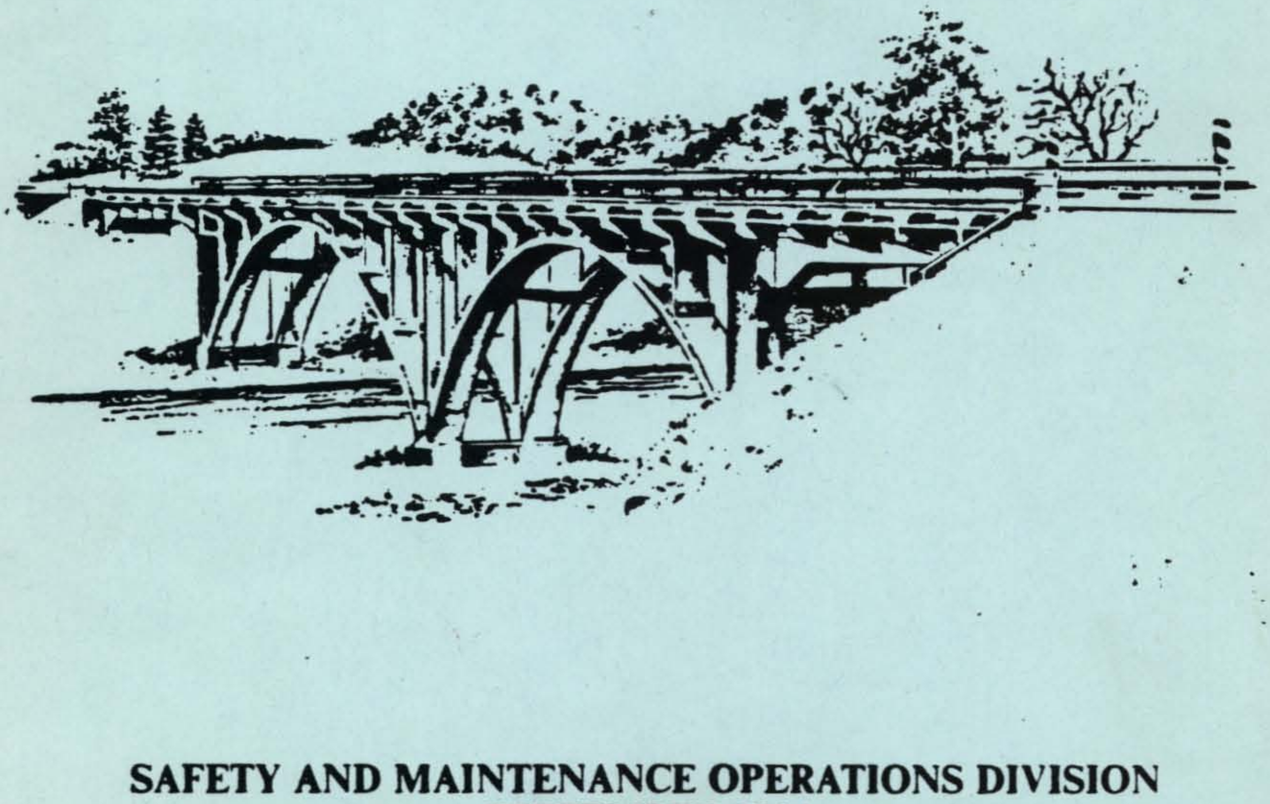
STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION

Bridge Inventory, Inspection And Appraisal Program (BRINSAP)

MANUAL OF PROCEDURES



SAFETY AND MAINTENANCE OPERATIONS DIVISION
SEPTEMBER 1984

BRINSAP MANUAL OF PROCEDURES

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CHAPTER I
GENERAL INFORMATION

1.100 INTRODUCTION

This Manual has been prepared to assist in executing the Department's *Bridge Inventory, Inspection and Appraisal Program*, otherwise known as BRINSAP or the Bridge Inspection Program. BRINSAP is the Department's program to implement the *National Bridge Inspection Standards* which are issued by the Federal Highway Administration.

The National Bridge Inspection Standards are spelled out in the Code of Federal Regulations, 23 CFR 650C, a copy of which is provided in the Appendix. The Standards require bridges to be inventoried, inspected and appraised in accordance with the *Manual of Maintenance Inspection of Bridges* published by the American Association of State Highway and Transportation Officials (AASHTO).

The AASHTO Manual together with this Manual establish the Department's procedures and policies for determining the physical condition and maintenance needs of the bridges in Texas. This Manual supercedes the BRINSAP Manual, dated March 1977.

1.101 PROGRAM OBJECTIVES

(1) Ensure the prompt discovery of any deterioration or structural damage that could become hazardous to the traveling public or that could become more costly to repair if corrective measures are not taken.

(2) Maintain an up-to-date inventory which indicates the condition of all bridges on public roadways.

(3) Maintain service records from which to appraise the relative value of various types of construction and repair.

(4) Determine the extent of minor deterioration requiring routine maintenance and repair work as the basis for planning bridge maintenance programs.

(5) Determine the extent of major deterioration requiring rehabilitation or replacement as the basis for planning bridge replacement and rehabilitation programs.

1.102 DEFINITIONS

(1) 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 of the roadway, track or passageway, of 20 feet or more between undercopings of abutments or backwalls, or spring lines of arches, or extreme ends of openings for multiple boxes; or having an inside diameter of 20 feet or greater in the case of pipes.

(2) A culvert is defined as a small structure under the roadway, usually for drainage. The term culvert is usually limited to buried structures where the clear span or spans between supports is

less than about 20 feet. However, a special class of culverts with clear spans up to about 40 feet has evolved from corrugated metal pipe culverts. If the span measured along the center of the roadway is more than 20 feet, then this type of culvert qualifies for bridge classification. Multiple culverts may also qualify for bridge classification under definition of (1) above.

(3) A tunnel is defined as a structure that carries a roadway through a topographical barrier. For the purposes of BRINSAP the term "bridges" is construed to include tunnels.

(4) A bridge is "on" an applicable route whether the bridge is carrying the route over or the route passes under the bridge. If the bridge carries a route over and another passes under, then the bridge is "on" both routes. The expression "route carried by a structure" means the route is being carried over by the bridge or through by the tunnel.

(5) The term "On-System" applies to any bridge on the Commission-designated State Highway System which includes route designations 11 through 19 given for Item 5.2 in Section 4.103. The term "Off-System" applies to all other bridges on any other public highway, street or road.

1.103 QUALIFICATIONS OF BRINSAP PERSONNEL

(1) **Brinsap Supervisor**. Each District should appoint a BRINSAP Supervisor who meets one or more of the following qualifications.

(a) Registered as a Professional Engineer in Texas.

(b) Qualified for registration as a Professional Engineer under Texas law.

(c) Has a minimum of 10 years of experience in bridge inspection assignments in a responsible capacity *and* has completed a comprehensive training course based on the FHWA Bridge Inspector's Training Manual. Such courses are sponsored by D-18M.

(2) **Bridge Inspector**. Each bridge safety inspection should either be performed or supervised on site by an individual who meets one or more of the following qualifications.

(a) Meets one or more of the qualifications of the BRINSAP Supervisor.

(b) Has a minimum of five years of experience in bridge inspection assignments in a responsible capacity and has completed a comprehensive training course based on the FHWA Bridge Inspector's Training Manual. Such courses are sponsored by D-18M.

(3) **Bridge Appraiser**. Bridge appraisals, as discussed in Part III of this Manual, should be made or supervised by an individual who meets one or more of the qualifications of the BRINSAP Supervisor.

1.104 BRIDGE SAFETY INSPECTIONS

Each On-System bridge and each bridge on the Federal-Aid Urban System will be inspected, in depth, at least every two years by a qualified Bridge Inspector, preferably on a cycle ending July 1 of each even numbered year. These inspections are in addition to, and should not be confused with maintenance inspections discussed in the D-18 Procedures Manual, Section 5-306C.

Using all available guidance, including this Manual, the Bridge Inspector records his findings on Form 1085, Bridge Inspection Record. Upon completion of Form 1085, the Bridge Inspector signs it and forwards it to District Headquarters where the findings, comments and condition ratings are reviewed by the BRINSAP Supervisor.

After reviewing the Bridge Inspector's work, the BRINSAP Supervisor sees that the necessary follow-up actions are carried out, that the Appraisal Ratings are re-examined, and that the BRINSAP file and District BRINSAP records are properly updated.

Certain categories of bridges require interim inspections to insure the safety of the traveling public. At the discretion of the BRINSAP Supervisor, some of these interim inspections may be delegated to maintenance personnel who have been instructed specifically in their inspection assignments, methods of reporting their findings and procedures to be followed in the event of a bridge emergency.

As discussed in Sections 3.400 and 3.403, interim inspections are required for any unposted bridge which cannot support the State legal load at the Inventory Rating level. Included in this category is any bridge that is posted for a weight limit higher than the Inventory Rating level. Any bridge with known deficiencies or which is in questionable condition should also receive interim inspections. And finally, any bridge which is posted for a weight limit less than the legal load should receive interim inspections if it is considered likely that frequent overloads are using the bridge despite the posted weight limit.

Reference: AASHTO Manual, Articles 2.3 and 4.1.

1.105 FOLLOW-UP ACTIONS

(1) Structural Analysis and Load Posting. Bridges of questionable load-carrying capacity should receive a structural analysis as discussed in Chapter III, Section 4. If a bridge has been analyzed previously, the calculations should be reviewed and revised if necessary to reflect current conditions. When analysis indicates that a bridge cannot safely carry the State legal load, suitable posting loads should be calculated and if the bridge already has load restriction signs, these should be evaluated for adequacy.

A list should be made for each District or local jurisdiction of all bridges that require load posting signs. Each list would include recommended load limits and would indicate those bridges whose load capacity is so low that closing is advisable.

For bridges within the Department's jurisdiction, i.e., On-System bridges, a Commission Minute Order must first be obtained prior to load posting, as discussed in the D-18 Procedures Manual, Section 5.309. Only then should load posting signs be removed, added or revised as approved by the Commission Minute Order.

For Off-System bridges, the BRINSAP Supervisor notifies each jurisdiction in writing of the bridges within its jurisdiction that are incapable of carrying the State legal load and thus should be posted for load restriction. The notification should include: a letter of transmittal addressed to the head of the agency responsible for maintenance; a copy of the list of recommended load postings and bridge closings; a map that identifies the location of each bridge; and a statement to the effect that additional information is available in our files upon request. In the letter of transmittal it should be emphasized that the Department is furnishing this information only for advice and assistance and that no mandatory imposition is intended.

(2) Routine Handling of Bridge Inspection Findings. For On-System bridges maintained by the Department, the BRINSAP Supervisor prepares reports summarizing bridge deterioration found in the District. The Bridge Inspection Follow-Up Action Worksheet, shown in Plate I-1, illustrates a typical format for such reports. Another typical format is a series of memorandums

each covering the bridges in one Maintenance Section. With the memo format each bridge showing deterioration would be listed and followed by a brief description of the deterioration. Regardless of the format employed, photographs and sketches should be included in the reports if it would otherwise be difficult to describe the deterioration. The reports should be forwarded to the Engineer responsible for bridge maintenance, who uses them as the basis for bridge maintenance, rehabilitation and replacement programs.

For Off-System bridges and On-System bridges maintained by others, the BRINSAP Supervisor makes timely written notification of the inspection findings to the agency responsible for maintenance. The notification should include: a letter of transmittal addressed to the head of the agency responsible for maintenance; a copy of the most recent bridge inspection reports for each bridge within its jurisdiction (a copy of all attachments should be included); a map that identifies the location of each bridge; and a statement to the effect that additional information is available in our files upon request.

(3) Emergency Handling of Bridge Inspection Findings. Upon discovery of critical conditions posing immediate danger to the traveling public, the Bridge Inspector immediately notifies the BRINSAP Supervisor, who then assesses the situation and, if warranted, takes emergency action to eliminate the danger. For On-System bridges, this might include such actions as using State Forces to close or repair the bridge. For Off-System bridges, emergency action would generally consist of immediately notifying the agency responsible for maintenance. All verbal contact with local jurisdictions regarding critical bridges should be followed as soon as practical with written notification of the bridge inspection findings. Such notification should be hand delivered or sent by registered mail.

1.106 BRINSAP FILE

The BRINSAP file is a computerized file that contains a record of each bridge and tunnel on public roadways in Texas. Each bridge record contains data shown on the Structure, Inventory and Appraisal Sheet, Form 1321-1&2, which is coded in accordance with Chapter IV of this Manual.

The BRINSAP file should be maintained in an accurate and up-to-date condition as discussed in Section 4.100. All inquiries concerning the preparation and submittal of BRINSAP data should be directed to D-10.

1.107 DISTRICT BRINSAP RECORDS

One of the important functions of the BRINSAP program is for each District to maintain a complete, accurate and current record of each bridge in their District. To be useful, the records should be maintained in an orderly system that allows ready access to all the information for a given bridge.

The types of information that should be readily accessible for a given bridge are set forth in Section 4 of the AASHTO Manual. Much of the information required by the AASHTO Manual is summarized in the BRINSAP file, and for this reason each District should keep printouts of that portion of the BRINSAP file pertaining to the bridges in their District.

Periodically the District should obtain a new set of printouts showing the current contents of the BRINSAP file.

In addition to printouts of the BRINSAP file, the District should keep a folder on each bridge. The folder should provide a complete history of the bridge, and should contain all the required information that is not available from the BRINSAP file. The Original Inventory Report (see next paragraph), the initial Bridge Inspection Report (Form 1085), and the initial Bridge Appraisal Worksheet (Form 1387) should be kept in the folder as a permanent record along with subsequent Bridge Inspection Reports and Bridge Appraisal Worksheets. If there is no significant change in the bridge condition and appraisal between inspections, then subsequent Bridge Inspection Reports and Bridge Appraisal Worksheets may be culled when they are more than four years old if they provide no useful information on the history of the bridge.

The original Inventory Report would usually consist of Form 536, Bridge Survey, as shown in Plate 1-2, with attachments as needed to record the information required by the AASHTO Manual. Where construction plans are available much of the required information can be obtained from the plans and may be omitted from the Original Inventory Report. In the absence of construction plans, the Original Inventory Report should contain all the items required in Article 3.2.2 of the AASHTO Manual except for Items 26, 31, 32 and any item that is not applicable to a given bridge, such as a channel profile sheet for a grade separation bridge.

Various items of additional information as set forth in Articles 3.2.3 and 3.2.4 of the AASHTO Manual should be noted in the bridge record as such items of information become available.

T E X A S   H I G H W A Y   D E P A R T M E N T

BRIDGE INSPECTION FOLLOW-UP ACTION WORKSHEET

DISTRICT_______________________ COUNTY_____________________ HIGHWAY___________________

CONTROL_______________________ SECTION___________________ STRUCTURE NO.____________________

STRUCTURE NAME:____

REMARKS____

INSPECTOR____ DATE_____________________

PART OF STRUCTURE	RECOMMENDED ACTION
Roadway - Wearing Surface	
Roadway - Deck	
Roadway - Other	
Superstructure - Main Members	
Superstructure - Bearings	
Superstructure - Other	
Substructure - Abutments	
Substructure - Bents & Piers	
Substructure - Other	
Channel & Channel Protection	
Retaining Walls	
Approaches	
Other	

Form 1386-1
2-75 Edition

DISTRICT MAINTENANCE OFFICE COMMENTS

____
____
____
____
____
____
____
____

Date: ____________________ Comments By: ____________________

FOLLOW-UP ACTIONS TAKEN

Description	Date	Verified By

Form 1386-2
2-75 Edition

Form 536-1 (Rev. 6/79)

BRIDGE SURVEY

(MAINTENANCE DIVISION)

Highway:__________
County:__________
Control:__________
Structure:__________
District:__________

Surveyed by:__________ Date:__________

Structure Name:__________

Speedometer Reading at beginning of Road:__________ At Structure:__________

Distance from beginning of Road:__________ Miles

General Description:__________

Clear Width between Curbs:__________ Vertical Clearance:__________

Type Deck & Surfacing:__________

Stringers: Spans__________

Type__________ Size__________ Number__________

Spacing__________ Controlling Span Length (C-C Bearings)__________

Stringers: Spans__________

Type__________ Size__________ Number__________

Spacing__________ Controlling Span Length (C-C Bearings)__________

Remarks:__________

Date built:__________

Inventory Structural Rating:__________

or Posted Load Restriction:__________

By:__________

Sheet No.__________ of__________ Sheets

Form 536-2 (Rev. 6/79)

PLATE I-2

CHAPTER II
INSPECTION PROCEDURES

SECTION 1—INTRODUCTION

2.100 GENERAL

Bridge inspection is the use of techniques to determine the condition of a bridge, with the user of these techniques being the Bridge Inspector. Good bridge inspection consists of five steps:

(1) Planning of the inspection to ensure that attention is given to each bridge component in accordance with its importance,

(2) Preparation according to the inspection plan,

(3) Careful and systematic observation,

(4) Complete and accurate recording of significant observations,

(5) Assessment of observations to determine condition ratings.

2.101 REFERENCES

In later sections of this Chapter, specific articles from the following references are listed to provide additional guidance for the inspection.

AASHTO Manual for Maintenance Inspection of Bridges, 1983.

FHWA Bridge Inspector's Training Manual 70, 1971.

FHWA Bridge Inspector's Manual for Movable Bridges, 1977.

2.102 FIELD RECORDS

The field records of a bridge inspection should contain a complete and accurate description of the findings, including all signs of distress, failure or defects worthy of mention, as well as ratings of the bridge's condition. Form 1085, Bridge Inspection Record, shown in Plate II-1, serves not only the record-keeping needs but also the need for an inspection checklist to prevent oversights during the inspection. Attachments should be made to Form 1085 where additional space is required for comments, photographs, sketches or measurements.

Form 1085 has a section for each of the six bridge components and for miscellaneous elements. Subcomponents of each component are referred to as elements. The Bridge Inspector enters a numerical condition rating for each applicable element of each component. Each element is rated as to how its condition affects the component as a whole. The best rating is a "9" while the worst is a "0". The rating system is described on Form 1085 and is fully discussed in Chapter 3, Section 1.

The condition rating for each element should equal or exceed the minimum rating listed to the left of each element on Form 1085. The minimum ratings reflect the worst effect that each element could have on the overall component even if the element was thoroughly damaged or deteriorated.

Under this system the overall component rating, which is to be written in the box below the list of elements, equals the lowest rating of any element of the component.

The Bridge Inspector should record fully supportive comments on Form 1085 for all ratings of 7 or below. Attachments should be made to Form 1085 where sketches, photographs or additional comments are needed to record the findings. The Bridge Inspector signs Form 1085 upon completion of inspection. All attachments should be initialed and dated.

From time to time the Bridge Inspector may be called upon to record additional information regarding such things as traffic safety features or the historical significance of bridges. Record-keeping formats for such information should be decided in discussion with the BRINSAP Supervisor.

The original inventory inspection of a bridge requires more extensive record-keeping than Form 1085 provides for subsequent inspections. Refer to the AASHTO Manual, Chapter 3, for guidance in preparing the original inventory record and supplementary records.

SECTION 2—MATERIALS

2.200 STEEL

Examine for any change in alignment and for kinks, bows, torn metal, bends and broken or loose rivets or bolts. Examine for cracks in all areas of high bending moment, and at reaction points such as bearings and connections, especially in and around welds, rivet holes and other changes in cross section.

Members made of ordinary steel should be inspected to see that an effective coating is present to prevent corrosion. Coating failures and subsequent corrosion normally begin on the edges and corners, around rivets, bolt heads and welds, and in joints, pockets, depressions and crevices which tend to trap water and debris.

Since the late 1960s many steel bridges have been built with weathering steel, which contains special alloys to control corrosion. The corrosion process of weathering steel produces a tightly adhering coating of rust scale which inhibits further corrosion. Several conditions can interfere with the formation of a tightly adhering rust scale. Chloride ions from deicing salts or nearby bodies of saltwater can cause weathering steel to rust similarly to the way normal steel rusts. In an industrial environment, corrosive pollutants can reach concentrations sufficient to destroy the protective coating and cause the continued corrosion of weathering steel. Poor details which allow water and debris to collect and remain in contact with the surface of weathering steel can also result in continued corrosion.

Weathering steel should be inspected to see that the protective rust coating has properly formed. Evidence of continued corrosion, such as flaking and pitting should be noted. Where there is evidence of continued corrosion, the plate thickness at several accessible locations should be measured periodically with a micrometer.

Reference: FHWA Manual 70, Chapter 5, Sections 2 and 28.

2.201 CONCRETE

Examine for cracking, scaling, spalling, inadequate cover over reinforcement, exposed reinforcement, corrosion of reinforcement and loss of reinforcement cross-sectional area due to corrosion. Also examine for other deterioration such as hollow sounding areas where the concrete cover has delaminated. Pay close attention to areas of high bending moment or shear, to reaction points such as bearings and connections and to the exposed surface of the bridge deck.

Any cracking, other than the usual hairline cracking associated with the normal behavior of reinforced concrete, should be accurately noted and compared with previous inspection reports to determine if the crack formation is continuing.

Reference: FHWA Manual 70, Chapter 5, Section 1.

2.202 TIMBER

Examine for fungus decay (dry rot and brown rot), insect damage (termites, carpenter ants and powder-post beetles), damage from marine borers, weathering (warping, splintering, etc.), chemical damage (resembles decay), fire damage, wear and impact damage. Use a knife, ice pick or borer to test for decay and internal damage.

Pay close attention to bearing areas, connection areas, areas that retain moisture and debris, areas of piling at the ground line or waterline, and areas around any holes, cuts or other breaks in the timber surface that would allow access to the untreated interior.

Reference: FHWA Manual 70, Chapter 5, Section 3.

2.203 MASONRY

Examine for any displacement, splitting, crushing or any excessive loss of mortar that could cause such deterioration to occur or accelerate. Also, look for any leakage that may be causing a loss of mortar.

Reference: FHWA Manual 70, Chapter 2, Section 5.

SECTION 3—BRIDGE COMPONENTS

2.300 ROADWAY (Item 58)

The roadway component is the deck portion of a bridge carrying vehicular traffic. For railroad, pedestrian, utility and other such underpasses which carry no automotive traffic, code the roadway component not applicable.

(1) Wearing Surface. The wearing surface is any separately applied topping, such as an asphaltic concrete overlay, which is designed to provide a smooth riding surface and to protect the deck from deterioration. The wearing surface is subject to abrading, cracking, crushing and other deteriorating effects produced primarily by the repeated action of heavy wheel loads. Code the wearing surface not applicable if traffic rides directly on the deck.

(2) Deck. The deck is that element of the roadway that directly supports traffic and distributes traffic loads to the main members or floor system. For flat or parabolic slab bridges, i.e., those where the slab is the main member, for composite slab-and-girder bridges, and for direct traffic box culverts, the deck includes only the concrete covering over the top reinforcing steel. In these types of bridges, when extensive scaling, spalling or delamination reaches the top reinforcing steel, the main member capacity will be reduced and should be rated accordingly under the superstructure component. For non-composite bridges, the deck includes the whole of the slab, or similarly functioning element such as timber planking or steel grating.

References: FHWA Manual 70, Chapter 5, Section 20.
AASHTO Manual, Article 2.4.2(10).

(3) Joints. Bridge joints are discontinuities designed into the roadway. Expansion joints are discontinuities extending completely through the roadway and superstructure to allow for independent movement of superstructure sections.

Pan girder bridges and slab bridges may have non-expansion joints between superstructure units, but without studying the as-built plans the Bridge Inspector may not be able to distinguish such joints from expansion joints. Both types of joints in pan girder and slab bridges are maintenance problems because the joint seals are prone to failure. Once the joint seals fail, incompressible particles wedge into the joints and push the superstructure units apart. This action can severely damage bent caps and abutments.

Continuous steel bridges and truss bridges, primarily the older designs, may have sealed construction joints at approximately 30-foot intervals within each superstructure unit. A diafram or floor beam will be found underneath supporting each joint. This type of joint poses maintenance problems similar to the problems with pan girder and slab bridge joints. The joint seals fail in the absence of frequent maintenance. When incompressible particles wedge into this type of joint, the concrete haunches between the deck and the diaframs or floor beams may be broken off, and the expansion joints at the ends of the unit may be damaged.

Failure of joint seals on any type of bridge will allow water to reach superstructure and substructure elements. The water may accelerate corrosion of these elements, especially if deicing salts are used on the bridge.

In newer bridges many joint problems have been eliminated by eliminating as many joints as practical. All construction joints are permanently closed by making reinforcing steel continuous across the joints. Non-expansion joints between superstructure units are eliminated by making the deck continuous across the joint between superstructure units. Where expansion joints are necessary, the joint may be left open and provision made for particles to fall out the bottom of the joint. Where sealed expansion joints are needed, more attention is given to design a durable seal. See the following references for guidance in the inspection of expansion joints.

References: FHWA Manual 70, Chapter 5, Section 21.
AASHTO Manual, Article 2.4.2(9).

(4) Drainage System. The drainage system includes any ditch, drain, gutter, gully, flume, catch basin, downspout, scupper, weep hole or other device used to remove water from the roadway. The drainage system should prevent ponding on the travelway, and should remove the water without causing damage or deterioration to any component of the bridge.

Indications of improper drainage are clogged drain openings, damaged or clogged downspouts, detrimental erosion at discharge points, corrosion or other deterioration around outlets, and sand or soil accumulation on the deck.

References: FHWA Manual 70, Chapter 5, Section 24.
AASHTO Manual, Article 2.4.2(10).

(5) Miscellaneous Roadway Elements. The remaining elements listed under the roadway component on Form 1085 seldom present any particular problem to the Bridge Inspector. Besides the usual deterioration associated with the various construction materials, these elements are subject to impact damage which is almost always obvious.

References: FHWA Manual 70, Chapter 5, Section 22.
AASHTO Manual, Articles 2.4.2(11 through 14).

2.301 SUPERSTRUCTURE (Item 59)

The superstructure component is that portion of a bridge that spans between substructure units and carries dead loads and traffic loads between the substructure units. The usual types of superstructure elements are discussed in this section. See Sections 2.400 through 2.404 for discussion of special types of superstructure elements.

(1) Main Members and Connections. Main members are those whose failures would cause a collapse of the bridge. Main member types are listed under Item 43 in Section 4.103. Main member connections are those whose failures would result in the complete or partial failure of main members. For flat or parabolic slab bridges, for composite slab-and-girder bridges, and for direct traffic box culverts, the deck is the main member or a part thereof. In these types of bridges, when extensive scaling, spalling or delamination reaches the top reinforcing steel, the main member capacity will be reduced and should be rated accordingly.

Besides the usual deterioration associated with the various construction materials, main members of grade separation bridges may be subject to impact damage from high loads.

References: FHWA Manual 70, Chapter 5, Sections 12 and 13.
AASHTO Manual, Articles 2.4.2(5 through 7).

(2) Floor System Members and Connections. The floor system includes those members that carry load from the deck to the main members. Floor system connections are those whose failure would result in the complete or partial failure of a floor system.

