



**DEVELOPMENTAL SPECIFICATIONS  
FOR  
REMOVAL OF CONCRETE BOX GIRDER BRIDGES**

**Effective Date  
October 16, 2007**

**THE STANDARD SPECIFICATIONS, SERIES 2001, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

**01104.01 DESCRIPTION**

This item shall consist of removal of all portions of an existing structure, except the portions that may be required or permitted to be left in place. Unless otherwise provided, all structures or parts of structures to be removed shall become the property of the Contractor. Work shall be performed in accordance with these Developmental Specifications and Section 2401 of the Standard Specifications.

**01104.02 BRIDGE REMOVAL**

The Contractor shall submit a complete Bridge Removal Plan to the Engineer detailing procedures and sequence for removing portions of the bridge, including all features necessary to remove the bridge in a safe and controlled manner. The removal plans, indicating detailed sequences of operations, shall be submitted to the Engineer for review and approval, at least, 30 calendar days prior to start of removal operations of the existing bridge.

The Contractor shall, in accordance with Article 1105.03 of the Standard Specifications, submit working drawings, with design calculations, ~~to the Engineer~~ for the proposed Bridge Removal Plan. The Bridge Removal Plan shall be prepared by a Professional Engineer licensed in the State of Iowa. The design calculations shall be adequate to demonstrate the stability of the structure during all stages of the removal operations. Calculations shall be provided for each stage of bridge removal and shall include dead and live load values assumed in the design of protective covers. At a minimum, a stage will be considered to be partial removal of the top slab, sidewalk, or portions of the superstructure, in any span; or bent caps or columns at support locations.

Concrete superstructures may be removed by any means consistent with regulations regarding safety and protection of adjacent property. Where portions of existing substructures lie wholly or in part within limits for a new structure, they shall be removed as necessary to accommodate construction of the proposed structure.

The Contractor's Professional Engineer, licensed in the State of Iowa, shall inspect and be present during the removal operations of any bridge component that may affect the structural stability of the remaining

structure. Should an unplanned event occur, the Contractor's Professional Engineer licensed in the State of Iowa shall immediately submit the procedure of operation proposed to correct or remedy the occurrence to the Engineer for approval.

**A. Bridge Removal Plans.**

The Bridge Removal Plan shall include the following:

1. The bridge removal sequence for the entire structure, including staging of bridge removal.
2. Type of equipment and locations on and/or adjacent to the structure during removal operations.
3. Temporary support shoring or temporary bracing if required.
4. Locations where work is to be performed over and/or adjacent to traffic.
5. Details and locations of protective covers or other measures to assure that bridge removal operations will not endanger the public or damage other highway facilities.
6. Proposed bridge removal date. Refer to the bridge plans for any applicable event date restrictions.
7. Contact names, and office and cellular phone numbers for individuals responsible for the demolition.
8. Details of safety measures to be used during the removal operations (law enforcement for site security, barricades, etc.).
9. Provisions for control of dust from removal operations.
10. Proof of insurance coverage for the demolition activities, including adequate coverage for basic and aggregate. Insurance coverage shall be in accordance with Article 1107.02 of the Standard Specifications for the specific method of removal.

**B. Bridges over Roadways that may be Closed to Traffic.**

The following additional requirements apply to the removal of portions of the existing bridge that are over or adjacent to roadways that may be closed to public traffic:

1. The closure of roadways to public traffic shall conform to the Traffic Control Plan.
2. The following City of Des Moines officials shall be notified by the Contractor 48 hours prior to actual demolition:

Fire Chief	283-4237
Police Chief	283-4800
City Traffic Engineer	283-4973
City Engineer	283-4920

3. Prior to closing of a roadway to traffic to accommodate bridge removal operations, the Contractor shall have all necessary workers, materials, and equipment at the site as needed to proceed with the removal work in an expeditious manner. While the roadway is closed to public traffic, work shall be pursued promptly and without interruption until the roadway is reopened to public traffic.

