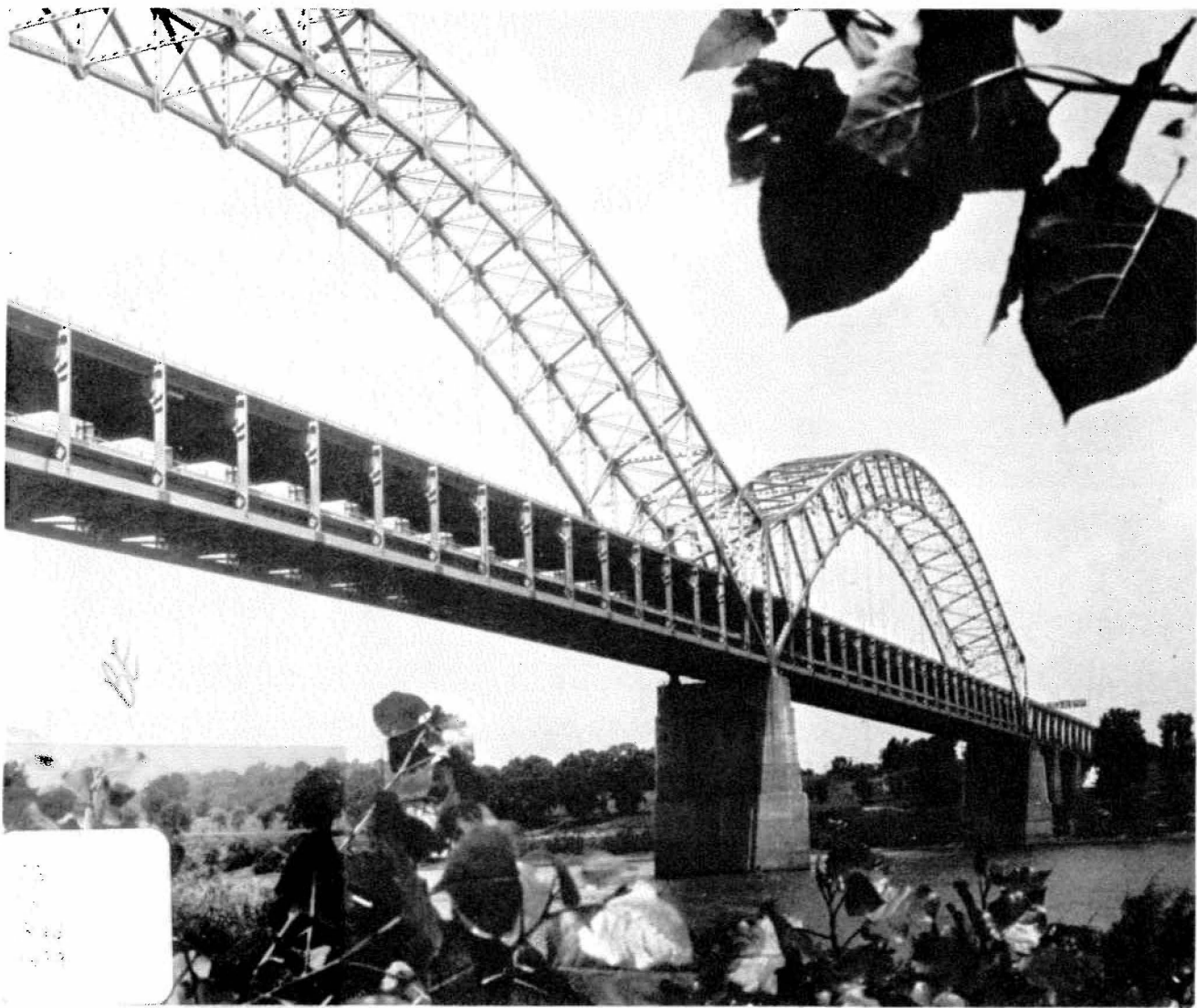


95 RECORDING AND CODING GUIDE...  
**RECORDING AND CODING GUIDE**  
**FOR THE STRUCTURE INVENTORY**  
**AND APPRAISAL**  
**OF THE NATION'S BRIDGES**

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U.S. DEPARTMENT OF TRANSPORTATION/FEDERAL HIGHWAY ADMINISTRATION

U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
WASHINGTON, D.C. 20590



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Prepared by the  
DESIGN & INSPECTION BRANCH  
BRIDGE DIVISION  
WASHINGTON, D. C.



## INTRODUCTION

This Guide, which has been endorsed by the AASHTO Subcommittee for Bridges and Structures, has been prepared for use by the States in recording and coding the data elements that will form a bridge inventory data base. By having a complete and thorough inventory, an accurate report can be made to the Congress of the number and state of the Nation's bridges, arranged in a manner that would best suit needs for future legislation. It will also provide the data necessary for FHWA to produce Defense Bridges and Critical Highway Facilities reports.

Most of the identification and structural items should be available from the State highway and transportation departments. The coded items in this Guide are considered to be an integral part of the data base that can be used to meet several Federal reporting requirements, as well as a large part of States' needs. Reports submitted in connection with the Highway Bridge Replacement and Rehabilitation Program and the National Bridge Inspection Program also are related to this Guide. Obviously, it is intended that present data and future reports be developed using the bridge inventory data base.

The AASHTO Manual for Maintenance Inspection of Bridges (called AASHTO Bridge Manual in this Guide) discusses the various items of information that are to be recorded as part of original bridge reports. That manual and the Bridge Inspector's Training Manual discuss inspection procedures and the preparation of detailed reports about the structure components. These reports will be the basis for recording values for many of the data elements shown in the Guide, particularly those having to do with the condition or the appraisal ratings.

This Guide is based on the Structure Inventory and Appraisal Sheet (SI&A Sheet), which is included. This form is intended to be a repository for the pertinent elements of information about an individual structure. Its use is optional, subject to the statements in the preceding paragraph of this Introduction. Any of the items shown may be requested from time to time and in a form similar to the SI&A Sheet.

The use of this Guide is optional, i.e., each State may use its own code scheme. However, when data are requested, whether in tabular or in computer readable form, the format will be based on the codes in the Guide. A State choosing to use its own codes should provide for translation or conversion to those in the Guide. In other words, the States are responsible for having the capability to obtain, store, and report certain information about bridges whether or not this Guide or the SI&A Sheet is used. Any requests for submittals of these data by FHWA will be based on the definitions, explanations, and codes supplied in the Guide, the AASHTO Bridge Manual, the Bridge Inspector's Training Manual, and the FHPM Vol. 6, Chapter 10, Section 2 - Defense Bridges and Critical Highway Facilities Reports.

All items shall be coded right justified with leading zeros unless otherwise noted.

### IDENTIFICATION CODE

#### Item 1 - State Code

3 digits

The first two digits are the Federal Information Processing Standards (FIPS) code for States and the third digit is the FHWA region code.

#### State Codes

<u>Code</u>	<u>State</u>	<u>Code</u>	<u>State</u>
014	Alabama	331	New Hampshire
049	Arizona	342	New Jersey
056	Arkansas	356	New Mexico
069	California	362	New York
088	Colorado	374	North Carolina
091	Connecticut	388	North Dakota
103	Delaware	395	Ohio
124	Florida	406	Oklahoma
134	Georgia	410	Oregon
160	Idaho	423	Pennsylvania
175	Illinois	441	Rhode Island
185	Indiana	454	South Carolina
197	Iowa	468	South Dakota
207	Kansas	474	Tennessee
214	Kentucky	486	Texas
226	Louisiana	498	Utah
231	Maine	501	Vermont
243	Maryland	513	Virginia
251	Massachusetts	530	Washington
265	Michigan	543	West Virginia
275	Minnesota	555	Wisconsin
284	Mississippi	568	Wyoming
297	Missouri	020	Alaska
308	Montana	159	Hawaii
317	Nebraska	113	Dist. of Columbia
329	Nevada	721	Puerto Rico

#### Item 2 - State Highway Department District

2 digits

The highway district in which the bridge is located should be represented by a two-digit code. Existing district numbers should be used where districts are identified by number. Where districts are identified by name, a code number should be assigned based on an alphabetical listing of the districts.

#### Item 3 - County (Parish)

3 digits

Counties should be identified with the FIPS code scheme specified by the U. S. Census of Population and Housing - 1970.

Item 4 - City/Town Code

4 digits

Cities and towns should be identified according to the instructions and sources noted above in Item 3. If the structure is not in a city or town, code all zeroes.

Item 5 - Inventory Route

9 digits

The inventory route number must be for the highway route being inventoried. This is desired even in the case of a minor, non-Federal-aid highway overpassing a Federal-aid highway.

If the route beneath the structure is on a Federal-aid system, is a defense route, or is otherwise important, the defense and route oriented items should be recorded in a separate record and coded with respect to the route beneath. The necessary items are Items 1, 3-20, 24, 27-29, 42, 43, and 47-29. Item 8 should, of course, be recorded and coded for both routes to allow the two sets of data to be cross referenced. If the structure overpassing the inventory route does not carry a highway, only the necessary items listed above should be recorded with respect to the inventory route. (First digit of Item 5 would then be coded a 2).

When two or more routes are concurrent, the highest of the hierarchy of systems as shown in the second coded position below will be used. If the concurrent routes are of the same hierarchy level, the lowest numbered route will be used. The same applies to any situation where a structure goes over two or more routes.

It cannot be overemphasized that all route oriented data must agree with the coding as to whether the inventory route is on or under the bridge as indicated by the first digit of Item 5.

The first position (leftmost) will indicate if the route is carried by the structure or goes under it:

- 1 Route carried by structure
- 2 Route under structure
- A through Z Multiple routes under structure  
(List Defense Routes first)

The second position shall identify the kind of highway:

- 1 Interstate highway
- 2 U.S. numbered highway
- 3 State highway
- 4 County highway
- 5 City street
- 6 Federal lands road
- 7 State lands road
- 8 Other (include toll roads not otherwise indicated)

## Item 5 - Inventory Route (cont'd)

The next position should identify highways that are designated as:

- 0 None of below
- 1 Mainline
- 2 Alternate
- 3 Bypass
- 4 Spur
- 5 Toll roads
- 6 Business
- 7 Ramp, Wye, Connector, etc.
- 8 Service and/or unclassified frontage road
- 9 Truck route

The route number should be right-justified in the next five positions (see example below).

The last position indicates the directional suffix to the route number when it is part of the route number.

- 0 Not applicable
- 1 North
- 2 East
- 3 South
- 4 West

However, in some cases, letters may be used with the route numbers as part of the route number and not to indicate direction. In such cases, the latter should be included in the five position route number field.

### Examples:

Interstate 95, on	record	1 1 1 00095 0	code	111000950
Interstate 70S, under		2 1 1 00070 3		211000703
State Highway 104, Spur, under		2 3 4 00104 0		234001040
U.S. 30E Bypass, on		1 2 3 00030 2		123000302
City street, on		1 5 0 00000 0		150000000
Exist ramp from I-81, under		2 1 7 00081 0		217000810
County Highway on		1 4 1 00173 0		141001730
Interstate 84 under		2 1 1 00084 0		211000840
Interstate 495 on		1 1 1 00495 0		111004950
State Hwy 120 (Defense Rte) under		A 3 1 00120 0		A31001200
State Hwy 130 under		B 3 2 00130 0		B32001300

#### Item 6 - Features Intersected

25 positions

The information to be recorded for this item will be the name or names of the features intersected by the structure whether the features are over or under the structure. When one of the features intersected is another highway, the signed number or name of the highway (e.g., I 81, US 51, SR 772, Mill Road) should appear first (leftmost) in the field. The names of any other features should follow, separated by a semicolon or a comma. Abbreviations should be used where necessary, but an effort should be made to keep them meaningful. This item should be left justified without trailing zeroes.

It is requested that a structure on a designated defense highway considered to be a critical facility, which is defined in FHPM Volume 6, Chapter 10, Section 2, be identified by an asterisk in the 25th position. A blank space will indicate a non-critical facility.

#### Item 7 - Facility Carried by Structure

18 positions

The facility being carried by this structure should be recorded and coded. For example, S to W Ramp, Ramp from I 495 to I 95, C&O Railroad, Great Eastern Pipeline and others. This item should be left justified without trailing zeroes.

#### Item 8 - Structure Number

15 positions

It is required that the official structure number be recorded. It is not necessary to code this number according to an arbitrary national standard. Each agency should code the structure number according to its own internal processing procedures. When recording and coding for this item and following items, any structure or structures with a closed median should be considered as one structure, not two.

The structure number must be unique for each bridge within the State, and once established should not be changed.

One of the major problems with bridge numbers has been the shifting of numbers left or right in the 15 spaces provided. Therefore, it is recommended that all 15 field positions be filled.