Many common structure types have no floor system because the deck can carry traffic loads directly to the main members. However, on most long span bridges the main members are spaced relatively far apart and, consequently, the deck needs support from a floor system which generally consists of stringers and floor beams.

Reference: FHWA Manual 70, Chapter 5, Section 14.

(3) Secondary Members and Connections. Secondary members are those whose principal function is to brace main members against lateral movement. Secondary member connnections are those whose failures would result in complete or partial failure of secondary members.

Most secondary members stabilize the superstructure and transmit lateral loads to the substructure. The failure of secondary members will rarely threaten the load carrying capacity of a bridge under normal conditions.

The common types of secondary members are diaframs, cross frames and lateral wind bracing. Special types of secondary members are found on many truss bridges as discussed in Section 2.400.

Reference: FHWA Manual 70, Chapter 5, Sections 16 and 17.

(4) Bearings. Bearings are the superstructure elements that transfer loads from the superstructure to the substructure or, in the case of cantilever construction, between sections of the superstructure. Many rigid frame bridges, arch bridges, short span bridges and culverts may not have bearings. On short span concrete bridges, bearings may be nothing more than a few layers of roofing felt.

Many bridges, however, need both expansion bearings and fixed bearings. Expansion bearings allow the superstructure to rotate and move a certain amount in the longitudinal direction without damaging the substructure or superstructure. Fixed bearings allow only rotational movements.

In addition, some bridges need shear keys or wind locks. These are bearing devices that transfer lateral loads while allowing rotation and longitudinal movement.

Improper alignment, accumulation of debris, excessive corrosion or other conditions can be detrimental to bearing devices. The Bridge Inspector should note these conditions and should determine if the bearings have locked up or otherwise failed to perform their function. Also note any damage resulting from bearing failure.

References: FHWA Manual 70, Chapter 5, Sections 18 and 19.
AASHTO Manual, Article 2.4.2(8).

2.302 SUBSTRUCTURE (Item 60)

The substructure component includes the abutments and the piers or bents that support the superstructure and transfer loads down into the ground. The usual types of substructure elements are discussed in this Section. See Sections 2.400 through 2.404 for discussion of special types of substructure elements.

(1) Abutments. Abutments are the substructure elements that support the ends of a bridge. By far the most common type of abutment on newer bridges is the open or spill-through abutment consisting of a cap and several piling or drilled shafts. For this type of abutment the approach fill spills through the openings between piling or drilled shafts and forms a slope under the bridge.

Although rare in modern bridge construction, the closed or cantilever abutment is common on older bridges. The cantilever abutment is designed with a breast wall or pier to retain the approach fill. The breast wall or pier has a cap to support the superstructure and has a footing with or without piling to transfer loads into the ground.

Besides the usual deterioration associated with the various construction materials, abutments are subject to foundation movement. Cantilever abutments at waterways are susceptible to undermining by scour and erosion, which is more likely to be critical if the footing is not supported on piling.

References: FHWA Manual 70, Chapter 5, Sections 7 and 8.
AASHTO Manual, Article 2.4.2(3).

(2) Intermediate Supports. Bridges of more than one span have one or more intermediate supports. Intermediate supports are classified as bents or piers and are similar to abutments except that the above ground portion of an intermediate support is usually much greater than the above ground portion of an abutment. Intermediate supports may extend far enough above ground to require lateral support such as bracing, tie beams or web walls.

Besides the usual deterioration associated with the various construction materials, intermediate supports are subject to foundation movement. Intermediate supports in waterways are susceptible to undermining by scour and erosion. Erosion might also remove soil from one side of an interior support and thereby produce lateral soil loads not provided for in the original design. Intermediate supports of grade separation structures may be subject to impact damage from errant vehicles.

References: FHWA Manual 70, Chapter 5, Sections 7, 10 and 11.
AASHTO Manual, Articles 2.4.2(3 and 4).

(3) Collision Protection System. Bridges over navigable waterways usually have a system of dolphins and fenders to protect piers against the normal impact of manuevering vessels. At critical bridges, very large dolphins may be installed to sustain the direct collision of large vessels.

Grade separation bridges usually have guard fences, median barriers, crash walls, crash cushions or similar devices, singly or in combination, which serve to protect the substructure from collision and to minimize the damage to errant vehicles.

Besides the usual deterioration associated with the various construction materials, most collision protection systems are subject to damage from the collisions they protect against. Any such deterioration or damage should be noted on the inspection report.

References: FHWA Manual 70, Chapter 5, Section 25.

2.303 CHANNEL AND CHANNEL PROTECTION (Item 61)

Drainage ditches, streams, rivers, canals, lakes, bays and any other such waterways are considered channels. Grade separation bridges are not considered to have a channel component unless the bridge carries automotive traffic over a substantial waterway that would require a bridge classification structure in the absence of a grade separation bridge.

The channel bed and channel banks should be inspected to determine if any condition exists that could cause damage to the bridge. Evidence of scour, channel bed degradation, bank erosion and channel inadequacy should be noted. When significant changes have occurred in the channel profile, the Bridge Inspector should update the channel profile sheet and investigate the causes and the probable and potential effects the changes may have on the bridge.

Riprap, dikes, jetties and other channel protection devices are sometimes provided to stabilize the channel and thereby protect the substructure and approaches. The Bridge Inspector should note any deterioration and inadequacy of these devices and should determine if repairs or improvements in the channel protection are advisable.

References: FHWA Manual 70, Chapter 5, Section 26.
AASHTO Manual, Articles 2.4.2(2) and 3.2.2(16 and 28).

2.304 RETAINING WALLS (Item 62)

Retaining walls are structures designed to hold back earth where it is necessary to maintain an abrupt change in the ground elevation. In bridge construction, retaining walls are primarily used to hold back portions of the approach embankment.

(1) Abutment Backwalls and Wingwalls. Abutment backwalls are short vertical walls found on top of most abutments. Abutment backwalls hold back the uppermost layers of embankment behind the abutment.

Abutment wingwalls are retaining walls resembling wings found attached to the ends of most abutments. On open abutments the wingwalls extend from the bottom of the cap up to the roadway and serve to keep the embankment from spilling around the ends of the backwall. Wingwalls on open abutments usually extend above the roadway and form part of the bridge rail. On closed abutments, the wingwalls usually extend from the bottom of the abutment footing to the top of the backwall. This type of wingwall is usually the reinforced-concrete, cantilever type consisting of a vertical wall on a spread footing. Smaller bridges, especially Off-System bridges, commonly have wingwalls constructed of timber piling and planks. Occasionally, other materials such as masonry or sheet piling have been used.

The inspection of abutment backwalls and wingwalls is similar to that of an abutment.

(2) Embankment Retaining Walls. Embankment retaining walls are used to hold back the embankment under the bridge or on the sides of the approach roadway. Embankment retaining walls have become prevalent in urban areas primarily at grade separation structures where insufficient right-of-way is available for embankment slopes. In addition to the reinforced-concrete, cantilever retaining walls, a variety of earth-retaining systems are used for embankment retaining walls. Several systems use precast wall panels which are tied back into the embankment by various means. Other systems use precast or prefabricated crib walls of various configurations.

Besides looking for the usual deterioration associated with the various construction materials, the Inspector should look for evidence of progressive failure, such as bulging, settling or tilting. The Bridge Inspector should measure and record any such displacements for future reference.

(3) Culvert Headwalls and Wingwalls. See Section 2.403.

Reference: FHWA Manual 70, Chapter 5, Section 9.

2.305 APPROACHES (Item 63)

The approach component includes the embankment within a few hundred feet of the abutments; slope protection for the embankment such as riprap and vegetation; approach slabs or pavement; relief joints between the bridge and roadway pavement (necessary only when the roadway pavement is reinforced concrete); drainage; delineation; and sight distance. For railroad, pedestrian, utility and other such underpasses which carry no automotive traffic, code the approach component not applicable.

Examine embankments for slope failures, settlements, movements and excessive erosion. Check for inadequacies of slope protection and drainage. Check for unevenness or settlements of approach slabs or pavements, for cracks where water can enter the embankment soil, and for unsealed or clogged relief joints. Check for damage or deterioration of guard fence and delineators. Check whether the available sight distance has been reduced by vegetation growth or other encroachments.

References: FHWA Manual 70, Chapter 5, Section 23.
AASHTO Manual, Article 2.4.2(1).

2.306 MISCELLANEOUS

Miscellaneous elements include signs, illumination, warning devices, utility lines and other encroachments or appurtenances that are found on the bridge.

References: FHWA Manual 70, Chapter 5, Sections 29 through 31.
AASHTO Manual, Articles 2.4.2(19 and 20).

SECTION 4—STRUCTURE TYPES

2.400 TRUSS BRIDGES

A truss bridge is one in which the main members are arranged in a series of triangular figures. Due to their triangular arrangement, the main members of a truss are primarily under axial load. Main members of a truss are referred to as truss members or, more specifically, as upper chord members, lower chord members, end posts, verticals and diagonals. Each truss member and its connections must be checked closely for damage or deterioration because the weakening of one truss member or connection could result in the complete collapse of the bridge.

Floor members of a truss bridge are typical of floor members found in other bridges and should be inspected accordingly.

Secondary members of a truss bridge might include not only the usual diaframs, cross frames and wind bracings found in other bridges, but also various types of lateral bracing. Portal bracing and sway bracing are types of lateral bracing used on through trusses to brace the upper chord and to resist the sway effect of lateral wind loads. On pony trusses the same function may be served by knee braces or outrigger braces. Since portal bracing and sway bracing restrict vertical clearances, they are particularly vulnerable to damage from high loads. Furthermore, when damaged by high loads these members may damage the main members they are attached to.

References: FHWA Manual 70, Chapter 5, Sections 15 and 17.
AASHTO Manual, Articles 2.4.2(15 and 16).

2.401 SUSPENSION BRIDGES

In the late 19th and 20th centuries, perhaps as many as a hundred suspension bridges could be found on Texas roads. These suspension bridges had a characteristically flimsy design. Most had a single-lane, timber deck without stiffening trusses or guardrail or adequate wind bracing. Today only a few relics remain. Nearly all of the old suspension bridges have long since been replaced by stronger, safer bridges.

The inspection of an old suspension bridge differs from the inspection of any other old bridge primarily with regard to the main members and floor system. The main members include the main suspension cables, towers, saddles and anchors. The floor system includes the suspender rods, sockets and cable bands in addition to conventional floor beams and stringers. The Bridge Inspector should examine closely for corroded, cracked, broken or loose tension elements since these are critical to the safety of a suspension bridge.

References: FHWA Manual 70, Chapter 5, Section 34.
AASHTO Manual, Article 2.4.2(18).

2.402 MOVABLE SPAN BRIDGES

Movable span bridges lift, swing or tilt to provide an opening for waterway traffic. In addition to procedures common to fixed span bridges, the inspection of movable span bridges requires special procedures to determine the condition of the mechanism and power unit that provide movement.

Planning for the inspection of a movable span bridge should include a thorough study of the construction plans and the applicable sections of the following references. Special reporting formats should be prepared as recommended in the *Bridge Inspector's Manual for Movable Bridges*, Chapter IV.

References: FHWA Bridge Inspector's Manual for Movable Bridges, 1972.
AASHTO Manual, Article 2.4.2(17).

2.403 CULVERTS

Approximately one third of the bridge classification structures in Texas are culverts. The Bridge Inspector may encounter a variety of culvert designs, the peculiarities of which are discussed in the following sections. In general culverts will have each of the six bridge components in one form or another, and these should be inspected as discussed in Sections 2 and 3 of this Chapter.

Reference: FHWA Manual 70, Chapter 5, Section 27.

(1) Reinforced Concrete Box Culverts. The most common type of bridge classification culvert is the multiple box culvert constructed of reinforced concrete. Older construction is invariably cast-in-place whereas newer construction is likely to consist of precast units laid in 8′ to 12′ lengths.

(a) Roadway. On some culvert installations the traffic rides directly on the top slab or on an asphaltic wearing surface placed on the top slab. These installations are called direct traffic box culverts. In such installations the roadway component includes the wearing surface (if present), deck joints (if present), drainage system and miscellaneous elements.

On most culvert installations traffic rides on a pavement constructed on a fill that may range in height from 1 ' to 30 ' or more. In such cases the roadway component includes only the wearing surface, drainage system and miscellaneous items such as guard fence.

(b) Superstructure. The superstructure of a reinforced concrete box culvert includes only the main member (the top slab) and main member connections (the joints between the top slab and the walls). The superstructure is subject to shear failure under high fill which is indicated by longitudinal cracks in the top slab at or near the joints. The superstructure is also subject to flexural failure under high fills or heavy overloads. Flexural failure is indicated by a noticeable sag in the top slab accompanied by sizable longitudinal cracks near midspan. Distress at the joints may also be noted but is likely to be hidden on the outside of the box.

Normal flexural cracks will be found on most reinforced concrete box culverts, especially those under high fill. These cracks are commonly described as hairline flexural cracks and typically have a width on the order of 0.01 ". Circumferential cracks may also be noted at intervals along the length of the box. Circumferential cracks indicate differential settlements and are detrimental only because they can lead to corrosion of the main reinforcing steel.

(c) Substructure. The substructure of a reinforced concrete box culvert includes the vertical walls and the bottom slab or footings. If a bottom slab is present it may be subject to the same types of shear and flexural failure that the top slab is subject to. If there is no bottom slab then the major problem to look for will be undermining of the footings.

(d) Channel and Channel Protection. Outfall aprons, toe walls, riprap or similar constructions around the opening of a culvert serve to maintain channel stability and to prevent undermining of the culvert or erosion of the surrounding fill.

(e) Retaining Walls. The retaining wall component includes headwalls and flared or parallel or straight wingwalls. Wingwalls keep the embankment from spilling around the ends of the culvert whereas headwalls keep the embankment from spilling over the top of the culvert ends. On some installations, these elements are omitted and the culvert is extended all the way out to the end of the embankment slope much the way pipe culverts are often installed.

(f) Approaches. If the culvert is under a fill, then the fill should be rated under the embankment and slope protection elements.

(2) Timber Culverts. The Bridge Inspector may occasionally encounter culverts in which the main member is a laminated timber deck covered with fill and the substructure is concrete, masonry or timber construction. These should be inspected with particular attention to decay of the timber deck.

(3) Concrete Pipe Culverts. Precast reinforced concrete pipe culverts are available in diameters up to 10' which may qualify for bridge classification per Section 1.102 if installed on a very large skew. Although precast and cast-in-place unreinforced pipe are also available, they are generally small diameter pipe which do not qualify for bridge classification even in multiple installations.

The top half of a pipe is considered the superstructure and the bottom half of the substructure. Other elements and components are typical of those discussed under reinforced concrete box culverts.

The principal mode of failure is flattening of the pipe accompanied by extensive longitudinal cracking. In addition to examining for longitudinal cracks, the Bridge Inspector should check for flattening by measuring horizontal and vertical diameters at intervals along the culvert.

(4) Corrugated Metal Pipe Culverts. The term corrugated metal refers to aluminum or galvanized steel sheet metal up to 0.168" thick that has been manufactured with corrugation up to 6" by 1". Metal culverts having larger corrugations are called structural plate structures and are discussed in the following subsection.

Corrugated metal pipe culverts are available in riveted, welded or lock seam fabrication in diameters up to about 10' which may qualify for bridge classification per Section 1.102 if installed on a very large skew. In most cases corrugated metal pipes are round, but sometimes they are manufactured with a flattened bottom to get the most flow area in a given height, in which case they are called pipe arches.

The top half of the pipe or pipe arch is considered the superstructure and the bottom half the substructure. Other elements and components are typical of those discussed under reinforced concrete box culverts.

The principal mode of failure is flattening of the pipe which progresses to an inward buckling of the pipe wall, and culminates in a complete or partial collapse of the pipe. In addition to checking for cross-sectional distortions that would indicate a potential failure, the Bridge Inspector should examine for abrasion and corrosion inside the pipe, and for damage to the metal edges at the culvert inlet.

(5) Structural Plate Structures. The term structural plate structure refers to a variety of round, elliptical and arch shaped metal culverts which involve relatively large radii of curvature and are available in spans up to about 40'. Currently, steel plates up to 0.280" thick are manufactured in 6" x 2" corrugations, and aluminum plates up to 0.250" thick are manufactured in 9" x 2½" corrugations.

A structural plate structure is a composite structure made up of a metal ring and a soil envelope. Both materials play a vital part in the strength of the structure. Structural plate structures are assembled on site by bolting corrugated plates together to form the metal ring. Suitable backfill is then pushed against the sides and over the top of the metal ring in a carefully controlled procedure of placement and compaction.

The inspection of a structural plate structure is similar to that of a corrugated metal culvert and should include a thorough examination for deterioration, damage and cross-sectional distortion. However, as the span length increases so does the difficulty of inspection. Moreover, the longer span structures are much more susceptible to errors in construction, the primary ones being inadequate compaction and the use of unsuitable backfill such as soils with a high percentage of clay or silt.

An illustrative failure occurred in 1983 near Antwerp, Ohio. A structural plate structure with a 30' span collapsed 10 years after installation. Investigation of the collapse, which caused five deaths and four injuries, indicated that the primary reason for the collapse was the use of an unsuitable backfill material that was 90% clay. Pavement settlements and cross-sectional distortions had been noticed for many years but the implications had been ignored by the authority responsible for maintenance. As the pavement settled it had been periodically filled in with additional asphalt to a cumulative thickness of approximately 2' at midspan of the bridge.

From the preceding account, it is obviously important that the Bridge Inspector examine structural plate structures for pavement settlement and cross-sectional distortion. Visual sighting and selected measurements may suffice for smaller structures in multiple installations, but for structural plate structures with a clear span of 20′ or more the Bridge Inspector should carefully measure the cross-section at several sections along the length of the structure. The minimum requirements are to measure the horizontal span at the spring line and the vertical height at the midspan and quarter points. The vertical dimensions should be referenced to a suitable elevation such as the spring line.

Detailed measurements should be made initially every two years. If the records show no significant distortions or movements then the interval of measurement may be increased up to 10 years.

2.404 TUNNELS

The components of a tunnel are similar to the components of a culvert with the main difference being that the roadway passes through a tunnel whereas it passes over a culvert. Inspection of tunnel components is similar to the inspection of the components of a large culvert.

Close inspection of the tunnel lining is required to detect loose or delaminated concrete that may fall to the roadway. At the entrances close inspection is required to detect loose rock or other material that may slide down onto the roadway.

It is not unusual for water to leak from the seams or cracks in a tunnel. However, in freezing weather leaking water can form icicles that may reach dangerous proportions, and if the water drips on the roadway the pavement may ice over. Each leak must be studied to determine if remedial action is necessary. In minor cases the water may be diverted to the sides of the tunnel. In extreme cases waterproofing may be necessary.

The condition of reflector buttons, traffic stripes and other roadway delineation should be given special attention due to the importance such items have in providing good visibility in a tunnel.

SECTION 5—UNDERWATER INSPECTION

2.500 GENERAL

Bridges over waterways may require underwater inspection to determine the condition of the Substructure (Item 60) or the Channel and Channel Protection (Item 61). Underwater inspection includes probing and sounding techniques as well as techniques for visual inspection using divers, remote-controlled cameras or caissons. The inspection techniques, the frequency each technique is to be used, and the requirements for special equipment depend on channel and substructure characteristics.

In most cases underwater inspection is unnecessary because the stream is small enough during periods of low water to permit adequate inspection of the substructure and channel. In those cases where significant portions of the substructure and channel are constantly submerged, appropriate underwater inspection techniques should be employed.

Reference: FHWA Manual 70, Chapter 5, Section 33.

2.501 CHANNEL CONDITION

Investigation of the channel condition should not require divers or special equipment except in rare instances. In ordinary cases the Bridge Inspector measures the channel profile with a drop line from the upstream side of the bridge, and investigates scour conditions around piers with a drop line or other depth finding device while operating from a boat.

Reference: AASHTO Manual, Article 2.4.2(2).

2.502 SUBSTRUCTURE CONDITION

Investigation of the substructure condition does not usually require divers or special equipment. Substructure deterioration will usually be critical in the splash zone, the area near the water surface which is exposed at different times to both air and water. With few exceptions a thorough examination of the splash zone at low tide or periods of low water will provide a sufficient indication of the condition of portions below the splash zone.

One important exception occurs where piling are capped at the water surface. The cap can prevent an examination of splash zone portions of the piling. Additionally, concrete piling capped at the water surface may have been split or cracked during installation, and such damage could have easily gone undetected since the major part of the piling is underwater.

Situations, such as piling capped at the water surface, justify the use of divers for a thorough initial inspection and periodic reinspections of critical areas. Other situations may also justify the use of divers, particularly where there is above water deterioration or some indication that substructure problems may exist underwater.

Reference: AASHTO Manual, Article 2.4.2(3).

2.503 USE OF DIVERS

Divers performing underwater inspection or operating underwater cameras shall meet the qualifications of a Bridge Inspector. Divers should normally be non-Department employees performing under a properly executed diving services agreement.

STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
Form 1085-1 – 9-84

Bridge Inspection Record

District ________ County ________ Control ________ Section ________ Structure No. ________ Highway ________

Description ____

________________________ Inspector's Signature ________________________ Date ________

Condition Rating

9 ________ New condition
8 ________ Good condition – no repairs needed
7 ________ Generally good condition – potential exists for minor maintenance
6 ________ Fair condition – potential exists for major maintenance
5 ________ Generally fair condition – potential exists for minor rehabilitation
4 ________ Marginal condition – potential exists for major rehabilitation
3 ________ Poor condition – repair or rehabilitation required immediately
2 ________ Critical condition – bridge should be closed until repairs are complete
1 ________ Critical condition – bridge closed but repairable
0 ________ Critical condition – bridge closed and beyond repair
N ________ Not applicable

NOTES: Enter a rating for each element of each component. The rating should equal or exceed the minimum rating listed to the left of each element. The overall Component Rating should equal the lowest rating of any element of the component. Fully supportive comments are to be made hereon or on attachments for all ratings of 7 or below.

Roadway

Min.		Condition Rating
1	Deck	
6	Wearing Surface	
6	Joints, Expansion, Open	
6	Joints, Expansion, Sealed	
6	Joints, Other	
6	Drainage System	
6	Curbs, Sidewalks & Parapets	
6	Median Barrier	
6	Railings	
7	Railing Protective Coating	
7	Delineation (curve markers)	
	Other	

Roadway Component Rating ________

Comments:

Superstructure

Min.		Condition Rating
0	Main Members – Steel	
0	Main Members – Concrete	
0	Main Members – Concrete, Prest.	
0	Main Member Connections	
1	Floor System Members	
1	Floor System Connections	
5	Secondary Members	
5	Secondary Member Connections	
6	Expansion Bearings	
6	Fixed Bearings	
6	Steel Protective Coating	
	Other	

Superstructure Component Rating ________

Comments:

PLATE II-1

Substructure

Min.		Condition Rating
0	Abutments	
	Caps	
	Above Ground	
	Below Ground or Foundation	
0	Intermediate Supports	
	Caps – Concrete	
	Caps – Steel	
	Caps – Timber	
	Above Ground – Concrete	
	Above Ground – Steel	
	Above Ground – Timber	
	Above Ground – Masonry	
	Below Ground or Foundation	
5	Collision Protection System	
6	Steel Protective Coating	

Substructure Component Rating

Comments:

Channel & Channel Protection

Min.		Condition Rating
4	Channel Banks	
4	Channel Bed	
5	Rip Rap	
5	Dikes	
5	Jetties	
	Other	

Channel & Channel Protection Component Rating

Comments:

Retaining Walls

Min.		Condition Rating
5	Abutment Backwalls & Wingwalls	
5	Embankment Retaining Walls	
5	Culvert Headwalls & Wingwalls	
	Other	

Retaining Walls Component Rating

Comments:

Approaches

Min.		Condition Rating
4	Embankments	
5	Slope Protection	
5	Slabs or Pavements	
6	Relief Joints	
6	Drainage	
6	Guardfence	
7	Delineation	
7	Sight Distance	
	Other	

Approaches Component Rating

Comments:

Miscellaneous

Min.		Condition Rating
7	Signs	
7	Illumination	
7	Warning Devices	
7	Utility Lines	
	Other	

Comments:

Form 1085-2 – 9-84

CHAPTER III

BRIDGE RATING

SECTION 1—CONDITION RATINGS

3.100 GENERAL

As discussed in Section 2.102 a one-digit condition rating is assigned to each bridge element and component. Brief descriptions of the ratings are printed on the Bridge Inspection Record, Form 1085, as shown in Plate II-1. Detailed descriptions are provided in Plates III-1 and III-2.

The term "condition" as used in the condition rating descriptions refers to the amount of deterioration or damage observed in the field irrespective of any design deficiencies. For example, an old bridge designed to lower standards may show less deterioration than a newer bridge designed to current standards. In this case, the old bridge would have higher condition ratings even though the newer bridge is stronger, wider and safer than the old bridge. Design deficiencies are addressed under appraisal ratings in Sections 3.200 through 3.206.

The Bridge Inspector should evaluate the deterioration of each element separately, and should determine its condition rating irrespective of the ratings of other elements unless deficiencies in the element are due to deficiencies in another element. One example where there may be an interdependence of condition ratings is instability of an embankment or channel bank that threatens the stability of an abutment, in which case the abutment would be rated down even if it showed no deterioration. In general such interdependences are rare and the Bridge Inspector should not rate one element down simply because other elements have low ratings.

Each element is rated as to how its condition affects the component as a whole. The condition rating for each element should equal or exceed the minimum rating listed to the left of each element on Form 1085. The minimum ratings reflect the worst effect that each element could have on the overall component even if the element was thoroughly damaged or deteriorated. Under this system the overall component rating, which is to be written in the box below the list of elements, equals the lowest rating of any element of the component.

Only permanent repairs or supports should be considered in determining condition ratings. Permanent implies that the repairs or supports return the damaged or deteriorated element to a condition which is as good or better than the remainder of the bridge. Temporary, on the other hand, implies that the repairs or supports are a stopgap measure, inferior to the remainder of the bridge and, therefore, likely to deteriorate faster than the remainder of the bridge. Temporary repairs or supports are not considered in determining condition ratings. For example, if a bridge superstructure is washed out in a flood, it should be rated a 2 even if a temporary superstructure has been erected to keep the bridge open. The rating of 2 is based on the fact that the original superstructure is unable to carry live load, and if the temporary repairs are removed the bridge would have to be closed.

It should be recognized that the determination of condition ratings is a matter of judgment requiring qualified Bridge Inspectors, knowledgeable and experienced in the field of bridges, to apply the instructions of this Manual. In situations where a good case can be made for either of two condition ratings, there is only one practical thing to do. Call it the way you see it.

SECTION 2—APPRAISAL RATINGS

3.200 GENERAL

Each of six bridge features is assigned a one-digit appraisal rating to evaluate a bridge in relation to the highway or road system and functional classification of which the bridge is a part. The general criteria for appraisal ratings are given in Plate III-3. Specific criteria for appraising each feature are given in subsequent sub-sections.

