FM 5-36

DEPARTMENT OF THE ARMY FIELD MANUAL

ROUTE RECONNAISSANCE AND CLASSIFICATION

HEADQUARTERS, DEPARTMENT OF THE ARMY

15 AUGUST 1960

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FIELD MANUAL
No. 5–36

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *15 August 1960*

ROUTE RECONNAISSANCE AND CLASSIFICATION

*** This manual supersedes FM 5–36, 26 April 1955, including C 1, 14 February 1956.**

LIST OF TABLES

CHAPTER 1
INTRODUCTION

Section I. PURPOSE AND SCOPE

1. Purpose

This manual provides the information necessary for troops of all branches to understand the technical aspects of the reconnaissance and classification of existing routes of communication in order to achieve their full and proper utilization. Methods of survey and reconnaissance for new routes are found in other manuals of the TM and FM 5-series.

2. Scope

a. This manual covers the collection, compilation, and dissemination of technical information concerning existing routes of communication, including roads, bridges, and other crossing means, which are needed to plan or execute movement of military vehicles. The manual discusses the information needed, the methods for obtaining it, how it is compiled, how it relates to the vehicle and bridge classification system, and how it is disseminated to the user. Such information includes the indicating of obstructions and classifications of routes on maps and the use of road signs. Detailed methods of classifying vehicles and

bridges are given in TM 5–260, Principles of Bridging.

b. The material presented herein is applicable without modification to both nuclear and non-nuclear warfare.

Section II. REFERENCES

3. Publications

Pertinent manuals and other military publications are listed in appendix I.

4. North Atlantic Treaty Organization Agreements

Information in this manual reflects, where appropriate, North Atlantic Treaty Organization (NATO) agreements in the form of standard agreements.

CHAPTER 2

RECONNAISSANCE AND REPORTING

Section I. GENERAL

5. Definition of a Route

A route is the road or roads, including tracks and bridges, used when moving from one place to another. It includes those roads, bridges, tunnels, fords, and ferries selected from a network in a given area for the movement of troops, equipment, and supplies. Although a route *may* also include the use of navigable waters, rail transportation facilities, and aircraft landing facilities, this manual is confined to the discussion of routes as defined above.

6. Definition of a Road

A road is an open way provided for the convenient passage of personnel, vehicles, and animals.

7. Recording Measurements

Measurements may be recorded in the metric system, the English system, or both, depending upon the requirements of the Commander concerned. The measurements must be clearly indicated, using universally known abbreviations such as "km" (kilometer), "m" (meter), "ft" (feet), and "mi" (miles).

Table I. Equivalent Units of Length

One	Mile	Yard	Feet	Inches	Kilometer	Meter	Centimeter
Mile	1.0000	1760.0000	5280.000	63,360.000	1.6093	1609.3490	
Yd	----------	1.0000	3.000	36.0000	----------	.9144	91.44
Ft	----------	.3333	1.000	12.000	----------	.3048	30.48
In.	----------	.0277	.0833	1.000	----------	.0254	2.54
Km	.6214	1093.6112	3280.8336	39,370.0032	1.0000	1000.0000	100,000.00
M	----------	1.0936	3.2808	39.3700	.0010	1.0000	100.00
Cm	----------	.0190	.0328	.3937	----------	.0100	1.00

Section II. ROUTE RECONNAISANCE

8. General

a. Route reconnaissance is a special type of engineer reconnaissance, although it is governed by the same fundamentals that apply to all reconnaissance. It is usually made on the ground because of the need for close physical inspections at, for example, bridge and drainage sites. Aerial reconnaissance, however, is often useful and should supplement ground reconnaissance when practicable (FM 5–30). Aerial photographs and ground photographs can save time and increase the value of reconnaissance reports (TM 30–246).

b. The purpose of route reconnaissance is to gain information which will aid in the selection of a route or routes to be used for the movement of troops, troop equipment, and supplies in military operations.

c. Instructions for making a route reconnaissance should be simple, clear, and comprehensive and should be issued for the purpose of accomplishing a specific objective. They should state when, where, and to whom the reports are to be submitted. They should specify the points between which the route is to extend, the area to be reconnoitered, the items of information considered particularly important, and specific route requirements.

