SECTION 702

CONTROLLED DEMOLITION

702.1 DESCRIPTION

Controlled demolition is the process of transporting, handling and disassembling the components of an open span structure to result in the complete or partial removal of the entire structure or elements of a structure according to the approved demolition plan. The Contract Documents will identify the category for each structure.

Information on existing structures is made accessible by the Owner, if the information is available. Evaluate project characteristics and prepare demolition plans according to the specified category listed in the General Notes.

Plan and execute all procedures necessary for full or partial removal of the structure in a safe and controlled manner that meets all applicable KDOT specifications and all applicable OSHA requirements.

After concrete removal, or before any steel repairs, test the paint for lead content. Properly handle any lead based paint. See **SECTION 714**.

702.2 DEMOLITION SUPERVISOR

The Demolition Supervisor is the person responsible for all rigging and handling of bridge primary and secondary members. The Demolition Supervisor shall be present at the construction site during the removal of Category B & C Structures.

All Demolition Supervisors must be pre-qualified for the scope, type and complexity of the existing structure. To become pre-qualified, provide proof of experience that the Demolition Supervisor has a minimum of 3 years of experience and at least 5 projects similar in scope, type and complexity.

KDOT will maintain a list of approved Demolition Supervisors on a Pre-Qualified List.

Complete the pre-qualification of the Demolition Supervisor prior to the pre-construction meeting, and/or submit to the KDOT Field Engineer proof of pre-qualification at the pre-construction meeting.

702.3 DEMOLITION PLANS

a. General. The Contract Documents will indicate the demolition category for each structure. Submit shop drawings according to **SECTION 105**.

Develop a unique Demolition Plan for each qualifying existing open span structure in the Contract Documents.

Submit a detailed Demolition Plan to the Owner's Engineer for each open span structure. Address all requirements for removal of the structure to the limits shown in the Contract Documents. Demolition may not proceed until a Demolition Plan has been approved.

During phased/staged demolition, the Contractor's responsibilities extend to the removal limits stated in the Contract Documents for each phase. Do not directly affect the remaining structure outside the removal limits for each phase, or affect the adjacent structure.

Include a Contingency Plan within the Demolition Plan indicating procedures to be carried out if the demolition stage completed does not comply with the Demolition Plan (i.e. the Plan states completion of rail removal, but due to unforeseen obstacles the majority of one rail has been partially disconnected from the existing structure, but it has not been removed).

b. Definitions. The level of review and the requirements for submittals by the Contractor to the Engineer are categorized by risk and complexity.

The Design Engineer will determine and assign the Category of the demolition and will indicate the demolition Category for each open span structure requiring removal on the design plans. Signing and Lighting structures, due to the typical removal procedures, will specify a demolition Category based upon the Signing and Lighting Engineer's engineering judgment. If this information is erroneously omitted, contact the State Bridge Office (SBO). Special considerations will control the selection of the demolition Category.

Controlled demolition of open span structures falls under three separate categories:

(1) Category A. This category requires approval of a Demolition Plan. Demolition typically includes open span structures that will not carry any type of traffic during the demolition operations, structures not adjacent to

traffic, or for structures that do not include a span over any type of traffic. Structures requiring phased removal will be considered for Category A demolition.

(2) Category B. This category requires approval of a Demolition Plan, and a pre-qualified Demolition Supervisor. Demolition will include open span structures with more complex traffic control. Although the removal, or partial removal, may be simple in nature, the structure may continue to carry traffic, be located adjacent to traffic, or include one or more spans over traffic or railroad. Deck or rail replacement, partial depth patching, substructure repair projects or similar controlled demolition activities have the potential to become projects which require a more stringent demolition Category, and as such may be included in this Category.

(3) Category C. This category requires an approved Demolition Plan reviewed by the SBO (or Bureau of Local Projects), a pre-qualified Demolition Supervisor, and the stamp of the Contractor's Professional Engineer. Demolition is defined as the category for open span structures with complex traffic control plans and removal sequences. Complex structures required to carry traffic during demolition operations, are adjacent to traffic, or structures that include one or more spans over traffic (curved structures, severely skewed structures, multi-level interchange structures, etc.) may be included in this Category. A structure with components being removed over traffic or with the potential to fall into traffic is considered to be a Category C structure.

c. Submittals.