Individual deficiencies in the various features are evaluated as to how they affect the safety and serviceability of the bridge as a whole. The intent of appraisal ratings is to compare the existing bridge to a new one built to the current standards for the particular highway system of which the bridge is a part.

The Appraiser should consider all relevant factors in evaluating a feature and should evaluate each feature separately irrespective of the other features' ratings. Although the following sub-sections provide guidelines for the appraisal of bridge features, in some cases the Appraiser may need expertise in specialized fields of engineering, such as structural design, maintenance, hydraulics, soils or traffic safety. The Appraiser should never hesitate to call upon the expertise of engineers in any such fields where the Appraiser lacks experience.

The Appraiser usually makes appraisals in the office where inspection files, project plans, specifications, standards and other reference materials are available if needed. The experienced Appraiser may, however, be familiar enough with current standards to make some appraisals in the field while performing the duties of Bridge Inspector. As an aid in making and recording appraisals, a Bridge Appraisal Worksheet is provided in Plate III-4.

3.201 STRUCTURAL CONDITION (Item 67)

This feature applies to all bridges and its rating takes into account any major structural deficiencies. This rating is to be based partially on the Roadway (Item 58), Superstructure (Item 59) and Substructure (Item 60) condition ratings and on the load carrying capacity.

The rating of this feature should be determined as given in Plate III-5, but should be no higher than the lowest of the Superstructure and Substructure condition ratings. The rating should also be no higher than the Roadway condition rating plus 1.

3.202 ROADWAY GEOMETRY (Item 68)

This feature applies to bridges over which automotive traffic passes and its rating represents the overall adequacy of the roadway width and the vertical clearance over the roadway.

Bridge roadway widths are measured perpendicular to the direction of travel and are taken as the horizontal distance between the faces of barriers to lateral movement, i.e., bridge rails, median barriers or curbs. The rating for bridge roadway width should be determined from the appropriate table in Plate III-6. However, regardless of the criteria in Plate III-6, if the bridge roadway width is less than the approach roadway width exclusive of shoulders, then this rating should be 3 or less.

Vertical clearances are measured as the smallest vertical distance from the pavement up to an overhead obstruction. The rating for vertical clearance should be determined from Plate III-7.

The overall rating for roadway geometry should be taken as the lowest rating determined for the roadway width and vertical clearance.

3.203 VERTICAL AND LATERAL UNDERCLEARANCES (Item 69)

This feature applies to bridges under which automotive or railroad traffic passes and its rating represents the adequacy of the vertical and lateral underclearances. Vertical clearances are measured as the smallest vertical distance from the structure down to the roadway surface (including usable paved shoulders) or to the top of railroad rails. Lateral clearances are measured as the smallest horizontal distance from the structure to the edge of a roadway lane or to the centerline of a railroad track.

This rating should be taken as the lowest rating determined from the criteria given in Plates III-7 and III-8. Code N if the bridge is not over a railroad or automotive roadway.

3.204 SAFE LOAD CAPACITY (Item 70)

This feature applies to structures over which automotive traffic passes and its rating represents the adequacy to carry the State legal load. This rating evaluates the load that may safely use the bridge in comparison to the State legal load.

It should be noted that the Engineer may decide to set the safe load capacity for a given bridge at a load level higher than the design or inventory rating. This decision can be made at the Engineer's discretion to minimize the need for posting of bridges as discussed in AASHTO Manual for Maintenance Inspection of Bridges, Article 4.1. In no case, however, should the load level used be greater than those permitted by the operating rating.

If the State legal load exceeds load levels permitted by the operating rating, then the bridge should have a posted load restriction and the appraisal of safe load capacity should be 4 or less. If the bridge already has a posted load restriction, then regardless of the operating rating, the appraisal of safe load capacity should be 4 or less. The appraisal of safe load capacity should be 5 or greater if the State legal load does not exceed load levels permitted by the operating rating and the bridge does not have a posted load restriction.

The appraisal of safe load capacity should reflect the use or presence of a temporary bridge or a bridge shored up or repaired on a temporary basis. This means the rating should reflect the loads actually allowed to use the bridge. If the bridge cannot safely carry the State legal load, it should be posted for load restriction and this appraisal rating should be based on the posted load restriction.

Additional criteria for determining this rating are given in Plate III-9.

3.205 WATERWAY ADEQUACY (Item 71)

This feature applies to all bridges carrying automotive traffic over any type of waterway. Its rating represents the adequacy of the waterway to carry peak water flows.

The primary criterion for determining this rating is the frequency of the design flood as given in Plate III-10. The design flood is the maximum water flow that can pass under the bridge. If hydraulic design information is not available, the frequency of the design flood may be assumed to equal the frequency of overflooding. Local officials and residents are usually a good source of information about bridges that have a history of overflooding.

The Bridge Inspector should also consider the condition of the channel and channel protection. Indicators, such as scour, erosion and damaged slope protection, become especially important in the absence of flood information. It is possible to have problems with the channel and channel protection with no apparent damage to the structure, yet the conditions indicate waterway inadequacies that could result in damage to the structure during a flood. Any adverse conditions of the channel and channel protection should be related to their current effect on the structure as well as the potential hazard to the structure if the condition is not corrected.

If there is no significant damage or potential hazard, then this rating should be 4 or higher. If significant damage or a potentially hazardous condition exists, then this rating would be 3 or less depending upon the extent.

3.206 APPROACH ROADWAY ALIGNMENT (Item 72)

This feature applies to bridges over which automotive traffic passes and its rating represents the adequacy of the approach roadway alignment, both horizontal and vertical.

This rating identifies those bridges which do not function properly or safely due to the alignment of the approaches. A bridge would rarely, if ever, be replaced due to the approach roadway alignment, but a bridge should be classified as obsolete when its approaches are such that they can no longer safely service today's traffic.

When the approach roadway alignment is questionable, the Bridge Inspector should drive the approaches, several times if necessary, to estimate the safe or comfortable speed limit. Consider only those curves which are close enough to the bridge that a vehicle will not have enough time to totally recover from the curve before entering the bridge.

The safe or comfortable speed limit on a horizontal curve may be defined as the estimated speed above which more than usual concentration and effort are required to remain in the proper lane throughout a curve. The safe or comfortable speed limit as determined in the field is a subjective evaluation of various factors such as the degree of curvature, lane and shoulder widths, road roughness and sight distances. When the bridge is on a crest or sag, the Bridge Inspector should not only consider headlight distance and sight distance versus stopping distance, but should also consider vertical accelerations in estimating the safe or comfortable speed limit.

The safe or comfortable speed limit may be assumed to equal the posted advisory speed if one exists.

Criteria for determining this rating are given in Plate III-11.

SECTION 3—TRAFFIC SAFETY RATINGS (Item 36)

3.300 GENERAL

Traffic safety features apply to bridges over which automotive traffic passes and their ratings represent whether or not the traffic safety features meet currently acceptable standards. Traffic safety features include bridge railing, approach guardrail transitions, approach guardrail and approach guardrail ends. The rating of traffic safety features is illustrated in Plate III-12 and discussed below. As an aid in making and recording appraisals, a Bridge Appraisal Worksheet is provided in Plate III-4.

Each of the four traffic safety features is assigned a rating of 1 if it meets currently acceptable standards, and is assigned a rating of 0 if it does not. If the feature is not required, as on bridges which do not carry automotive traffic, then code N. Bridge classification culverts do not require traffic safety features where the culvert opening is 30′ or more from the nearest edge of a traveled lane. If the end is within 30′, traffic safety features are required. However, if there are several feet of fill above the culvert, guard fence can be used along the full length of the culverts and approaches, in which case bridge railings and guardrail transitions are not required.

Currently acceptable standards have been developed using the AASHTO "Standard Specifications for Highway Bridges" and the AASHTO "Guide for Selecting, Locating and Designing Traffic Barriers." Details of the currently acceptable standards are provided in the Appendix as an aid in evaluating traffic safety features.

3.301 BRIDGE RAILING (First Digit of Item 36)

Some factors that affect the proper functioning of bridge railing are height, material, strength and geometric features. The primary purpose of bridge railing is to keep errant vehicles from falling off the bridge. The currently acceptable standards are designed to contain a 4500-pound vehicle traveling 60 mph and impacting the railing at a 25° angle. For a few critical locations, bridge railings have been designed to contain much larger vehicles such as a school bus or semi-trailer rig. These special railings will be much taller and stronger than any of the standard details provided in the Appendix.

Existing bridge railing should be checked against the details provided in the Appendix. In general, if the bridge railing was built or widened after 1965 as part of a State or Federal-Aid project, then the railing will meet currently acceptable standards. If the Bridge Inspector is unable to determine whether or not an existing bridge railing is one of the currently acceptable standards or a special railing that exceeds currently acceptable standards, then the Bridge Inspector should take detailed photographs and measurements of the bridge railing so that a thorough evaluation can be made.

3.302 APPROACH GUARDRAIL TRANSITIONS (Second Digit of Item 36)

The transition from the approach guardrail to the bridge railing requires that the approach guardrail be firmly attached to the bridge railing. It also requires that the approach railing be gradually stiffened as it comes closer to the rigid bridge railing. Without a gradual stiffening, the approach guardrail transition will cause snagging or pocketing of an impacting vehicle as it slides down the approach guardrail and into the end of the rigid bridge rail. One exception to this second requirement is the flexible T6 bridge railing which does not require stiffening of the approach guardrail.

There is one additional requirement of the transition. When curbs and sidewalks end at the end of a bridge, they should be gradually tapered out or shielded by the bridge railing and guardrail.

Details of currently acceptable transitions are provided in the Appendix as an aid in evaluating approach guardrail transitions.

3.303 APPROACH GUARDRAIL (Third Digit of Item 36)

Rarely does the need for a barrier stop at the end of a bridge. Thus an approach guardrail with adequate length and structural qualities is required. Details of currently acceptable approach guardrail are provided in the Appendix.

3.304 APPROACH GUARDRAIL ENDS (Fourth Digit of Item 36)

The ends of approach guardrails should be flared, buried, made breakaway or shielded so as not to be a hazard. Details of currently acceptable end treatments for approach guardrails are provided in the Appendix.

SECTION 4—STRUCTURAL RATINGS AND LOAD POSTING

3.400 GENERAL

The structural rating of a bridge is a numerical evaluation of its live load capacity. The two structural ratings used are the Inventory Rating and Operating Rating. The Inventory Rating is the lower of the two load levels and it represents the heaviest loads that can safely use the bridge for an idefinite period of time. The Operating Rating is the upper load level and it represents the absolute maximum permissible load that can safely use the bridge on an occasional basis. The live loads used in determining the Inventory and Operating Ratings are the standard AASHTO H or HS trucks.

The Inventory and Operating Ratings may be determined by either Load Factor or Working Stress methods. The method used should be identified in the rating calculations which become part of the permanent record of each bridge. Rating calculations should properly account for the strength of the construction materials in their current condition and should be reviewed periodically and updated as needed to reflect current conditions.

Temporary repairs or shoring should not be considered in the rating calculations. In other words, the Inventory and Operating Ratings should reflect the strength of the bridge without temporary repairs or shoring.

When the design loading of a bridge is known and there is no significant loss of strength due to damage or deterioration, the Inventory and Operating Ratings may be determined using the simplified procedures in this manual. However, when the design loading is unknown or the bridge has been significantly weakened by damage or deterioration, a detailed evaluation starting with a thorough field investigation is necessary. In such cases, refer to Chapters 4 and 5 of the AASHTO Manual for guidance in determining the Inventory and Operating Ratings.

When the reinforcing details of a concrete bridge are unknown, the physical inspection of the bridge may be all that is required for a qualified Engineer to make a judgment that the bridge is safe for all legal loads. If a concrete bridge is in sound condition and has been carrying unrestricted traffic for many years with no sign of distress, then it is acceptable to assume H15 Inventory and H20 Operating Ratings, and to not post the bridge for load restriction. The fact that the Inventory and Operating Ratings are assumed should be noted in the permanent record. The bridge should be inspected at intervals more frequent than every two years for any sign of distress that may develop until such time as the bridge is strengthened or replaced.

If the Inventory Rating of a bridge is less than H or HS20, the bridge should be considered for load posting. However, in order to minimize the need for posting bridges the agency responsible for maintenance may allow loads up to the Operating Rating to use the bridge provided that the agency maintains a level of inspection that will ensure the detection of problem areas in advance of actual detrimental behavior. This level of inspection should be more frequent than every two years.

If the Operating Rating of a bridge is less than H or HS20, i.e., the State legal load, the bridge should be posted as required by the National Bridge Inspection Standards, Code of Federal Regulations, 23 CFR 650C.

Procedures for determining suitable posting loads are provided in Section 3.403.

Reference: AASHTO Manual, Chapters 4 and 5.
Code of Federal Regulations, 23 CFR 650C.

3.401 INVENTORY RATING (Item 66)

As stated in Section 3.400 the Inventory Rating of a bridge represents the heaviest loads that may safely use the bridge for an indefinite period of time. When the Design Loading is known, the Inventory Rating may be assumed to equal the Design Loading provided the bridge has not been weakened by damage or deterioration or by the addition of dead weight such as thick overlays which were not allowed for in the design. Overlays 2" and thinner are not usually heavy enough to warrant reducing the Inventory Rating below the Design Loading. An exception would be a very light, weak bridge such as an old truss bridge that could be significantly weakened by a 2" overlay.

If the Design Loading is unknown or if the bridge has been significantly weakened, the Inventory Rating should be determined in accordance with Chapters 4 and 5 of the AASHTO Manual.

Example 1: Simple-span, concrete bridge. 1928 plans state "bridge was designed for a 15-ton truck." This equals the Design Loading currently designated H15. The bridge shows no significant damage or deterioration and has no more than a 2" overlay of asphaltic concrete. Therefore the Inventory Rating may be assumed to equal H15.

Example 2: Continuous, steel I-beam bridge. 1968 plans state "H20-S16 Loading" This equals the Design Loading currently designated HS20. The bridge shows no significant damage or deterioration that would reduce its load carrying capacity. The bridge has no overlay. Therefore the Inventory Rating may be assumed to equal HS20.

Example 3: Simple-span, steel I-beam bridge. 1964 plans state "H20 Loading." A significant amount of the steel cross-section has been lost due to corrosion. In addition, the bridge has been overlaid with 5" of asphaltic concrete. The Inventory Rating should be determined in accordance with Chapters 4 and 5 of the AASHTO Manual.

3.402 OPERATING RATING (Item 64)

As stated in Section 3.400 the Operating Rating of a bridge represents the absolute maximum permissible load that can safely use the bridge. When the Inventory Rating is assumed to equal the Design Loading as discussed in the previous section, it will often be satisfactory to assume that the ratio of the Operating Rating to the Inventory Rating equals the ratio of 75 to 55. In other words it will be conservative and, in many cases, sufficiently accurate to assume that the Operating Rating equals the Inventory Rating times the ratio of 75 to 55.

This simplified ratio technique was derived from the fact that the allowable stress level for Inventory Ratings is 55% of the yield stress whereas the allowable stress for Operating Ratings is 75% of the yield stress. If a bridge has no dead load then the entire portion of the allowable stress is used in carrying live load and the Operating to Inventory Ratio exactly equals the ratio of 75 to 55. On the other hand, if a bridge has a substantial amount of dead load then an accurate structural analysis in accordance with the AASHTO Manual will result in an Operating Rating substantially higher than that determined by the simplified ratio technique. In such cases the simplified ratio technique may not be sufficiently accurate.

Example 1: (Same as Example 1 in Section 3.401)

$$\text{Operating Rating} = \frac{75}{55} \times \text{H15} = \text{H20}$$

Example 2: (Same as Example 2 in Section 3.401)

$$\text{Operating Rating} = \frac{75}{55} \times \text{HS20} = \text{HS27}$$

Example 3: (Same as Example 3 in Section 3.401)
The Operating Rating should also be determined in accordance with Chapters 4 and 5 of the AASHTO Manual.

3.403 LOAD POSTING

As discussed in Section 3.400, a bridge that is incapable of safely carrying the State legal load should be posted for load restriction.

When it is necessary to post a bridge, the simplified procedure given in Plate III-13 may be used to determine suitable posting loads. The procedure is based on an analysis of several legal load configurations representing the actual loads likely to be encountered. The procedure results in an axle load limit for spans less than 40 ' and results in both an axle and a gross load limit for spans 40 ' and greater. Plate III-13 also illustrates the use of appropriate posting signs from the Texas Manual on Uniform Traffic Control Devices.

Approximations are involved in the procedure which make it unacceptable at load levels higher than the Inventory Rating. But more importantly, a posted load limit implies to the traveling public that loads up to the posted limit may safely use the bridge for an indefinite period of time without restriction as to the frequency such loads may cross the bridge. Since the Inventory Rating represents the heaviest loads that can safely use a bridge for an indefinite period of time, it is recommended if a bridge is to be posted that it be posted for a load limit equivalent to the Inventory Rating.

The AASHTO Manual recommends in Article 4.7.2 that no bridge should be posted for less than 6000 lbs. The simplified procedure given in Plate III-13 recommends that no bridge should be posted for less than a 5000-lb axle or tandem load limit or an 8000-lb gross load limit. These recommended values are based on the AASHTO Manual's recommendation and on an analysis of typical load configurations representing the actual loads likely to be encountered.

If the agency responsible for maintenance elects to post a bridge for a load limit higher than the Inventory Rating, then the agency should maintain a level of inspection and surveillance that will insure the detection of problem areas in advance of actual detrimental behavior. This level of inspection should be more frequent than every two years. When posting a bridge for a load limit higher than the Inventory Rating, the agency should also evaluate the bridge with respect to the actual loads likely to use the bridge.

For off-system bridges, when furnishing posting recommendations to the cities and counties, it should be emphasized that the Department is doing so only for advice and assistance, and that no mandatory imposition is intended. Since the Department has no authority to make posting mandatory, the decision as to whether an off-system bridge will be posted is left up to the discretion of the city or county authorities.

SECTION 5—SUFFICIENCY RATING

3.500 GENERAL

The sufficiency rating formula, which is outlined in Section 3.501, is a method of evaluating the factors that indicate a bridge's sufficiency to remain in service. The formula calculates the sufficiency rating of a bridge on a scale from 0 to 100. An entirely sufficient bridge would receive a rating of 100, whereas an entirely deficient bridge would receive a rating of 0. Utility bridges, railroad underpasses and other bridges that are not designed to carry automotive traffic do not receive a sufficient rating.

As part of the sufficiency rating calculation, bridges are classified as "Structurally Deficient" or "Functionally Obsolete." A bridge is labeled Structurally Deficient if it meets either of the following criteria:

(1) A condition rating of 4 or less for

Item 58—Roadway; or
Item 59—Superstructures; or
Item 60—Substructures.

(2) An appraisal rating of 2 or less for

Item 67—Structural Condition; or
Item 71—Waterway Adequacy.

If a bridge is not labeled Structurally Deficient it will be labeled Functionally Obsolete if it meets one of the following three criteria:

(1) An appraisal rating of 3 or less for

Item 68—Roadway Geometry and the bridge's roadway width is less than the following:

Item 29. ADT equal to or less than:	**Item 51. Roadway Width, Curb to Curb (feet)**
250	20
750	22
2,700	24
5,000	30
9,000	44
35,000	56

Bridges with ADT greater than 35,000 will be reviewed individually by FHWA.

(2) An appraisal rating of 3 or less for

Item 69—Underclearances; or
Item 72—Approach Roadway Alignment.

(3) An appraisal rating of 3 for

Item 67—Structural Condition; or
Item 71—Waterway Adequacy.

In determining if a bridge meets the structurally deficient or functionally obsolete criteria, Item 71 is considered only if the last digit of Item 42 is 0, 5, 6, 7, 8 or 9, and Item 69 is considered only if the last digit of Item 42 is 0, 1, 2, 4, 6, 7 or 8.

Sufficiency ratings are used by the Federal Highway Administration in their selection of candidate bridges for Federal Bridge Replacement and Rehabilitation Programs. Bridges not falling into the Structurally Deficient or Functionally Obsolete category are not selected as candidates. Bridges with sufficiency ratings less than 50.0 are eligible for replacement or rehabilitation, and those with ratings of 80.0 or less are eligible for rehabilitation.

An interactive program is available to calculate sufficiency ratings and determine structural deficiency and functional obsolescence. The program is called BRISUF and may be accessed through ROSCOE by typing BRISUF and pressing the enter key. Instructions on the use of this program may be obtained by entering on ROSCOE the following command: "PC.BRSFINFO". Contact the Automation Engineer or Administrator if problems are encountered in accessing and executing the program. Once accessed the program prompts all required inputs. Contact D-18M if the program does not appear to correctly calculate sufficiency ratings or correctly determine structural deficiency and functional obsolescence.

3.501 SUFFIENCY RATING FORMULA

The sufficiency rating is calculated as follows:

SUFFICIENCY RATING $= S_1 + S_2 + S_3 - S_4$ where

S_1, S_2, S_3 and S_4 are as given below. In the following calculations the # symbol refers to the Item numbers given in Section 4.103.

(1) S_1, STRUCTURAL ADEQUACY AND SAFETY (55 maximum, 0 minimum)

$S_1 = 55 - (A + I)$ where neither A nor I shall exceed 55 and neither shall be less than 0.

(a) Reduction for Deterioration

If the lowest of #59 (Superstructure Rating) or #60 (Substructure Rating) is:

≤ 2	A = 55
$= 3$	A = 40
$= 4$	A = 25
$= 5$	A = 10
≥ 6 (or = N)	A = 0

(b) Reduction for Load Capacity

$I = (36 - AIT)^{1.5} \times 0.2778$ where

AIT (Adjusted Inventory Tonnage) is calculated as follows. If the 1st digit of #66 is:

= 1; AIT = the 2nd and 3rd digits × 1.56
= 2; AIT = the 2nd and 3rd digits × 1.00
= 3; AIT = the 2nd and 3rd digits × 1.56
= 4; AIT = the 2nd and 3rd digits × 1.00
= 5; AIT = the 2nd and 3rd digits × 1.21
= 6; AIT = the 2nd and 3rd digits × 1.21
= 9; AIT = the 2nd and 3rd digits × 1.00

(2) S_2, SERVICEABILITY AND FUNCTIONAL OBSOLESCENCE (30 maximum, 0 minimum)

$S_2 = 30 - [J + (G + H) + I]$ where

J shall not exceed 13, (G + H) shall not exceed 15, and I shall not exceed 2.

(a) Rating Reductions

If #58 (Roadway Condition) is:

≤ 3	A = 5
= 4	A = 3
= 5	A = 1
≥ 6 (or = N)	A = 0

If #67 (Structural Condition) is:

≤ 3	B = 4
= 4	B = 2
= 5	B = 1
≥ 6 (or = N)	B = 0

If #68 (Roadway Geometry) is:

≤ 3	C = 4
= 4	C = 2
= 5	C = 1
≥ 6 (or = N)	C = 0

If #69 (Underclearances) is:

≤ 3	D = 4
= 4	D = 2
= 5	D = 1
≥ 6 (or = N)	D = 0

If #71 (Waterway) is:

≤ 3	E = 4
= 4	E = 2
= 5	E = 1
≥ 6 (or = N)	E = 0

If #72 (Approach Road Alignment) is:

≤ 3	F = 4
= 4	F = 2
= 5	F = 1
$\geq$ 6 (or = N)	F = 0

J = (A + B + C + D + E + F)

(b) Width of Roadway Insufficiency

Y = #51 (Roadway Width) ÷ First two digits of #28 (Lanes)

If Item 5.6 = 1, 2 or 8; X = #29 (ADT) ÷ First two digits of #28.

If Item 5.6 = 3 or 4; X = #29A (ADT) ÷ First two digits of #28.

i. For all bridges except culverts. Use when #43.4 (Structure Type, Culvert) is blank or 0.

If (#51 + 2′) < #32 (Appr. Rdwy. Width);	G = 5
If (#51 + 2′) $\geq$ #32;	G = 0

ii. For one-lane bridges only (culverts included).

If the first 2 digits of #28 = 01 and:

$Y < 14$	$H = 15$
$Y \geq 14 < 18$	$H = 15 \dfrac{18-Y}{4}$
$Y \geq 18$	$H = 0$

iii. For two or more lane bridges (culverts included).

If first 2 digits of #28 $=$ 02 & $Y \geq 16$; $H = 0$

If first 2 digits of #28 $=$ 03 & $Y \geq 15$; $H = 0$

If first 2 digits of #28 $=$ 04 & $Y \geq 14$; $H = 0$

If first 2 digits of #28 $\geq$ 05 & $Y \geq 12$; $H = 0$

Note: If one of the above four conditions are met, do not continue on with iii as no lane width reductions are allowed.