If the bridge numbering system is being developed, a uniform number format is suggested as follows:

- The first 3 digits - County Code
- The next 5 digits - Route Number
- The next 2 digits - Highway System Code
- The next 5 digits - A semi-sequentially ordered number starting after the route crosses the county line and increasing as the mile-post increases within the county limits. Bridges that are on the county line should be referenced to the preceding county, the exception being when the county line and the State line are the same.

Item 9 - Location

25 positions

This item will contain a narrative description of the bridge location. It is recommended that the location be keyed to a distinguishable feature on an official highway department map. Examples are: road junctions and topographical features. This item should be left justified without trailing zeros.

Item 10 - Inventory Route, Minimum Vertical Clearance 4 digits

Vertical clearances should be reported and coded in feet and inches. The minimum clearances for a 10-foot width of the pavement or traveled part of the roadway where the clearance is the greatest should be recorded. For structures having multiple openings, clearances for each opening should be recorded, but only the maximum of the minimum clearances for the two or more openings should be coded regardless of the direction of travel. This would be the practical maximum clearance. When no restriction exists, code "9999".

Item 11 - Milepoint

5 digits

If a milepoint location reference system is being used in the State, the milepoint location of the structure should be recorded and coded. The milepoint will refer to the beginning (or other point the State uses) of the bridge in the direction of increasing mileage. Code a 5-digit number to represent the milepoint to hundredths of a mile. Code all zeros if a milepoint location cannot be determined or is not appropriate.

If the milepoint location of the structure is at the beginning of the route mileage, code with a nominal value of 00001 rather than 00000.

Item 12 - Road Section Number

5 positions

If the bridge is on a designated defense highway, record and code the 5 character road section number that has been assigned in accordance with FHPM 6-10-2. The number should be right justified in the first 4 positions of the field as shown in the examples below. The 5th position should be left blank except when letter suffix is used. For a bridge which is not on a defense highway, the item is coded with 4 zeros, left justified.

Example:

<u>Road Section Number</u>	<u>Code</u>
5	0005
15	0015
125 A	0125A
1245	1245
none	0000



Item 13 - Bridge Description

2 positions

This item should be coded for all structures included in the inventory data base. The codes given below should be used to represent additional information describing the function of the bridge with respect to the route identified in Item 5. The order of the codes shown also is the hierarchy of their importance. This means that if two codes apply to a structure, 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 a second code does not apply, the second position should be left blank.

(Blank) When none of the following codes apply for the first or second position or both, the first or second position or both will be blank.

- D Where the structure carries a highway that is designated as a defense highway and goes over a defense highway.
- P For situations where separate structures carry two roadways in two directions of travel. The structure carrying the roadway in the direction of inventory (for defense highway, this is west to east and south to north) will be considered the first of the parallel bridges and the left position of the field for this structure will be left blank. The code "P" will be used for the structure carrying the opposite roadway.
- T For temporary structures erected for the purpose of carrying traffic pending or during the repair or replacement of an old structure.

The following conditions are considered to be in the temporary bridge classification and should be so identified with a "T".

- a. Bridges shored up, including additional temporary supports.
- b. Temporary repairs made to keep a bridge open.
- c. Bailey bridges.

Examples:

Code

- (Blank) (Blank) = 1. Permanent bridge carrying two-way traffic.  
or 2. Permanent "L" (left) or "R" (right) bridge with no parallel bridge.  
or 3. Permanent "R" bridge of a pair of Inventory Route bridges.

(Blank)T = Temporary "R" bridge of a pair of Inventory Route bridges.

Item 13 - Bridge Description (cont'd)

P(Blank) = Permanent "L" bridge of a pair of Inventory Route bridges.

PT = Temporary "L" bridge of a pair of Inventory Route bridges.

D(Blank) = Defense highway over a Defense highway, permanent bridge with two-way traffic.

DT = Defense highway over a Defense highway, temporary bridge with two-way traffic.

DP = Defense highway over a Defense highway, permanent "L" bridge of a pair of Inventory Route bridges.

T(Blank) = 1. Temporary bridge carrying two-way traffic.  
or 2. Temporary "L" or "R" bridge with no parallel bridge.

Item 14 - Defense Milepoint

4 digits

If the bridge is on a defense highway, record and code the number of miles to the nearest hundredth that the bridge is from the beginning of the defense road section (Item 12). If the bridge is not on a defense highway, code all zeros. If the defense milepoint is at the beginning of a defense section length, code with a nominal value of 0001 rather than 0000.

Item 15 - Defense Section Length

3 digits

Record and code the length of the road section identified in Item 12 to the nearest tenth of a mile. See attachment 1 to FHPM 6-10-2. The length should be coded as a 3-digit number. If the bridge is not on a defense highway, code all zeros.

Item 16 - Latitude

5 digits

For bridges on defense highways, record and code the latitude of each 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. If the bridge is not on a defense highway, a code of all zeros or the latitude is acceptable.

Example:                      35°27.3'                      code 35273

Item 17 - Longitude

6 digits

Longitude should be recorded and coded as instructed in Item 16. Leading zeros should be coded where needed. If the bridge is not on a defense highway a code of all zeros or the longitude is acceptable.

Example:                      81°5.8'                      code 081058



Item 18 - Physical Vulnerability

1 digit

If the bridge is on a designated defense highway, record and code the Physical Vulnerability of the bridge. The code is based on the type of structure. The item may be left blank if it is not applicable.

- |                           |                                      |
|---------------------------|--------------------------------------|
| 1 Timber trestle          | 6 Reinforced concrete - massive arch |
| 2 Concrete girder or slab | 7 Dam bridge                         |
| 3 Steel girder            | 8 Culverts                           |
| 4 Cantilever and truss    | 9 Tunnels                            |
| 5 Suspension              | 0 No structure                       |

Item 19 - Bypass, Detour Length

2 digits

If a ground level bypass is available at the structure site for the route given in Item 5, record and code the detour length as zero.

If the bridge is one of twin bridges and is not at an interchange, code 01 to indicate that the other twin bridge can be used as a temporary bypass. In other cases, indicate that actual length to the nearest mile of the detour length. The detour length should represent the total additional travel for a vehicle which would result from closing of the bridge. The factor to consider when determining if a bypass is available at the site is the potential for moving vehicles, including military vehicles, around the structure. This is particularly true when the structure is in an interchange. For instance, a bypass likely would be available in the case of diamond interchanges, interchanges where there are service roads available, 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" for 99 miles or more.

The detour route will be established following allowable criteria determined by the governing authority. (Some authorities will not allow a designated detour over a road or bridge of lesser "quality.")

Examples:

Diamond interchange, structure bypassable	code 00
Cloverleaf, not bypassable; 8-mile detour	08
Structure over river, 121-mile detour	99
Structure over highway, no interchange, bypassable at ground level	00

Item 20 - Toll

1 digit

One of the codes given below should be used.

- 1 Toll bridge. Tolls are paid specifically to use the structure.
- 2 On toll road. The structure carries a toll road, that is, tolls are paid to use the facility, which includes both the highway and the structure. Trucks permitted.

Item 20 - Toll (cont'd)

- 3 On free road. The structure is toll free and carries a toll free highway.
- 4 Toll parkway. Trucks not permitted on structures.

Item 21 - Custodian

1 digit

The actual name of the custodian of the structure will be recorded. In the absence of a clear designation, the custodian will be the agency responsible for maintaining the structure. The codes below should be used to represent the type of agency that is the custodian.

- 1 State highway agency
- 2 Other State agency
- 3 County agency
- 4 City or other local agency
- 5 Federal agency
- 6 Railroad
- 7 Other private
- 8 Combination
- 9 Unknown

Item 22 - Owner

1 digit

The actual name of the owner of the bridge should be recorded on the inventory sheet. The codes shown above in Item 21 should be used here to indicate the owner.

Item 23 - Federal-Aid Project Number

7 digits

If Federal funds have been used for construction or reconstruction of this structure, the Federal-Aid project number of the most recent project should be recorded, if available. Coding is optional.

CLASSIFICATION

Item 24 - Highway System

2 digits

The information to be recorded and the codes to be used should be those shown below. The most applicable code should be used for any case that does not seem to have an appropriate code. A frontage road, for example, can be coded according to the system of the adjacent mainline roadway.

Code

System

- |    |  |
|----|--|
| 01 | Interstate, rural, open to traffic     |
| 02 | Interstate, urban, open to traffic     |
| 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                      |
| 12 | Local city streets                     |
| 14 | Federal-Aid Urban                      |

Item 25 - Administrative Jurisdiction

1 digit

Coding is optional. If coded, use the codes shown.

- 1 State
- 2 Federal domain
- 3 Toll
- 4 Other existing (which includes county and local jurisdiction)

Item 26 - Functional Classification

2 digits

Code the currently approved Functional Classification.

<u>Urban Code</u>			<u>Functional Classification</u>	<u>Rural Code</u>
<u>Population (1000)</u>				
<u>5-25</u>	<u>25-50</u>	<u>50+</u>		
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

STRUCTURE DATAItem 27 - Year Built

4 digits

Record and code both the year of construction and latest year of major reconstruction of the structure. Code the last two digits of the years in which construction or reconstruction of the structure was completed. A code of "00" in the first two positions should be used for years 1900 and earlier. If the year built is unknown, provide a best estimate.

Example:

Built 1928	No reconstruction	code 2800
Built 1914	Reconstruction 1960	1460
Built 1898	Reconstruction 1948, 1964	0064

Item 28 - Lanes On and Under the Structure

4 digits

Code the number of through lanes being carried by the structure as a 2-digit number. Also, code the total number of through lanes being crossed over by the structure as a 2-digit number. This will be a 4-digit field consisting of two subfields containing the two values. The codes should be right-justified with leading zeros in each of the subfields.

Highway lanes only are to be considered.

Example:

16 lanes on (double-level),	0 lanes under	code 1600
8 lanes on,	12 lanes under (6 city streets)	0812

Item 29 - Average Daily Traffic

6 digits

Code a 6-digit number that shows the average daily traffic volume for the route identified in Item 5. Make certain the units position is coded even if estimates of ADT are determined to tens or hundreds of vehicles, that is, appropriate trailing zeros should be coded.

The ADT shown must be compatible with the other items coded for the bridges.

Example: Twin bridges with an open median.

If Items 51 and 28 are coded for one bridge, then the ADT must be for one bridge and not the total for the route.

Examples:	Volume	540	Code	000540
		15600		015600
		24000		024000

Item 30 - Year of Average Daily Traffic

2 digits

Record the year represented by the ADT above. Code the last 2 digits of the year so recorded.

Item 31 - Design Load

1 digit

Use the codes below to indicate the live load for which the structure was designed. The numerical value of the railroad loading should be recorded on the form. Classify any other loading, when feasible, using the nearest equivalent of the H loadings given below.

- |   |                                    |
|---|------------------------------------|
| 1 | H 10                               |
| 2 | H 15                               |
| 3 | HS 15                              |
| 4 | H 20                               |
| 5 | HS 20                              |
| 6 | HS 20+Mod                          |
| 7 | Pedestrian                         |
| 8 | Railroad                           |
| 9 | Other (describe on recording form) |
| 0 | Unknown                            |

Item 32 - Approach Roadway Width

3 digits

Code, to the nearest foot, a 3-digit number that represents the normal width of the roadway approaching the structure. This dimension will include the widths of the shoulders. For closed median structures, the approach median width at the normal point should be included in this dimension. When there is a variation between the approaches at either end of the structure, record and code the most hazardous of the approach conditions.

### Item 32 - Approach Roadway Width (cont'd)

Example:

<u>Left Shoulder</u>	<u>Left Roadway</u>	<u>Median</u>	<u>Right Roadway</u>	<u>Right Shoulder</u>	<u>Code</u>
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 examples shown are for closed medians only. Regardless of whether the median is open or closed, the data recorded must be compatible with the other related route and bridge data.

Example: If Item 51 is for traffic in one direction only, then Items 28, 29, 32, etc., must be for traffic in one direction only.

One acceptable definition of a shoulder is:

A shoulder must be constructed and maintained flush with the adjacent through-traffic lane, and structurally adequate for all weather and traffic conditions.

### Item 33 - Bridge Median

1 digit

Indicate with a 1-digit code if the median is non-existent, opened or closed. The median is closed when the area between the two roadways at the structure is bridged over and is capable of supporting traffic.

- 0 None
- 1 Open
- 2 Closed

### Item 34 - Skew

2 digits

The skew angle is the angle between the centerline of a pier and a line normal to the roadway centerline. Normally the skew angle will be taken from the plans and it is to be recorded to the nearest degree. If no plans are available, the angle is to be field measured if possible. If the skew angle is 0°, it should be so coded. When the structure is on a curve or if the skew varies for some other reason, the average skew should be recorded, if reasonable. Otherwise, record a "99" to indicate a major variation in skews of substructure units. A 2-digit number should be coded.

