

# GUIDELINES FOR SELECTING OFF-SYSTEM BRIDGES FOR REHABILITATION OR REPLACEMENT

These guidelines are intended to provide assistance in selecting OFF-SYSTEM bridge projects and estimating funding eligibility and participation in accordance with the requirements of the Federal Highway Bridge Replacement and Rehabilitation Program (HBRRP) and CDOT established criteria.

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## Introduction

What is a bridge? The Federal definition of a bridge as defined in the National Bridge Inspection Standards (NBIS) published in the Code of Federal Regulations (23 CFR 650.3) is as follows:

“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 of the roadway of more than 20 feet (6.1 meters) between undercopings of abutments or spring lines of arches, or extreme ends 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.”

Public bridges meeting this definition fall under the provisions of the National Bridge Inventory Standards (NBIS) and must be inspected on a regular basis. The results of the inspections become a part of the National Bridge Inventory (NBI).

The federal government, through the HBRRP, provides participating funding to the Colorado Department of Transportation (CDOT), as well as the other states, for financing a portion of the replacement or rehabilitation costs of bridges which are on the Select List. The Federal Highway Administration (FHWA) allows the States to utilize a portion of HBRRP funding for bridge inspection purposes.

Per the Federal regulations, CDOT apportions the HBRRP funding as follows: sixty-five percent of must be used for structures on Federal Aid highways (on-system), fifteen percent must be used for structures on local roads (off-system), and the remaining twenty percent can be used for bridges on either system at the discretion of the State. CDOT utilizes the remaining twenty percent for funding the participating portion of the bridge inspection program.

The terms on-system and off-system refer to the Federal Functional Classification description of the route carried by the bridge. More specifically,

- On-System bridges are those where Item 26 of the NBI = one of the following:
  - 01 (Rural, Principal Arterial - Interstate),
  - 02 (Rural, Principal Arterial - Other),
  - 06 (Rural, Minor Arterial),
  - 07 (Rural, Major Collector),
  - 11 (Urban, Principal Arterial - Interstate),
  - 12 (Urban, Principal Arterial - Other Freeways or Expressways) ,
  - 14 (Urban, Other Principal Arterial), or
  - 16 (Urban, Minor Arterial).
- Off-System bridges are those where Item 26 of the NBI = one of the following:
  - 08 (Rural, Minor Collector),
  - 09 (Rural, Local),
  - 17 (Urban Collector), or
  - 19 (Urban, Local).

## Definition of Terms

### National Bridge Inventory (NBI)

The aggregation of structure inventory and appraisal data collected to fulfill the requirement of the National Bridge Inspection Standards that each State shall prepare and maintain an inventory of all bridges subject to the NBIS.

### National Bridge Inspection Standards (NBIS)

Federal regulations establishing requirements for inspection procedures, frequency of inspections, qualifications of personnel, inspection reports, and preparation and maintenance of a State bridge inventory. The NBIS apply to all structures defined as bridges on all public roads.

### Public Road

Any road under the jurisdiction of and maintained by a public authority and open to public travel.

### Sufficiency Rating

The sufficiency rating formula is a method of evaluating data by calculating four separate factors to obtain a numeric value which is indicative of a bridge's sufficiency to remain in service. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero would represent an entirely insufficient or deficient bridge. The sufficiency rating shall not be less than 0% nor greater than 100%.

The factors considered in determining a sufficiency rating are: S1 - Structural Adequacy and Safety (55% maximum), S2 - Serviceability and Functional Obsolescence (30% maximum), S3 - Essentiality for Public Use (15% maximum), and S4 - Special Reductions (detour length, traffic safety features, and structure type - 13% maximum).

$$\text{Sufficiency Rating} = S1 + S2 + S3 - S4.$$

Bridges which have a sufficiency rating less than 80.0 qualify for the Federal Select List.

### Federal Select List of Bridges

The Federal Select List of Bridges, commonly known as "the Select List", is a subset of the National Bridge Inventory (NBI). The bridges on the Select List have a Sufficiency Rating less than, or equal to, 80.0 AND are either Structurally Deficient or Functionally Obsolete. HBRRP funds can be expended only on bridges which meet these Select List criteria.

To further refine the use of HBRRP funds, those bridges on the Select List that have a sufficiency rating from 50.0 through 80.0 qualify only for rehabilitation unless it can be shown that replacement is more economical or feasible. Bridges on the Select List which have a sufficiency rating less than 50.0 qualify for replacement.