4. All removal operations over or adjacent to the traveled way shall be performed during periods of time that the roadway is partially or completely closed to the public traffic except as otherwise specified in these Developmental Specifications.
5. Preliminary work shall be limited to operations that will not reduce the structural strength or stability of the bridge, or any element thereof, to a level that would constitute a hazard to the public. Such preliminary work shall also be limited to operations that cannot cause debris or any other material to fall onto the roadway. Protective covers may be used to perform preliminary work such as chipping or cutting the superstructure into segments, provided the covers are of sufficient strength to support all loads and are sufficiently tight to prevent dust and fine material from sifting down onto the traveled way. Protective covers shall extend at least 4 feet (1.2 m) beyond the limit of the work underway. Bottom slabs of box girders may be considered to be protective covers for preliminary work performed on the top slab inside the limits of the exterior girders.
6. Temporary support shoring, temporary bracing, and protective covers shall not encroach closer than 8 feet (2.4 m) horizontally from the edge or 14.5 feet (4.4 m) vertically above any traffic lane or shoulder that is open to public traffic.
7. During periods when the roadway is closed to public traffic, debris from bridge removal operations may be allowed to fall directly onto the lower roadway provided adequate protection from damage is furnished for all highway facilities. Prior to reopening the roadway to public traffic, all debris, protective pads, and devices shall be removed and the roadway swept clean with wet power sweepers or equivalent methods.
8. The removal operations shall be conducted in such a manner that the portion of the structure not yet removed remains in a stable condition at all times.

### **01104.03 REMOVAL METHODS**

Method for bridge removal shall be cutting/shearing, blasting, or another approved method.

#### **A. Cutting / Shearing**

Existing bridge superstructure and pier columns may be reduced into smaller sections to allow for partial removal. Smaller sections may be lifted by cranes or dropped on the pavement below provided that all the requirements of this Developmental Specification are met.

#### **B. Blasting**

The Contractor is permitted to use explosives for removal of the existing bridge superstructure and pier columns, provided the requirements outlined in this Developmental Specification are satisfied. Existing foundations shall not be blasted.

### **01104.04 USE OF EXPLOSIVES**

The requirements of Section 1107.10 of the Standard Specifications and the following shall apply:

#### **A. Pre and Post-Blast Property Survey Requirements**

##### **1. Description**

The locations of the affected properties shall be determined by a Contractor's representative qualified in vibration analysis / monitoring and damage assessment associated with blasting. The Contractor shall arrange with property owners affected by the project the rights-of-entry to their properties in order to engage in a pre-blast and post-blast property damage survey. The Contractor shall submit a Pre and Post-Blast Property Survey Report to the Engineer to document the investigation of the buildings on these properties.

## 2. Investigation Methods

The investigation shall consist of visually inspecting and recording all existing defects in the structures. The structures shall be thoroughly inspected from top to bottom, inside and out. The Report shall include names of inspectors, date of inspections, and descriptions and locations of defects. In addition, the Contractor shall mark existing cracks in such a way that future observations would indicate whether cracks continue to open or spread. Photographs shall be used in verifying written descriptions of damaged areas.

The Contractor shall arrange for professional photography capable of producing sharp, grain-free, high-contrast pictures with good shadow details for construction monitoring at the properties. Photographs shall be taken so that details of the buildings will be clear and well defined. The intent is to procure a record of the general physical condition of the buildings. Camera location shall be changed for each of the photographs and shall be varied so that all portions of the buildings' exterior surfaces will be covered by the view.

Each photograph shall contain the following information:

I-235, Polk County  
Project No.: \_\_\_\_\_  
Property Address: \_\_\_\_\_  
Building Description: \_\_\_\_\_  
View \_\_\_\_\_  
Looking \_\_\_\_\_  
Date \_\_\_\_\_  
Photographer \_\_\_\_\_

Photographs shall be 8 inches by 10 inches (200 mm by 250 mm), black and white glossy, mounted on paper with a flap for binding.

Before any blasting operations for demolition, the Contractor shall have record photographs taken of the portions of all the buildings affected by the proposed bridge demolition. Prints of each view shall be made available to the Engineer within 2 weeks after the exposure has been made and prior to the actual demolition activity.

The Contractor shall conduct a second inspection of each affected property once blasting is complete. The Contractor shall visually inspect and photograph each structure to verify the post-blast condition. The Contractor shall follow the same inspection procedures as previously outlined herein before for the pre-blast survey.

The Pre and Post-Blast Property Survey Report shall be typed on bond paper in text form with headings, indexes, etc., and shall be submitted within 30 calendar days of the final blasting. An evaluation of the property impacts from the blasting activities and final recorded seismograph charts shall be included in the Report. Rights for subsequent use shall become the property of the Contracting Authority.

## B. Ground Vibration Monitoring

### 1. Description

Work under this item shall consist of furnishing seismograph(s) and employing a trained operator to continuously monitor ground vibration at anticipated critical locations determined by the Contractor's vibration analysis. The purpose of the monitoring is to assess potential damages to adjacent structures due to blasting activities.