Example:

Skew	Code
0°	00
10°	10
8°	08
29°	29

### Item 35 - Structure Flared

1 digit

The appropriate box on the form should be checked to indicate whether or not the width of the structure varies. Generally, such variance will result from ramps converging with or diverging from the through lanes on the structure, but there may be other causes. Minor flares at ends of structures should be ignored. Code a "1" or "0" for Yes and No, respectively.

### Item 36 - Traffic Safety Features

4 digits

Bridge inspection shall include the recording of information on the following items so that the evaluation of their adequacy can be made. The data collected shall apply only to the route on the bridge.

- (1) Bridge railings: Some factors that affect the proper functioning of bridge railing are height, material, strength, and geometric features. Railings must be capable of smoothly redirecting an impacting vehicle. Bridge railings should be evaluated using the AASHTO "Standard Specifications for Highway Bridges" as a guide for establishing a currently acceptable standard.
- (2) Transitions: The transition from approach rail to bridge railing requires that the approach rail be firmly attached to the bridge railing. It also requires that the approach railing be gradually stiffened as it comes closer to the bridge railing. The ends of curbs and safety walks need to be gradually tapered out or shielded.
- (3) Approach guardrail: The structural adequacy and compatibility of approach guardrail with transition designs should be determined. Rarely does the need for a barrier stop at the end of a bridge. Thus an approach guardrail with adequate length and structural qualities to shield motorists from the hazards at a bridge site needs to be installed. In addition to being capable of safely redirecting an impacting vehicle, the approach rail must also facilitate a transition to the bridge railing that will not cause snagging or pocketing of an impacting vehicle. Acceptable guardrail design suggestions are contained in the AASHTO Guide for Selecting, Locating, and Designing Traffic Barriers.
- (4) Approach rail ends: As with guardrail ends in general, the ends of approach rails to bridges should be flared, buried, made breakaway, or shielded. Design treatment of guardrail ends is given in the AASHTO Guide for Selecting, Locating, and Designing Traffic Barriers.

The reporting of these features shall be as follows:

#### Code

#### Meaning

0

Inspected feature does not meet currently acceptable standards.\* Code "0" for a condition where guardrail is required and none is provided.



### Item 36 - Traffic Safety Features (cont'd)

1 Inspected feature meets currently acceptable standards.\* Code "1" for a condition where guardrail is not required.

N Not applicable.

\*Currently acceptable standards should take into account traffic volume and speed, types of vehicles in the traffic stream, height of bridge, and underbridge conditions and activities. Thus, currently acceptable standards for a "farm to market" bridge railing and approach rail should usually differ from that for an expressway.

<u>Digit Position</u>	<u>Feature Inspected</u>
1st	Bridge railing
2nd	Transitions
3rd	Approach guardrail
4th	Approach guardrail terminal

#### Examples:

36 - 1011  
36 - NNNN

Interpretation - All features meet currently acceptable standards except transitions.

- No traffic on bridge i.e., pedestrian bridge over highway or railroad bridge over highway.

### Item 37 - Blank

### Item 38 - Navigation Control

1 digit

Indicate for this item whether or not navigation control exists. The determination of whether or not a water course is navigable is made by the U. S. Coast Guard or the U. S. Army Corps of Engineers, whichever is applicable. Code "1" or "0" for Yes and No, respectively.

### Item 39 - Navigation Vertical Clearance

3 digits

If Item 38 has been coded "1", record in feet the minimum clearance imposed at the site as measured above a datum that is specified on a navigation permit issued by a control agency. This measurement will show the clearance that is allowable for navigation purposes. In the case of a swing or bascule bridge, the vertical clearance should be measured with the bridge in the closed position (i.e., open to vehicular traffic). The vertical clearance of a vertical lift bridge should be measured with the bridge in the raised or open position. The measurement should be coded as a 3-digit number. If Item 38 has been coded "0" code all zeros to indicate not applicable.

Item 39 - Navigation Vertical Clearance (cont'd)

Examples:	Actual	150.0	Record	150	Code	150
		20.6		21		021

Item 40 - Navigation Horizontal Clearance 4 digits

If Item 38 has been coded "1", record for this item the minimum horizontal clearance in feet. This measurement should be that shown on a navigation permit and may be less than the structure allows. Code the clearance as a 4-digit number. Code all zeros if Item 38 is coded "0".

Example:	95 ft.	Code	0095
	538 ft.		0538
	1200 ft.		1200

Item 41 - Structure Open, Posted or Closed to Traffic 1 digit

This item provides information about the operational status of a structure. If bridge is closed to all traffic, code "C".

Note: For bridges closed because of "Condition" it is intended to correspond to a code of "0" or "1" in any one or all of Items 59, 60, or 62.

If bridge is open to traffic, but is load and/or speed posted, code "P". If bridge is open to traffic with no load or speed restrictions, code "A".

Item 42 - Type Service 2 digits

This item is intended to show the type of service on the bridge and the type of service under the bridge. The person recording data on the form for this item will also record the proper code at that time. The service types for this item will be indicated by a 2-digit code. The first digit is for the service on the bridge as follows:

- 1 Highway
- 2 Railroad
- 3 Pedestrian exclusively
- 4 Highway-railroad
- 5 Highway-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
- 0 Other

The second digit will indicate the type of service under the bridge:

- 1 Highway, with or without pedestrian
- 2 Railroad
- 3 Pedestrian exclusively
- 4 Highway-railroad



Item 42 - Type Service (cont'd)

- 5 Waterway
- 6 Highway-waterway
- 7 Railroad-waterway
- 8 Highway-waterway-railroad
- 9 Relief
- 0 Other

Item 43 - Structure Type, Main

3 digits

When recording the data the proper code should be entered at the same time. The code used will be for the main span. The first digit of the 3-digit code will indicate type of design and kind of material and the second and third digits will indicate type of design and/or of construction.

TYPE OF STRUCTURE

1st Digit	2nd and 3rd Digits
1 Concrete	01 Slab
2 Concrete continuous	02 Stringer/Multi-beam or girder
3 Steel	03 Girder and Floorbeam System
4 Steel continuous	04 Tee Beam
5 Prestress concrete	05 Box Beam or Girders - Multiple
6 Prestress concrete continuous	06 Box Beam or Girders - Single or Spread
7 Timber	07 Frame
8 Masonry	08 Orthotropic
9 Aluminum, W.I. or C.I.	09 Truss - Deck
0 Other	10 Truss - Thru
	11 Arch - Deck
	12 Arch - Thru
	13 Suspension
	14 Stayed Girder
	15 Movable - Lift
	16 Movable - Bascule
	17 Movable - Swing
	18 Tunnel
	19 Culvert
	00 Other

Examples:

Timber Through Truss	Code 710
Masonry Culvert	819
Steel Suspension	313
Continuous Concrete Multiple Box Girders	205
Simple Span Concrete Slab	101
Tunnel in Rock	018

Item 44 - Structure Type, Approach Spans

3 digits

Indicate with a 3-digit code the type of structure in the approach spans to a major bridge or in the spans where the structural material is different. The codes are the same as for Item 43 preceding. However, code zeros if this item is not applicable. Use code "20" when no one type of design and/or construction is predominate in the approach units. If design and/or material is varied, code the first digit as "0".

Examples:	Simple prestress concrete I-beam	502
	Continuous concrete T-beam	204
	Continuous deck truss	409

Item 45 - Number of spans in Main Unit

3 digits

Record the number and indicate with a 3-digit code the number of spans in the main or major unit. This item will include all spans of most bridges, the major unit only of a sizable structure, or a unit of material or design different from that of the approach spans.

Item 46 - Number of Approach Spans

4 digits

Record the number and indicate with a 4-digit code the number of spans in the approach spans to the major bridge, or the number of spans of material different from that of the major bridge.

Item 47 - Total Horizontal Clearance

3 digits

The total horizontal clearance for the route identified in Item 5 should be measured and recorded to supply information that meets reporting requirements of FHPM 6-10-2. The clearance should be the available clearance measured between the most restrictive features -- curbs, rails, walls, or other structural features limiting the roadway (surface and shoulders). The measurement should be recorded and coded to the nearest tenth of a foot.

The purpose of this item is to give the available clearance for the movement of wide loads. This clearance has been identified in two ways, both of which are acceptable:

- a. Roadway surface and shoulders.
- b. Distance from face of pier (or rail around pier) to face of rail or slope at abutment.

Item 48 - Length of Maximum Span

4 digits

The length of the maximum span should be recorded. It shall be noted whether the measurement is center to center (c/c) or clear open distance (clr) between piers, bents, or abutments. Measurement shall be along centerline of bridge. For this item, code a 4-digit number to represent the measurement to the nearest foot.

Examples:	50 feet	code	0050
	117		0117
	1,050		1050

#### Item 49 - Structure Length

6 digits

Record and code a 6-digit number to represent the length of the structure to the nearest foot. This shall be the length of roadway which is supported on the bridge structure. The length should be measured back to back of backwalls of abutments or from paving notch to paving notch.

Culvert lengths should be measured along the  $\phi$  of roadway regardless of their depth below grade. Measurement should be made between inside faces of exterior walls.

Example:

50 feet	code	000050
5421 "	"	005421
333 "	"	000333
101,235 "	"	101235

#### Item 50 - Curb or Sidewalk Widths

6 digits

Record and code two contiguous 3-digit numbers to represent the widths of the left and right curb or sidewalks to nearest tenth of a foot. This essentially is a 6-digit number, with the leftmost 3 digits representing the left curb or sidewalk and the rightmost 3 digits representing the right curb or sidewalk. "Left" and "Right" should be determined on the basis of direction of inventory.

Example:

Left side	Right Code	Code
None	8.3'	000083
10.0	4.1'	100041
8.3	None	083000
12.1	11.5	121115
None	None	000000
0.6	1.5	006015

#### Item 51 - Bridge Roadway Width, Curb-to-Curb

4 digits

The information to be recorded is the most restrictive minimum distance between curbs or rails on the structure roadway. If the median is covered at the structure, the distance will be between the outside curbs or rails of the structure; i.e., the distance will include both roadways and the median widths. The measurement should be exclusive of flared areas for ramps; i.e., it should be the minimum or nominal width. A 4-digit code should be used to represent the distance to the nearest tenth of a foot.

#### Item 51 - Bridge Roadway Width, Curb to Curb (cont'd)

Where traffic runs directly on the top slab (or wearing surface) of the culvert, e.g., an R/C box without fill, code the actual roadway width (curb-to-curb or rail-to-rail). This will also apply where the fill is minimal and the culvert headwalls affect the flow of traffic.

Where the roadway is on a fill carried across a pipe or box culvert and the culvert headwalls do not affect the flow of traffic, code 0000. This is considered proper inasmuch as a filled section over a culvert simply maintains the roadway cross-section.

Example:	36.0'	wide	code	0360
	110.13'			1101
	66.37'			0664

#### Item 52 - Deck Width, Out to Out

4 digits

Record and code a 4-digit number to show the out-to-out width to the nearest tenth of a foot. If the structure is a through structure, the number to be coded will represent the lateral clearance between superstructure members. The measurement should be exclusive of flared areas for ramps, i.e., it should be the minimum or nominal width.

Where traffic runs directly on the top slab (or wearing surface) of the culvert, e.g., an R/C box without fill, code the actual width (out-to-out). This will also apply where the fill is minimal and the culvert headwalls affect the flow of traffic.