Category A Demolition Plans. Provide the Field Engineer with one set of Demolition Plans before demolition begins. Demolition Plans will include at a minimum, as applicable:

(1) A list of all equipment that will be used;

(2) Sequence and limits of removal/partial removal/repair;

(3) Measures to contain falling, or rolling, debris;

(4) Heavy stockpile/equipment loads on the bridge, detailed in accordance with **subsection 702.6**; and

(5) Traffic Control Plan Modification will be according to **SECTION 805**.

No additional requirements apply to this Demolition Category.

Category B Demolition Plans. Provide the Field Engineer with one set of Demolition Plans 2 weeks prior to the demolition meeting. Meet each requirement for a Category A Demolition and at a minimum the following:

(1) A removal sequence showing gravity loads imposed by Contractor equipment and materials.

(2) Proposed methods of demolition, as applicable:

- A list of all equipment that will be used;
- Details of methods to brace the existing structure during demo process;
- Saw cut and/or break point locations;
- Crane pick locations, loads, positions, charts, and rigging;
- Location of protective covers or shields;
- Temporary drainage plan; and
- Proposed backfill after removal of below grade structures.

(3) Specific details for removal will be clearly defined, as applicable:

- Practical environmental conditions limits for removal;
- Detailed Pick descriptions (Length, Center of Gravity, weight, etc.);
- Cross-frame or diaphragm removal sequence; and
- Temporary shoring/falsework details in compliance with **SECTION 708**.

(4) On the Demolition Plans, list the name of the person who is responsible for all rigging and handling of all elements requiring removal. This person, referred to as the Demolition Supervisor, must be present at the site during the demolition of all elements requiring removal. All field operations and field changes are under the authority and responsibility of the Contractor's Demolition Supervisor.

(5) Do not suspend/swing any elements over highway traffic at any time during any stage of the removal procedure.

No additional requirements apply to this Demolition Category.

Category C Demolition Plans. Meet each requirement for a Category B Demolition. In addition, submit the final Demolition Plan details, according to **SECTION 105**, to the SBO (or Bureau of Local Projects) for review at least 4 weeks before the pre-demolition meeting.

(1) The Engineer will require a pre-demolition meeting before any Category C demolition operations begin. The Demolition Supervisor will attend this pre-demolition meeting to discuss any field concerns related to the demolition procedures and to increase familiarity with each existing structure to be removed.

(2) Intermediate Stability. Defined as the point in time when the composite nature, or redundancy of the as-built structure, or elements of the structure, can no longer be relied upon to be stable under dead or live loads. This condition may be due to general or localized degradation of the structure, or due to demolition preparations. Before any connection between the existing structure and the element being removed has been compromised, provide protective stability measures for the existing structure, and for the element being removed. The existing state of the overall structural stability, or stability of particular elements of the structure, may be a major factor in the decision for complete, or partial removal.

- The composite nature and structural integrity of an as-built structure shall be verified before it is relied upon. This requires calculations, procedures and drawings to be developed and sealed by the Contractor's Professional Engineer.
- Field changes causing increased load effects at any controlling portion of the structure must be approved and resealed by the Engineer who originally developed the plans before work begins. This work is under the authority of the Contractor's Professional Engineer.

In no case will the Engineer allow any type of traffic to travel under incomplete structures undergoing demolition without compliance of the Demolition Plan.

d. Calculations. Include the following as a minimum:

(1) Calculations to substantiate structural adequacy and stability for each stage of demolition, accounting for the structure's lack of completeness, various stages of partial connections, or complex structural geometry.

(2) Primary member bearing calculations clearly stating minimum net downward forces at bearing locations at critical stages of removal.

(3) Calculations to determine translations and rotations at intermediate removal conditions.

(4) Design calculations indicating and verifying the load capacity and stability of all temporary supports, falsework bents, shields or covers, and bracing when used to allow traffic to travel under the incomplete structure.

(5) Calculations indicating structural redundancy of the incomplete structure will be required at intermediate stages of demolition. These calculations will be required to account for unforeseen obstacles to the removal process that necessitate halting demolition at an undesignated stopping point.

(6) Using alternative dead and live loading patterns producing the maximum load effect at controlling locations of the as-built structure, the Contractor's Engineer may create an envelope of allowable means and methods for the demolition procedures.