### 2. Equipment

The seismograph shall be a continuous monitoring instrument capable of producing a continuous strip recording of the seismic readings, or a continuous dated report of all seismic events

exceeding a predetermined threshold. The seismograph shall be supplied with all accessories necessary for making seismographic observations.

### **3. Monitoring Procedures**

The Contractor, in the presence of the Engineer, shall take seismograph readings prior to blasting to establish an ambient index. The seismograph shall be placed to continuously monitor all blasting activities. Attentive observation of the seismographic readings shall be made during all blasting operations.

Ground vibration shall be measured as the particle velocity. The blasting activities shall not generate ground vibration with maximum peak particle velocity that would result in damage, as determined by the Contractor, but not to exceed 12.7 mm per second at frequencies below 40 Hz, or 50.8 mm per second at frequencies greater than 40 Hz; or alternatively, a maximum of 12.7 mm per second peak particle velocity below 10 Hz, and a maximum of 50.8 mm per second above 40 Hz, and a maximum of 0.20 mm displacement between 10 and 40 Hz. Particle velocity shall be recorded in three mutually perpendicular directions. The maximum allowable peak particle velocity shall apply to each of the three measurements.

### **C. Blasting Plan**

The Blasting Plan shall be submitted no later than 30 calendar days prior to bridge removal for review by the Engineer and shall provide the following information:

1. List of at least three projects within the last 5 years on which the Contractor has removed similar bridge structures using explosives. The list shall contain names and phone numbers of owners' representatives who can verify the Contractor's participation on those projects.
2. Name and experience record of the Contractor's superintendent in charge of the bridge removal operations and the explosives personnel.
3. Provisions for transport, security, and use of explosives including locations. It is anticipated that explosives will not be delivered to the site until just before they are needed. On site storage will not be permitted. A City Fire Department inspector and off-duty police officer shall be present while explosives are within the City limit.
4. Application of explosives for structure removal shall be identified as in accordance with explosive manufacturer's instructions. Detailed plans showing how the structure will be prepared for demolition, the type and amount of explosives to be used. Information including type of blasting 'covers' to be used to control flying material.
5. Securing of any required permits.
6. Details of seismograph monitoring including number of seismograph units, locations, and name/experience of trained operator who will continuously monitor ground vibration near buildings or other existing structures.

### **01104.05 ROAD CLOSURE LIMITS**

Depending on the method of removal employed, the Contractor will be allowed to close I-235 to traffic using either of the following traffic control schemes outlined below:

- A.** The Contractor will be allowed to close I-235 to traffic between 12:00a.m. and 2:00 p.m. Sunday to allow for complete superstructure removal over the traveled way. Lane closure may be allowed between 2:00 p.m. Sunday and 6:00 a.m. Monday to complete the bridge removal operation; during this period a minimum of one traffic lane in each direction shall remain open and the Contractor will be limited to performing debris removal and clean up.

B. The Contractor will be allowed to close I-235 to traffic for brief periods not to exceed 20 minutes between 9:00 p.m. and 6:00 a.m. weekdays to allow for partial removal of the structure.

**01104.05 SUMMARY OF SUBMISSIONS AND NOTIFICATIONS**

A. The following submittal requirement shall apply for all methods of bridge removal.

<b>Activity</b>	<b>Due</b>
Bridge Removal Plan	30 calendar days prior to removal
Notifications	48 hours prior to actual demolition

B. If explosives are in any way used for bridge removal, the following additional submittal and notification requirements shall apply:

<b>Activity</b>	<b>Due</b>
Blasting Plan	30 calendar days prior to blasting
Pre-blast photos	To be made available prior to blasting
Pre- and Post-Blast Property Survey Report	30 calendar days following final blasting
Copies of any required permits	To be made available prior to blasting

The Engineer will complete the review of the Bridge Removal Plan and Blasting Plan, if applicable, within 21 calendar days of the date the entire plan is received.

The Contractor shall submit six copies of the Bridge Removal Plan and Blasting Plan, if applicable, on sheets not to exceed the 11 inches by 17 inches (280 mm by 430 mm) size.

**01104.06 METHOD OF MEASUREMENT**

Removal of all material from the bridge, including removal in stages, will be measured as lump sum. No measurement will be made of individual items on the bridge.

**01104.07 BASIS OF PAYMENT**

The lump sum price bid for Removal of Existing Structures Bridge shall be full compensation for furnishing all material, equipment, and labor and for performance of all work including removal plans as required, safety and protective measures, cleanup, and disposal of non-salvaged materials.