9. Terrain Considerations

Items of information of particular importance

include, but are not necessarily limited to, the following items:

a. The nature of the terrain.

b. Existing roads and their physical characteristics, including lengths and load-bearing capabilities (app. II).

c. Obstructions which may create bottlenecks or slow down movement. They are classified as natural or artificial—

(1) Natural obstructions include such features as watercourses, terrain compartments, wooded and jungle areas, swamp and inundated areas and mountains.

(2) Artificial obstructions include such factors as nuclear radiation, built-up areas, tactical obstacles (minefields, barbed wire), communication wire, low underpasses, narrow tunnels, narrow bridges, and other manmade features.

d. Bridges and other stream-crossing means.

e. Tunnels.

10. Specific Requirements

Specific route requirements include the maximum weight, maximum width, maximum height, and classification of the vehicles to be moved; the approximate number of each class to be moved per hour; and the approximate length of time the route is to be used.

Section III. ROUTE RECONNAISSANCE REPORT

11. General

a. The route reconnaissance report should be accurate, clear, concise, relevant, and specific. The preferable method of preparing this report is in simplified map form (fig. 1) using symbols (fig. 2) to indicate the limiting features. This report is accompanied by a road reconnaissance report (par. 17) and such bridge, tunnel, ferry, and ford reconnaissance reports as are necessary. The route report is supported by military sketches of limiting features; by local maps; and by photo-

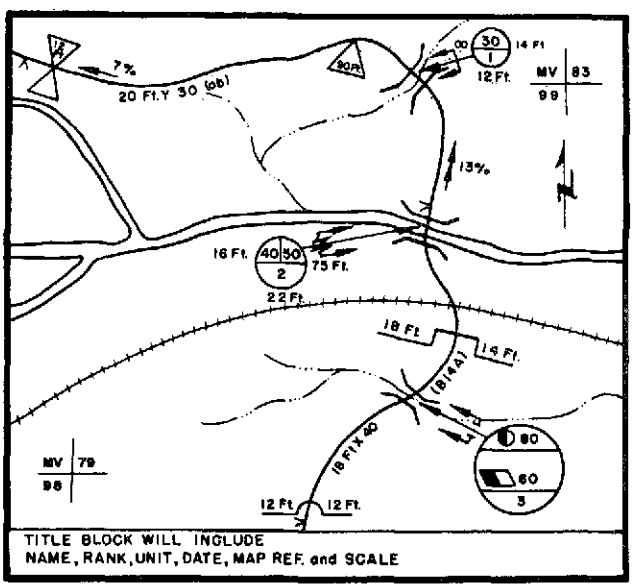
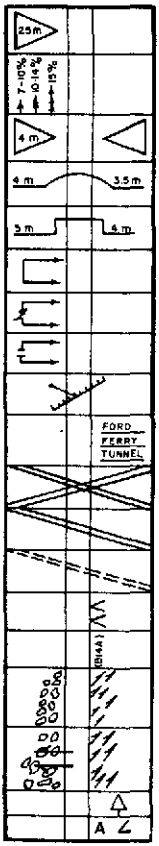


Figure 1. Example of a route reconnaissance report.