702.4 DEMOLITION INFORMATION RESPONSIBILITY SUMMARY

The Contractor's Engineer shall provide the following information (Category C):

- Plan of the work area showing the as-built permanent support structures of the structure to be disconnected or removed, roads, railroad tracks, waterways (including navigational channel), overhead and underground utilities and other information pertinent to the demolition procedure.
- Removal sequence for all elements of the structure noting any temporary support conditions, such as holding crane positions, temporary supports or bracing, shoring, protective shields or covers, dead man cables, anchor blocks, etc.
- Details describing the number and location of the permanent, or temporary, cross-frames or diaphragms for each stage of removal.
- Details addressing the expected condition of each bearing device for each stage of construction. State the minimum number of positive bearing connections or supplemental connections to each bent cap which will resist potential destabilizing forces.
- Details addressing modified traffic control, utility and railroad issues.
- Demolition Plans to meet general falsework requirements in **DIVISION 700** if falsework bents, temporary shoring, or strong-backs are used to maintain the stability of the remaining structure.

- Contingency Plan specifying the various unintended partial stages of demolition and removal, including end-of-day bracing and stability requirements. The Contractor's Engineer will also need to address real-time concerns arising from the on-going demolition process.

The Contractor's Demolition Supervisor shall provide the following information (Category B or C):

- Verification to the Contractor and the Field Engineer that member reference marks, as described in the Demolition Plan, have been transferred to the existing structure to allow the Contractor and the Field Engineer to conduct a field review;
- Limits for windspeed/gust, or other environmental concerns for crane operations;
- Proposed crane locations for primary picks showing all necessary information;
- Capacity chart for each crane configuration;
- Center of gravity, lift weight (including rigging) for all picks;
- Primary/secondary element removal location and storage;
- Details of any temporary lifting devices to be bolted/welded to permanent members, including stage and method of attachment, capacity, and stage of removal and
- Temporary support details for bridge bearings.

The Owner's Inspector shall require the following (Category A, B and C):

- A dimensionally accurate Demolition Plan, clearly stating the limits of removal, girder line locations, etc., to permanently transfer to the existing structure;
- Requirements for bracing. At the end of each workday, remove, or temporarily brace, the structural elements not properly stabilized to bring these elements into compliance with the Demolition Contingency Plan; and
- All rigging must have capacity stamps, tags or be otherwise permanently marked on the device (per OSHA Standards).

702.5 PRECONSTRUCTION CONFERENCE

Discuss the Demolition Plan at the pre-construction or pre-demolition meeting.

Resolve any questions during the meeting concerning the Demolition Plan or specific demolition procedures to the satisfaction of the Contractor, Contractor's personnel, and the Engineer before demolition begins.

Additional circumstances may be addressed to include within the Contingency Plan. Modify the Contingency Plan to include all situations agreed upon during the meeting.

702.6 CONSTRUCTION REQUIREMENTS

Do not perform any demolition work without an approved Demolition Plan.

Keep the approved Demolition Plans available on site at all times.

Maintain a consistent, core group of staff (supervisors and laborers) through the completion of demolition.

Demolish the existing structure and perform all work required to remove the structure to the limits stated and as detailed in the Contract Documents. Upon completion of the demolition, remove all obstructions or debris resulting from these operations.

Without prior written approval by the KDOT Area Engineer, do not stock pile construction materials, debris, or rubble exceeding the lesser of the posted load limit, or 20 tons. Equipment on the structure must not exceed the lesser of the posted load limit, or the Operating Load Rating for the structure. To request written approval, provide the KDOT Area Engineer plans showing the location, quantity and weight of the proposed materials, debris and/or equipment exceeding the stated limits.

Perform demolition in a reasonable, controlled, methodical fashion. Demolition Plan approval by the Engineer will not and does not relieve the Contractor of the responsibility for the safety of the methods used, safety of the equipment, or from carrying out the work in full accordance with **SECTION 107**.

Demolition is complete when all elements are removed to the limits shown in the Contract Documents and any shoring and debris are removed.

702.7 MEASUREMENT AND PAYMENT

The Engineer will not measure Controlled Demolition, Demolition Plans and Contingency Plans for separate payment. All required work is subsidiary to the other bridge items in the contract.