If $X \leq 50$ and:

$Y < 9$	$H = 7.5$
$Y \geq 9$	$H = 0$

If $X > 50$ but ≤ 125 and:

$Y < 10$	$H = 15$
$Y \geq 10 < 13$	$H = 15 \dfrac{13-Y}{3}$
$Y \geq 13$	$H = 0$

If $X > 125$ but ≤ 375 and:

$Y < 11$	$H = 15$
$Y \geq 11 < 14$	$H = 15 \dfrac{14-Y}{3}$
$Y \geq 14$	$H = 0$

If $X > 375$ but ≤ 1350 and:

$Y < 12$	$H = 15$
$Y \geq 12 < 16$	$H = 15 \dfrac{16-Y}{4}$
$Y \geq 16$	$H = 0$

If $X > 1350$ and:

$Y < 15$	$H = 15$
$Y \geq 15 < 16$	$H = 15\,(16-Y)$
$Y \geq 16$	$H = 0$

(c) Vertical Clearance Insufficiency

If #12 (Defense Road) > 0 and:

$\#53 \geq 1600$	$I = 0$
$\#53 < 1600$	$I = 2$

If $\#12 = 0$ and:

$\#53 \geq 1400$	$I = 0$
$\#53 < 1400$	$I = 2$

(3) S_3, ESSENTIALITY (15 maximum, 0 minimum)

$S_3 = 15 - (A + B)$

(a) Public Use

$$A = \frac{* \text{(ADT)} \times * \text{(Detour Length)}}{200{,}000 \times K} \times 15 \quad \text{where}$$

$$K = \frac{S_1 + S_2}{85}$$

(b) Military Use

If $\#12 > 0$	$B = 2$
If $\#12 = 0$	$B = 0$

(4) SPECIAL REDUCTIONS (Use only when $S_1 + S_2 + S_3 \geq 50$)

$S_4 = A + B + C$

(a) Detour Length Reduction:

$A = * \text{(Detour Length)}^4 \times (5.205 \times 10^{-8})$ Max. $= 5$

(b) Structure Type Reduction:

If the 1st digit of #43.1 is a 7 or 8, or if the 2nd digit is a 2, 3, 4, 5, 6 or 7, then;

$B = 5$

(c) Highway Safety Feature Reduction:

If 2 digits of $\#36 = 0$; $C = 1$
If 3 digits of $\#36 = 0$; $C = 2$
If 4 digits of $\#36 = 0$; $C = 3$

* If Item 5.6 = 1, 2 or 8 use #29 (ADT) and #19 (Detour Length)
  If Item 5.6 = 3 or 4 use #29A (ADT) and #19A (Detour Length)

CONDITION RATINGS

RATING	DESCRIPTION	EXPLANATION	COMMENTS
9	New condition.	No significant deterioration or damage. This rating may be used for as long as 10 years after construction.	GOOD. The component is new or in good condition. Preventative maintenance may be desirable.
8	Good condition. No repairs needed.	Minor cracking, scaling or chipping of concrete elements. No rust present on major structural elements. Only minor isolated rust on secondary elements.	
7	Generally good condition. Potential exists for minor maintenance.	Minor deterioration or damage that probably will not progress to a serious defect if not repaired within the next few years. Includes defects that call for preventative maintenance or cosmetic repairs.	
6	Fair condition. Potential exists for major maintenance.	Major deterioration or damage to secondary or major elements. Also includes progressive deterioratin that could lead to failure. Load carrying capacity has not yet been seriously reduced.	FAIR. The component is satisfactorily performing its function, but repair work is necessary.
5	Generally fair condition. Potential exists for minor rehabilitation.	Same as for Rating 6 except the extent of deterioration or damage is greater and repair may require complicated or extensive procedures.	
4	Marginal condition. Potential exists for major rehabilitation.	Applies only to major structural elements where deterioration or damage seriously reduces the load carrying capacity of the bridge. Load posting should be considered.	POOR. The component is still performing its function but at a minimum level. Repair work deserves immediate attention.
3	Poor condition. Repair or rehabilitation required immediately.	Major structural element deteriorated or damaged so as to reduce its capacity to carry trucks. A structural analysis should be performed to determine the load capacity and the bridge should be posted for load restriction.	
2	Critical condition. Bridge should be closed until repairs are complete.	Major structural element deteriorated or damaged such that it is inadequate to carry any live load or is in danger of collapse under traffic. Structural analysis indicates the bridge is not capable of safely carrying 6,000 lbs.	CRITICAL. The component is not performing its function tion. Traffic cannot safely use the bridge.
1	Critical condition. Bridge is closed but repairable.	Bridge can be reopened with a complete rehabilitation. A study is needed to determine the feasibility of repair versus replacement.	
0	Critical condition. Bridge is closed & is beyond repair.	Deterioration or damage is so extensive that repair is not feasible.	
N	Not Applicable.		

CONCRETE DECK CONDITION RATINGS

FAHP Manual 6-7-2-7 Category Classification	Rating	Description	Condition Indicators (% Deck Area)			
			Spalls	Delam-inations	Electrical Potential	Chloride Content
Category #3 Light Deterioration	9	New condition.	None	None	0	0
	8	Good condition. No repairs needed.	None	None	None >0.35	None >1.0 #/CY
	7	Generally good condition. Potential exists for minor maintenance.	None	<2%	45% <0.35	None >2.0 #/CY
Category #2 Light Deterioration	6	Fair condition. Potential exists for major maintenance.	<2% spalls <u>or</u> sum of all deteriorated and/or contaminated deck concrete <20%.			
	5	Generally fair condition. Potential exists for minor rehabilitation	<5% spalls <u>or</u> sum of all deteriorated and/or contaminated deck concrete 20% 40%.			
Category #1 Extensive Deterioration	4	Marginal condition. Potential exists for major rehabilitation.	>5% spalls <u>or</u> sum of all deteriorated and/or contaminated deck concrete 40% to 60%.			
	3	Poor condition. Repair or rehabilitation required immediately.	>5% spalls <u>or</u> sum of all deteriorated and/or contaminated deck concrete >60%.			
Structurally Inadequate Deck	2	Critical condition. Bridge should be closed until repairs are complete.	Deck structural capacity grossly inadequate.			
	1	Critical condition. Bridge is closed.	Deck has failed completely. Repairable by replacement only.			

NOTES: In most cases the Bridge Inspector uses spalls and delaminations as deck condition indicators. In areas where deicing salt is used, chloride content or electrical potential are usually measured to decide whether to replace or rehabilitate a deteriorated deck.

APPRAISAL RATING

GENERAL CRITERIA

RATING	DESCRIPTION
9	Condition(s) superior to present desirable criteria
8	Condition(s) equal to present desirable criteria
7	Condition(s) better than present minimum criteria
6	Condition(s) equal to present minimum criteria
5	Condition(s) somewhat better than minimum adequacy to tolerate being left in place as is
4	Condition(s) meeting minimum tolerable limits to be left in place as is
3	Basically intolerable condition(s) requiring high priority of repair or reconstruction
2	Basically intolerable condition(s) requiring high priority to replace the structure
1	Immediate repair or reconstruction necessary to put the structure back in service
0	Immediate replacement of the structure necessary to put back in service

Form 1387-1
9-84 Edition

STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION

BRIDGE APPRAISAL WORKSHEET

DISTRICT__________ COUNTY__________ HIGHWAY__________

CONTROL__________ SECTION__________ STRUCTURE NO.__________

APPRAISER'S SIGNATURE__________ DATE__________

APPRAISAL
RATING*

9____Condition(s) superior to present desirable criteria
8____Condition(s) equal to present desirable criteria
7____Condition(s) better than present minimum criteria
6____Condition(s) equal to present minimum criteria
5____Condition(s) somewhat better than minimum adequacy to tolerate being left in place as is
4____Condition(s) meeting minimum tolerable limits to be left in place as is
3____Basically intolerable condition(s) requiring high priority of repair or reconstruction
2____Basically intolerable condition(s) requiring high priority to replace the structure
1____Immediate repair or reconstruction necessary to put the structure back in service
0____Immediate replacement of the structure necessary to put back in service

*For features shown on the reverse side of this Form.

APPRAISAL
RATING

TRAFFIC SAFETY FEATURES
Item 36

0____Feature does not meet currently acceptable standards
1____Feature meets currently acceptable standards

BRIDGE RAILING 1st Digit	TRANSITIONS 2nd Digit
Feature Rating - ☐	Feature Rating - ☐
APPROACH GUARDRAIL 3rd Digit	APPROACH GUARDRAIL TERMINAL 4th Digit
Feature Rating - ☐	Feature Rating - ☐

STRUCTURAL CONDITION Item 67 Feature Rating - ☐	SAFE LOAD CAPACITY Item 70 Feature Rating - ☐
ROADWAY GEOMETRY Item 68 Feature Rating - ☐	WATERWAY ADEQUACY Item 71 Feature Rating - ☐
UNDERCLEARANCE Item 69 Feature Rating - ☐	APPROACH ROADWAY ALIGNMENT Item 72 Feature Rating - ☐

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PLATE III-4 (cont.)

FOR

STRUCTURAL CONDITION

(Item 67)

<table>
<tr><th>RATING</th><th>DESCRIPTION</th><th>ADT≥400</th><th>ADT<400</th></tr>
<tr><td>9</td><td>Structural condition exceeds present desirable criteria</td><td rowspan="5">IR≥HS20</td><td rowspan="4">IR≥HS20</td></tr>
<tr><td>8</td><td>Structural condition equals present desirable criteria</td></tr>
<tr><td>7</td><td>Structural condition exceeds present minimum criteria</td></tr>
<tr><td>6</td><td>Structural condition equals present minimum criteria</td></tr>
<tr><td>5</td><td>Structural condition is somewhat better than minimum tolerable limit</td><td>HS20>IR≥H15</td></tr>
<tr><td>4</td><td>Structural condition meets minimum tolerable limit</td><td>HS20>IR≥H15</td><td>H15>IR≥H10</td></tr>
<tr><td>3</td><td>Intolerable condition requiring high priority of repair</td><td>H15>IR≥H10</td><td>H10>IR≥H5</td></tr>
<tr><td>2</td><td>Intolerable condition requiring high priority of replacement</td><td rowspan="3">H10>IR≥H3</td><td rowspan="3">H5>IR≥H3</td></tr>
<tr><td>1</td><td>Immediate repair necessary to put the bridge back in service</td></tr>
<tr><td>0</td><td>Immediate replacement necessary to put the bridge back in service</td></tr>
</table>

IR = Inventory Rating
ADT = Average Daily Traffic (vehicles per day)

APPRAISAL RATING

FOR

BRIDGE ROADWAY WIDTHS

(Item 68)

A. CONTROLLED ACCESS HIGHWAY MAIN LANES

FACILITY	LEFT CLEAR.	LANES	RIGHT CLEAR.	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
2-Lane,	4'	24'	10'	38'			
1-Way	4	24	10		38'		
	3	24	6			33'	
	2	24	4				30'
3-Lane,	4	36	10	50			
1-Way	4	36	10		50		
Depressed	3	36	6			45	
Median	2	36	4				42
3-Lane,	10	36	10	56			
1-Way	10	36	10		56		
Flush or	8	36	8			52	
Raised	4	36	4				44
Median							
4-Lane,	10	Nx12'	10	12N+20'			
or More,	10	Nx12'	10		12N+20'		
1-Way	8	Nx12'	8			12N+16'	
	4	Nx12'	4				12N+8'

NOTES:
PRES. DESR. = Present Desirable (Appraisal Rating of 8)
PRES. MIN. = Present Minimum (Appraisal Rating of 6)
MIN. ADEQ. = Minimum Adequacy (Appraisal Rating of 5)
MIN. TOL. = Minimum Tolerable (Appraisal Rating of 4)
N = Number of Lanes

B. RAMPS, DIRECT CONNECTIONS, ONE-WAY FRONTAGE ROADS, AND BUSWAYS

FACILITY	LEFT CLEAR.	LANES	RIGHT CLEAR.	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
1-Way	4'	Nx12'	4'	12N+8'			
Frontage	2	Nx12'	2		12N+4'		
Roads	1	Nx11'	1			11N+2'	
	1	Nx10'	1				10N+2'
1-Lane	4	14	8	26'			
Direct	4	14	8		26'		
Connection	3	14	6			23'	
	2	14	4				20'
2-Lane	4	24	8	36			
Direct	4	24	8		36		
Connection	3	24	6			33	
	2	24	4				30
Ramps	4	14	8	26			
	4	14	6		24		
	3	14	4			21	
	2	14	3				19
Busways	10	13	10	33			
	8	12	8		28		
	6	12	6			24	
	4	12	4				20

PLATE III-6 (cont.)

C. MULTILANE[1] FACILITIES WITHOUT ACCESS CONTROL

FACILITY	LEFT CLEAR.	LANES	RIGHT CLEAR.	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
2-Way Traf.	10'	Nx12'	10'	12N+20'			
On 1 Bridge	8	Nx12'	8		12N+16'		
ADT ≤ 7500	6	Nx12'	6			12N+12'	
	4	Nx12'	4				12N+8'
2-Way Traf.	10	Nx12'+16'	10	12N+36'			
On 1 Bridge	8	Nx12'+4'	8		12N+20'		
ADT ≥ 7500	6	Nx12'+4'	6			12N+16'	
	4	Nx12'+4'	4				12N+12'
2-Way Traf.	4	Nx12'	10	12N+14'			
on Divided	4	Nx12'	8		12N+12'		
Facility[2]	3	Nx12'	6			12N+9'	
	2	Nx12'	4				12N+6'
Urban Streets	2	Nx12'	2	12N+4'			
(Multi-lane	2	Nx11'	2		11N+4'		
Curbed Road-	1	Nx11'	1			11N+2'	
way)[3,4]	1	Nx10'	1				10N+2'

1. Multi-lane refers to roadways with three or more lanes of traffic.

2. On facilities with four or more lanes, when the two directions of traffic are carried on separate bridges or on one bridge with a median barrier, each direction is considered as a separate roadway and the bridge roadway width is measured from the face of the inside barrier (median barrier or bridge rail) to the face of the outside barrier (bridge rail or curb).

3. If the approach roadway provides parking lanes, sidewalks or a median, the present minimum criterion is to maintain the same curbed cross-section across the bridge. If the bridge is narrower than the approach roadway including existing parking lanes, sidewalks and median, then the minimum tolerable criterion is to provide a gradual curbed or delineated transition to the reduced cross-section.

4. Uncurbed, multi-lane urban streets should be evaluated using the appropriate multi-lane category above. Uncurbed, one-way urban streets should be evaluated as for two-way traffic on a divided facility.

D. TWO-LANE, TWO-WAY FACILITIES (PRIMARY AND SECONDARY HIGHWAYS, CITY STREETS, COUNTY ROADS AND FRONTAGE ROADS)

FACILITY	LEFT CLEAR.	LANES	RIGHT CLEAR.	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
0-250 ADT	4'	22'	4'	30'			
	4	20	4		28'		
	2	18	2			22'	
	0	18	0				18'
250-400 ADT	4	24	4	32			
	4	22	4		30		
	2	20	2			24	
	0	20	0				20
400-750 ADT	6	24	6	36			
	6	22	6		34		
	4	22	4			30	
	2	20	2				24
750+2200 ADT	8	24	8	40			
	4	24	4		32		
	4	22	4			30	
	2	22	2				26
2200+ ADT	10	24	10	44			
	8	24	8		40		
	6	22	6			34	
	4	22	4				30

PLATE III-6 (cont.)

APPRAISAL RATING

FOR

VERTICAL CLEARANCES

(Items 68 and 69)

FACILITY	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
Interstate Highway and Other Freeway Main Lanes	16'-6"	16'-6"	15'-6"	14'-6"
Other Systems	16'-6"	16'-6"	15'-0"	14'-6"
Pedestrian and Utility	17'-6"	17'-6"	16'-6"	15'-6"
Railroad Overpasses	23'-0"	23'-0"	22'-6"	22'-6"

NOTES:

PRES. DESR. = Present Desirable (Appraisal Rating of 8)

PRES. MIN. = Present Minimum (Appraisal Rating of 6)

MIN. ADEQ. = Minimum Adequate (Appraisal Rating of 5)

MIN. TOL. = Minimum Tolerable (Appraisal Rating of 4)

APPRAISAL RATING

FOR

UNDERPASS LATERAL CLEARANCE

(Item 69)

FACILITY	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
A. INTERSTATE HIGHWAY AND OTHER FREEWAYS (Passing Underneath)				
RURAL				
Left Clearance	30'	30'	8'*	6'*
Right Clearance	30	30	16	12 *
URBAN				
Left Clearance	30	30	16	4
Right Clearance	30	30	12	10
URBAN FRONTAGE ROADS	15	15	10	6
B. PRIMARY AND SECONDARY HIGHWAYS (Passing Underneath)				
Left or Right Clearance				
ADT 750 or Less	16'	16'	12'	7'
ADT 750 - 1500	30	30	16	7
ADT More than 1500	30	30	16	7
C. FM, RM, RECREATION AND RURAL FRONTAGE ROADS (Passing Underneath)				
Left or Right Clearance				
ADT 250 or Less	7'	7'	4'	2'
ADT 250 - 750	7	7	4	2
ADT 750 - 1500	16	16	7	4
ADT More than 1500	30	30	16	7
D. RAILROAD PASSING UNDERNEATH				
Left or Right Clearance (As measured from centerline of railroad track to face of pier)	25'	25'	12'**	8'5"**

NOTES: * Guard fence required when clearance on divided highway is less than 16'.

** Crash walls are also required for clearances less than 25'.

APPRAISAL RATING

FOR

SAFE LOAD CAPACITY

(Item 70)

RATING	DESCRIPTION	LOAD CAPACITY
9	Safe load capacity is greater than present desirable criteria	IR $\geq$ HS20
8	Safe load capacity is equal to present desirable criteria	IR = HS20
7	Safe load capacity is somewhat greater than present minimum criteria	HS20 > IR > H15 (1)
6	Safe load capacity is equal to present minimum criteria	IR = H15 (1)
5	Safe load capacity is somewhat greater than minimum tolerable criteria	H15 > IR > H10 (1)
4	Safe load capacity meets present minimum tolerable criteria	AL $\geq$ 15,000 (2)
3	Safe load capacity is less than minimum tolerable criteria. High priority for repair or reconstruction is recommended	15,000 > AL $\geq$ 5,000 (2)
2	Safe load capacity is less than minimum tolerable criteria. High priority for replacement is recommended	
1	Bridge should be closed to traffic. Repair or reconstruction is recommended to reopen the bridge to traffic	AL < 5,000 (3)
0	Bridge should be closed to traffic. Replacement of the bridge is recommended	

IR = Inventory Rating
AL = Posted Load Restriction, Single or Tandem Axle Load (lbs.)

1. If the operating rating is less than HS20 or if the bridge is posted for load restriction, the appraisal rating shall be "4" or less as indicated in the table.
2. If the operating rating is less than HS20, the bridge should be posted for load restriction. The recommendation for load posting is based on the National Bridge Inspection Standards as established by Title 23, United States Code (23 USC § 650.303c). See Plate III-13 for calculation of posting loads if the bridge should have a posted load restriction but does not currently have one.
3. The recommendation for bridge closing is based on the AASHTO Manual for Maintenance Inspection of Bridges, Article 4.7.2.

APPRAISAL RATING

FOR

WATERWAY ADEQUACY

(Item 71)

FACILITY	DESIGN FREQUENCY OR FREQUENCY OF OVER-FLOODING (IN YEARS)			
	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
Controlled Access Highway Main Lanes	50	50	30	20
Other Highways and Frontage Roads	50	50	30	10

NOTES:

PRES. DESR. = Present Desirable (Appraisal Rating of 8)

PRES. MIN. = Present Minimum (Appraisal Rating of 6)

MIN. ADEQ. = Minimum Adequate (Appraisal Rating of 5)

MIN. TOL. = Minimum Tolerable (Appraisal Rating of 4)

APPRAISAL RATING

FOR

APPROACH ROADWAY ALIGNMENT

(Item 72)

FACILITY	SAFE OR COMFORTABLE SPEED LIMIT (MPH)* PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
Primary Highways (IH, US & SH Routes)	70	55	50	45
Secondary Highways (FM, RM, RR & Other On-System Routes)	65	50	45	40
Other Paved Roads - High Speed (Posted Speed Limit $\geq$ 45 MPH)	55	45	40	35
Other Paved Roads - Low Speed (Posted Speed Limit $\leq$ 40 MPH)	45	40	35	30
Unpaved Roads	40	35	30	25

NOTES:

PRES. DESR. = Present Desirable (Appraisal Rating of 8)

PRES. MIN. = Present Minimum (Appraisal Rating of 6)

MIN. ADEQ. = Minimum Adequate (Appraisal Rating of 5)

MIN. TOL. = Minimum Tolerable (Appraisal Rating of 4)

*The safe or comfortable speed limit may be assumed to equal the posted advisory speed if one exists. Otherwise, determine as discussed in Section 3.206.

TRAFFIC SAFETY FEATURES

(Item 36)

RATING	MEANING
1	Inspected feature meets currently acceptable standards
0	Inspected feature does not meet currently acceptable standards

Digit Position	Feature
1st	Bridge Railing
2nd	Approach Guardrail to Bridge Railing Transitions
3rd	Approach Guardrail
4th	Approach Guardrail End

Code N where a feature is not required.

Examples

- 1011

Interpretation: All features meet concurrently acceptable standards except transitions.

- NNNN

Interpretation: Traffic safety features are not required.

This procedure is appropriate for computing posting loads equivalent to the inventory rating. Approximations are involved which make this procedure unacceptable at load levels higher than the Inventory Rating.

The posting load in pounds is the product of the RATING MULTIPLIER and the INVENTORY RATING in tons for the standard "H" truck. In selecting the RATING MULTIPLIER from the table use the longest simple span length or 80% of the longest continuous span length, whichever gives the longest span length for the bridge. If the resulting span length is 160' or greater, then the bridge should receive an analysis more exact than this procedure.

The recommended posting increments are listed below. Round off to the nearest increment listed. Bridges should not be posted for loads in excess of the maximum figure in each column.

Post axle and gross load for span lengths 40' and greater. Post axle load only for span lengths 39' and less. Weight limit signs should conform to the Texas Manual on Uniform Traffic Control Devices. The recommended signs are R12-2Tb or R12-4Tb except if the axle load is noted "*" use signs R12-2Tc or R12-4Tc.

SPAN	RATING MULTIPLIER	
	AXLE OR TANDEM	GROSS
FEET	LBS./H-TON	LBS./H-TON
≤ 20	1,600	
25	1,550	
30	1,500	
35	1,450	
40	1,450	3,100
45	1,450	2,950
50	1,450	2,800
60	1,450	2,600
70	1,450	2,500
80	1,450	2,450
90	1,450	2,400
100	1,450	2,350
120	1,450	2,300
140	1,450	2,250
160	1,450	2,200

EXAMPLE 1

35' Simple Span Slab & Girder Bridge, H14 Rating
Axle = 14 x 1,450 = 20,300 lbs.
Post 21,000 tandem axle (Sign R12-2Tc)

EXAMPLE 2

120' Pony Truss, H7 Rating
Axle = 7 x 1,450 = 10,100 lbs.
Gross = 7 x 2,300 = 16,100 lbs.
Post 10,000 lbs. axle or tandem and
16,000 lbs. gross (Sign R12-4Tb)

EXAMPLE 3

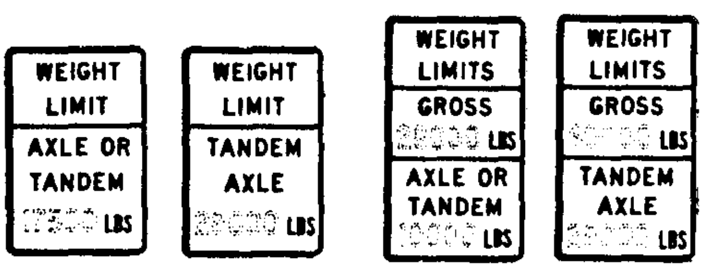
30'-40'-30' Continuous Slab Bridge with
25' slab approach spans, H10 Rating.
0.80 x 40' = 32' > 25' = Use 32' span
Axle = 10 x 1,480 = 14,800 lbs.
Post 15,000 lbs. axle or tandem (Sign R12-2Tb)

EXAMPLE 4

25' Simple Span Timber Bridge, H3 Rating
Axle = 1,550 x 3 = 4,650 lbs. < 5,000 lbs.
Recommendation: Close bridge until repair increases capacity.

LOAD INCREMENTS FOR AXLE OR TANDEM LBS.	LOAD INCREMENTS FOR GROSS LBS.
5,000	8,000
7,500	10,000
10,000	12,000
12,500	14,000
15,000	16,000
17,500	20,000
21,000*	24,000
24,000*	28,000
28,000*	32,000
32,000*	36,000
	40,000
	44,000
	48,000
	52,000
	60,000
	68,000
	76,000

*Axle load exceeds 20,000 lbs. single axle limit, therefore post for tandem axle (Signs R12-2Tc or R12-4Tc).



R12-2Tb R12-2Tc
24" x 36"

R12-4Tb R12-4Tc
24" x 42"

CHAPTER IV
CODING GUIDE

4.100 GENERAL

This coding guide is used in maintaining and interpreting the computerized BRINSAP file which contains a record for each bridge and tunnel on public roadways in Texas.

The BRINSAP file is maintained in an accurate and up-to-date condition by changing data to reflect changes in the bridges, by correcting errors found in the data, by adding new records for new bridges, and by deleting records for bridges that are removed from service.

The usual procedure to accomplish the above is to fill out the appropriate coding form, as explained in Section 4.101, which is then entered into a submittal file via the CRT. Submittal files are gathered periodically from the various Districts and are processed by D-10 to update the BRINSAP file. After processing the submittal files, D-10 returns a printout of the submittal files along with a listing of any coding errors identified by the computer. Error corrections are usually accomplished by resubmitting corrected versions of those portions of the submittal file that contained errors.

4.101 CODING FORMS

The coding forms given in the Appendix are used as a guide to properly input data into the BRINSAP file. Each bridge record in the BRINSAP file consists of eight "cards" or lines of data with each card consisting of 80 spaces. The data, which is arranged on the cards as shown in Form 1321-1&2 (See Appendix), must be input in the proper spaces on the correct card.

The BRINSAP file is maintained by adding, deleting or changing bridge records. These actions are accomplished using Form 1321-1&2 as follows:

(1) Adding Bridge Records (Bridge recently built or recently opened to public traffic). Fill in Form 1321-1&2 completely.

(2) Deleting Bridge Records (Bridge destroyed, replaced or removed from service). Enter the Bridge ID Number and a "D" under the item "Transaction Code" on Card 1 of Form 1321-1&2. All other cards for the bridge should be omitted from the submittal file.

(3) Changing Bridge Records (Update data or correct data errors). Fill in Form 1321-1&2 only to the extent of entering those items that are to be changed. All other items should be left blank and if no items are changed on a card for a given bridge, the card should be omitted from the submittal file.

In routine updating of the BRINSAP file, card 6 will be the only card containing data changes for most bridges. For this reason Form 1321-6 is provided as shown in the Appendix. Changes in card 6 data for up to 62 bridges can be recorded on each sheet of Form 1321-6.

4.102 CODING INSTRUCTIONS

When filling out coding forms the following rules should be followed:

(1) Make all entries legible using dark lead pencil only.

(2) Use only one character per column (or space).

(3) Use numerics and alphabetics in proper fields, i.e., never enter alphabetics in fields indicated as being solely numerical.

(4) Right-justify entries in fields, i.e., an entry of 57 in a four-column field should be entered as "0057" or the number 2 in a three-column field should be entered as "002".

(5) All numerics should appear as follows:

1 2 3 4 5 6 7 8 9 0

(6) All alphabetics should appear as CAPITAL letters as follows:

A B C D E F G H I J K L M N Ø P Q R S T U V W X Y Ƶ

(7) The only special characters that may be used are shown below. They may only be used in Items 6.1, 7, 9 and 23.2.

/ + - ( ) $ * = , .

(8) Unless otherwise directed in the Coding Guide, items for which data is unknown or not applicable should be left blank. However, Items 36, 58 through 62, 65, and 67 through 72 should never be left blank. It is important that either a code of 0 through 9 or N be entered to indicate the rating or the nonapplicability of the item.

(9) The data must be coded consistently. For example, if Item 51 (Roadway Width on the Bridge) is coded for traffic in one direction only, then Item 28 (Lanes on Structure), 29 (ADT), 32 (Approach Roadway Width), etc., must be for traffic in one direction only.

4.103 ITEM DESCRIPTIONS

BRIDGE IDENTIFICATION NUMBER

DHT County Number	Field Length = 3
DHT Control Number for the Principal Route*	Field Length = 4
DHT Control Section Number for the Principal Route*	Field Length = 2
*County Road/City Street Identification Number for Off-System Bridges	Field Length = 6
DHT Permanent Structure Number	Field Length = 3

Item 1—State Code — Field Length = 3

The first two digits are the Federal Information Processing Standards code for States and the third digit is the FHWA region code. The code entry for Texas is 486.