(1) Sharp Curve
(radius in feet or meters)

(2) Steep Grade (arrows point uphill) (grade in percent)
(length of arrows may show length of grade when scale allows)

(3) Constriction (width in feet or meters)

(4) Arch constriction (width on left & height on right in feet or meters)

(5) Underpass Constriction (width on left & height on right in feet or meters)

(6) Bypass easy

(7) Bypass difficult

(8) Bypass impossible

(9) Level crossing

(10) Ford (length, width, bottom & depth)
Ferry (length, width, load capacity)
Tunnel (length, width, height)

(11) Road Block

(12) Road Block (ready to use but not in position)

(13) Proposed Road Block

(14) Limits of Sector

(15) Civil or Military Route Designation

(16) Cover (Road lined with trees)
(deciduous – left)
(evergreen – right)

(17) Cover (woods) (deciduous – left) (evergreen – right)
Arrow denotes possibility of driving off the road into deciduous cover.

(18) Critical point

(19) The letter identifies the photo, and the apex of the "∠" orients it at point of exposure.

Figure 2. Symbols for use in the route reconnaissance report.

graphs showing the terrain, the roads and tunnels, and the bridges, ferries, fords, and other stream-crossing means.

b. Symbols used in preparing route reconnaissance map reports are given in figure 2.

12. Checklist

A checklist for use in obtaining the data from which to prepare a route reconnaissance report is listed below and illustrated in figures 1 and 2.

a. Length between well-marked points, in either miles or kilometers and decimal fractions thereof may be shown.

b. Curves having a radius of less than 100 feet (30 m.), each with its radius in feet or meters.

c. Steep grades, each with its maximum gradient in percent and length of any grade of 7 percent or greater.

d. The road width of constrictions, each with the width of its traveled way in feet or meters, and its length in either miles or kilometers and decimal fractions thereof.

e. Underpass limitations, each with its limiting height and width in feet or meters.

f. Bridge bypasses, each classified as easy, difficult, or impossible (defined in par. 22).

g. Civil or military road numbers or other designation.

h. Cover and/or concealment suitable for parking and camouflage.

i. Feasibility of driving off the road, including shoulders.

j. Location of fords and ferries, including limited information.

Section IV. ROAD RECONNAISSANCE

13. General

Road reconnaissance is performed to obtain the information about existing roads upon which to base road classifications, primarily in support of the establishment of a route. It is concerned with the conditions of existing roads for immediate use and not for maintenance operations. The information obtained is used to estimate the quantity and kind of traffic and loads that a road can accommodate in its present condition. Road reconnaissance may also include estimates of the practicability of improvement and of the engineer work involved in conditioning a route to accommodate specified traffic and loads. A road reconnaissance carried out by an officer or NCO other than an Engineer may require supplementation by an Engineer reconnaissance to provide additional data necessary for complete classification of the road.

14. Requirements

Information required for the reconnaissance report of an existing road includes the following:

a. Local name of the road.

b. Local road designation and number.

c. Location of the road by map grid reference.

d. The length of the road between specified and readily identifiable points.

e. The normal width of the road—

(1) Between fences.

(2) Between drainage ditches.

(3) Between edges of pavement; that is, traveled way.

f. Alinement of the road.

g. Drainage, including culverts.

h. Foundation.

i. Surface.

j. Obstructions, including kinds and locations (obstructions include, but are not limited to, underpasses, fords, large tree limbs, craters, projecting buildings, areas subject to inundation, and so on).

k. Reductions in width.

l. Excessive gradients; locations and grades of all gradients steeper than 7 percent.

m. Sharp curves; location and radius of all with a radius shorter than 100 feet or 30 meters.

n. Bridge locations (bridge reconnaissance is described in par. 19–22).

o. Underpass locations together with their lengths, widths, and heights.

p. Tunnel locations together with their lengths, widths, and heights (tunnel reconnaissance is described in par. 30 and 31).

q. Ford locations (ford reconnaissance is described in pars. 34 and 35).

r. Ferry locations (ferry reconnaissance is described in pars. 41–43).

s. Snowshed locations and estimated coverage.

t. Snow gallery locations together with their lengths, widths, and heights.