## Selection Procedure

To ensure that bridge replacement and rehabilitation projects utilizing HBRRP funds are selected and categorized correctly for the Statewide Transportation Improvement Program (STIP), the following procedure is established:

1. Verify that the structure is on, or currently qualifies for, the Federal Select List of Bridges. In order to qualify for the Select List, two conditions must be satisfied:
  - a) The structure must have a Sufficiency Rating of 80.0 or less and
  - b) The structure must be either Structurally Deficient (SD) or Functionally Obsolete (FO). Whether a structure is SD or FO is determined by applying specific Federal criteria. If a structure is both SD and FO, then the SD designation controls.

Changes of bridge inspection coding may cause the bridge to fall off the current Select List. Bridges are generally considered eligible if the bridge has appeared on the Select List sometime in the last ten years. Any request to use HBRRP funds for a bridge not on the Select List should be fully documented and justified to indicate that additional deficiencies have developed through some natural or unforeseen phenomenon or that the bridge was dropped from the Select List because of changes in the Federal Coding Guide. Contact the Bridge Management Unit for clarification in these cases.

2. Determine if the structure qualifies for replacement or rehabilitation funding:
  - a) Replacement: Structures on the Select List with a Sufficiency Rating LESS THAN 50 qualify for replacement. However, rehabilitation of a structure should always be considered.

Project eligibility includes total replacement of a structurally deficient or functionally obsolete bridge with a new facility constructed in the same general traffic corridor.

- b) Rehabilitation: Structures on the select list with a Sufficiency Rating less than or equal to 80.0 qualify for rehabilitation.

Project eligibility includes the work required to restore the structural integrity of a bridge, as well as work necessary to correct major safety defects, except as noted under ineligible work.

3. HBRRP requirements which must be addressed:

- a) Design Requirements: The project design for replacement or rehabilitation must follow the criteria set by the following design documents: CDOT Project Development Manual, CDOT Bridge Design Manual, the CDOT Drainage Manual, the AASHTO LRFD Bridge Design Specifications and the AASHTO Policy on Geometric Design of Highways and Streets.

A structural selection report shall address alternative and economic solutions for the replacement or rehabilitation of the existing bridge.

On a case-by-case basis, under certain conditions a structure apparently only eligible for rehabilitation may still be replaced:

1. the existing structure type makes rehabilitation impossible, or
2. the existing conditions would be sacrificed by rehabilitation, or
3. the cost of rehabilitation would exceed the cost of replacement.

Applicable hydraulic and environmental issues shall also be included in the report. This report should be submitted in the early stages of the design process to CDOT Staff Bridge Design and Management through the Special Highway Committee. CDOT Staff Bridge Design and Management will forward the report to the appropriate Region Local Agency Program Manager for review and concurrence.

b) Ineligible work:

- 1) Roadwork: The costs of long approach fills, causeways, connecting roadways, interchanges, ramps, and other extensive earth structures, when constructed beyond the attainable touchdown point, are not eligible under the HBRR program.

A nominal amount of approach work, sufficient to connect the new facility to the existing roadway or to return the gradeline to an attainable touchdown point in accordance with good design practice is eligible. This additional eligible work should be no more than 15% of the cost for replacing the bridge “approach slab to approach slab.”

Roadwork costs exceeding 15% of the bridge replacement or rehabilitation costs shall utilize other funding sources.

- 2) Aesthetic features: Special architectural features on bridges required by the environmental document may be eligible for HBRRP funds. Otherwise, other funding sources shall be utilized.