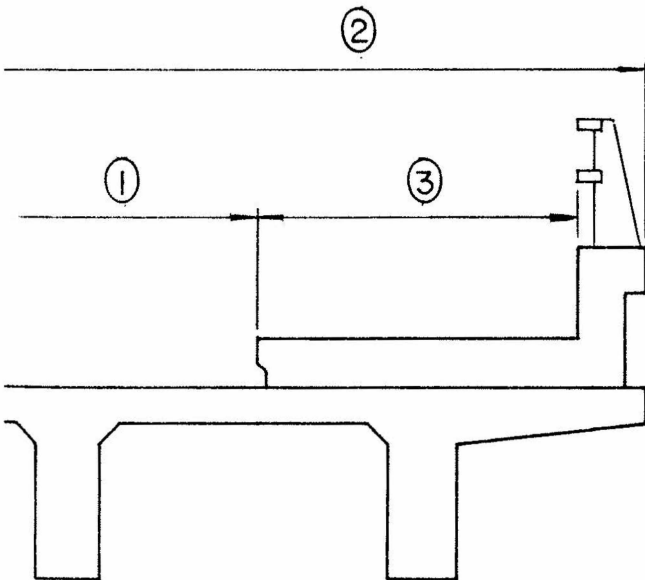
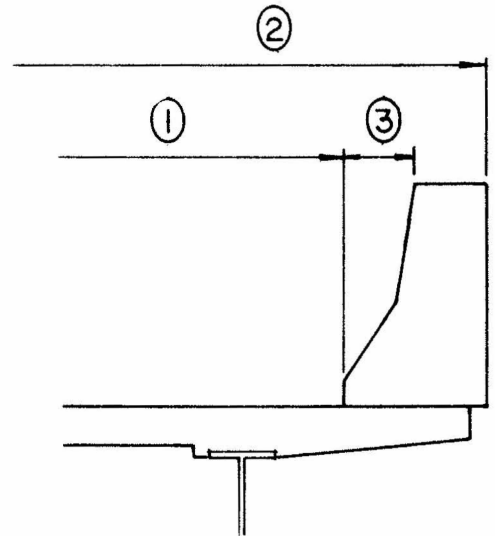
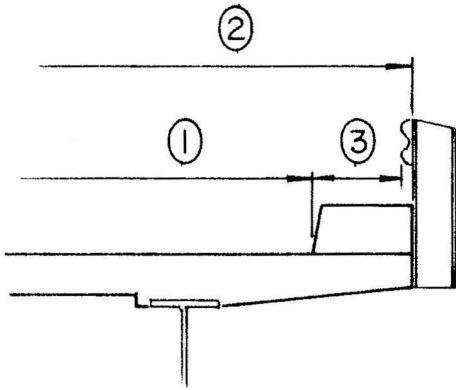
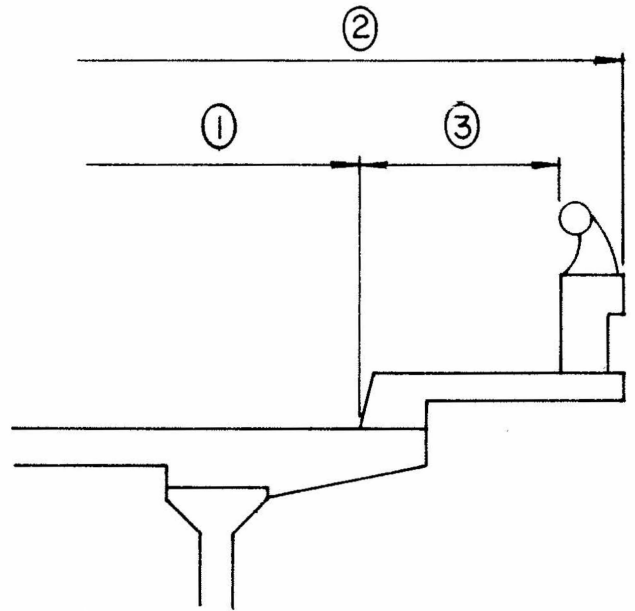
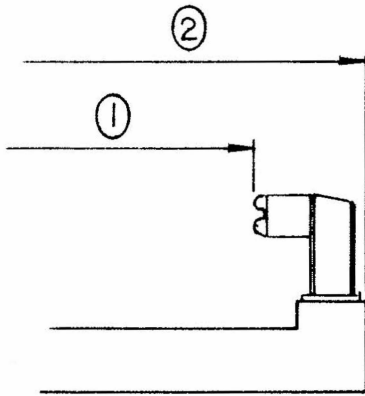
Where the roadway is on a fill carried across a pipe or box culvert and the culvert headwalls do not affect the flow of traffic, code 0000. This is considered proper inasmuch as a filled section over a culvert simply maintains the roadway cross-section.

#### Item 53 - Minimum Vertical Clearance Over Bridge Roadway 4 digits

The information to be recorded for this item is the actual minimum vertical clearance over the bridge roadway, to any superstructure restriction, to the nearest inch. When no superstructure restriction exists above the bridge roadway, code 9999. When a restriction is 100 feet or greater, code 9912. A 4-digit number should be coded to represent feet and inches.

Examples:	17'-3"	code	1703
	75'-11"		7511
	No restriction		9999
	115'		9912

# HORIZONTAL MEASUREMENTS



- ① Item 51 ~ Bridge Rdwy. width ~ curb to curb or rail to rail.
- ② Item 52 ~ Deck width ~ out to out.
- ③ Item 50 ~ Curb or sidewalk width.

Item 54 - Minimum Vertical Underclearance

4 digits

Record and code a 4-digit number to represent in feet and inches, the minimum vertical clearance from the roadway or railroad track beneath the structure to the underside of the superstructure. Code zeros for structures over any other feature.

Item 55 - Minimum Lateral Underclearance on Right

3 digits

If the feature beneath the structure is either a railroad or highway, code a 3-digit number to represent the minimum lateral clearance on the right. If the feature is not a railroad or highway, code "999" to indicate not applicable. The lateral clearance should be measured to the nearest tenth of a foot from the right edge of the roadway, excluding shoulders, or from the centerline (between the rails) of the right-hand track in the case of a railroad, to the substructure unit -- pier, abutment, etc., a rigid barrier -- or to the toe of slope steeper than three to one. The underclearance measurements to be recorded will be the minimum after measuring the clearance in both directions of travel. In the case of a dual highway this would mean the outside clearances of both roadways should be measured and the smaller distance recorded and coded.

If two related features are below the bridge, measure both and record the lesser of the two. An explanation should be written as to what was recorded even though this information cannot be coded.

The presence of ramps is not considered in this item; therefore, the minimum lateral clearance on the right should be measured from the right edge of the through roadway.

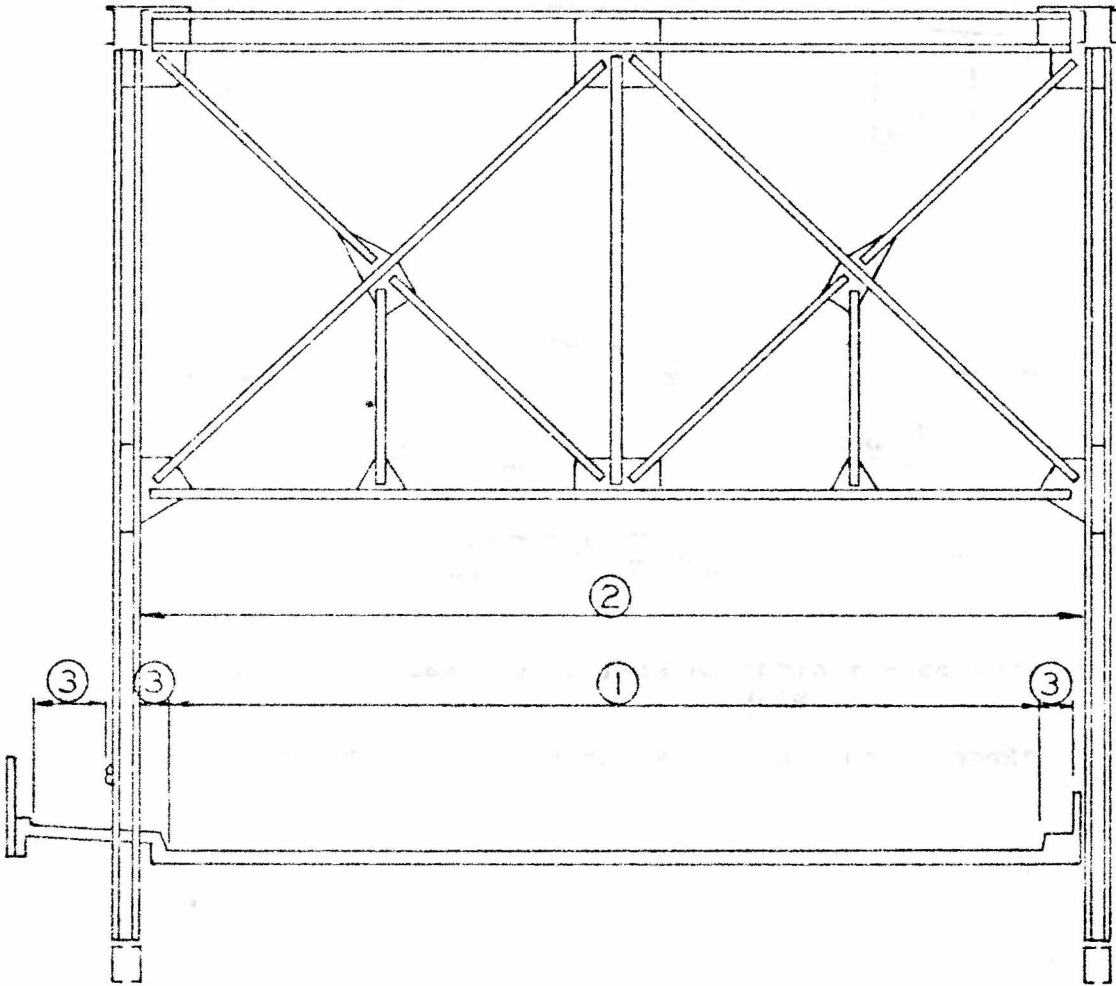
Item 56 - Minimum Lateral Underclearance on left

3 digits

(for divided highways, one-way streets and ramps)

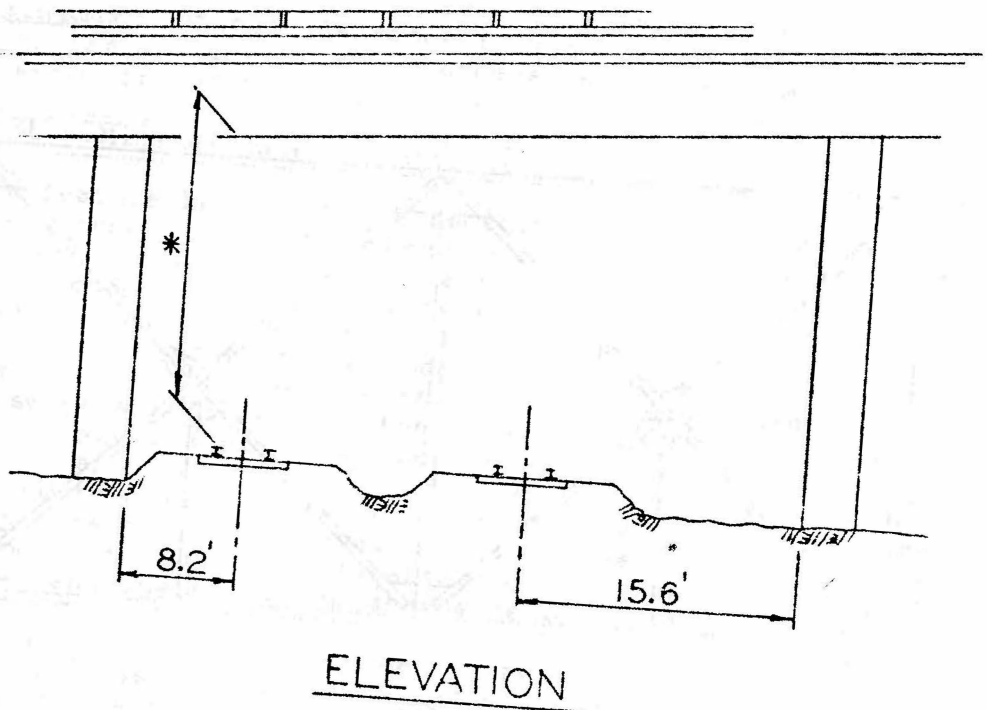
The minimum clearance on the left (median side for divided highways) of the roadway beneath the structure regardless of the direction of travel is to be recorded. As was explained in Item 55, the clearance on the left in both directions of travel should be measured and the smaller distance recorded. The clearance is to be measured from the left edge of roadway, excluding shoulders, to the nearest substructure unit or any rigid median barrier. In the case of a dual highway where there is no obstruction in the median area, a notation of "open" should be recorded and "999" should be coded. For clearances greater than 99.8 ft, code "998". A 3-digit code to represent the distance to the nearest tenth of a foot should be used. If the item is not applicable, code with "000".