15. Methods of Measuring Curves

a. The radius of a short-radius curve may be estimated by using a cord to swing an arc. This method is shown in figure 3. The curve is staked as an arc of a circle by swinging an arc with tracing tape or cord from the experimentally determined center of a circle which is tangential to the relatively straight approaches to the curve being measured. The length of the tape or cord from the center of the circle to its circumference is the radius of the curve. This method is practical for curves having a radius up to 250 feet and located on relatively level ground. In figures 3, 4, and 5: ℄ = centerline; *PC* = point of curvature; *PI* = point of intersection; *PT* = point of tangency.

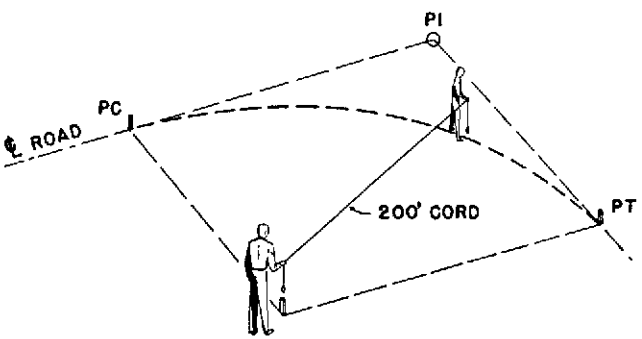


Figure 3. A curve staked by using a cord.

b. The approximate radius of a curve may be determined by laying out right triangles (3:4:5 proportion) at the *PC* and *PT* locations as shown in figure 4. The intersection "O", formed by extending the base legs of each triangle, represents the center of a circle. Therefore, the distance *R* from point "O" to either the *PC* or the *PT* may be considered as the curve radius.

c. Another method for determining the radius of a curve is based on the formula—

$$\text{Radius} = C^2/8m + m/2 \text{ (fig. 5)}.$$

Where: C = length of cord

m = perpendicular distance from center of cord to centerline ($\mathbb{C}_L$) of road.

R = Radius of the circle

Solving for R the above formula becomes—

$$R = C^2/8m + m/2$$

By fixing m at any convenient distance, such as 5 feet, the formula becomes—

$$R = C^2/40 + 2.5$$

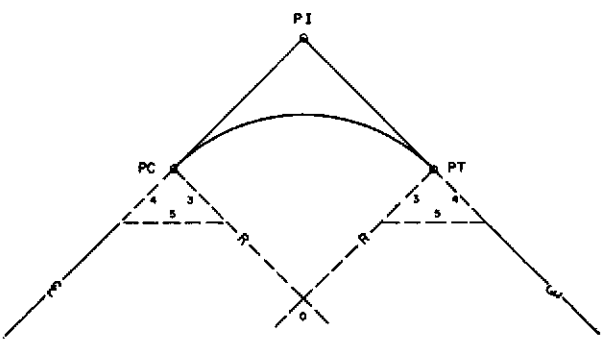


Figure 4. Curve radius by locating center of circle.

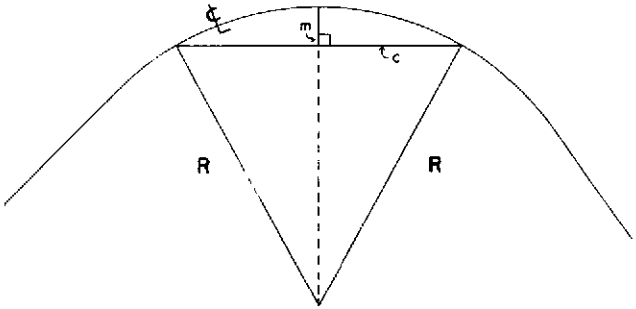


Figure 5. Measuring a curve using formula $R = C^2/8m + m/2$.