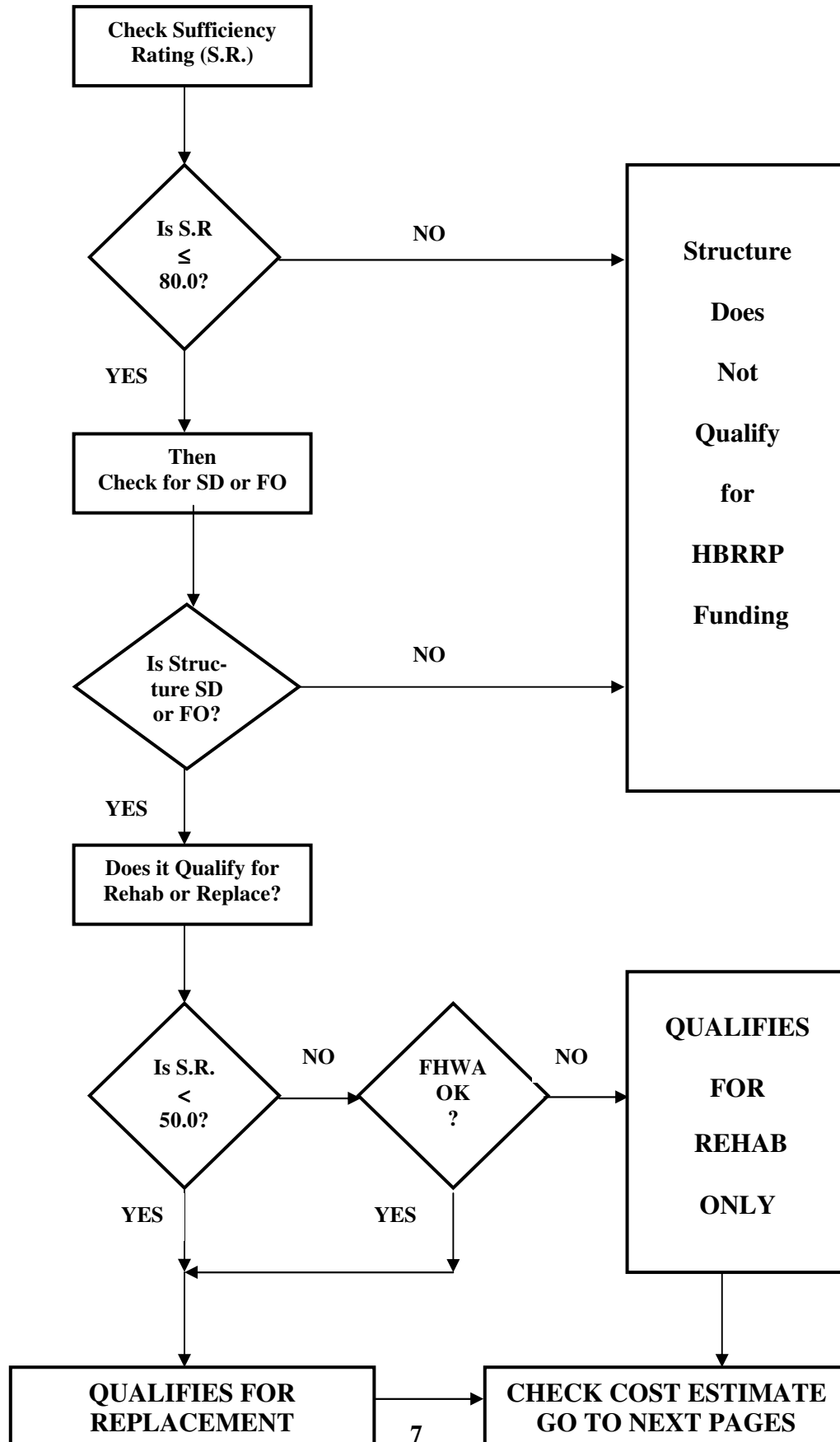
- 3) Ten-Year Rule: A bridge will not appear on the Select List nor qualify HBRRP funding within 10 years of the date of its construction, reconstruction or major rehabilitation. This policy applies no matter what funds were used for the construction, reconstruction or rehabilitation: Federal, State, local, private, or any combination thereof.

Bridges removed from the Select List because of the 10-year rule criteria but with Federal-aid funds obligated for construction work prior to their removal will continue to be eligible for HBRRP funds.

- 4) Examples of work which are not considered reconstruction or major rehabilitation and are not eligible for HBRRP funding:
- A. Safety feature replacement or upgrading (for example, bridge rail, approach guardrail or impact attenuators).
  - B. Overlay of bridge deck as part of a larger highway surfacing project (for example, overlay carried across bridge deck for surface uniformity without additional bridge work).
  - C. Utility work.
  - D. Emergency repair to restore structural integrity to the previous status following an accident. Federal ER program funding may be available for a declared disaster exceeding \$700,000 roadway/bridge damage.
  - E. Retrofitting to correct a deficiency which does not substantially alter the physical geometry or increase the load-carrying capacity.
  - F. Work performed to keep a bridge operational while plans for complete rehabilitation or replacement are under preparation (for example, adding a substructure element or extra girder).

# HBRRP FUNDING QUALIFICATIONS

## Flow Chart for Decision Makers



## HBRRP FUNDING QUALIFICATIONS

### Estimating Reasonable Costs for Bridge Replacement

#### **Calculate the deck area of the existing bridge to the nearest Square Foot:**

- (1) Structure Length (NBI Item49): \_\_\_\_\_ Ft.
- (2) Width out-to-out (NBI Item52): \_\_\_\_\_ Ft.
- (3) Existing Deck Area [(1) x (2)] = \_\_\_\_\_ Sq. Ft.