Item 2—State Highway Department District — Field Length = 2

This Item is the identification number of the highway district in which the bridge is located. It is used in conjunction with the Bridge Identification Number.

Item 3—Transaction Code Field Length = 1

This Item is applicable only when adding or deleting a bridge record. This Item is left blank when making changes to an existing record. The following codes are used:

A To indicate that a bridge record is being added to the tape file. In this case the complete record shall be coded.

D To indicate that a bridge record which is currently on the tape file is being deleted. In this case, the only other thing that need be coded is the Bridge Identification Number (columns 1-12, card 1).

Item 4—City/Town Code Field Length = 4

This Item is derived from the Department of Commerce Coding Manual for the U.S. Census. An entry is made in this Item only if the bridge is within the limits of an incorporated city or town listed in the Code Manual. If the bridge is within a city or town not listed in the Manual, or is not within a city or town, this Item is left blank. Refer to the Roadway Information (RIS) Manual to interpret this Item.

Item 5—Principal Route Field Length = 11

The Principal Route is also referred to as the Inventory Route. For a bridge which involves only one route (i.e. the route either is being carried by the bridge or underpasses the bridge, or the route is logged both over and under the bridge), the Principal Route is that one route, and there is no "Other Route."

For a highway grade separation bridge the Principal Route is the higher of the two in the system hierarchy given in Item 5.2. For instance, US highways are higher than SH highways.

When the two routes are of the same system, such as two US highways, the one with the lowest number is the Principal Route. If the two routes are of the same system and number but are differentiated by a directional letter suffix, such as 35E and 35W, the Principal Route is the highest in the hierarchy given in Item 5.5.

The route other than the one deemed the Principal Route is termed simply the Other Route. This Other Route is identified in Items 6.2 and 5A which appear on card 7.

For interchanges of three or more levels, the 1st and 2nd level routes, i.e., those nearest the ground, are paired to determine the Principal Route. Each additional level is considered independently from the 1st and 2nd levels, and will not have an Other Route unless the bridge crosses over a route which is at grade and which is different from the route(s) carried by the 1st and 2nd levels. In this case the additional level is paired with the route it crosses to determine the Principal Route.

Item 5.1—The first position indicates the route as being the Principal Route:

1 Principal Route

Item 5.2—The next two positions identify the system of the Principal Route:

11 Interstate Highway
12 US Highway

13 State Highway
14 State Loop or Spur
15 Farm or Ranch to Market Road
16 Park Road
17 Recreation Road
18 Metropolitan Highway (Federal-Aid Urban System routes that have been designated part of the State highway system)
19 Other On-System Route
21 County Road/Highway
31 City Street/Road/Highway, etc. (Including Federal-Aid Urban System routes not designated as Metropolitan Highways)
41 Federal Lands Road
51 State Lands Road
61 Toll Road
99 Other

Item 5.3—The next position further identifies the Principal Route:

1 Mainline (Use this code unless one the following is more descriptive.)
2 Alternate
3 Bypass
4 Spur
5 Toll Road
6 Business Route or Loop
7 Ramp, Connector, etc.
8 Service or Frontage Road
9 Truck Route

Item 5.4—The Principal Route number is right justified in the next five positions. This includes Metropolitan Highway and other Federal-Aid Urban System route numbers, and signed numbers for county roads. Code zeros for county roads and city streets that do not have signed route numbers.

Item 5.5—The next position indicates the directional suffix if one is part of the route number. It should be coded:

0 Not Applicable
1 North
2 East
3 South
4 West

Item 5.6—The last position is to stipulate the function of the bridge with regard to the Principal Route. The Principal Route:

1 Crosses a stream, waterway, canyon, channel, ditch or other such topographical barrier
2 Overpasses a roadway, railroad, pedestrian walkway, utility passageway or other such facility

3 Underpasses an On-System route
4 Underpasses an Off-System route
5 Underpasses a railroad
6 Underpasses a pedestrian bridge
7 Underpasses a utility bridge
8 Passes through a tunnel
9 Other structure
0 Not applicable

Item 6.1—Features Intersected — Field Length = 20

The information recorded for this item is the name or names of the features intersected by the Principal Route whether the features are over or under the bridge. When one of the features intersected is another highway, the signed number of the highway is entered in the field. All entries are left-justified. The names of any other features such as rivers, creeks, utility lines and railroads should follow separated by a semicolon or a comma. An asterisk at the end of Item 6.1 identifies the bridge as a critical facility with respect to defense or the national economy.

Examples:	Principal route passes over Walnut Creek	WALNUT CREEK.
	Principal route passes under FM 305	FM 305.
	Principal route passes under Cactus Railroad	CACTUS RR.

Item 6.2—Route Intersected (The Other Route) — Field Length = 9

If the feature intersected is an Other Route, then Item 6.2 is coded with the appropriate Control, Section and Permanent Structure Number for an On-System route, or the county road/city street ID and Permanent Structure Numbers for an Off-System route. The structure number on the Other Route is the same as the structure number used in the Principal Route identification. Note that Item 6.2 appears on card 7. If there is no Other Route, this Item is blank.

Item 7—Facility Carried Over By Structure — Field Length = 18

The facility carried by the structure is left-justified in the field for this Item.

Examples:	IH 81 passes over Walnut Creek	IH 81
	US 551 passes under FM 305	FM 305
	SH 137 passes under the Cactus Railroad	CACTUS RR

Item 9—Location — Field Length = 25

This Item contains a description of the bridge location which is usually keyed to a distinguishable feature such as a road junction or topographical feature found on an official highway department map.

Item 10.2—Principal Route Total Horizontal Clearance — Field Length = 4

This Item contains the horizontal clearance for the Principal Route which is measured to the nearest tenth of a foot between restrictive features such as railing, walls, median barriers, curbs taller than nine inches or other features that limit the roadway width. The purpose of this Item is to give the available clearance for the movement of wide loads. The clearance should equal the total width of the roadway and shoulders unless restricted as indicated above. For multiple roadways such as commonly occur at underpasses, the maximum horizontal clearance should be entered for this Item.

Item 10.3—Principal Route Minimum Vertical Clearance — Field Length = 4

This Item contains the minimum vertical clearance over the Principal Route which is measured in feet and inches for a 10-foot width of the pavement or traveled part of the roadway where the clearance is the greatest. For bridges having multiple openings, clearances for each opening should be measured but only the maximum is coded. This would be the practical maximum clearance. Feet are coded in the first two positions and inches are coded in the last two positions. When no restriction exists, 9999 is coded.

Item 10.4—Widening — Field Length = 1

Coding for this Item is given below. For instance, if a bridge has been widened only on one side in only one widening job, then code 1 would apply; however, if the bridge has been widened only on one side in three separate widening jobs, then code 3 would apply. If the bridge has been widened on both sides under one job, then code 5 would apply; and if the bridge has been widened on both sides under two different widening jobs then code 6 would apply. This item only applies to bridges that carry automotive traffic.

0 No widening or not applicable
1 One side, one widening job
2 One side, two widening jobs
3 One side, three widening jobs
4 One side, four widening jobs
5 Both sides, one widening job
6 Both sides, two widening jobs
7 Both sides, three widening jobs
8 Both sides, four widening jobs
9 Other widening

Item 11—Milepoint — Field Length = 5

For the Principal Route a five-digit number is coded to represent the milepoint to thousandths of a mile. For On-System routes, this Item is taken from the D-10 Road Inventory (RI-1) straight-line diagrams, and the mileage is measured from the most northerly or westerly terminus of the route, or as specified by D-10. For Federal-Aid Urban routes, city streets, or county roads this Item is the mileage to the bridge measured from the beginning of the street or road as indicated on urban or county maps furnished by D-10.

Item 12—Road Section Number — Field Length = 5

If the Principal Route is a designated defense highway, the defense road section number for that route is coded in this Item. The number is right-justified in the first four positions of the field as shown in the examples below. The fifth position is left blank except when letter suffix is used. If the route is not a defense highway zeros are coded.

Examples:

Road Section Number	Code
3	0003
12	0012
122A	0122A
1245	1245
non-defense highway	00000

Item 13—Bridge Description Field Length = 2

The codes given below are used to provide additional information on the function of the bridge with respect to the Principal Route.

The order of the codes shown is the hierarchy of their importance. This means that if two codes apply to a bridge, the first of the codes (reading down the list) will be shown in the first position and the next one in the second position. If none of the following codes apply to the second position or both the first and second positions, then the second position or both positions will be blank.

D The route is a designated defense highway and another defense highway passes over or under it.

P Where separate bridges carry two roadways of the Route in two directions of travel, code P is used for the bridge carrying the Route in the direction opposite to the direction of inventory. For defense highways, the direction of inventory is west to east and south to north. Code P is not used for the bridge carrying the Route in the direction of inventory.

T Temporary bridge erected to carry traffic pending the repair or replacement of an old bridge. This includes bridges shored up with additional temporary supports, bridges kept open with temporary repairs and Bailey bridges.

Possible Codes

First Position	Second Position
D	blank
D	P
D	T
P	blank
P	T
T	blank
blank	blank

Item 14—Defense Milepoint Field Length = 5

If the Principal Route is a defense highway, this Item is coded with the number of miles to the nearest hundredth from the bridge to the beginning of the defense road section (Item 12). If the route is not a defense highway, the item is left blank.

Item 15—Defense Section Length Field Length = 3

The length of the defense road section identified in Item 12 is coded to the nearest tenth of a mile. If the route identified in Item 5 is not a defense highway, this Item is left blank.

Example: 56.3 mile section Code 563

Item 16—Latitude Field Length = 5

If the Principal Route is a defense highway, the latitude of the bridge is coded in degrees, minutes and tenths of minutes. The point of the coordinate may be the beginning of the bridge in the direction of inventory or any other point the State has chosen to use. The item is left blank where not applicable. Leading zeroes are coded where needed.

Example: 35° 27.3′ Code 35273

Item 17—Longitude Field Length = 6

Longitude is coded as instructed in Item 16.

Example: 81° 5.8′ Code 081058

Item 18—Physical Vulnerability Field Length = 1

If the Principal Route or the Other Route is a designated defense highway, the physical vulnerability of the bridge is coded based on the type of structure. The item is left blank if neither the Principal Route or the Other Route is a defense highway.

1 Timber
2 Concrete Girder
3 Steel Girder
4 Cantilever and Truss
5 Suspension
6 Reinforced Concrete - Massive Arch
7 Dam Bridge
8 Box Culverts
9 Tunnels
0 No Structure

Item 19—Bypass, Detour Length Field Length = 2

This Item contains the shortest feasible detour measured to the nearest mile. The detour may include any On-System or Off-System route so long as the bridges and roadways are adequate to carry the detoured traffic. The detour length represents the total additional travel for a vehicle which would result if the bridge were closed or if the vehicle were unable to pass over or under the bridge due to restricted clearances or load restrictions.

If a ground level bypass is available at the bridge site the detour length is coded zero. If the bridge is one of twin bridges and is not at an interchange, 01 is coded to indicate that the other twin bridge can be used as a temporary bypass. The factor to consider when determining if a bypass is available at the site is the potential to move vehicles, including military vehicles, around the structure. This is particularly true when the bridge is in an interchange. For instance, a bypass would likely be available in the case of diamond interchanges, interchanges with service roads, or other interchanges where the positioning and layout of the ramps is such that they could be used without difficulty to get around the structure. Code 99 means 99 miles or more.

Examples:	**Code**
Diamond interchange, structure bypassable	00
Cloverleaf, not bypassable; 8 mile detour	08
Structure over river; 121 mile detour	99
Structure over highway, no interchange, bypassable	00

Item 20—Toll Field Length = 1

The following codes are used:

1 Toll Bridge. Tolls are paid specifically to cross the bridge, and the bridge does not carry a toll road.
2 Toll Road. The bridge carries a toll road, that is, tolls are paid to use the facility which includes both the highway and the bridge.
3 Free Road. The bridge is toll free and carries a toll free highway or carries a non-highway (such as a railroad) over a toll free route.
4 Toll Parkway. Same as 2 except trucks not permitted.

Item 21—Custodian Field Length = 1

The codes below are used to indicate the type of agency that is custodian of the bridge. In the absence of a clear designation, the custodian will be the agency responsible for maintaining the bridge.

1 State highway department
2 Other State agency
3 County agency
4 City or other local agency
5 Federal agency
6 Railroad
7 Other private
8 Any combination of the above, i.e., state and railroad, etc.
9 Unknown

Item 22—Owner Field Length = 1

The codes given under Item 21 are used to indicate the type of agency that owns the bridge.

Item 23.1—Type Project Field Length = 1

The codes shown below are used to indicate the type of project involved in construction or reconstruction of the bridge. Code 1 is used if any Federal funds have ever been expended on the bridge whether for construction or reconstruction. In other cases the code for the original construction is used.

1 Federal Aid
2 Non-Federal Aid with all State funds
3 Non-Federal Aid with other public non-state funds
4 Non-Federal Aid with private funds
5 Other or unknown

Item 23.2—Project Number Field Length = 7

The project number of the project referred to Item 23.1 is coded if known. This field may contain letters and numbers.

Item 24—Federal-Aid System Field Length = 2

The most appropriate of the following codes is used to indicate the type of Federal-Aid System of which the Route is a part. Codes 9 through 12 indicate non-Federal-Aid routes.

01 Interstate, rural
02 Interstate, urban
03 Other FA primary, rural
04 Other FA primary, urban
05 FA secondary rural, State jurisdiction
07 FA secondary rural, local jurisdiction
09 Other State highways, rural (Non-FA)
10 Other State highways, urban (Non-FA)
11 Local rural roads (Non-FA)
12 Local city streets (Non-FA)
14 Federal-Aid Urban

Item 25—Administrative Jurisdiction Field Length = 1

This Item indicates the type of administrative jurisdiction that applies to the Principal Route regardless of whether the same jurisdiction applies to the bridge. This Item is coded as follows.

1 State
2 Federal domain
3 Toll
4 Other including city, county, and local jurisdictions

Item 26—Functional Classification Field Length = 2

The functional classification codes are as follows:

	Urban Code			**Functional System**	**Rural Code**
Population (x 1000)	5-25	25-50	50+		
	11	21	41	Interstate	01
	12	22	42	Other Freeway & Expressway	—
	13	23	43	Other Principal Arterial	02
	14	24	44	Minor Arterial	03
	15	25	45	Collector	—
	—	—	—	Major	04
	—	—	—	Minor	05
	16	26	46	Local	06

Item 27—Year Built Field Length = 4

The year of construction and year of the last major rehabilitation (reconstruction or widening) are coded. The last two digits of the years of completion are coded. A code of 00 in the first two positions is used for bridges built in 1900 or earlier.

Examples:	**Code**
Built 1928 No rehabilitation	2800
Built 1914 Rehabilitation 1960	1460
Built 1898 Rehabilitation 1948, 1964	0064

Item 28—Lanes on Structures Field Length = 4

The total number of through lanes carried by the bridge is right-justified in the first 2 positions. The total number of through lanes crossed by the bridge is right-justified in the last 2 positions.

Examples:	**Code**
16 lanes on, 0 lanes under	1600
8 lanes on, 12 lanes under	0812

Item 29—Average Daily Traffic Field Length = 6

The average daily traffic volume for the Principal Route is entered for this item. The unit's position is coded even if estimates of ADT are determined to tens or hundreds of vehicles.

Examples:	**ADT**	**Code**
	540	000540
	15,600	015600

Item 30—Year of Average Daily Traffic Field Length = 2

This Item contains the last two digits of the year in which the ADT in Item 29 was counted or estimated.

Item 31—Design Load Field Length = 1

The following codes are used to indicate the live load which the bridge was designed to carry. Highway loadings are classified using the nearest equivalent of the H loadings given below.

1	H 10	6	HS 20 + Mod
2	H 15	7	Pedestrian
3	HS 15	8	Railroad
4	H 20	9	Other
5	HS 20	0	Unknown

Item 32—Approach Roadway Width Field Length = 3

This Item contains the dimension to the nearest foot, which best represents the normal width of the approaching roadway of the route carried by the structure. The dimension includes the widths of shoulders and includes the median width of the bridge carries both directions of traffic. In order to be considered as part of this width a shoulder must be constructed and maintained flush with the adjacent through-traffic lane and must be adequate for all weather and traffic conditions.

When there is a variation between the approaches at either end of the bridge, the most representative dimension is coded. This Item is left blank if not applicable as in the case of a railroad, pedestrian or utility underpass.

Examples:

Left Shoulder	Left Roadway	Median	Right Roadway	Right Shoulder	Code
4.0	____	____	16	6.0	026
6.0	____	____	36	12.0	054
12.0	48	30	48	12.0	150
10.0	24	16	36	10.0	096

The above examples are for closed medians only. Whether the median is open or closed, the data must be consistent. For example, if Item 51 is for traffic in one direction only, Item 32 must be for trafffic in one direction only.

Item 33—Bridge Median Field Length = 1

This Item indicates if the median over the bridge or through the tunnel is non-existent, open or closed.

0 Non-existent or Not Applicable, as for a railroad, utility, or pedestrian underpass
1 Open
2 Closed

A median is some physical separation of opposing directions of traffic such as a raised portion with or without a guard fence. A painted stripe in itself should not be considered as a median.

Each twin, in the the case of twin bridges carrying the two roadways of a divided highway, is considered to be carrying one-directional traffic and has no median. If a bridge is carrying both roadways of a divided highway, the median is considered open if the space between the two roadway decks is six inches or more in width and closed if less than six inches.

In cases where a culvert is continuous under the roadways of a divided highway, the median is considered closed.

Item 34—Skew Field Length = 2

The skew is coded to the nearest degree. When the bridge is on a curve or if the skew varies for some other reason, the average skew is coded, if reasonable. Otherwise, a 99 is coded to indicate a major variation in skews of substructure units.

Examples:

Skew	Code
10°	10
8°	08
29°	29

Item 35—Structure Flared Field Length = 1

This Item indicates whether or not the width over the bridge, or through the tunnel, varies. Generally, such variance will result from ramps converging with or diverging from the through lanes on the bridge, but there may be other causes. Minor flares at ends of bridges or tunnels should be ignored. The following codes are used:

1 Structure is flared
0 Structure is not flared

Item 36—Traffic Safety Features Field Length = 4

This item indicates whether or not the Bridge Railing (1st digit), Approach Guardrail Transitions (2nd digit), Approach Guardrails (3rd digit), and Approach Guardrail Ends (4th digit) meet currently acceptable standards. This Item is coded as illustrated in Plate III-12 and as discussed in Chapter III, Section 3. The following codes are used:

1 Feature meets standards
0 Feature does not meet standards
N Feature is not required

Item 37—Historical Significance Field Length = 1

This Item indicates the historical significance of the bridge by the following codes.

1 Bridge is on the National Register of Historic Places (listing to be provided by the Historic Preservation Office).

2 Bridge is eligible for the National Register of Historic Places (not used unless specifically instructed).

3 Bridge is at least 40 years old and meets one or more of the following qualifications:

—pin-connected truss or otherwise unique metal truss, suspension bridge, concrete arch, masonry arch, concrete truss, or is made of cast iron.

—is of unique architecture and/or engineering design, and/or contains artistic embellishment such as cast iron, steel finials and fretwork, or concrete.

—is a "one of a kind" design.

4 Bridge is at least 40 years old but does not possess any of the criteria for 3 above.

5 Other.

Item 38—Navigation Control Field Length = 1

This Item indicates whether or not navigation control exists for the bridge or tunnel. Navigation control refers to the authority exercised by the U.S. Coast Guard or the U.S. Army Corps of Engineers with respect to navigable waters.

0 No navigation control exists
1 Navigation control exists

Item 39—Navigation Vertical Clearance Field Length = 3

If Item 38 is coded 1, then this Item contains the minimum clearance in feet imposed at the site as specified on the navigation permit issued by the control agency. This Item indicates the clearance allowable for navigation purposes. In the case of a bascule bridge, the vertical clearance is measured with the bridge in the closed position, i.e., open to vehicular traffic. If Item 38 is coded 0, this Item is coded with zeros also. If Item 38 has been coded 1 and there is no vertical clearance as in the case of swing barges, 0 is coded for this item. The vertical clearance of a swing bridge is measured with the bridge in the closed position, i.e., open to vehicular traffic. The vertical clearance of a vertical lift bridge is measured in the raised or open position.

Examples:	**Actual**	**Record**	**Code**
	75.0 feet	75	075
	150.0 feet	150	150
	20.6	21	021

Item 40—Navigation Horizontal Clearance — Field Length = 4

If Item 38 is coded 1, then this Item contains the minimum horizontal clearance in feet. This measurement should be that shown on a navigation permit and may be less than the structure allows. If Item 38 is coded 0, this Item is left blank.

95 feet	code 0095
538 feet	code 0538

Item 41—Operational Status — Field Length = 1

This Item provides indicates the operational status of a structure using the following codes:

C Bridge is closed to all traffic. This corresponds to a code of 0 or 1 in any one or all of Items 59, 60, and 62.

P Bridge is open to traffic but is load restriction posted.

A Bridge is open to traffic with no load restriction.

Item 42—Type Service — Field Length = 2

This item indicates the types of service over and under the bridge, or through and over the tunnel, as follows:

1st digit
OVER BRIDGE OR THROUGH TUNNEL

1 Highway (use for non-grade separation bridges)
2 Railroad
3 Pedestrian exclusively
4 Highway and railroad
5 Highway and pedestrian
6 Overpass structure at an interchange or second level of a multilevel interchange
7 Third level (interchange)
8 Fourth level (interchange)
9 Building or plaza

2nd digit
UNDER BRIDGE OR OVER TUNNEL

1 Highway, with or without pedestrian
2 Railroad
3 Pedestrian exclusively
4 Highway and railroad
5 Waterway
6 Highway and waterway
7 Railroad and waterway
8 Highway, railroad and waterway
9 Relief
0 Other

Item 43.1—Structure Type, Main Spans Field Length = 4

Coding for this Item is derived from the following Tables. For those cases where a bridge structure has been widened, the type describing the original structure is coded. If not applicable, as for a culvert, tunnel or ferry, all four digits are left blank.

1st digit—SPAN TYPE

1 Simple Span
2 Continuous
3 Cantilever
4 Cantilever with Suspended Span
5 Arch
6 Rigid Frame
7 Movable
8 Suspension or Stayed
9 Other

2nd digit—ROADWAY TYPE

1 Deck
2 Through
3 Part Through
*4 Combination 1 & 2
*5 Combination 1 & 3
*6 Combination 2 & 3
*7 Combination 1,2 & 3
*9 Other

*Not normally applicable to Span Type 1

3rd & 4th digits—MAIN MEMBER TYPE

11 Steel I-Beam
12 Plate Girder—Multiple
13 Plate Girder, Var. Depth—Multiple
14 Plate Girder with Floor System
15 Steel Box Girder—Multiple
16 Steel Box Girder—Single or Spread
18 Steel Orthotropic Plate Girder
19 Other Steel

21 Concrete Girder—Tee Beam
22 Concrete Girder, Var. Depth—Tee Beam
23 Concrete Box Girder—Multiple
24 Concrete Box Girder—Single or Spread
25 Concrete Slab & Girder—Pan Formed
26 Concrete Slab, Flat
27 Concrete Slab—Variable Depth
28 Concrete Arch, Open Spandrel
29 Other Concrete

31 PS Concrete Girder—Multiple
32 PS Concrete Girder with Floor System
33 PS Concrete Box Girder—Multiple
34 PS Concrete Box Girder—Single or Spread
35 PS Concrete Slab & Girder—Pan Formed
36 PS Concrete Slab—Full Depth
37 PS Concrete Slab—Partial Depth
39 Other Prestressed Concrete

41 Timber Stringers—Multiple
42 Timber Girder with Floor System
43 Timber Truss
49 Other Timber

51 Metal Arch
52 Other Metal
53 Masonry Arch or Other Masonry
54 Movable, Vertical Lift
55 Movable, Bascule
56 Movable, Horizontal Swing
57 Movable, Other
59 Other Than Metal Truss or Other Metal
61 Pratt Truss, Parallel Chord
62 Pratt Truss, Half-Hip, Parallel Chord
63 Warren Truss, Parallel Chord
64 Warren Quadrangular Truss, Parallel Chord
65 Baltimore Truss, Parallel Chord
66 K Truss, Parallel Chord
67 Whipple Truss, Parallel Chord
68 Bedstead Truss, Parallel Chord
71 Parker Truss, Polygonal Top Chord
72 Camelback Truss, Polygonal Top Chord
73 Pennsylvania Truss, Polygonal Top Chord
74 K Truss, Polygonal Top Chord
75 Warren Truss, Polygonal Top Chord
76 Bowstring Truss, Polygonal Top Chord
77 Lenticular Truss, Polygonal Top Chord
78 Whipple Truss, Polygonal Top Chord
79 Pegram Truss, Polygonal Top Chord
81 Howe Truss, Parallel Chord
82 Post Truss, Parallel Chord
83 King Post or Waddell "A" Truss
84 Queen Post Truss, Parallel Chord
85 Bollman Truss, Parallel Chord
86 Fink Truss, Parallel Chord
87 Fink-Stearns Truss, Parallel Chord
88 Kellog Truss, Parallel Chord
89 Pratt-Greiner Truss, Parallel Chord
91 Continuous Truss
92 Wichert Continuous Truss
93 Vierendeel Truss
97 Other Truss, Parallel Chord
98 Other Truss, Polygonal Top Chord

Examples:

Description	Code
Simple Span Concrete Flat Slab	1126
Warren Pony Truss, Parallel Chord	1363
Continuous Steel Deck Plate Girder, Multiple	2112
Concrete Rigid Frame	6129
Closed Spandrel Concrete Arch	5129
Parker Through Truss	1271
Masonry Arch	5153
Simple Span Concrete Pan Girder	1125
Movable Vertical Lift	7254
Cable Stayed Girder with Floor System	8214
Pratt Through Truss	1261

Item 43.2—Structure Type, Major Approach Spans Field Length = 4

Coding for this Item is derived from the codes under Item 43.1. Approach spans are those spans in a bridge which are of a different structure type or material from that of the main spans. Utilizing these same distinctions, the approach spans should be considered in two categories, major and minor, with the major approach spans usually being those immediately adjacent to the main spans.

Main spans are those of greatest length within a bridge and are normally at the center of the feature being crossed. Major approach spans are those spans of a different type, or of the same type but 75 percent or less than the length of the longest main span and are normally at one or both ends of the main spans. Minor approach spans are either a different type from the main and major approach spans, or 75 percent or less than the length of the longest major approach span.

Item 43.3—Structure Type, Minor Approach Spans Field Length = 4

Coding for this Item is derived from the codes under Item 43.1, and will apply to minor approach spans as described in Item 43.2. This Item is left blank if not applicable, as would be the case where no distinctions could be made between major and minor approach spans.

Item 43.4—Structure Type, Culvert Field Length = 2

Coding for culverts is derived from the following table. Where the bridge is other than a culvert, this Item is left blank.