In the practical application of the formula, m is measured from the centerline of the curve toward the estimated center of the circle and then C is measured perpendicularly to m, making sure that C is centered on m. If C is measured to be 58 feet, then—

$$R = C^2/40 + 2.5, \text{ then}$$
$$R = 86.6 \text{ feet}$$

Note that when m is equal to 5 feet and R is equal to 100 feet, C must be equal to 62.44 feet. Thus, when measuring C, any value greater than 62.44 will give a value of R greater than 100 feet, and the curve therefore need not be reported.

16. Determining Road Gradient

Percent of slope (road gradient) can be determined by using the formula—

$$\frac{\text{Vertical distance}}{\text{Horizontal distance}} \times 100 = \text{Percent of slope.}$$

If a clinometer is available, percent of slope can be read directly.

Section V. ROAD RECONNAISSANCE REPORT

17. General

a. A road reconnaissance report is one which contains the necessary information required for the classification of a road. Characteristics of a given road may change considerably in relatively short distances. Therefore, any reconnaissance report may require the use of several copies of the reporting form, each covering a selected section of road.

b. The Road Reconnaissance Report (DA Form 1248) (fig. 6) is used to report road information. Short forms or worksheets for rapid fieldwork may be designed and produced by the unit making the reconnaissance.

18. Method of Using DA Form 1248

When it is impossible to determine any item required by the report, the appropriate space should be marked NOT KNOWN. If the width of the roadway varies, item 6 of the form should indicate the lower and upper limits of the width and the stretches of roadway of different widths should be indicated on the mileage chart. Similarly, if the data for items 9, 10, 11 and 12 of the form are different for various stretches of road, they should be so indicated by placing the appropriate road classification formula (par. 57) on the mileage chart opposite the stretch of road to which the classification applies. Obstructions are listed and described in section III of the form, and indicated on the map or overlay by appropriate

ROAD RECONNAISSANCE REPORT (FM 5-36)

DATE: 12 AUGUST 1960

TO: (If reconnaissance ordered by headquarters) S-2 185th ECB

FROM: (Name, grade and unit of officer or NCO making reconnaissance) 1st Lt John J. Smith 185th ECB

1. MAPS	a. COUNTRY	b. SCALE	c. SHEET NUMBER OF MAPS	d. DATE/TIME GROUP (Or elsewhere)
	VIRGINIA, ALLANDALE	1:25000	US SHEET 5561 I SW. AMS V834	11/630R

SECTION I - GENERAL ROAD INFORMATION

2. ROAD GRID REFERENCE		4. ROAD MARKING (Civilian or military number of road)	5. LENGTH OF ROAD (Miles or kilometers, specify)
FROM	TO		
305034-294100	315060-294750	FAIR FAT 6W4	6.7 MILES

6. WIDTH OF ROADWAY (Feet or meters, specify)	8. WEATHER DURING RECONNAISSANCE (Include last rainfall, if known)
14-20 FEET	HOT, DRY, 95°F, LAST RAIN
7. RECONNAISSANCE	ABOUT 15 JUN 1960
DATE: 11 AUGUST 1960 TIME: 0800 - 1200	

SECTION II - DETAILED ROAD INFORMATION (When circumstances permit more detailed information will be shown in an overlay or on the mileage chart on the reverse side of this form. Standard symbols will be used.)

9. ALINEMENT (Check one ONLY)		10. DRAINAGE (Check one ONLY)	
	(1) FLAT GRADIENTS AND EASY CURVES		(1) ADEQUATE DITCHES, CROWN/CAMBER WITH ADEQUATE CULVERTS IN GOOD CONDITION
	(2) STEEP GRADIENTS (Excess of 7 in 100)	✓	
	(3) SHARP CURVES (Radius less than 100 ft (30m))		(2) INADEQUATE DITCHES, CROWN/CAMBER OR CULVERTS, ITS CULVERTS OR DITCHES ARE BLOCKED OR OTHERWISE IN POOR CONDITION
✓	(4) STEEP GRADIENTS AND SHARP CURVES		