## HORIZONTAL MEASUREMENTS



- ① Item 51 - Bridge Roadway Width - Curb to curb or rail to rail
- ② Item 52 - Deck Width - Out to out
- ③ Item 50 - Curb or sidewalk width

DIMENSIONS FOR OVERHEADS  
(ITEMS 54 & 55)  
EXAMPLE

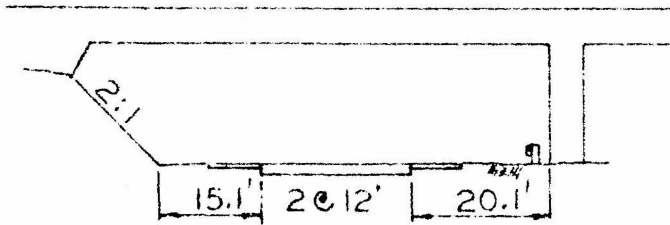


Item 55 - Minimum Lateral Underclearance = 8.2'  
on Right

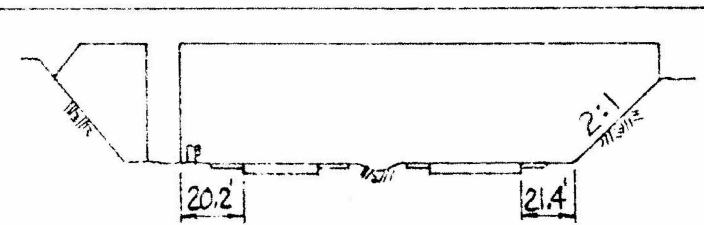
\*Record and code the minimum Vertical Underclearance



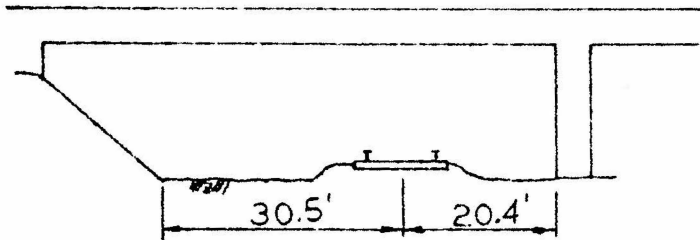
# MINIMUM LATERAL UNDERCLEARANCE - LT. & RT. (ITEMS 55 & 56) EXAMPLES



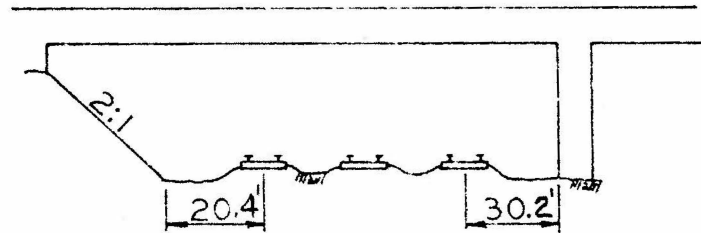
-- LT. 15.1' RT. FOR 2-WAY TRAFFIC  
15.1' LT. 20.1' RT. FOR 1-WAY TRAFFIC



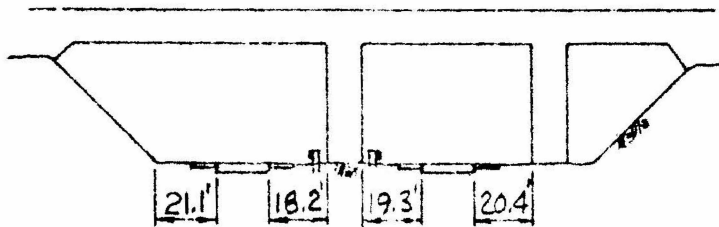
OPEN LT. 20.2' RT.



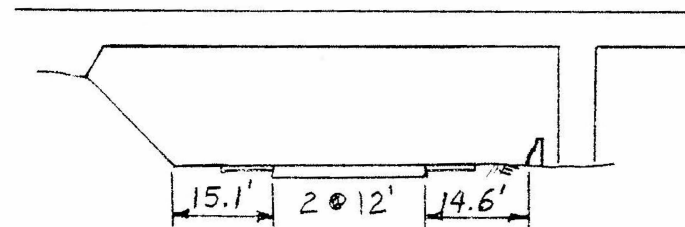
-- LT. 20.4' RT.



-- LT. 20.4' RT.



18.2' LT. 20.4' RT.



-- LT. 14.6' RT. FOR 2-WAY TRAFFIC  
15.1 LT. 14.6' RT. FOR 1-WAY TRAFFIC

Item 57 - Wearing Surface - Protective System

1 digit

The kind of wearing surface material on the structure should be recorded. One of the codes given below should be used to represent the wearing surface material and type of protective system.

- 1 Concrete - no protective system
- 2 Asphaltic concrete - no protective system
- 3 Asphalt block
- 4 Grating - open or closed
- 5 Wood planking
- 6 Asphaltic concrete with known membrane  
(This should be recorded and coded from office records and not field determined)
- 7 Other
- 8 Asphaltic concrete with cathodic protection

Concrete With Coated Rebar Protective System

- A Epoxy
- B Galvanized
- C Other coating

Concrete - Special Concrete Protective System

- D Low slump dense concrete
- E Polymer modified concrete
- F Polymer impregnated concrete
- G Internally sealed concrete
- H Other type of special concrete

---

J Any combination of the above

N Not applicable

Example: A filled culvert or arch with the approach roadway section carried across the structure

### CONDITION

Items 58 through 65, with the exception of Items 63 and 64, will be coded with a 1-digit code that indicates the condition rating for the items.

Rating	Equivalent Rating Conditions	
	1978	1972
N	Not applicable	Not applicable
9	New condition	New condition
8	Good condition - no repairs needed	Good condition - no repair necessary
7	Generally good condition - potential exists for minor maintenance	Minor items in need of repair by maintenance forces
6	Fair condition - potential exists for major maintenance	Major items in need of repair by maintenance forces
5	Generally fair condition - potential exists for minor rehabilitation	Major repair - contract needs to be let
4	Marginal condition - potential exists for major rehabilitation	Minimum adequate to tolerate present traffic, immediate rehabilitation necessary to keep open
3	Poor condition - repair or rehabilitation required immediately	Inadequacy to tolerate present heavy load - warrants closing bridge to trucks
2	Critical condition - the need for repair or rehabilitation is urgent. Facility should be closed until the indicated repair is complete.	Inadequacy to tolerate any live load - warrants closing bridge to all traffic
1	Critical condition - facility is closed. Study should determine the feasibility for repair	Bridge repairable, if desirable to reopen to traffic
0	Critical condition - facility is closed and is beyond repair	Bridge conditions beyond repair - danger of immediate collapse

CONDITION RATING (ITEM 58)

CONCRETE BRIDGE DECK EVALUATION

		Condition Indicators (% deck area)			
Category Classification	Rating	Spalls	Delaminations	Electrical Potential	Chloride Content #/CY
Category #3 Light Deterioration	9	none	none	0	0
	8	none	none	none >0.35	none >1.0
	7	none	<2%	45% <0.35	none >2.0
Category #2 Moderate Deterioration	6	<2% spalls <u>or</u> sum of all deteriorated and/or contaminated deck concrete <20%			
	5	<5% spalls <u>or</u> sum of all deteriorated and/or contaminated deck concrete 20 to 40%			
Category #1 Extensive Deterioration	4	>5% spalls <u>or</u> sum of all deteriorated and/or contaminated deck concrete 40 to 60%			
	3	>5% spalls <u>or</u> sum of all deteriorated and/or contaminated deck concrete >60%			
Structurally Inadequate Deck	2	Deck structural capacity grossly inadequate			
	1	Deck has failed completely Repairable by replacement only			
	0	Holes in deck - danger of other sections of deck failing			

Note: The specialized table can be used as a guide for evaluating deck conditions using different condition indicators.

When rating an item, it is not necessary that all of the previous condition be met to arrive at a numerical rating.

Those portions of bridges that are being supported or strengthened by temporary members will be rated based on their actual condition, i.e., the temporary members are not considered in the rating of the item.

The determination of which of the above ratings apply to each of the items will be based on an evaluation of all the relevant factors and information that are included in the detailed inspection reports. The rating chosen for each of these items will, in effect, be a composite of all of the relevant factors. It should be recognized that this will require judgment, particularly for those items where the ratings seem not to apply. It is recognized that there are unique situations, but, again, it is expected that some judgment will be used.

For additional explanation or definitions relating to these items, the AASHTO Bridge Manual and Bridge Inspector's Training Manual should be used.

These statements apply equally to Items 67-72.

Item 58 - Deck 1 digit

This item refers to the riding surface, deck slab or plate, wearing surface, and any fixed or expansion joint devices. A defective expansion device, alone, should not cause a rating below "6".

The specialized table can be used as a guide for evaluating deck conditions using different condition indicators.

Item 59 - Superstructure 1 digit

This item includes all structural members, bearing devices and any drainage system.

In most all cases, the superstructure rating should not be influenced by the deck rating. Exceptions to this would include concrete slab, T-beam and box girder spans.

Item 60 - Substructure 1 digit

This item includes piers, abutments, piles, fenders, footing scour conditions, or other.

Item 61 - Channel and Channel Protection 1 digit

Stream stability and condition of riprap, spur, dike, etc., are included in this item.

Item 62 - Culvert and Retaining Walls

1 digit

This item includes alignment, settlement problems, retaining wall stability, and structural integrity of culverts. Code "N" if the structure is not a culvert.

Item 63 - Estimate Remaining Life

2 digits

The remaining life of the structure should be estimated based on all related and appropriate factors such as material, traffic volumes, age, and other. The estimate, which should be made using the best judgment of a knowledgeable individual, should reflect the remaining life without major reconstruction. Use a 2-digit code.

Examples:	4 years remaining	code	04
	15 years remaining		15

Item 64 - Operating Rating

3 digits

This capacity rating, referred to as the operating rating, will result in the absolute maximum permissible load level to which the structure may be subjected for the vehicle type used in the rating. It should be emphasized that for HS loading, the total weight in tons of the entire vehicle should be coded, i.e., HS20 should be coded "236" even though the HS20 lane loading controls and is used to determine the rating, and HS10 should be coded "218". A 3-digit code will be used. The first digit will show the type of loading:

1	H loading	6	Type 3-3 unit
2	HS loading	7	Railroad loading
3	Alternate Interstate Loading	8	Pedestrian or special loading
4	Type 3 unit		
5	Type 3-S2 unit	9	Gross load only given

The first digit must be coded with an appropriate code (1 through 9). If the bridge is closed and/or will not carry any live load code the second and third digits "00".

The second and third digits will give the gross loading in tons, except pedestrian and railroad loading. For railroad loading only, the second and third digits will give Cooper Class or equivalent, if known, otherwise code "700". Code pedestrian loading as "800".

The use or presence of a temporary bridge requires special consideration in coding. In such cases, since there is no permanent bridge, Items 64 and 66 should be coded as "900" even though the temporary structure is rated for as much as full legal load.

A bridge shored up or repaired on a temporary basis is considered a temporary bridge and the inventory and operating rating should be coded as if the temporary shoring were not in place.

Example:	3-S semi-trailer, 72000 pounds	code 536
	HS 30	254
	Temporary bridge	900
	Shored-up bridge	403*

\* Load capacity without shoring

Item 65 - Approach Roadway Alignment 1 digit

For this item, give the rating in relation to the effect on the use of the bridge.

Item - 66 Inventory Rating 3 digits

This capacity rating, for the vehicle type used in the rating, will result in a load level which can safely utilize an existing structure for an indefinite period of time. The statements and codes in Item 64 apply to this item also. This stress value shall not exceed but may be lower than the original design stress.

#### APPRAISAL

The intention of the "Appraisal" section is to evaluate a bridge in relation to the highway system and functional classification of which the bridge is a part. The individual deficiencies in the various rated items need to be evaluated as to how they affect the bridge as a unit. The structure, then, would be compared to a new one built to the State's current standards for that particular type of road. On this basis, it is not always necessary to use the highest standard, but it is not recommended to use unduly low standards. It is recommended that AASHTO standards be followed for establishing design, minimum adequate and intolerable categories, unless the State's approved criteria differ from those in the AASHTO guides.

Items 67 through 72 will be coded with a one-digit code that indicates the appraisal rating for the item. The ratings and codes are:

- N Not applicable
- 9 Conditions superior to present desirable criteria
- 8 Conditions equal to present desirable criteria
- 7 Condition better than present minimum criteria
- 6 Condition equal to present minimum criteria
- 5 Condition somewhat better than minimum adequacy to tolerate being left in place as is
- 4 Condition meeting minimum tolerable limits to be left in place as is
- 3 Basically intolerable condition requiring high priority of repair

- 2 Basically intolerable condition requiring high priority of replacement
- 1 Immediate repair necessary to put back in service
- 0 Immediate replacement necessary to put back in service

Refer to the statements following condition ratings for Items 58 - 65.

#### Item 67 - Structural Condition

1 digit

Rate the overall structural condition, taking into account the major structural deficiencies. The Appraisal Rating is to be based partially on the Deck, Superstructure, Substructure Condition ratings and the load carrying capacity.

The condition of the deck should have a relatively small influence on this appraisal rating and rarely should the appraisal rating for the structural condition be less than "4" due to a bridge deck problem. Exceptions to this would be concrete slab, T-beam and box girders. The minimum numerical rating of "4" is realistic if only the bridge deck needs replacement and the rest of the supporting superstructure is to remain in place. A lower rating could be justified if a significant amount of additional reconstruction or replacement is required on the rest of the superstructure to restore the load carrying capacity of the bridge.

The bridge is appraised not only on physical condition, but also on load carrying capacity, of the superstructure and substructure. Therefore, a well-maintained bridge may still be appraised at a "4" or "5" because the original design load or the inventory rating was less than today's standard.

Of first importance are those items whose malfunction or loss would adversely affect the integrity of the structure. For example, a loose expansion device, a pier cap that needs concrete work, or a damaged truss portal, should not classify a bridge as a "basically intolerable condition".