1st digit—SPAN TYPE

1 Single Box
2 Multiple Box
3 Single Pipe
4 Multiple Pipe
9 Other

2nd digit—MAIN MEMBER TYPE

1 Steel
2 CGM
3 Concrete
4 Timber
5 Masonry
9 Other

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Item 43.5—Structure Type, Tunnel | Field Length = 1

Coding for tunnels is derived from the following table. Where the structure is other than a tunnel, this Item is left blank.

1	Steel	5	Timber
2	CGM	6	Masonry
3	Concrete	7	Tunnel in rock
4	Concrete, prestressed	9	Other

Item 44.1—Substructure Type, Main Spans | Field Length = 3
Item 44.2—Substructure Type, Major Approach Spans | Field Length = 3
Item 44.3—Substructure Type, Minor Approach Spans | Field Length = 3

Items 44.1, 44.2 and 44.3 pertain to intermediate supports only, to the exclusion of abutments, and are not applicable to culverts or tunnels. Where a main span shares an intermediate support with an approach span, the support is coded under Item 44.1. Where a major approach span shares an intermediate support with a minor approach span, the support is coded under Item 44.2. Where a structure has no intermediate supports, this Item as well as 44.2 and 44.3 are left blank. Coding is derived from the following tables.

1st digit—ABOVE GROUND		2nd digit—BELOW GROUND		3rd digit—CAP	
1	Pile Bents	1	Steel Piles	1	Concrete
2	Single Column Bent*	2	Concrete Piles (including steel shell concrete piles)	2	Steel
3	Multiple Column Bent*	3	Timber Piles	3	Timber
4	Concrete Column Bent with Tie Beam*	4	Drilled Shafts	4	Masonry
5	Concrete Column Bent with Web Wall*	5	Spread Footing	9	Other
6	Concrete Pier	6	Spread Footing on Drilled Shafts		Leave blank if no cap or not applicable
7	Masonry Pier	7	Spread Footing on Piles		
8	Trestle (steel, concrete or timber)	9	Other		
9	Other				

*Could be above ground portions of drilled shafts

Item 45.1—Number of Main Spans | Field Length = 3

The number of main spans in the bridge is entered for this Item. If the bridge is a culvert this Item contains the number of boxes or pipes in the culvert. This Item is left blank for tunnels.

Item 45.2—Number of Major Approach Spans | Field Length = 4

The total number of major approach spans in the bridge is entered in this Item. Note that spans of this type may lie on one or both sides of the main span or spans. This Item as well as 45.3 are not applicable to culverts or tunnels and in such cases are left blank.

Item 45.3—Number of Minor Approach Spans Field Length = 4

The number of minor approach spans in the bridge plus any aditional spans not counted in Items 45.1 or 45.2 is entered for this Item. Note that spans of this type may lie on one or both ends of the structure.

Item 46—Total Number of Spans Field Length = 4

The total number of spans in the bridge is entered for this Item. This number is the total of the entries in Items 45.1, 45.2 and 45.3. If the bridge is a culvert, the number of boxes or pipes contained therein is coded in this Item. This Item is left blank for a tunnel or if otherwise not applicable.

Item 48—Length of Maximum Span Field Length = 4

The length of the maximum span measured to the nearest foot along the roadway centerline is entered for this Item. The measurement should be as specified in Section 3.2.2 of the AASHTO Manual. For culverts this Item applies to the largest culvert box or pipe.

Examples:	**Span Length**	**Code**
	50 feet	0050
	1050 feet	1050
	11 feet 3 inches	0011

Item 49—Structure Length Field Length = 6

The length of the bridge, culvert or tunnel measured to the nearest foot is entered for this Item. The length should be measured back to back of backwalls of structure abutments as specified in Section 3.2.2 of the AASHTO Manual.

Example: 333 feet code 000333

Item 50—Sidewalk Widths Field Length = 6

This Item contains the widths of the right and left sidewalks over a bridge or through a tunnel as measured to nearest tenth of a foot for widths up to 9.9 feet. The leftmost three digits represent the left sidewalk and the rightmost three digits represent the right sidewalk. Left and Right are determined as if traveling in the direction of logging. Zeros are coded if no sidewalks are present. For widths greater than 9.9 feet 099 is coded.

Examples:	**Left Side**	**Right Side**	**Code**
	None	8.3′	000083
	10.0′	4.1′	099041
	8.3′	None	083000
	12.2′	11.1′	099099

Item 51—Roadway Width, Curb to Curb — Field Length = 4

This Item contains the clear distance as measured to the nearest tenth of a foot between the outside curbs of the roadway(s) over the bridge or through a tunnel, inclusive of any median width on the bridge. The measurement is exclusive of flared areas for ramps, i.e., it should be the minimum or nominal width. When a brush curb (9″ or less) is used, the width is measured to the face of parapet, guardrail or railing. Non-automotive traffic carrying underpasses are coded with zeros.

Examples:

Roadway	Code
26.00′	0260
110.13′	1101
66.37′	0664
2-24.00′	0480
2-24.00′ with 4′ median	0520

Item 52—Deck Width — Field Length = 4

This Item contains the extreme out-to-out width of the bridge deck to the nearest tenth of a foot including median, if any. If the bridge is a thru structure or tunnel, the number coded is the lateral clearance between superstructure members. The measurement is exclusive of flared areas for ramps, i.e., it should be the minimum or nominal width. Non-automotive traffic carrying underpasses are coded with zeros.

Examples:

Roadway	Code
26′ with 18″ wide curbs	0290
2-26′ with 18″ wide curbs and 4′ median	0590

Item 53—Minimum Vertical Clearance Over Bridge Roadway — Field Length = 4

This Item contains the minimum vertical clearance over the roadway carried by the structure, with measurement recorded in feet and inches to the nearest inch. Where no restriction exists above the roadway and clearance is therefore unlimited 9999 is coded.

Examples:

Clearance	Code
17′-3″	1703
75′-11″	9999
Unlimited	9999

Item 54—Minimum Vertical Underclearance — Field Length = 4

This Item contains the minimum vertical clearance from the roadway or railroad track beneath the bridge to the underside of the superstructure. The measurement is recorded in feet and inches as shown in the examples under Item 53. Zeros are coded for bridges over any feature other than a railroad or roadway.

Item 55—Minimum Lateral Underclearance on Right Field Length = 3

If the feature beneath the bridge is either a railroad or highway the minimum lateral clearance to the right is entered for this Item. If the feature is not a railroad or through roadway of a highway, 999 is coded to indicate not applicable. The lateral clearance is measured to the nearest tenth of a foot from the right edge of the roadway, or from the centerline (between the rails) of the righthand track in the case of a railroad, to the substructure unit or to the toe of a slope steeper than three to one. The underclearance measurement coded is the minimum of the right hand clearances in both directions of travel. In the case of a divided highway, this would mean the outside clearances of both roadways are measured and the smaller distance is coded. If two related features are below the bridge, both are measured and the lesser is recorded.

Item 56—Minimum Lateral Underclearance On Left Field Length = 3
(for Divided Highways Only)

The minimum clearance on the left (median side) of the roadway beneath the bridge is entered for this Item. The clearance on the left for both directions of travel is measured and the smaller distance coded. The clearance is measured to the nearest tenth of a foot from the left edge of roadway to the nearest substructure unit or any median barrier. In the case of a dual highway where there is no obstruction in the median area, 999 is entered in the field.

Item 57.1—Type Deck, Main Spans Field Length = 3
Item 57.2—Type Deck, Major Approach Spans Field Length = 3
Item 57.3—Type Deck, Minor Approach Spans Field Length = 3

Coding Items 57.1, 57.2 and 57.3 is derived from the following table. Where the bridge is a railroad, pedestrian, utility or other such underpass, or a culvert which does not have direct traffic contact, these Items are coded N.

1st digit—MATERIAL

1 Concrete
2 Concrete, Light-weight Aggregate
3 Precast concrete
4 Prestressed Concrete
5 Laminated Timber
6 Timber Plank
7 Steel Grid
8 Steel or other Metal
9 Other

2nd digit—DESIGN

1 Non-Composite
2 Composite (monolithic slab, or slab and girder (pan form) designs, and the like are composite)
N Not applicable

3rd digit—WEARING SURFACE

1	Bare Concrete	A	Concrete with Epoxy-Coated Rebars
2	Asphaltic Seal or HMAC Overlay	B	Concrete with Galvanized Rebars
3	Block	C	Concrete with Other Rebar Coating
4	Open Grate	D	Low Slump Dense Concrete
5	Wood Plank	E	Polymer-Modified Concrete
6	Asphalt with Membrane (this should be recorded from office records only, not field determined)	F	Polymer-Impregnated Concrete
7	Concrete with Linseed Oil Treatment	G	Internally sealed concrete
8	Concrete with Cathodic Protection	H	Special concrete other than A thru G above
9	Other than above or A thru N below	J	Any combination of A thru H above
		N	Not applicable

Item 58—Roadway Condition Field Length = 1
Item 59—Superstructure Condition Field Length = 1
Item 60—Substructure Condition Field Length = 1
Item 61—Channel and Channel Protection Condition Field Length = 1
Item 62—Retaining Wall Condition Field Length = 1

Items 58 through 62 and 65 are coded on a scale from 0 through 9 to indicate the condition of the various bridge components. A 9 indicates that the component is in new condition whereas a rating of 4 or less indicates that the component is in poor or critical condition. Detailed descriptions of the components and the criteria for determining the condition ratings are given in Chapter II, Section 3, and Chapter III, Section 1, and in Plates II-1, III-1 and III-2.

Item 63—Estimated Remaining Life Field Length = 2

The remaining life of the bridge is estimated based on all appropriate factors such as material, traffic volume, age and condition. The estimate, which should be made using the best judgment of a knowledgeable individual, reflects the number of years the bridge can continue to carry traffic without major reconstruction.

Examples:

Estimated Life	Code
4 years remaining	04
15 years remaining	15

Item 64—Operating Rating Field Length = 3

This Item contains the Operating Rating referred to in Article 4.1 of the AASHTO Manual and discussed in Section 3.402 of this Manual. This Item uses the same codes given in Item 66. The first digit of this Item should be the same as the first digit used for Item 66.

Item 65—Approach Roadway Condition (see above) Field Length = 1

Item 66—Inventory Rating Field Length = 3

This Item contains the Inventory Rating referred to in Section 4.1 of the AASHTO Manual and discussed in Section 3.401 of this Manual. The first digit indicates the type of loading as follows:

1 H Truck
2 HS Truck
3 Alternate Interstate Loading
4 Gross or Other Loading
5 Load Restricted to Tandem Axle
6 Load Restricted to Single or Tandem Axle*
7 Railroad Loading
8 Pedestrian or Special Loading (but bridge not load restricted)
9 Load Restricted to Gross Load

*Should be code 5 if load restriction is greater than 20,000 lb.

If a bridge is load restricted, codes 5, 6 or 9 govern over codes 1, 2, 3 or 4. Code 9 governs over codes 5 or 6 where a bridge has both axle and gross load restrictions. For codes 1, 2, 3, 4 and 9 the second and third digits give the gross loading in tons. For codes 5 and 6 the second and third digits give the single or tandem axle loading in tons. For railroad loading, the second and third digits will give Cooper Class or equivalent. Where the railroad loading is unknown, no attempt is made to calculate the loading and this Item is coded 700. Pedestrian and other special loadings are coded 800.

For a bridge shored up or repaired on a temporary basis both the inventory and operating ratings are coded as if the temporary repairs or shoring were not in place. Where the load calculates out to a fraction of a ton, the figure is rounded downward to the next whole ton.

Examples:

Rating	Code
H5.6	105
H10	110
H15	115
H20.5	120
H15-S12(HS15)	227
H20-S16(HS20)	236
H27-S21(HS27)	248
28,000 LB Tandem Axle	514
15,000 LB Axle or Tandem	607
Cooper E60 Railroad Load	760
Unknown Railroad Load	700
Pedestrian Loading	700
58,420 LB Gross	929

Item 67—Appraisal of Structural Condition Field Length = 1
Item 68—Appraisal of Roadway Geometry Field Length = 1
Item 69—Appraisal of Vertical and Lateral Underclearance Field Length = 1
Item 70—Appraisal of Safe Load Capacity Field Length = 1

Item 71—Appraisal of Waterway Adequacy Field Length = 1
Item 72—Appraisal of Approach Roadway Alignment Field Length = 1

Items 67 through 72 are coded on a scale of 0 through 9 to indicate how the various bridge features compare to current standards. A 9 indicates that the feature exceeds current standards whereas a rating below 4 indicates that the feature falls below tolerable limits. Detailed descriptions of the criteria for rating the various features are provided in Chapter III, Section 2 and in Plates III-5 through III-11.

Items 73 through 88—Proposed Improvements Data

If the sufficiency rating of a bridge is greater than 80, zeros should be entered for the proposed improvements data. When a bridge becomes deficient or obsolete and its efficiency rating drops to 80 or less, proposed improvements data should be entered, or an X should be entered in every position of those Items of the proposed improvements data where data is not entered. When an X is entered, computer routines will supply the data, provided that the bridge is deficient or obsolete and its sufficiency rating is 80 or less.

Computer-supplied data can be overriden by entering the desired data. This would usually be done when improvements are actually under consideration.

Item 73—Year Needed Field Length = 2

This Item contains the last 2 digits of the year improvements are needed. The computer will assume the year needed equals the date of last inspection plus the estimated remaining life of the bridge.

Examples:

Year Needed	Code
1970	70
1975	75
1999	99
2005	05

Item 74—Type of Service Field Length = 1

This Item uses the codes for the first digit of Item 42 to represent the type of service to be provided on the bridge.

Item 75—Type of Work Field Length = 3

This Item indicates the type of work proposed to improve the bridge. The first two digits indicate the proposed work as follows:

30 Widening existing bridge or other major structure
31 Replacement of bridge or other structure because of condition
32 Replacement of bridge or other structure because of relocation of road
33 Construction of new bridge or major structure (except to eliminate a railroad grade crossing or one for pedestrians only)
34 Construction of pedestrian over or under crossing
35 Other structure work
36 Strengthening
37 Rehabilitation

The third digit indicates whether the proposed work is to be done by contract or the owner's forces. A 1 indicates contract, and 2 indicates owner's forces.

Examples:	**Code**
Strengthen existing bridge by contract	361
Replacement of weakened bridge by owner's forces	312

Item 76—Length of Improvement Field Length = 6

The length of the proposed improvement to the nearest foot is entered for this Item. This length is not necessarily the full length of the structure.

Examples:	**Length of Improvement**	**Code**
	250 feet	000250
	12345 feet	012345

Item 77—Proposed Design Loading of Improvement Field Length = 1

This Item uses the codes specified in Item 31 to show the design loading proposed for the improvement.

Item 78—Proposed Roadway Width Field Length = 4

The width of the proposed reconstructed roadway to the nearest foot is entered for this Item. The width is from face to face of rails.

Item 79—Proposed Number of Lanes Field Length = 2

The number of lanes proposed for the bridge is entered for this Item.

Item 80—Design ADT Field Length = 6

The ADT which controls the design of the improved bridge is entered for this Item. The ADT should be to the nearest ten and coded as shown in Item 29.

Item 81—Year of Design ADT Field Length = 2

The last two digits of the year of the design ADT are entered for this Item.

Item 82—Year of Proposed Adjacent Roadway Improvements Field Length = 2

This Item contains the last two digits of the year that improvements to the roadway approaches are expected to take place. Zeros are coded if adjacent roadway improvements are not expected.

Item 83—Type of Proposed Adjacent Roadway Improvement Field Length = 1

The type of improvement proposed for approaches to the bridge are entered for this Item as follows:

1	Resurface	4	Shoulder Improvements
2	Reconstruction	5	Other
3	Widening	0	Not Applicable

Item 84—Total Cost of Improvements Field Length = 5
Item 85—Preliminary Engineering Cost Field Length = 3
Item 86—Demolition Cost Field Length = 3
Item 87—Substructure Cost Field Length = 5
Item 88—Superstructure Cost Field Length = 5

Items 84 through 88 are coded in thousands of dollars. If the total cost is for a replacement structure, it may be larger than the sum of Items 85 through 88, since it includes the necessary eligible approach work and other miscellaneous work. D appearing after Item 84 on the printout indicates the data is supplied by the District. C indicates the data is supplied by the computer.

Examples:	**Cost**	**Code**
	$ 55,850	00056
	250,000	00250
	7,451,233	07451

Item 90—Date of Last Inspection Field Length = 6

The numbers representing the month, day and year the bridge was last inspected are coded as follows:

Examples:	**Inspection Date**	**Code**
	August 15, 1979	081579
	November 1, 1980	110180

Items 5A through 30A—Data for the Other Route Items for the Other Route

Items for the Other Route are indicated by the suffix A after the Item number. Items for the Other Route are left blank if there is no Other Route.

Item 5A—Other Route Field Length = 11

For definition and discussion, See Item 5.

Item 5.1A—This item indicates the route as being the Other route.
2 Other route

Item 5.2A—The next two digits shall identify the system of the Other Route. The coding system is the same as given under Item 5.2.

Item 5.3A—The next position should further identify the Other Route. The coding system is the same as given under Item 5.3.

Item 5.4A—The Other Route number is right-justified in the next five positions. See Item 5.4 for instructions.

Item 5.5A—The next position indicates the directional suffix to the Other Route Number when one is part of the route number. The coding system is the same as given under Item 5.5.

Item 5.6A—The last position is to stipulate the function of the structure with regard to the Other Route. The coding system is the same as given under Item 5.6.

Item 10.2A—Other Route Total Horizontal Clearance Field Length = 4

This is the total horizontal clearance for the Other Route. See Item 10.2 for discussion.

Item 10.3A—Minimum Vertical Clearance Over Other Route Field Length = 4

The information to be recorded and coded for this item is the minimum vertical clearance over the Other Route. See Item 10.3 for discussion.

Item 11A—Milepoint Field Length = 5

For the Other Route code a five-digit number to represent the milepoint to thousandths of a mile. See Item 11 for discussion.

Item 12A—Road Section Number Field Length = 5

If the Other Route is a designated defense highway, the road section number for that route is coded in this Item. See Item 12 for discussion.

Item 13A—Bridge Description Field Length = 2

This Item provides additional information on the function of the bridge with respect to the Other Route. See Item 13 for discussion.

Item 14A—Defense Milepoint Field Length = 5

If the Other Route is a defense highway, code the number of miles to the nearest hundredth that the applicable bridge is from the beginning of the defense road section (Item 12A). If the route is not a defense highway, the item is left blank.

Item 15A—Defense Section Length Field Length = 3

The length of the defense road section identified in Item 12A is coded to the nearest tenth of a mile. The length is coded as a three-digit number. If the route identified in Item 5A is not a defense highway, this item is left blank.

Item 19A—Bypass, Detour Length Field Length = 2

This Item is discussed under Item 19.

Item 24A—Federal-Aid System Field Length = 2

This Item is used to indicate the type of Federal-Aid System of which the Other Route is a part. This Item is coded as given under Item 24.

Item 25A—Administrative Jurisdiction Field Length = 1

This Item indicates the type of administrative jurisdiction that applies to the Other Route regardless of whether the same jurisdiction applies to the bridge. This Item is coded as given under Item 25.

Item 26A—Functional Classification Field Length = 2

The functional classification codes are as given under Item 26.

Item 29A—Average Daily Traffic Field Length = 6

The average daily traffic volume for the Other Route is entered for this Item as illustrated under Item 29.

Item 30A—Year of Average Daily Traffic Field Length = 2

This Item contains the last two digits of the year in which the ADT in Item 29A was counted or estimated.

Title 23—Highways

Subpart C—National Bridge Inspection Standards

§ 650.301 Application of standards.

The National Bridge Inspection Standards in this part apply to all structures defined as bridges located on all public roads. In acordance with the AASHTO (American Association of State Highway and Transportation Officials) Highway Definitions Manual, 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 of the roadway of more than 20 feet 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.

§ 650.303 Inspection procedures.

(a) Each highway department shall include a bridge inspection organization capable of performing inspections, preparing reports, and determining ratings in acordance with the provisions of the AASHTO Manual [1] and the Standards contained herein.

(b) Bridge inspectors shall meet the minimum qualifications stated in § 650.307.

(c) Each structure required to be inspected under the Standards shall be rated as to its safe load carrying capacity in accordance with section 4 of the AASHTO Manual. If it is determined under this rating procedure that the maximum legal load under State law exceeds the load permitted under the Operating Rating, the bridge must be posted in conformity with the AASHTO Manual or in accordance with State law.

(d) Inspection records and bridge inventories shall be prepared and maintained in accordance with the Standards.

[1] The "AASHTO Manual" referred to in this part is the "Manual for Maintenance Inspection of Bridges 1978" published by the American Association of State Highway and Transportation Officials.

§ 650.305 Frequency of inspections.

(a) Each bridge is to be inspected at regular intervals not to exceed 2 years in accordance with section 2.3 of the AASHTO Manual.

(b) The depth and frequency to which bridges are to be inspected will depend on such factors as age, traffic characteristics, state of maintenance, and known deficiencies. The evaluation of these factors will be the responsibility of the individual in charge of the inspection program.

§ 650.307 Qualifications of personnel.

(a) The individual in charge of the organizational unit that has been delegated the responsibilities for bridge inspection, reporting, and inventory shall possess the following minimum qualifications:

(1) Be a registered professional engineer; or

(2) Be qualified for registration as a professional engineer under the laws of the State; or

(3) Have a minimum of 10 years experience in bridge inspection assignments in a responsible capacity and have completed a comprehensive training course based on the "Bridge Inspector's Training Manual," [2] which has been developed by a joint Federal-State task force.

(b) An individual in charge of a bridge inspection team shall possess the following minimum qualifications:

(1) Have the qualifications specified in paragraph (a) of this section; or

(2) Have a minimum of 5 years experience in bridge inspection assignments in a responsible capacity and have completed a comprehensive training course based on the "Bridge Inspector's Training Manual," which has been developed by a joint Federal-State task force.

[2] The "Bridge Inspector's Training Manual" may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

§ 650.309 Inspection report.

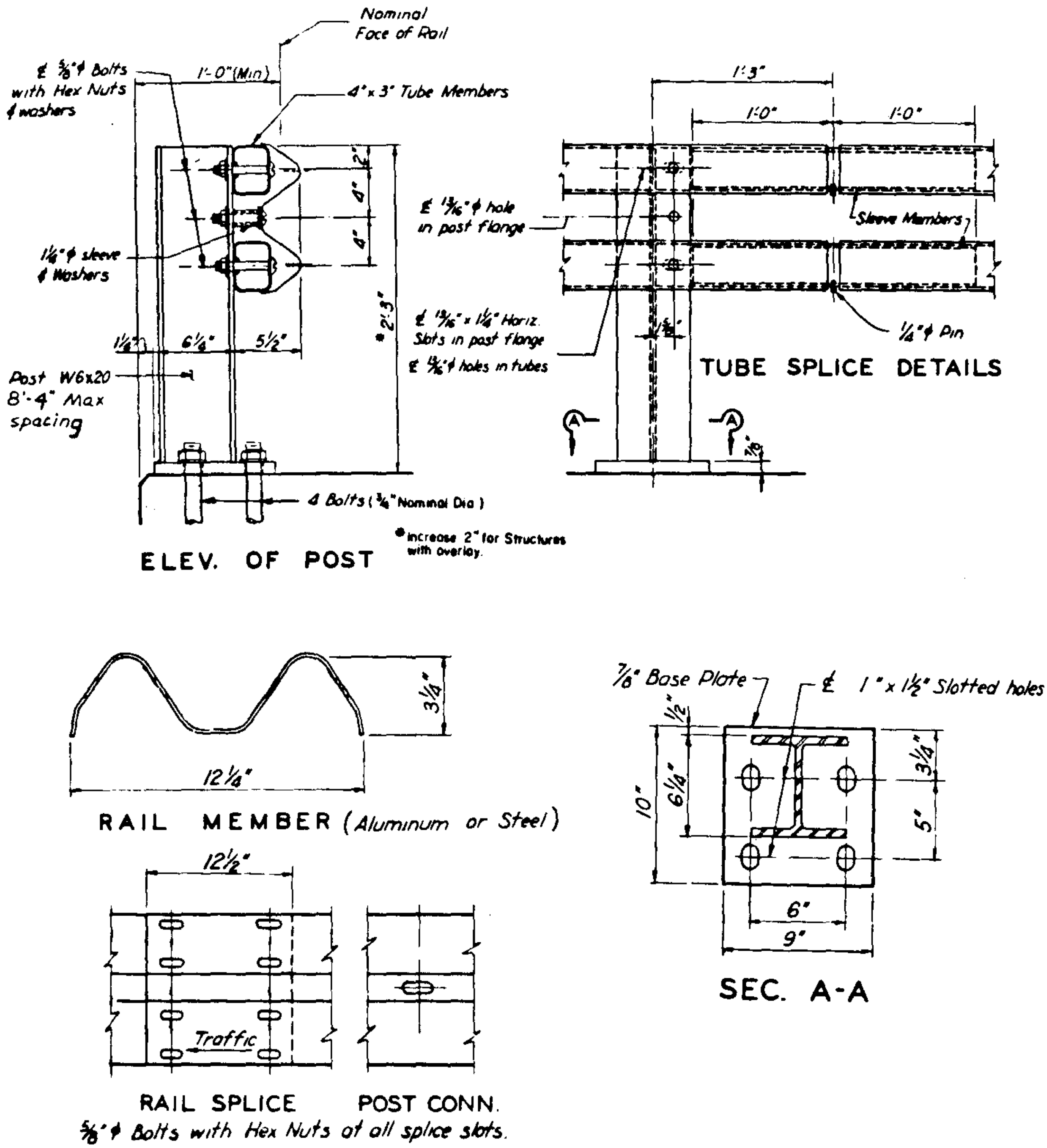
The findings and results of bridge inspections shall be recorded on standard forms. The data required to complete the forms and the functions which must be performed to compile the data are contained in section 3 of the AASHTO Manual.

§ 650.311 Inventory.

(a) Each State shall prepare and maintain an inventory of all bridge structures subject to the Standards. Under these Standards, certain structure inventory and appraisal data must be collected and retained within the various departments of the State organization for collection by the Federal Highway Administration as needed. A tabulation of this data is contained in the structure inventory and appraisal sheet distributed by the Federal Highway Administration as part of the Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (Coding Guide) in January of 1979. Reporting procedures have been developed by the Federal Highway Administration.

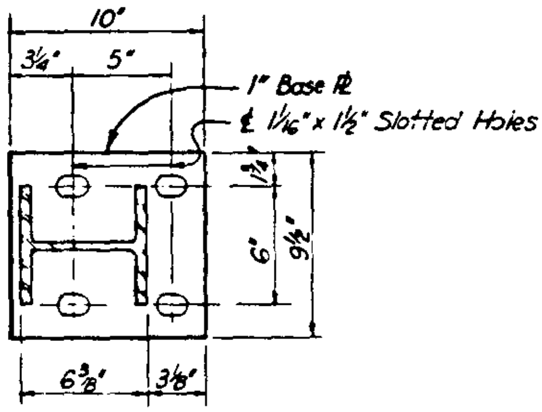
(b) All bridges subject to these Standards shall be inventoried by December 31, 1980, as required by section 124(a), and (c) of the Surface Transportation Assistance Act of 1978. Newly completed structures or any modification of existing structures which would alter previously recorded data on the inventory forms shall be entered in the State's records within 90 days.