#### **I. ESTIMATING THE REPLACEMENT COST:**

National average deck area of replaced bridge = 2.2 x Original Deck Area

#### **Estimate deck area of replacement bridge:**

- Existing Deck Area (3) from above \_\_\_\_\_ Sq. Ft.
- Multiply by size factor \_\_\_\_\_ x 2.2
- (4) Estimated new deck area = \_\_\_\_\_ Sq. Ft.

#### **Estimated cost for replacement based on new deck area:**

Colorado's total bridge costs run about 1.75 times the Federal Bridge Construction Unit Costs (FBCC) that are reported to the Federal Highway Administration each year. The factor accounts for the roadway work, utilities, environmental work etc. that relates to the bridge replacement project. Using that factor and the Federal Bridge Construction Unit Costs then the estimated cost for the replaced bridge can be determined as follows:

- Estimated new deck area (4) from above \_\_\_\_\_ Sq. Ft.
- Times Fed Bridge Construction Unit Cost, \_\_\_\_\_ x \$FBCC/Sq. Ft.\*
- Times Colorado's typical cost factor, \_\_\_\_\_ x 1.75
- Times engineering cost factor \_\_\_\_\_ x 1.15
- Total estimated eligible cost for new bridge, \$ \_\_\_\_\_ \*\***

\* Contact the CDOT Bridge Management Unit for the most current value or use \$70/Sq. Ft. as a "ball park" figure.

\*\*If the submitted cost estimate varies from this number by more than 20%, then the project should be reviewed in detail. 80% of the eligible total may be granted as participating funding.

**HBRRP FUNDING QUALIFICATIONS**  
**Estimating Reasonable Costs for Bridge Rehabilitation**

**Calculate the deck area of the existing bridge to the nearest Square Foot:**

- (1) Structure Length (NBI Item49): \_\_\_\_\_ Ft.  
 (2) Width out-to-out (NBI Item52): \_\_\_\_\_ Ft.  
 (3) Existing Deck Area [(1) x (2)] = \_\_\_\_\_ Sq. Ft

**II. ESTIMATING REHABILITATION COST:**

Rehabilitation may entail widening a deck. Using this as a guide, the cost for rehabilitating a bridge with or without deck widening can be estimated as follows:

**Estimate the new deck area of the widened bridge:**

The national average size of a widened deck = 1.5 x Original Deck Area. The average cost per square foot for widening may be found in the CDOT's Cost Data (CCD) book published by the Cost Estimates Unit. If not widening or proceed directly to Estimate the cost for rehabilitation below.

- (5) Total Deck Area (3) from above \_\_\_\_\_ Sq. Ft.  
 Multiply times 1.5 size factor \_\_\_\_\_ x 1.5  
 (6) Estimated total deck area = \_\_\_\_\_ Sq. Ft.  
 (7) Amount of new deck area [(6) – (5)] = \_\_\_\_\_ Sq. Ft.

**Estimate the cost for rehabilitation:**

- Use (3) from above for rehabilitation without widening  
 Use amount of new deck area from (7) above if widening \_\_\_\_\_ Sq. Ft.  
 Average cost for widening/rehab, \_\_\_\_\_ x \$CCD/Sq. Ft.\*  
 Times engineering cost factor \_\_\_\_\_ x 1.15  
 Estimated eligible cost for rehabilitation \$ \_\_\_\_\_ \*\*

- \* Contact the CDOT Bridge Management Unit for the most current value or use \$60/Sq. Ft. as a “ball park” figure.
- \*\*If the submitted cost estimate varies from this number by more than 10%, then the project should be reviewed in detail. 80% of the eligible total may be granted as participating funding.

## County or City Managers Checklist

1. Does bridge meet selection procedure criteria on sheets 4-6?
  - a. Bridge is on current select list?
  - b. Roadway costs are less than 15% total bridge (approach slab to approach slab) costs?
2. Application is submitted to Special Highway Committee through Colorado Municipal League (CML) or Colorado Counties Association (CCA). Project meet federal requirements?
3. Application for project approved by Special Highway Committee? Funding level approved? Project is placed on the STIP?
4. Bridge Selection Report submitted to CDOT: 1 copy to Staff Bridge and 1 copy to the Region Local Program manager for review?
5. CDOT's comments addressed? Plans distributed to Region Local Agency Program manager?
6. Project bid and awarded?