#### Item 68 - Deck Geometry

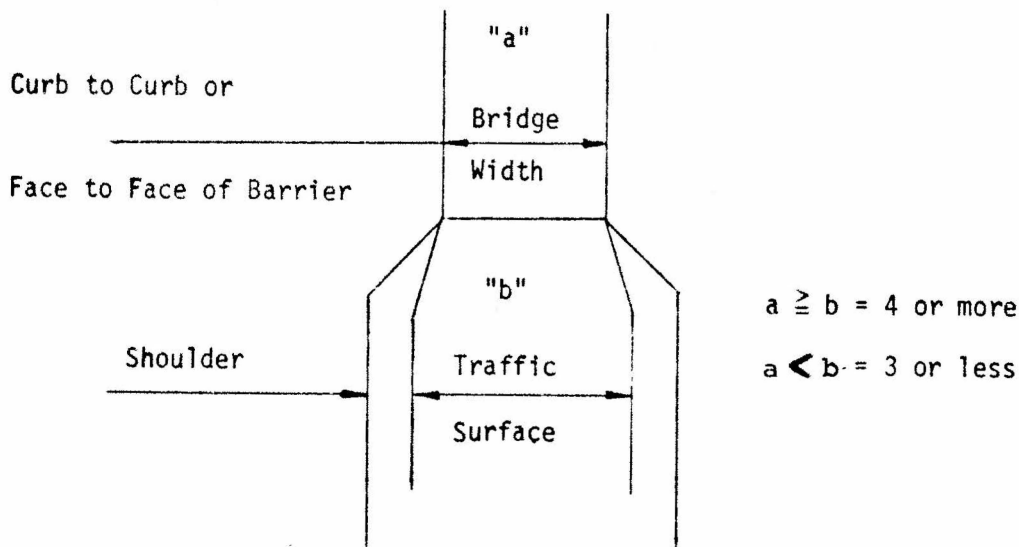
1 digit

Deck geometry is one of the more difficult items to appraise due to the varied standards and classes of roads used by the State on the different Federal-aid systems. The States are encouraged to establish basic criteria for evaluating deck geometry for these different systems and classes of roads. The key phrases to use in conjunction with the current State's standards in assigning an appraisal rating are "condition meeting minimum tolerable limits to be left in place" and "basically intolerable condition". This criteria developed from current design, minimum adequate and intolerable categories must be realistic to be meaningful.



#### Item 68 - Deck Geometry (cont'd)

One suggested beginning for the development of appraisal rating criteria, based only on the deck and approach roadway widths, is shown in the sketch below. The suggested values could be lowered if other factors (vertical clearance over the deck and horizontal or vertical clearance on the bridge) affect the flow of traffic.



#### Item 69 - Underclearances, Vertical and Horizontal 1 digit

This refers to vertical and horizontal underclearances from the through roadway to the superstructure or substructure units, respectively. Code "N" unless the bridge is over a highway or railroad.

#### Item 70 - Safe Load Capacity 1 digit

Code rating in accordance with appropriate system criteria. It should be noted that the National Bridge Inspection Standards require the posting of load limits only if the maximum legal loads in the State produce stresses in excess of the operating rating stress level. However, a State may elect to use a lesser stress level, as low as the inventory rating level, to determine a safe load capacity for any or all of its bridges. This safe load capacity should be entered as Item 70. If the safe load capacity is such that posting is required, Item 70 shall be coded as 4 or less. If no posting is required, Item 70 shall be coded as 5 or greater, somewhat better than minimum adequacy.

This item evaluates the safe load of a bridge in comparison to the State legal load. In a way, it merely reflects the relationship between the load that may legally use the bridge and the desired capacity for bridges on the same highway system. It differs from the appraisal of the Structural Condition in that Item 67 uses the inventory or design rating, while the Safe Load Capacity may be based on any stress level between inventory and operating rating inclusive.

#### Item 70 - Safe Load Capacity (cont'd)

The use or presence of a temporary bridge again affects the coding. The safe load rating should reflect either the actual capacity or the posted load, if any, of the temporary bridge. This also applies to bridges shored up or repaired on a temporary basis. This means the capacity rating will reflect the loads the bridge is actually carrying.

#### Item 71 - Waterway Adequacy

1 digit

This item describes the waterway adequacies. All scour erosion, condition of slope protection, stream capacity, etc., should be recorded. It is possible to have stream problems from slope protection, scour and the general condition with no apparent damage to the structure. These conditions should be related to their current affect on the structure and the potential hazard to the structure if the condition is not corrected. If there is no apparent damage or potential hazard, then the rating code should be "4" or higher. If some major damage has resulted or a potentially hazardous condition exists, then the rating would be "3" or less depending upon the extent.

#### Item 72 - Approach Roadway Alignment

1 digit

Code the rating based on the adequacy of the approach roadway alignment. This item 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.

#### PROPOSED IMPROVEMENTS

If Item 73 is coded with zeroes, then Items 74-88 shall be coded with zeroes except Item 84 may be used for coding maintenance costs.

#### Item 73 - Year Needed

2 digits

The information to be recorded for this item will be the year improvements are estimated to be needed. The determination of the year can be made through the State's normal highway planning procedures. A 2-digit number will be coded to represent this information. Use zeroes to indicate "no answer" or "improvement not needed".

Example:	Improvement Needed	Code
	1970	70
	1975	75
	Not scheduled	00
	None needed	00

#### Item 74 - Type of Service

1 digit

Use the code shown in Item 42 to represent the type of service to be provided on the bridge.

### Item 75 - Type of Work

3 digits

The information to be recorded for this item will be the type of work proposed to be accomplished on the structure to improve it to the point that it will provide the type of service specified in Item 74. A 2-digit number should be coded to represent the proposed work type. The codes below are similar to those used in preparing Form PR-37 for highway safety improvements:

- 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

In addition, a 1-digit suffix code should be used to indicate whether the proposed work is to be done by force account or by contract.

Contract	code 1
Owner's forces	2

Example: Strengthen existing structure by contract 361

### Item 76 - Length of Improvement

6 digits

Code a 6-digit number that represents the length of the proposed improvement to the nearest foot. This length will not necessarily be the full length of the structure. However, the total length of the eligible approach improvement should be included.

Example:	Length of Improvement	Code
	250 feet	000250
	1200 "	001200
	12345 "	012345

### Item 77 - Proposed Design Loading of Improvement

1 digit

Use the codes as specified in Item 31 to show the design loading proposed for the improvement.

### Item 78 - Proposed Roadway Width

4 digits

Code a 4-digit number to represent the width of the proposed reconstruction roadway to the nearest foot. The width will be from curb to curb or from face to face of rails if the curbs are 9 inches or less in width.

Item 79 - Proposed Number of Lanes 2 digits

Code a 2-digit number to indicate the number of lanes proposed as part of the improvement.

Item 80 - Design ADT 6 digits

Code a 6-digit number to represent the ADT which controls the design of the new improvement. The ADT should be to the nearest ten and coded as shown in Item 29.

Item 81 - Year of Estimated ADT 2 digits

Code a 2-digit number to represent the last two digits of the year of the estimated ADT given in Item 80.

Item 82 - Year of Proposed Adjacent Roadway Improvements 2 digits

Code a 2-digit number to represent the last two digits of the year in which it is expected that improvements to the roadway approaches to the bridge will take place.

Item 83 - Type of Proposed Adjacent Roadway Improvements 1 digit

Code a 1-digit number to represent the type of improvement proposed for approaches to the bridge. Use the following codes:

- 0 Not applicable
- 1 Resurface
- 2 Reconstruction
- 3 Widening
- 4 Shoulder improvements
- 5 Other (explain in remarks)

Item 84 - Cost of Improvements 5 digits

Code a 5-digit number to represent the total cost of the proposed improvements to thousands of dollars.

If the cost coded 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.

This item may also be used for coding maintenance costs.

Example:	Cost of Improvement	Code
	\$ 55,850	00056
	250,000	00250
	7,451,233	07451

Item 85 - Preliminary Engineering

3 digits

Code as a 3-digit number to represent the estimated cost in thousands of dollars of the preliminary engineering.

Item 86 - Demolition

3 digits

Code as a 3-digit number to represent the estimated cost in thousands of dollars to demolish the existing structure.

Item 87 - Substructure

5 digits

Code as a 5-digit number to represent the estimated cost in thousands of dollars to construct the substructure of the proposed improvement.

Item 88 - Superstructure

5 digits

Code as a 5-digit number to represent the estimated cost in thousands of dollars to construct the superstructure of the proposed improvement.

Item 89 -

Item no longer used. (Originally used with Bridge Replacement Program.)

Item 90 - Inspection Date

6 digits

Code the date a structure is inspected. The item should be coded in the form:

MM  
(month

DD  
day

YY  
year)

REMARKS

In addition to any other applicable statements, remarks must include a statement of action taken, if any, pursuant to findings of inspection.

# STRUCTURE INVENTORY & APPRAISAL SHEET

Revised 12-78

IDENTIFICATION		CLASSIFICATION		By	Date
1 State		24 Highway System		Transfer of Data	
2 Hwy District				Maintenance Insp.	
3 County	4 City/Town	25 Administrative		Condition Analysis	
5 Inventory Route	On <input type="checkbox"/> Under <input type="checkbox"/>	26 Functional		Appraisal	
6 Features Intersected				Cost Estimate	
				General Review	
7 Facility Carried by Structure		STRUCTURE DATA			
8 Structure No. of		27 Year Built		28 Type Service	
9 Location		29 Lanes on Str. under		29 Structure Type - Main	
10 Min. Vert. Clearance, Inv. Rte.		30 ADT	31 Year	30 - Approach	
11 Milepoint		32 Design Load		31 No. of Spans - Main	
12 Road Section No.		33 Appr Rdwy Width w/ Shld		32 - Approach	
13 Defense Bridge Description		34 Br Median <input type="checkbox"/> None <input type="checkbox"/> Open <input type="checkbox"/> Closed		33 Total Horiz. Clearance	
14 Defense Milepoint		35 Skew		34 Max Span Length	
15 Defense Section Length		36 Structure Flared <input type="checkbox"/> Yes <input type="checkbox"/> No		35 Structure Length	
16 Latitude		37 Traffic Safety Features		36 Sidewalk Lt. ft, Rt	
17 Longitude		38 Navigation Control <input type="checkbox"/> Yes <input type="checkbox"/> No		37 Br Roadway Width (curb to curb)	
18 Physical Vulnerability		39 - Vertical ft		38 Deck Width (out-out)	
19 By pass, Detour Length		40 - Horizontal ft		39 Vert Clearance over Deck	
20 Toll		41 Open, Posted, or Closed		40 Underclearance - Vertical	
21 Custodian				41 - Lateral Right	
22 Owner				42 - Left	
23 FAP No.				43 Wearing Surface	
CONDITION		Material	Condition Analysis	Rating	
44 Deck				(9-0)	
45 Superstructure					
46 Substructure					
47 Channel & Channel Protection					
48 Culvert & Retaining Walls					
49 Estimated Remaining Life		49 Approach Roadway Alignment			
50 Operating Rating		50 Inventory Rating			
APPRAISAL		Deficiencies	Rating		
51 Structural Condition			(9-0)		
52 Deck Geometry					
53 Underclearances - Vertical & Lateral					
54 Safe Load Capacity					
55 Waterway Adequacy					
56 Approach Roadway Alignment					
PROPOSED IMPROVEMENTS					
57 Year Needed	Completed	Describe (Item 75)			
58 Type of Service					
59 Type of Work					
60 Improvement Length	ft				
61 Design Loading					
62 Roadway Width	ft				
63 Number of Lanes		63 Prop Rdwy Improvement - Year			
64 ADT	64 Year	- Type			
		Remarks:			
65 Cost of Improvements	\$	000			
66 Prel. Engrg.	\$	000			
67 Demolition	\$	000			
68 Substructure	\$	000			
69 Superstructure	\$	000			
70 Insp Date					

## Appendix A

### Highway Bridge Replacement and Rehabilitation Program Sufficiency Rating Formula

The sufficiency rating formula described herein is a method of evaluating factors, which are indicative of bridge sufficiency to remain in service. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient or deficient bridge.

# SUMMARY OF SUFFICIENCY RATING FACTORS

## 1. STRUCTURAL ADEQUACY AND SAFETY

$S_1 = 55\%$  Max.

59 Superstructure  
60 Substructure  
62 Culvert  
66 Inventory Rating

## 2. SERVICEABILITY AND FUNCTIONAL OBSOLESCENCE

$S_2 = 30\%$  Max.

12 Defense Highway  
28 Lanes on Structure  
29 ADT  
32 Appr. Rdwy. Width  
43 Structure Type  
51 Bridge Rdwy. Width  
53 VC over deck  
58 Deck Condition  
67 Structural Condition  
68 Deck Geometry  
69 Underclearances  
71 Waterway Adequacy  
72 Appr. Rdwy. Align.

## 3. ESSENTIALITY FOR PUBLIC USE

$S_3 = 15\%$  Max.