(1983)

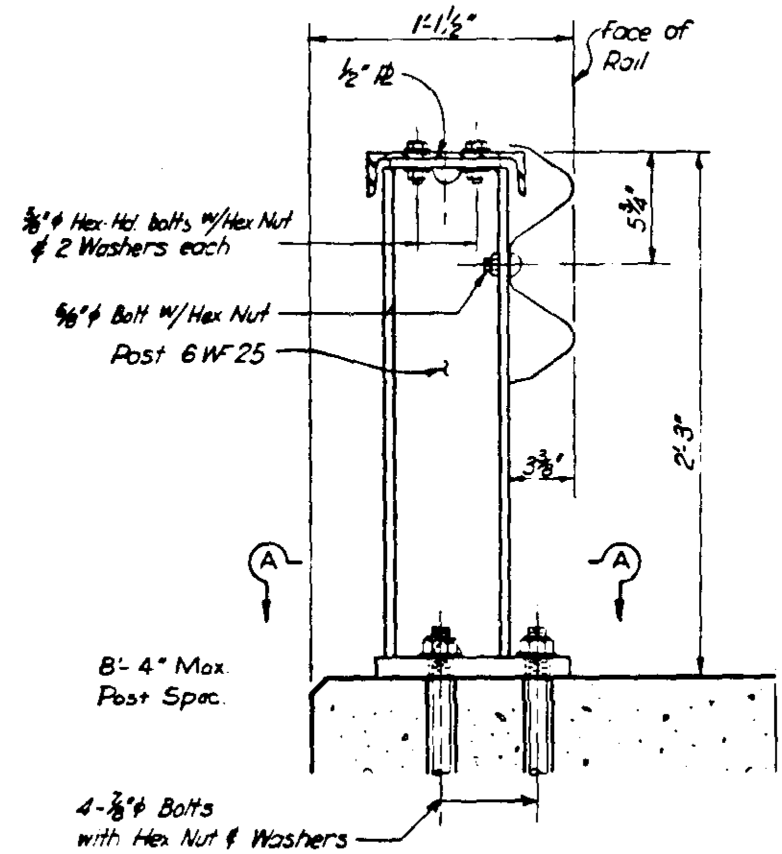


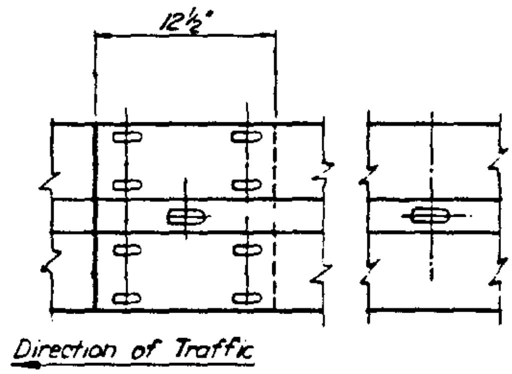
DEEP BEAM RAIL DETAILS

TRAFFIC RAIL TYPE T101

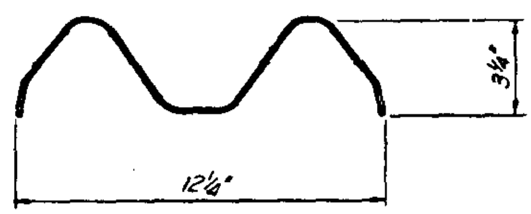


SEC. A-A





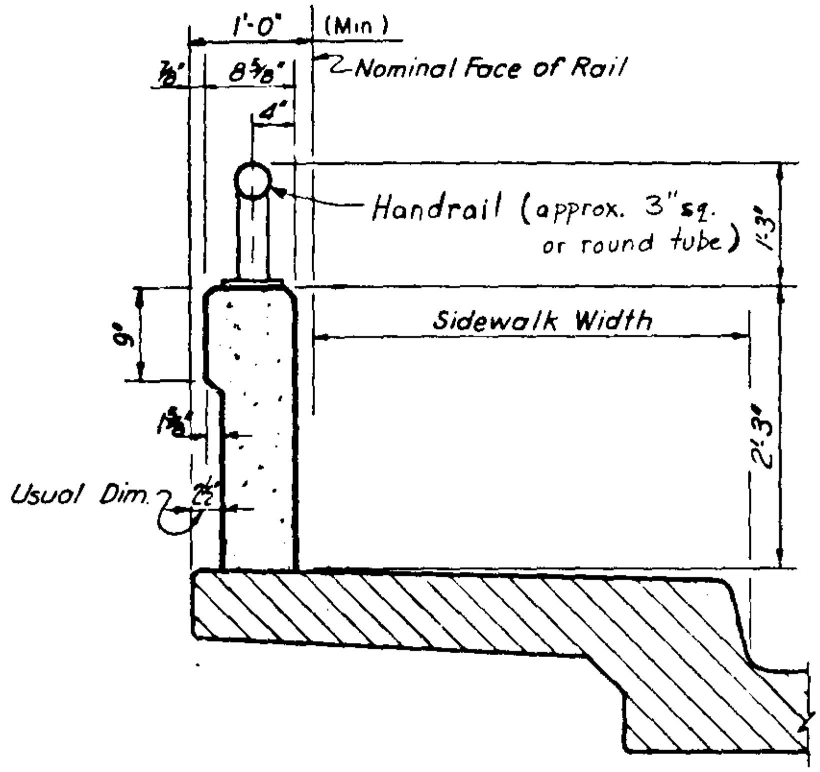
RAIL SPLICE DETAIL



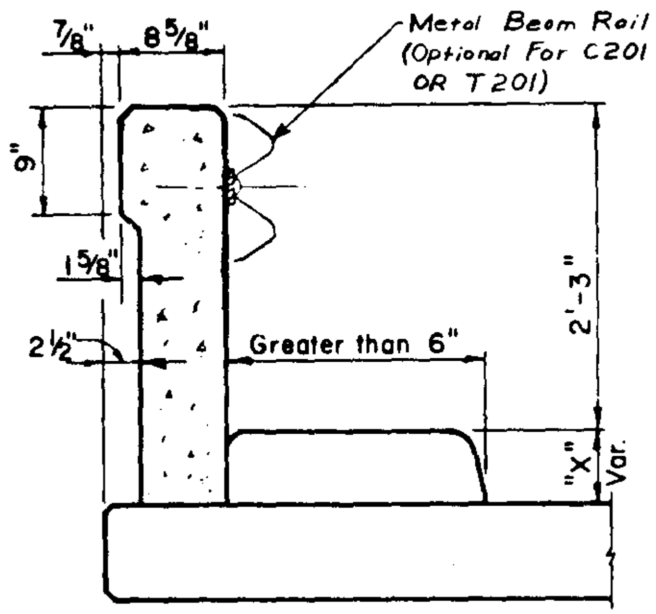
DEEP BEAM RAIL MEMBER

TRAFFIC RAIL TYPE T1

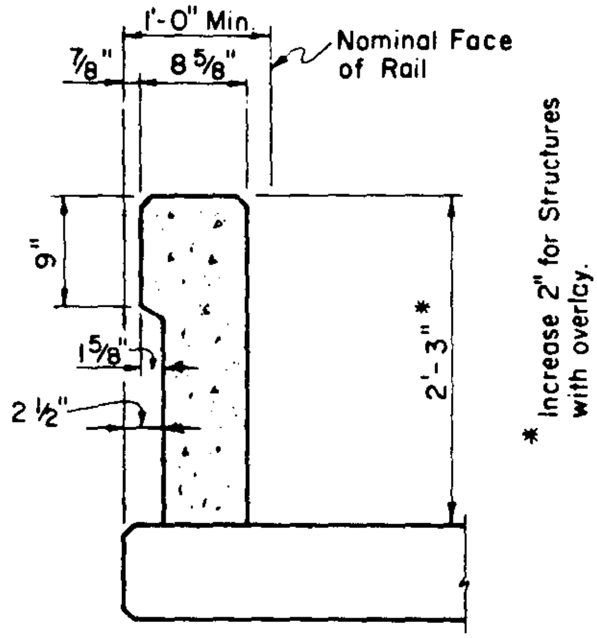
A.2-2 Standards for Traffic Safety Features



