effective conditions for streams not being re-mapped occur as a result of the project, the applicant must obtain a LOMR after project completion, regardless of whether or not a CLOMR was required.

3) Pre-Flood Conditions Model:
   a) 2011 LiDAR may be used as a starting point to create the pre-flood conditions geometry. 2011 LiDAR data may be downloaded here: https://geodata.co.gov.
   b) Pre-Flood Crossing: The dimensions of the previously existing crossing destroyed or damaged by the 2013 floods can be obtained from the original bridge or culvert plans, the building permit for the bridge or culvert, past County bridge inventory data, past photos of the bridge or culvert, etc.
   c) Flow Rates: The proposed conditions model shall use the recent CWCB/CDOT hydrology. Hydrology reports can be downloaded here: http://cwcb.state.co.us/water-management/flood/Pages/2013FloodResponse.aspx.
   d) Roughness: Roughness coefficients shall be assigned based on site specific conditions and justified in the submitted report.
   e) Guard rails must be included in modeling if they were present on pre-flood structure.

4) If a Rise is Unavoidable:
   a) The bridge or culvert must be designed in such a manner that the design results in the least amount of rise in water surface elevation.

b) Boulder County locally administers the floodway on many streams where a floodway is not delineated on the FIRM. In these situations, rises in the water surface elevation of 0.00 - 0.50 ft compared to existing conditions do not require a CLOMR. Alternatively, a Boulder County Floodway Review must be completed to determine if the rise impacts insurable structures or has any adverse impacts. Rises in water surface elevation on an insurable structure will not be approved under any circumstance. Additional information on Boulder County Floodway Reviews can be found here: http://www.bouldercounty.org/doc/transportation/floodwayreviewprocedures.pdf.

c) For rises greater than 0.50 ft compared to existing conditions in Boulder County floodways or rises greater than 0.00 ft compared to existing conditions in FEMA floodways, the applicant must apply for a CLOMR.

d) If a CLOMR is required, the applicant must also obtain a LOMR after project completion.

e) If rises in water surface elevation of 0.30 ft or greater compared to existing conditions for streams being re-mapped or compared to effective conditions for streams not being re-mapped occur as a result of the project, the applicant must obtain a LOMR after project completion, regardless of whether or not a CLOMR was required.

5) Freeboard and Scour:

a) The Storm Drainage Criteria Manual (SDCM) contains the specific freeboard, scour, and scour countermeasure requirements for private access bridges and culverts. The current SDCM can be found here: http://www.bouldercounty.org/property/flood/pages/stormdrainagemanual.aspx.

6) File Naming:

a) HEC-RAS plans should be named the following as applicable:

- Existing Conditions
- Proposed Conditions
- Effective Conditions
- Pre-Flood Conditions

Once the Transportation staff has determined that the hydraulic modeling is sufficient and that the proposed bridge or culvert location is feasible, the applicant may proceed with structural design. Please note that there may be some very specific instances where a proposed bridge or culvert may not be feasible. In that event, the Transportation staff will work with the applicant and their P.E. on an alternative solution.

Design Exceptions for Flood-Affected Accesses

Policy

Section 2.8.5 of the Boulder County Multimodal Transportation Standards (Standards) allows for design exceptions where it may be exceptionally difficult to both conform to these Standards and to maintain the

special character and environmental values associated with the County's historic townsites, environmentally significant areas, or areas with significant viewsheds.

In light of the 2013 Flood event, the ability to consider design exceptions has been expanded to flood-affected private accesses. Because of the challenges many owners face when rebuilding bridge structures in compromised waterways, all design exception requests that meet the criteria listed below will be considered.

When applying for a design exception, the applicant will document in writing good and sufficient cause for a requested design exception on the most recent Boulder County Design Exception Request Form, which is to be signed by a Colorado Professional Engineer. The rationale for the Design Exception Request shall demonstrate the following:

1. It is not likely to compromise public safety.
2. It is **not contrary to best engineering practices**, as reflected by the approach outlined in the American Association of State Highway and Transportation Officials' (AASHTO) Guide for Achieving Flexibility in Highway Design or other guidelines that may be more appropriately applied to flood-affected access issues and are widely accepted in the engineering community.
3. It is not contrary to the intent and general purpose of:
    a. the Standards, including, without limitation, an appropriate balance of safety, multimodal mobility, and pursuit of the environmental, community, and sustainability goals outlined in the Comprehensive Plan;
    b. the Land Use Code, including regulations related to the Floodplain Overlay District in Section 4-400;
    c. the most recently approved Boulder County Storm Drainage Criteria Manual (SDCM); and
    d. the most recently approved International Building Code.
4. It does not result in a significant impact to the public due to maintenance of the improvements.
5. It is reasonably necessary for the health, safety, and welfare of the public.

Note that temporary construction conditions are not a viable reason for a design exception request. Upon receipt of a written request for a design exception the County Engineer may issue a determination on whether a design exception should be granted or denied given the context. The County Engineer will provide a copy of the determination to the applicant.

Steps to Applying for a Design Exception

All design exception requests must be completed and submitted by a qualified professional engineer registered in the State of Colorado.

1. Describe the design alternative being proposed
2. Identify the standard for which the exception is being requested.
3. Identify a guideline that is widely accepted in the engineering community that provides guidance in keeping with the design exception request. While a list of accepted guidelines is provided below, the engineer may provide a guideline not on the list to the County Engineer for review and approval.
4. Describe why, in the engineer's professional opinion, the design exception will meet the design exception criteria.

Resources

- AASHTO Guide for Achieving Flexibility in Highway Design – First Edition
- Federal Highway Administration's (FHWA) Hydraulic Engineering Circular 23 (HEC-23) Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance – Third

Edition

- FHWA HEC-18 Evaluating Scour at Bridges – Fifth Edition
- FHWA Hydraulic Design Series Number 7 (HDS-07) Hydraulic Design of Safe Bridges
- FHWA HDS-06 River Engineering for Highway Encroachments: Highways in the River Environment
- FHWA HDS-05 Hydraulic Design of Highway Culverts – Third Edition