12 Defense Highway  
19 Detour Length  
29 ADT

## 4. SPECIAL REDUCTIONS

$S_4 = 13\%$  Max.

19 Detour Length  
36 Traffic Safety Features  
43 Structure Type, Main

$$\text{SUFFICIENCY RATING} = S_1 + S_2 + S_3 - S_4$$

Sufficiency Rating shall not be  
< 0 nor > 100



# HIGHWAY BRIDGE REPLACEMENT & REHABILITATION PROGRAM

## SUFFICIENCY RATING FORMULA

### 1. STRUCTURAL ADEQUACY AND SAFETY (55% maximum)

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

$\leq 2$   
 $= 3$   
 $= 4$

A = 55%  
 B = 40%  
 C = 25%  
 D = 10%

Or A, B, and C = 0, and #59 or #60 = 5

If #59 and #60 = N and #62 (Culvert Rating) is:

$\leq 2$   
 $= 3$   
 $= 4$

E = 55%  
 F = 40%  
 G = 25%  
 H = 10%

Or E, F, and G = 0, and #62 = 5

### Reduction for Load Capacity:

a) Calculate AIT (Adjusted Inventory Tonnage) as follows:

When the 1st digit of #66 = 1, AIT = the 2nd & 3rd digits multiplied by 1.56;

When the 1st digit of #66 = 2, AIT = the 2nd & 3rd digits multiplied by 1.00;

When the 1st digit of #66 = 3, AIT = the 2nd & 3rd digits multiplied by 1.56;

When the 1st digit of #66 = 4, AIT = the 2nd & 3rd digits multiplied by 1.01;

When the 1st digit of #66 = 5, AIT = the 2nd & 3rd digits multiplied by 0.77;

When the 1st digit of #66 = 6, AIT = the 2nd & 3rd digits multiplied by 0.67;

When the 1st digit of #66 = 9, AIT = the 2nd & 3rd digits multiplied by 1.00;

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

Note: If  $(36 - AIT) \leq 0$ , then  $I = 0$ .

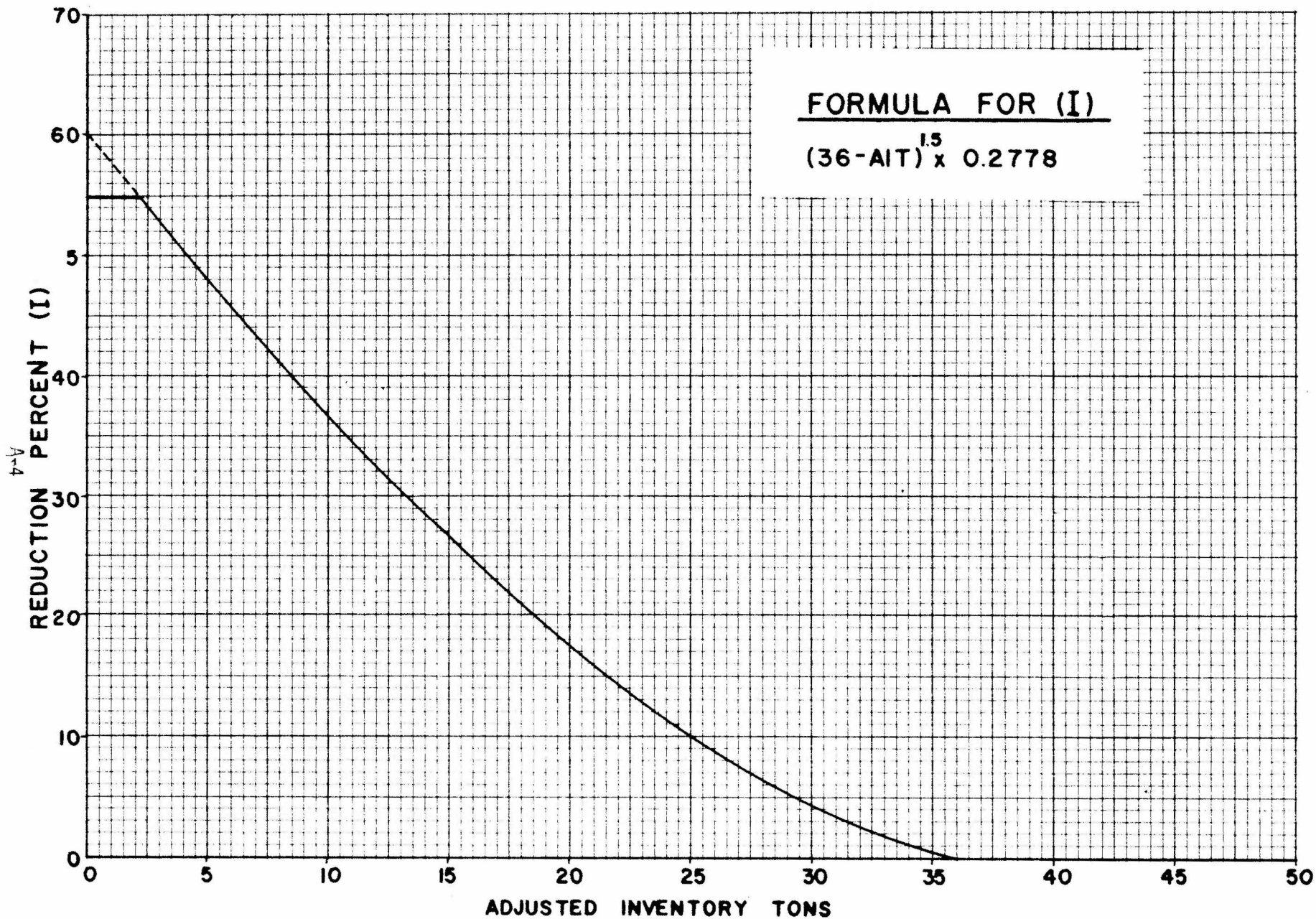
Limits: 55% to 0%

$$S_1 = 55 - (A+B+C+D+E+F+G+H+I)$$

$S_1$  shall not be less than 0% nor greater than 55%

FORMULA FOR (I)

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



## 2. SERVICEABILITY AND FUNCTIONAL OBSOLESCENCE (30% maximum)

### Rating Reductions (13% maximum)

If #58 (Deck Condition) is:	$\leq 3$	A = 5%
	= 4	A = 3%
	= 5	A = 1%
If #67 (Structural Condition) is:	$\leq 3$	B = 4%
	= 4	B = 2%
	= 5	B = 1%
If #68 (Deck Geometry) is:	$\leq 3$	C = 4%
	= 4	C = 2%
	= 5	C = 1%
If #69 (Underclearances) is:	$\leq 3$	D = 4%
	= 4	D = 2%
	= 5	D = 1%
If #71 (Waterway Adequacy) is:	$\leq 3$	E = 4%
	= 4	E = 2%
	= 5	E = 1%
If #72 (Approach Road Alignment) is:	$\leq 3$	F = 4%
	= 4	F = 2%
	= 5	F = 1%

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

J shall not be less than 0% nor greater than 13%.

### Width of Roadway Insufficiency (15% maximum)

Note: #1 applies to all bridges;  
#2 applies to 1-lane bridges only;  
#3 applies to 2 or more lane bridges;  
#4 applies to all except 1-lane bridges.

and

$$X \text{ (ADT/Lane)} = \#29 \text{ (ADT)} \div \text{First 2 digits of } \#28 \text{ (Lanes)}$$
$$Y \text{ (Width/Lane)} = \#51 \text{ (Bridge Rdwy. Width)} \div \text{First 2 digits of } \#28$$

#1 - Use when the last 2 digits of #43 (Structure Type) are not 19 (Culvert):

$$\text{If } (\#51 + 2 \text{ Ft.}) < \#32 \text{ (Approach Roadway Width)} \quad G = 5\%$$

#2 - For 1-lane bridges only.

If the first two digits of #28 (Lanes) are equal to 01 and:

If $Y < 14$	$H = 15\%$
If $Y \geq 14 < 18$	$H = 15 \left( \frac{18-Y}{4} \right) \%$
If $Y \geq 18$	$H = 0\%$

#3 - For two or more lane bridges. If these limits apply, do not continue on to #4 as no lane width reductions are allowed.

If the first 2 digits of #28 = 02 and $Y \geq 16$	$H = 0\%$
If the first 2 digits of #28 = 03 and $Y \geq 15$	$H = 0\%$
If the first 2 digits of #28 = 04 and $Y \geq 14$	$H = 0\%$
If the first 2 digits of #28 $\geq 05$ and $Y \geq 12$	$H = 0\%$

#4 - For all except 1-lane bridges.

If $Y < 9$ and $X > 50$	$H = 15\%$
If $Y < 9$ and $X \leq 50$	$H = 7.5\%$
If $Y \geq 9$ and $X \leq 50$	$H = 0\%$

If  $X > 50$  but  $\leq 125$  and:

$Y < 10$	$H = 15\%$
$Y \geq 10 < 13$	$H = 15 \left( \frac{13-Y}{3} \right) \%$
$Y \geq 13$	$H = 0\%$

If  $X > 125$  but  $\leq 375$  and:

$Y < 11$	$H = 15\%$
$Y \geq 11 < 14$	$H = 15 \left( \frac{14-Y}{3} \right) \%$
$Y \geq 14$	$H = 0\%$

If  $X > 375$  but  $\leq 1350$  and:

$$Y < 12$$

$$H = 15\%$$

$$Y \geq 12 < 16$$

$$H = 15 \left( \frac{16-Y}{4} \right) \%$$

$$Y \geq 16$$

$$H = 0\%$$

If  $X > 1350$  and:

$$Y < 15$$

$$H = 15\%$$

$$Y \geq 15 < 16$$

$$H = 15(16-Y)\%$$

$$Y \geq 16$$

$$H = 0\%$$

"Width of Roadway Insufficiency" shall not be less than 0% nor greater than 15%.

Vertical Clearance Insufficiency - (2% maximum)

If #12 (Defense Road)  $> 0$  and:

$$\#53 \text{ (VC over Deck)} \geq 1600$$

$$I = 0\%$$

$$\#53 < 1600$$

$$I = 2\%$$

If #12 = 0 and:

$$\#53 \geq 1400$$

$$I = 0\%$$

$$\#53 < 1400$$

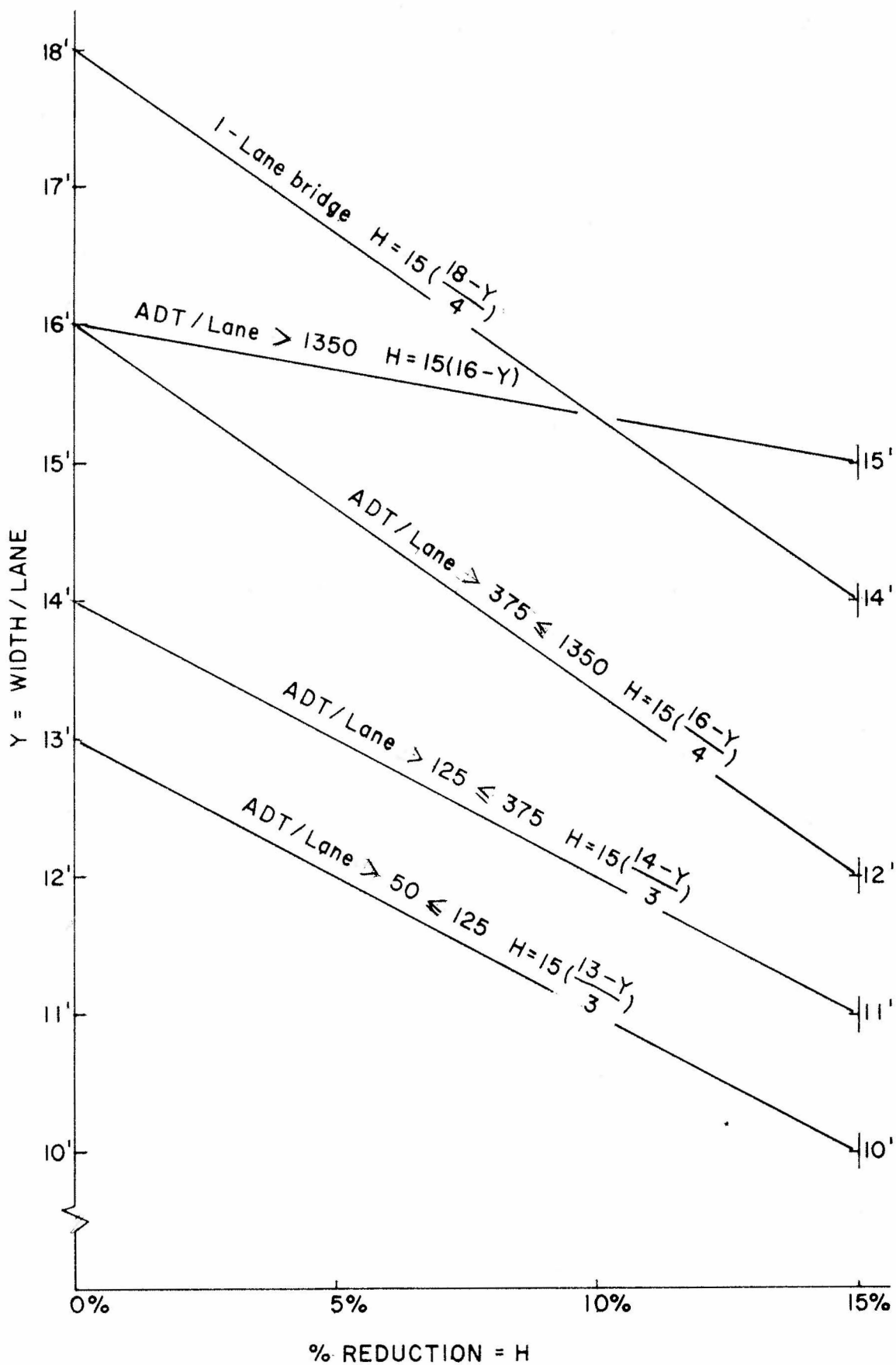
$$I = 2\%$$

"Vertical Clearance Insufficiency" shall not be less than 0% nor greater than 2%.

$$S_2 = 30 - [J + (G + H) + I] \quad \text{where } J \text{ shall not exceed } 13\% \text{ and } (G + H) \text{ shall not exceed } 15\%.$$

$S_2$  shall not be less than 0% nor greater than 30%.