COMBINATION RAIL TYPE C201



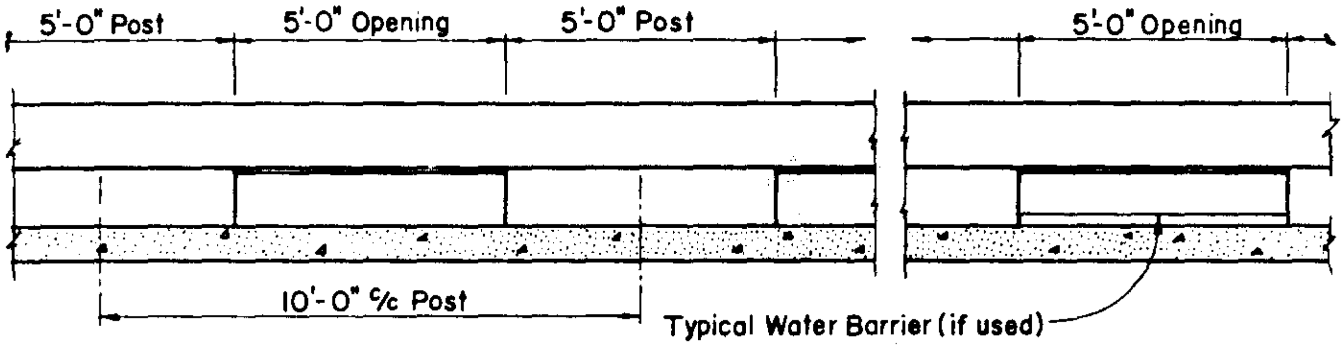
WITH CURBS OVER 6" WIDE

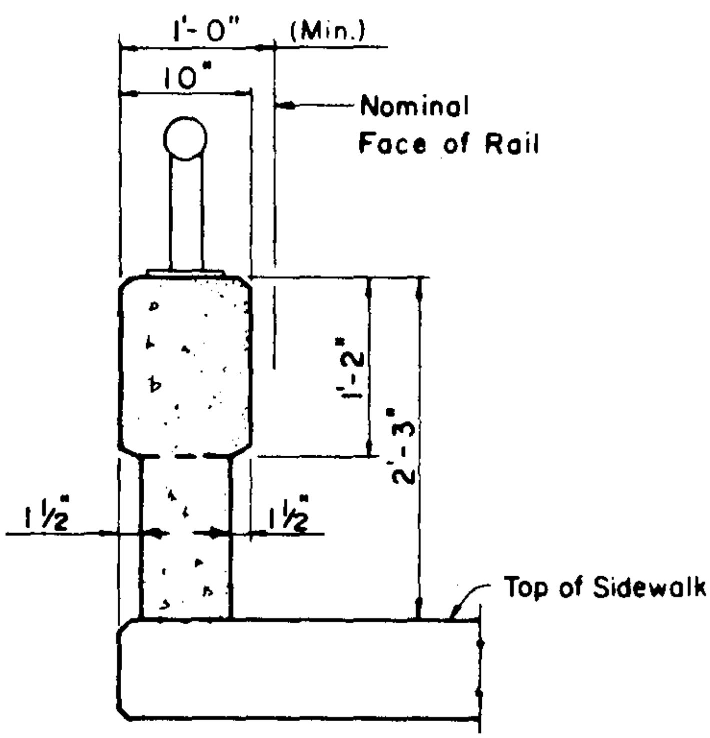


WITH NO CURBS

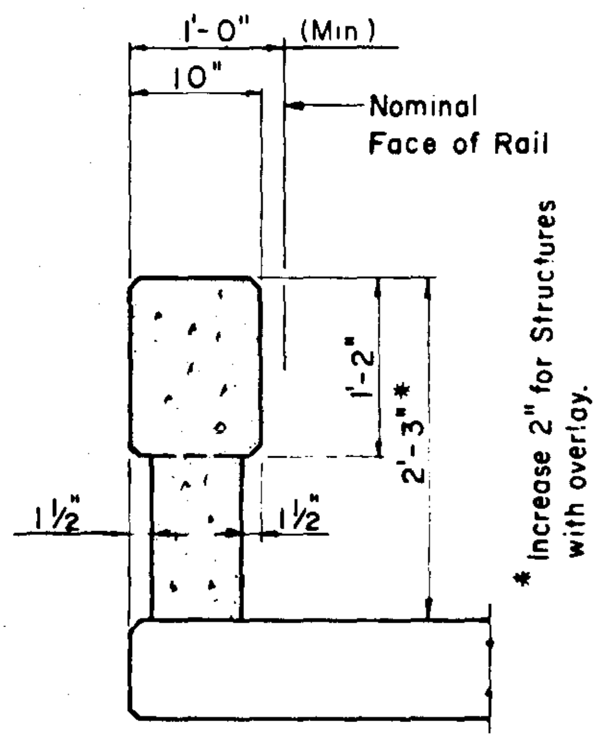
TRAFFIC RAIL TYPE T201

A.2-3 Standards for Traffic Safety Features

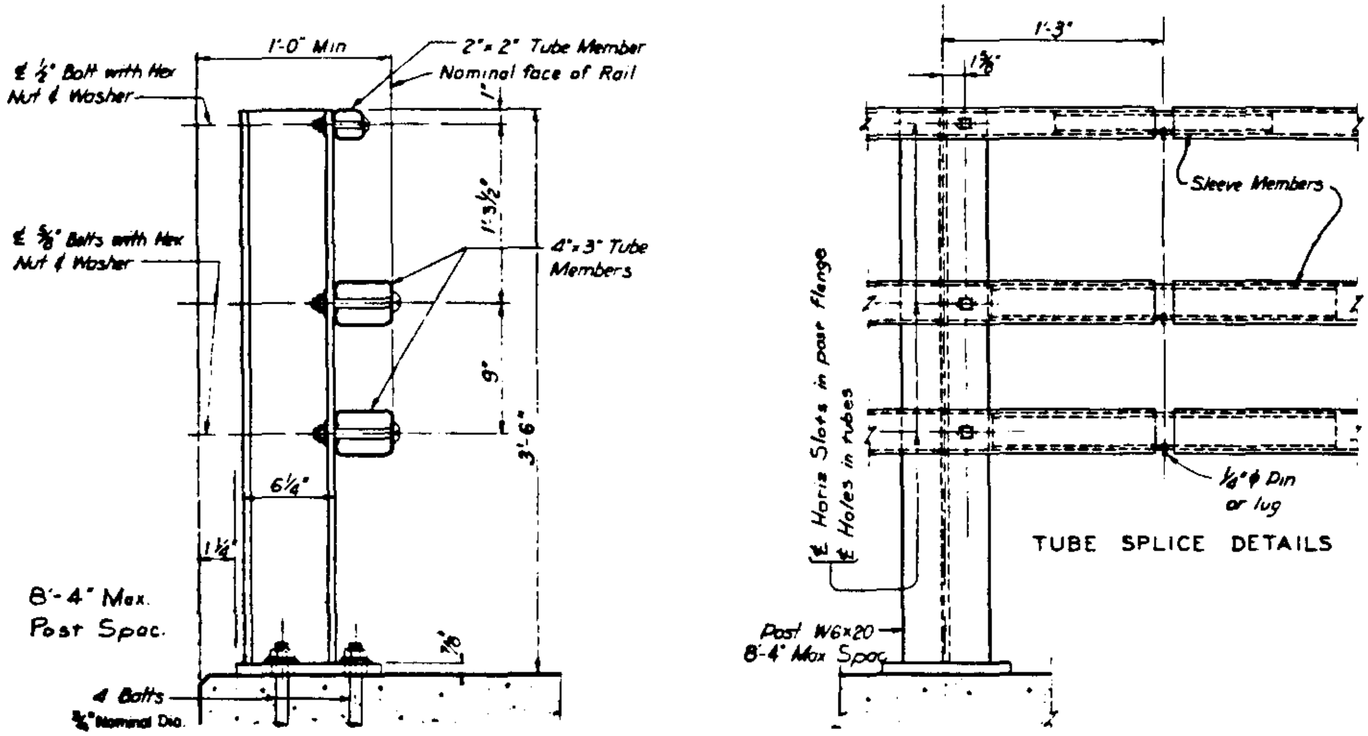




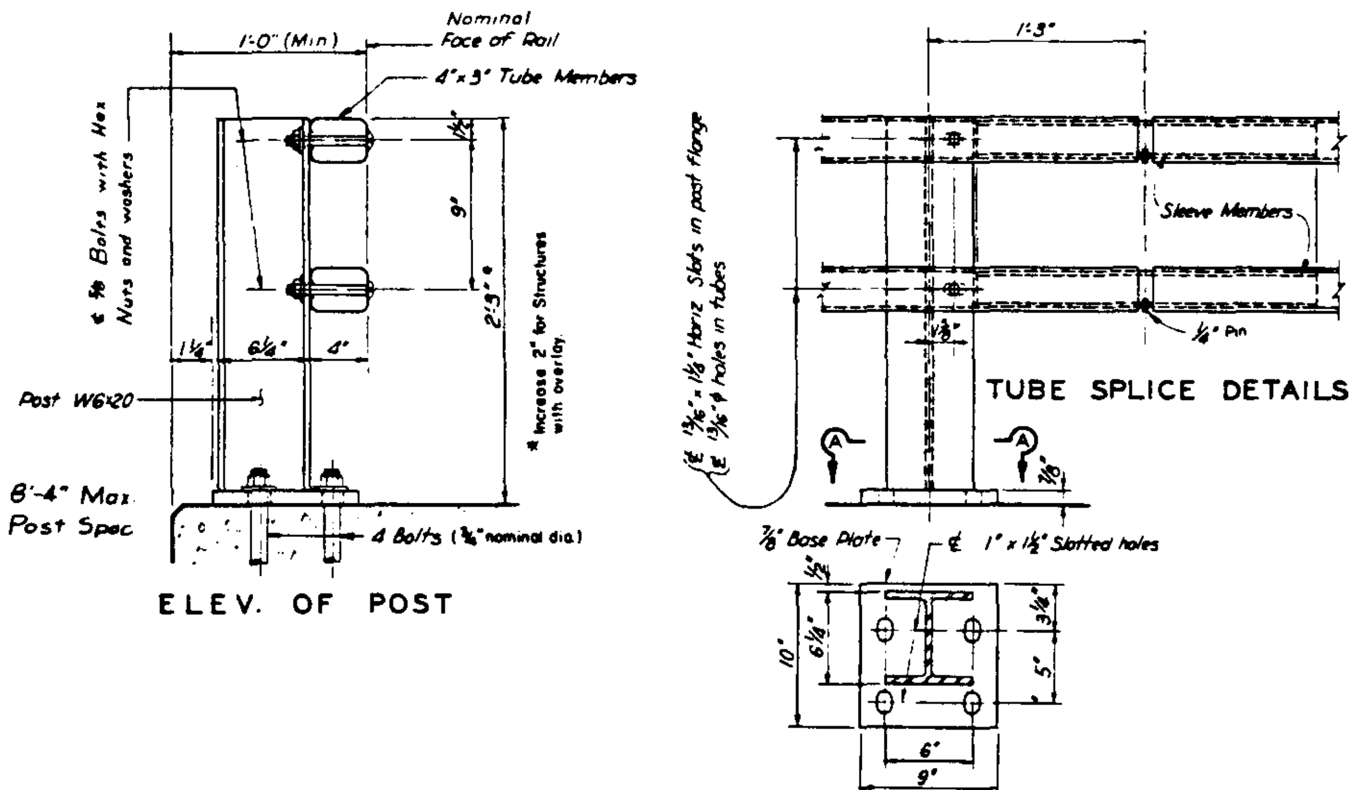
COMBINATION RAIL
TYPE C202



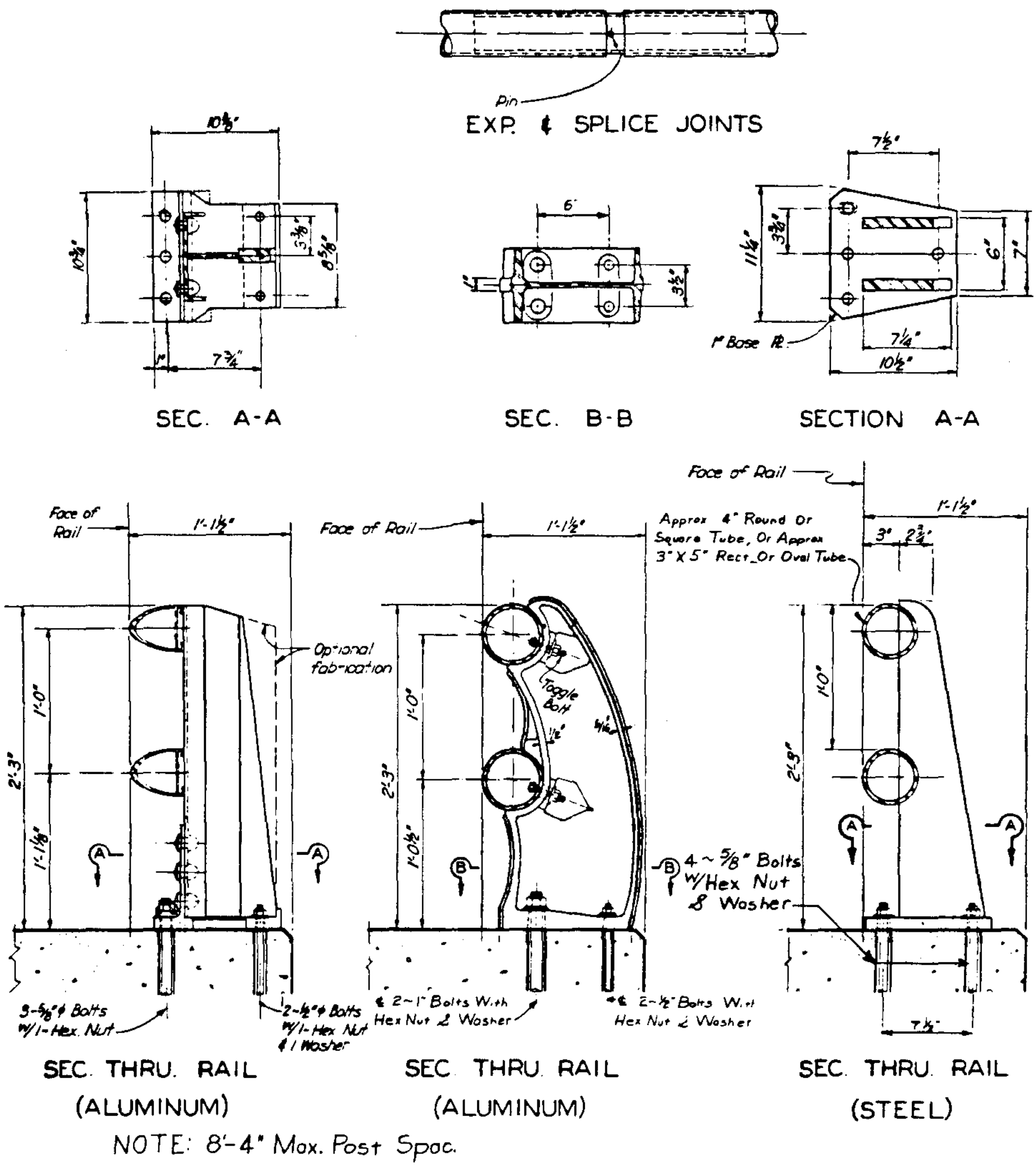
TRAFFIC RAIL
TYPE T202



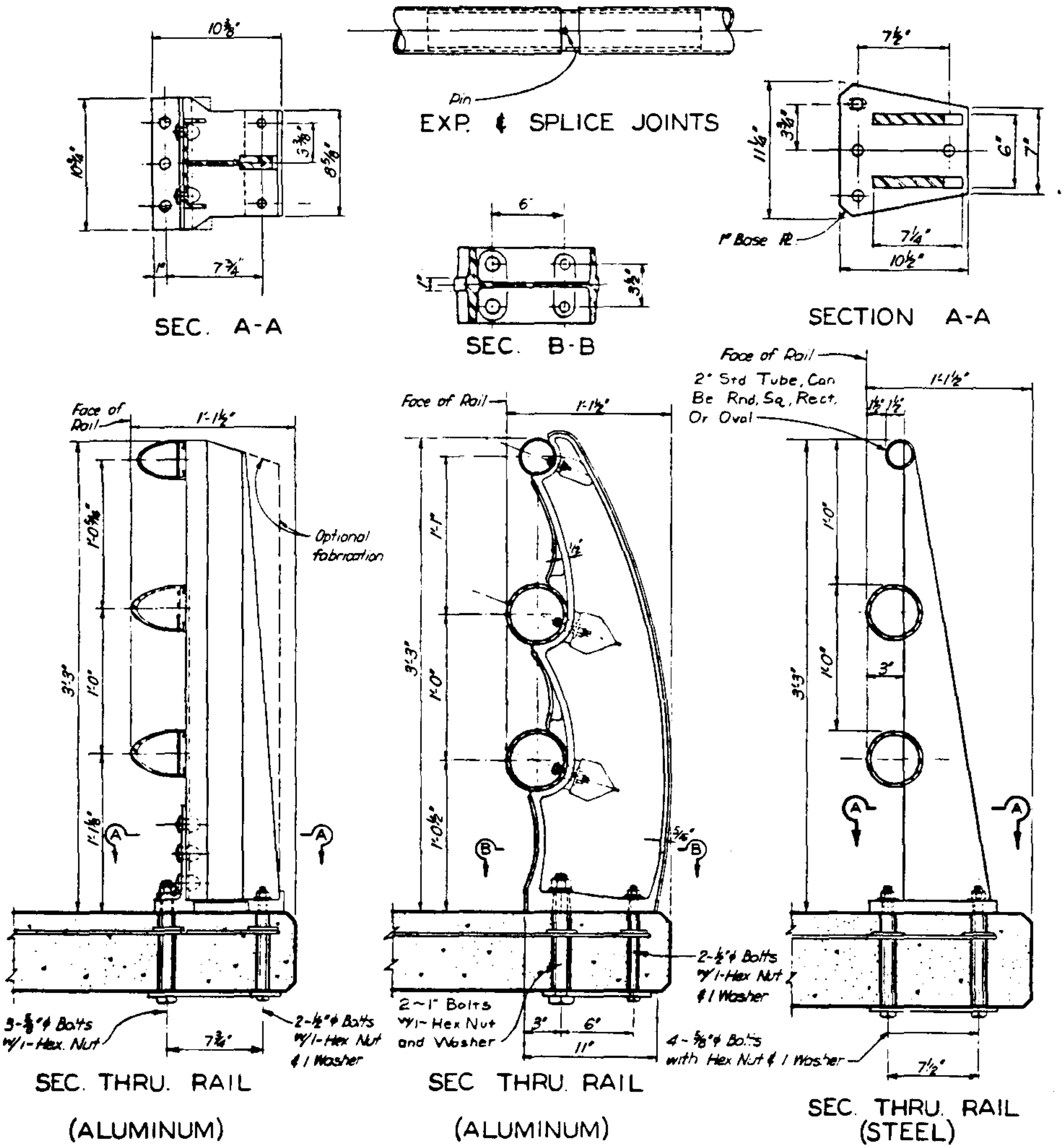
COMBINATION RAIL TYPE C301



TRAFFIC RAIL TYPE T301



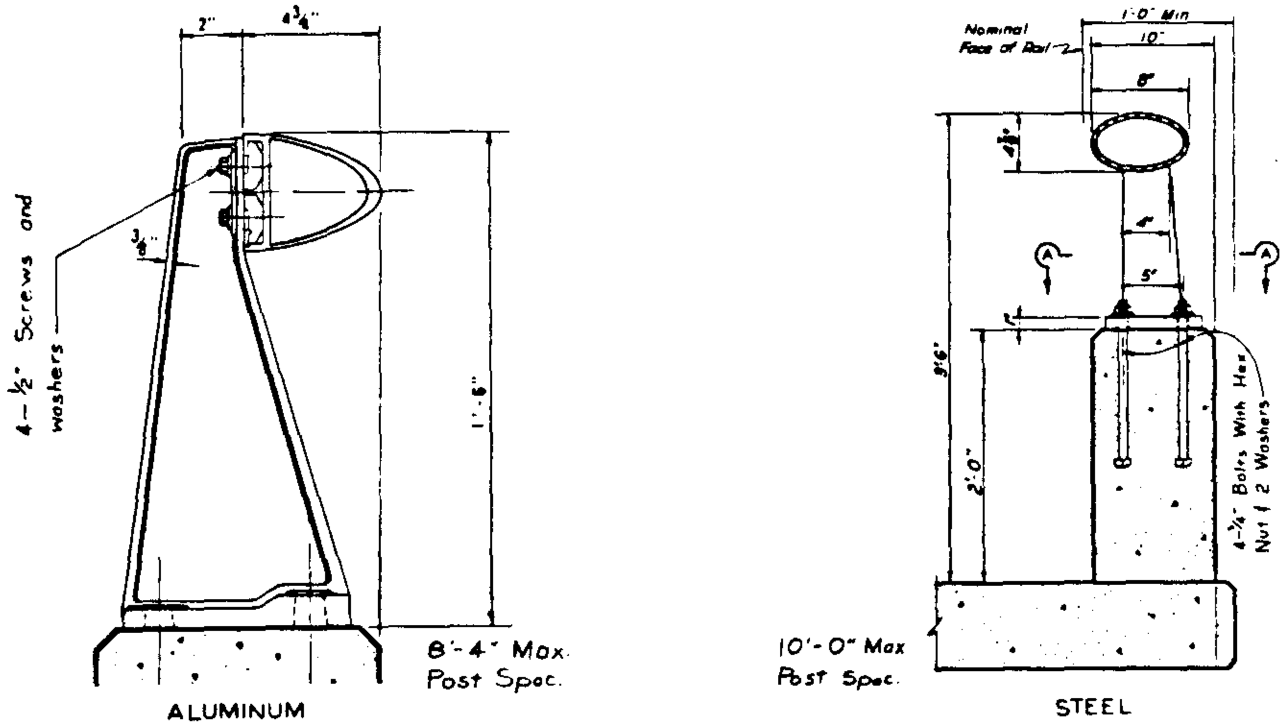
TRAFFIC RAIL TYPE T3



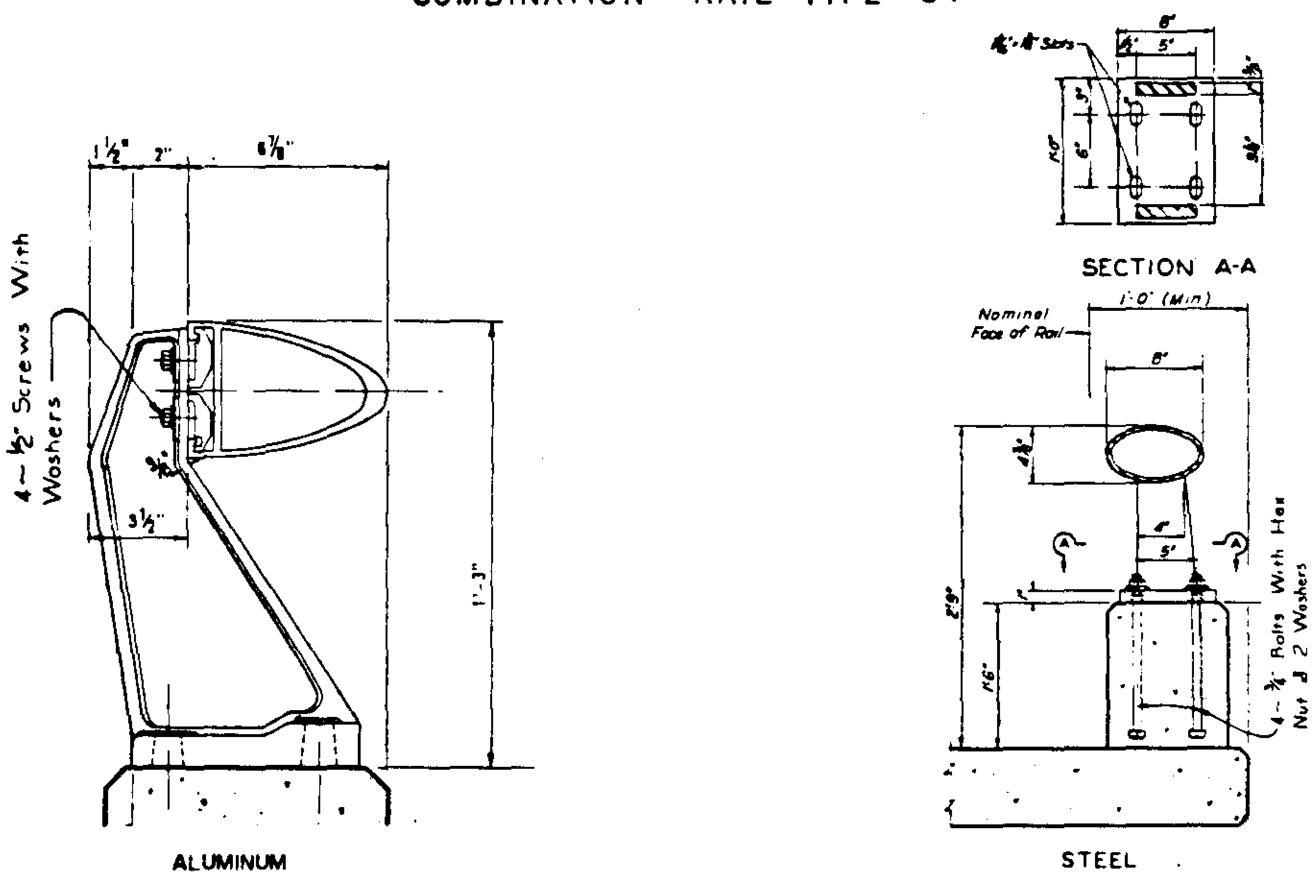
NOTE: 8'-4" Max. Post Spac.

COMBINATION RAIL TYPE C3

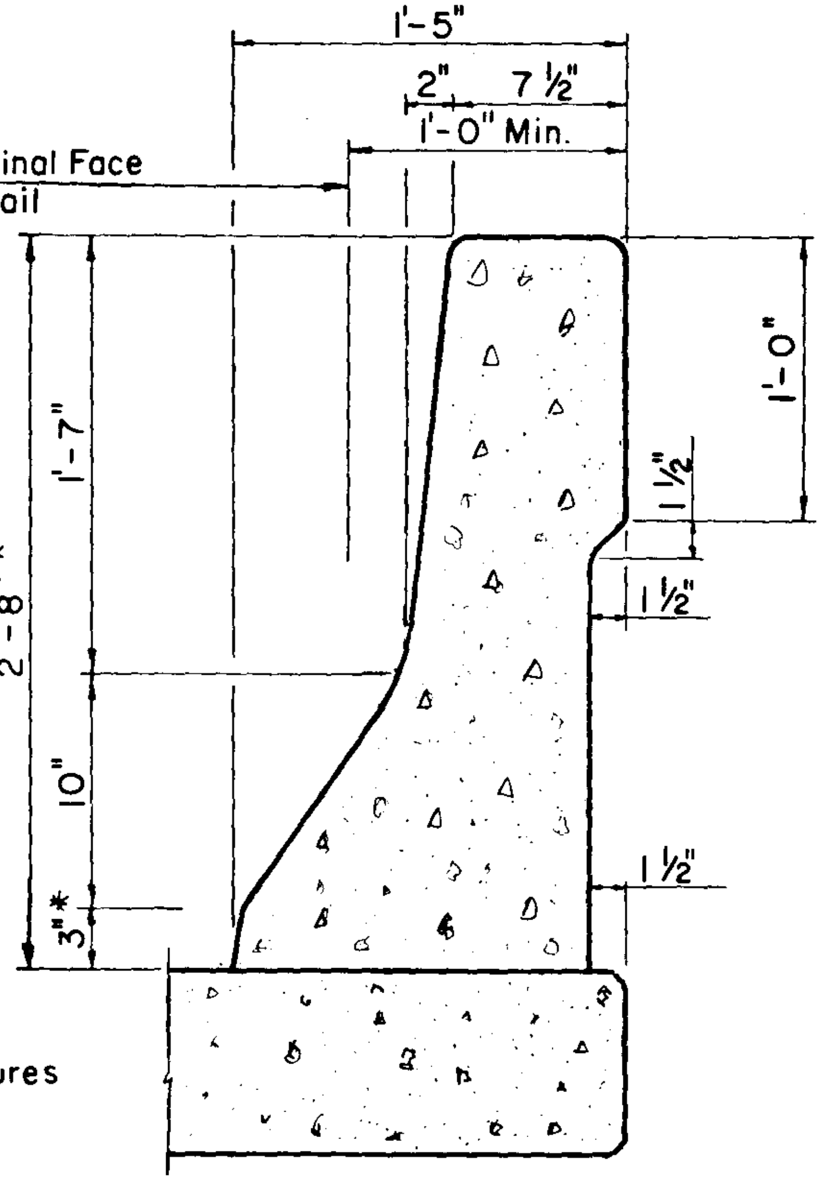
A.2-7 Standards for Traffic Safety Features



COMBINATION RAIL TYPE C4

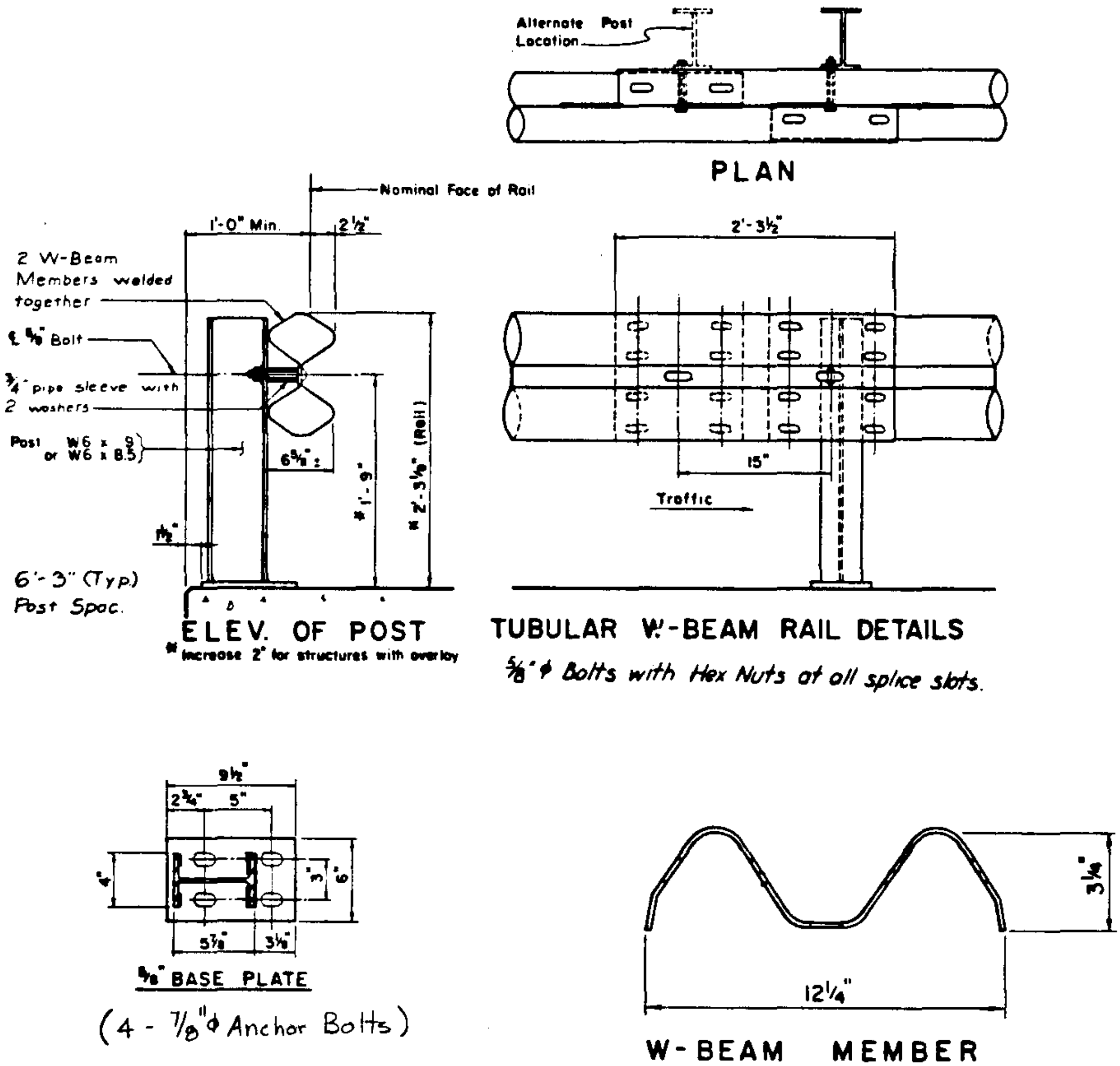


TRAFFIC RAIL TYPE T4

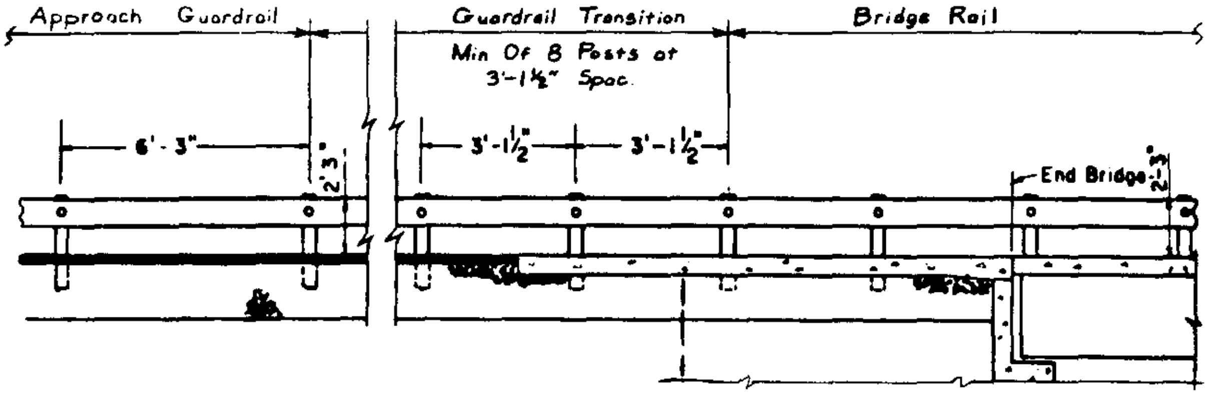


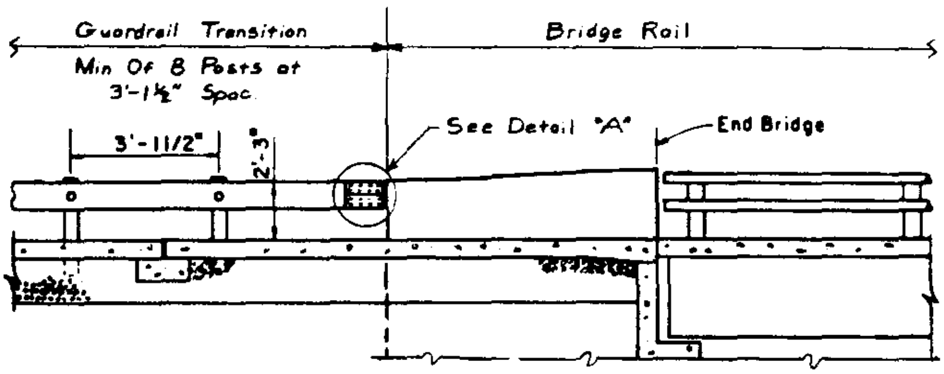
* Increase 2" for Structures with overlay.

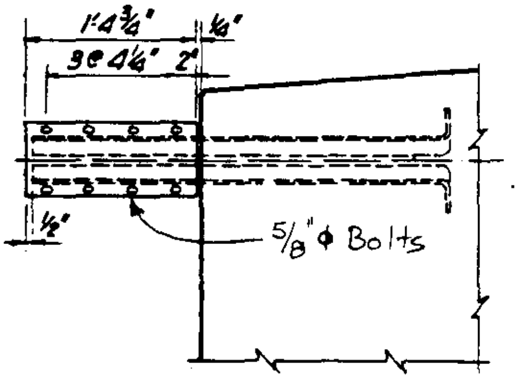
TRAFFIC RAIL TYPE T5



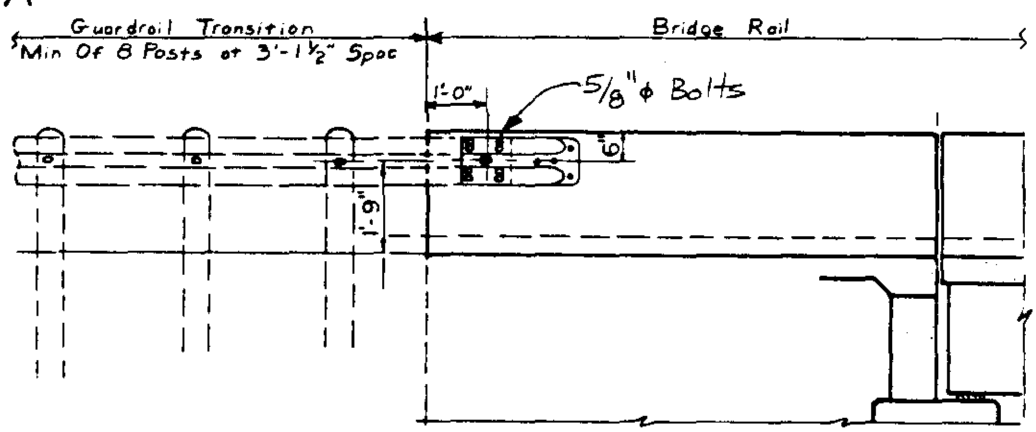
TRAFFIC RAIL TYPE T6



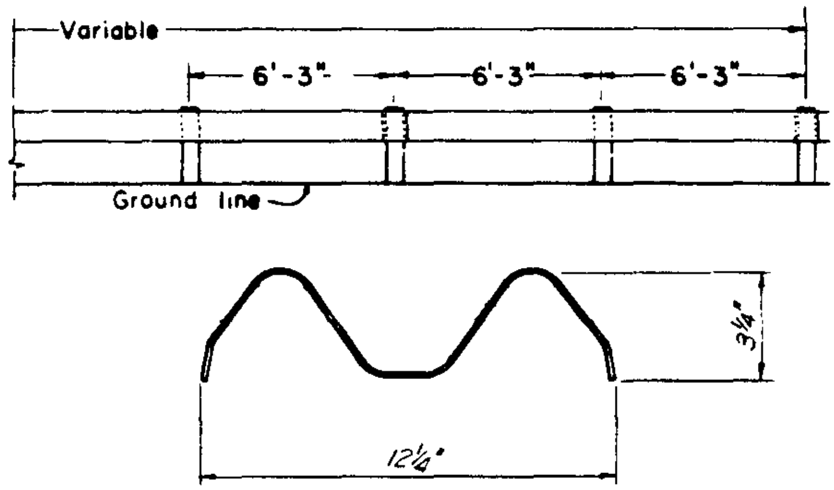




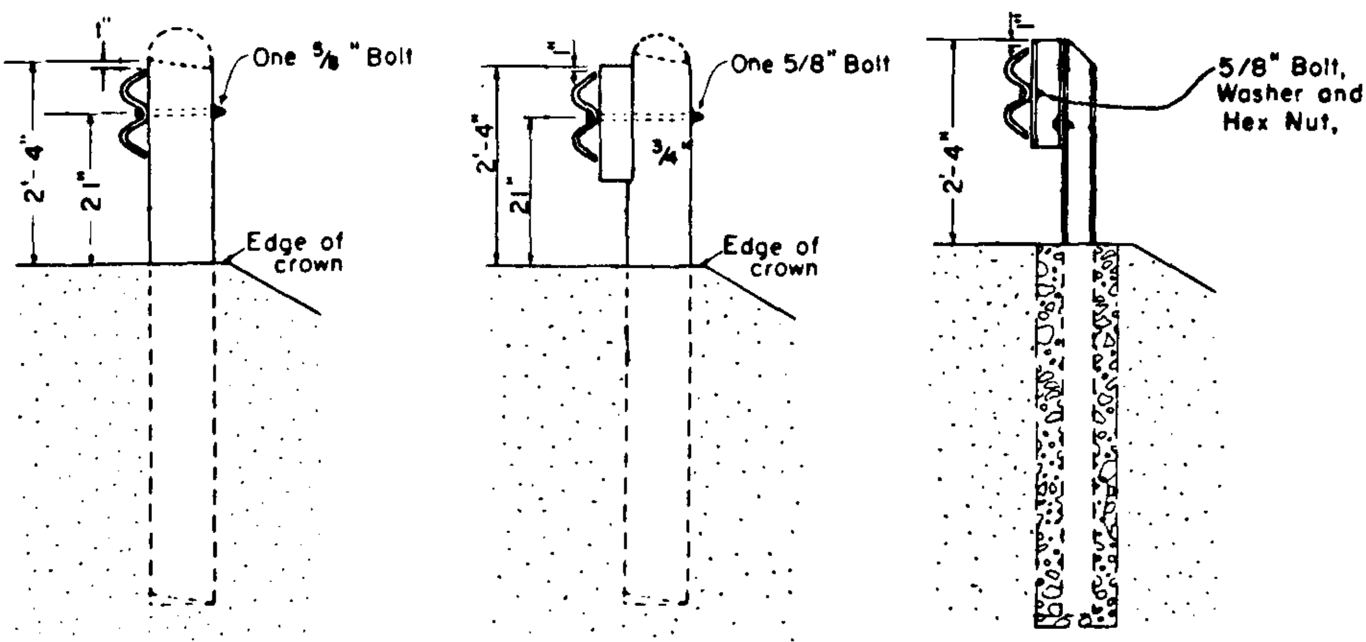
DETAIL "A"



APPROACH GUARDRAIL TRANSITIONS



SECTION THRU GUARD RAIL

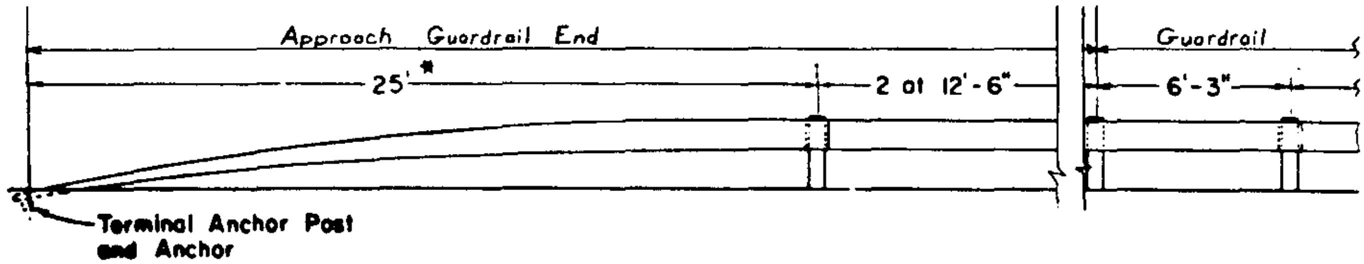


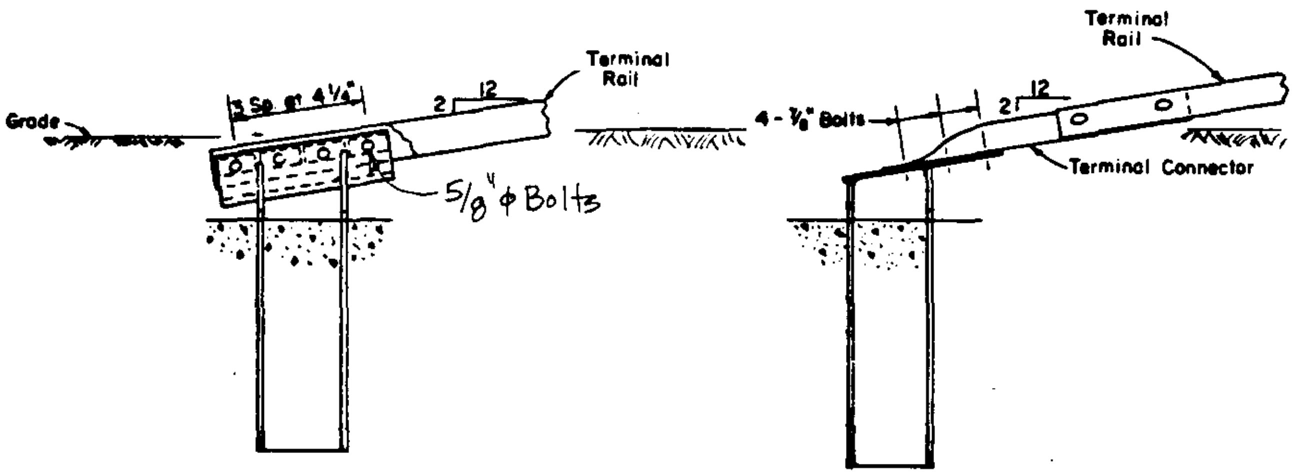
WOOD LINE POST

WOOD LINE POST (Blockout)

STEEL LINE POST (Blockout)

APPROACH GUARDRAIL





ANCHOR POSTS

APPROACH GUARDRAIL END