# WIDTH OF ROADWAY INSUFFICIENCY



3. ESSENTIALITY FOR PUBLIC USE (15% maximum)

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

$$A = \frac{\#29 \text{ (ADT)} \times \#19 \text{ (Detour Length)}}{200,000 \times K} \times 15$$

A shall not be  
< 0% nor > 15%.

If #12 is > 0

B = 2%

If #12 = 0

B = 0%

$$S_3 = 15 - (A + B)$$

S<sub>3</sub> shall not be less than 0% nor greater than 15%.

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

(a) Detour Length Reduction:

$$A = (\#19)^4 \times (5.205 \times 10^{-8}) \quad \text{Max.} = 5\%$$

(b) If the 2nd and 3rd digits of #43 (Structure Type, Main) are 10, 12, 13, 14, 15, 16, 17, then;

$$B = 5\%$$

(c) If 2 digits of #36 (Highway Safety Feature)	= 0	C = 1%
If 3 digits of #36	= 0	C = 2%
If 4 digits of #36	= 0	C = 3%

$$S_4 = A + B + C$$

---

$$\text{SUFFICIENCY RATING} = S_1 + S_2 + S_3 - S_4$$

and Sufficiency Rating shall not be < 0 nor > 100

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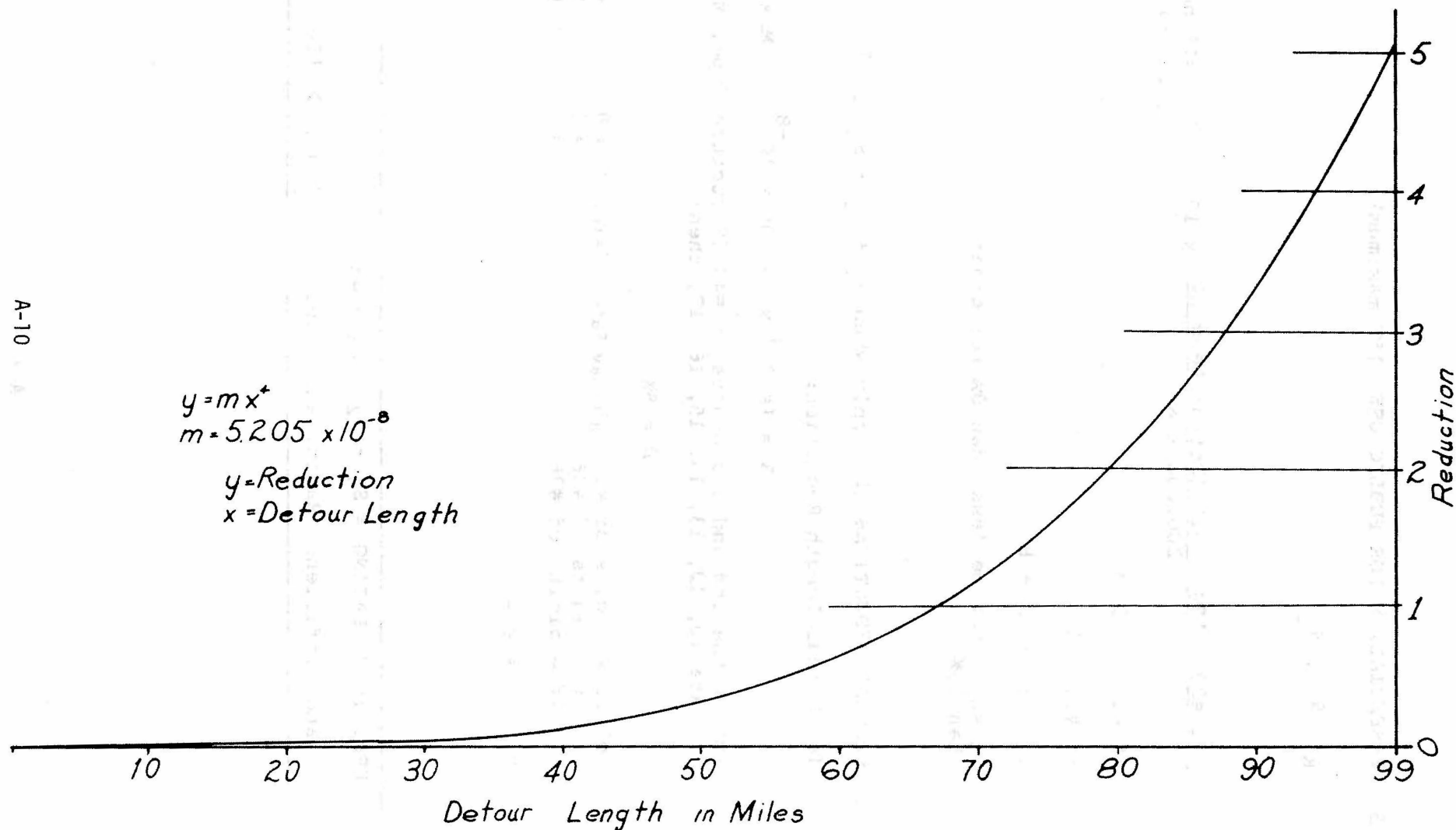


# SPECIAL REDUCTION FOR DETOUR LENGTH

A-10

$$y = mx^*$$
$$m = 5.205 \times 10^{-8}$$

$y = \text{Reduction}$   
 $x = \text{Detour Length}$



Appendix B  
CALCULATION OF SUFFICIENCY RATING

1. Structural Adequacy and Safety

$$A, B, D, E, F, G, H = 0$$

$$C = 25\%$$

$$I = [36 - (1.56)(20)]^{1.5} (0.2778) = 2.9$$

$$S_1 = 55 - 25 - 2.9 = 27.1$$

2. Serviceability and Functional Obsolescence

$$A = 1\%, B = 2\%, C = 4\%, D = 0, E = 2\%, F = 2\%$$

$$J = (1 + 2 + 4 + 2 + 2) = 11\%$$

$$X = 375, Y = 10.75$$

$$\#1 (21.5 + 2) > 23 \quad G = 0$$

#2 - Not Applicable

#3 - Not Applicable

$$\#4 \quad X = 375, Y = 10.75 \quad H = 15\%$$

$$I = 0$$

$$S_2 = 30 - [11 + (0 + 15) + 0] = 4.0$$

3. Essentiality For Public Use

$$K = \frac{27.1 + 4.0}{85} = 0.36$$

$$A = \frac{750 \times 40}{200,000 \times 0.36} \times 15 = 6.2$$

$$B = 0$$

$$S_3 = 15 - (6.2 + 0) = 8.8$$

4. Special Reductions

$$S_1 + S_2 + S_3 = 27.1 + 4.0 + 8.8 = 39.9 < 50$$

$$\therefore S_4 = 0$$

$$\text{SUFFICIENCY RATING} = 27.1 + 4.0 + 8.8 = 39.9$$

# STRUCTURE INVENTORY & APPRAISAL SHEET

Revised 12-78

IDENTIFICATION		CLASSIFICATION		By	Date
1 State <u>069</u>		24 Highway System <u>03</u>		Transfer of Data	
2 Hwy District <u>01</u>		25 Administrative <u>1</u>		Maintenance Insp.	
3 County <u>045</u>	4 City/Town <u>0000</u>	26 Functional <u>04</u>		Condition Analysis	
5 Inventory Route <u>131002750</u>	On <input checked="" type="checkbox"/> Under <input type="checkbox"/>			Appraisal	
6 Features Intersected <u>EXAMPLE CREEK</u>				Cost Estimate	
7 Facility Carried by Structure <u>Rte. 275</u>				General Review	
8 Structure No. <u>0400121</u>	1 of	STRUCTURE DATA			
9 Location <u>Near Eel River</u>		27 Year Built <u>3000</u>	40 Type Service		<u>TS</u>
10 Min. Vert. Clearance, Inv. Rte. <u>9999</u>		28 Lanes on Str. <u>02</u> under <u>00</u>	41 Structure Type - Main		<u>702</u>
11 Milepoint <u>00231</u>		29 ADT <u>00750</u>	42 - Approach		<u>0010</u>
12 Road Section No. <u>0000</u>		30 Design Load <u>0</u>	43 No of Spans - Main		<u>004</u>
13 Defense Bridge Description		31 Appr Rdwy Width %Sld <u>023</u>	44 - Approach		<u>0000</u>
14 Defense Milepoint		32 Br Median <input checked="" type="checkbox"/> None <input type="checkbox"/> Open <input type="checkbox"/> Closed	45 Total Horiz. Clearance		<u>215</u> ft
15 Defense Section Length		33 Skew <u>00</u>	46 Max Span Length		<u>0020</u> ft
16 Latitude <u>44521</u>		34 Structure Flored <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	47 Structure Length		<u>00082</u> ft
17 Longitude <u>117242</u>		35 Traffic Safety Features <u>0000</u>	48 Sidewalk		<u>000</u> ft, R, L
18 Physical Vulnerability		36 (1100)	49 Br Roadway Width (curb-curb)		<u>21.5</u> ft
19 By-pass, Detour Length <u>40</u>		37 Navigation Control <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	50 Deck Width (out-out)		<u>24.0</u> ft
20 Toll <u>5</u>		38 - Vertical <u>000</u> ft	51 Vert Clearance over Deck		<u>99.99</u> "
21 Custodian <u>1</u>		39 - Horizontal <u>0000</u> ft	52 Underclearance - Vertical		<u>00.00</u> "
22 Owner <u>1</u>		40 Open, Posted, or Closed	53 - Lateral Right		<u>999</u> ft
23 FAP No.			54 Left		<u>999</u> ft
			55 Wearing Surface <u>1</u>		
CONDITION		Material		Condition Analysis	
41 Deck				Rating (1-5)	<u>5</u>
42 Superstructure					<u>5</u>
43 Substructure					<u>4</u>
44 Channel & Channel Protection					<u>4</u>
45 Culvert & Retaining Walls					<u>N</u>
46 Estimated Remaining Life <u>05</u>		47 Approach Roadway Alignment			<u>4</u>
48 Operating Rating <u>133</u>		49 Inventory Rating			
APPRAISAL		Deficiencies		Rating (1-5)	
50 Structural Condition					<u>4</u>
51 Deck Geometry					<u>3</u>
52 Underclearances - Vertical & Lateral					<u>N</u>
53 Safe Load Capacity					<u>5</u>
54 Waterway Adequacy					<u>4</u>
55 Approach Roadway Alignment					<u>4</u>
PROPOSED IMPROVEMENTS					
56 Year Needed <u>80</u>	Completed	Describe (Items)		<u>Remove and Replace</u>	
57 Type of Service <u>1</u>					
58 Type of Work <u>311</u>					
59 Improvement Length <u>000100</u>	ft				
60 Design Loading					
61 Roadway Width <u>0040</u>	ft				
62 Number of Lanes <u>02</u>		63 Prop Rdwy Improvement - Year	<u>00</u>		
64 ADT <u>009000</u>	Year <u>80</u>	65 - Type	<u>0</u>		
		Remarks:			
66 Cost of Improvements	\$	<u>160,000</u>			
67 Prel Engrg.	\$	<u>10,000</u>			
68 Demolition	\$	<u>12,000</u>			
69 Substructure	\$	<u>45,000</u>			
70 Superstructure	\$	<u>115,000</u>			
71 Insp Date	<u>9/25/78</u>				

FHWA TFHRC Tech Reference Center



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