11. FOUNDATION (Check one ONLY)	
✓	(1) STABILIZED COMPACT MATERIAL OF GOOD QUALITY
	(2) UNSTABLE, LOOSE OR EASILY DISPLACED MATERIAL

12. SURFACE DESCRIPTION (Complete items 12a and b)

a. THE SURFACE IS (Check one ONLY)	
✓	(1) FREE OF POTHOLES, BUMPS, OR RUTS LIKELY TO REDUCE CONVOY SPEED
	(2) BUMPY, RUTTED OR POTHOLED TO AN EXTENT LIKELY TO REDUCE CONVOY SPEED

b. TYPE OF SURFACE (Check one ONLY)			
	(1) CONCRETE		(6) FARRBOUND MACADAM
	(2) BITUMINOUS (Specify type when known):		(7) GRAVEL
✓	SEE MILEAGE CHART		(8) LIGHTLY METALLED
	(3) BRICK (Pave)		(9) NATURAL OR STABILIZED SOIL, SAND CLAY, SHELL, CINDERS, DISINTEGRATED GRANITE, OR OTHER SELECTED MATERIAL
	(4) STONE (Pave)		(10) OTHER (Describe):
	(5) CRUSHED ROCK OR CORAL		

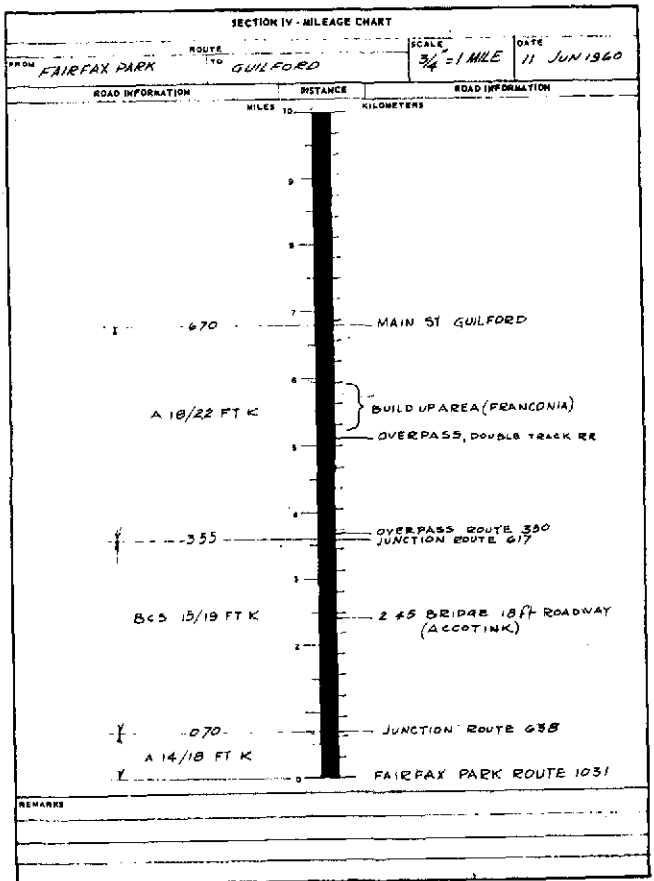
SECTION III - OBSTRUCTIONS (List in the columns below particulars of the following obstructions which affect the traffic capacity of a road. If information of any factor cannot be ascertained, insert "NOT KNOWN")
(a) Overhead obstructions, less than 14 feet or 4.25 meters, such as tunnels, bridges, overhead wires and overhanging buildings.
(b) Restrictions to road widths which limit the traffic capacity, such as snakes, narrow bridges, archways, and buildings.
(c) Excessive gradients (Above 7 in 100)
(d) Curves less than 100 feet (30 meters) in radius
(e) Fords

SERIAL NUMBER a	PARTICULARS b	GRID REFERENCE c	REMARKS d
1	STEEP GRADE - 8% UP HILL GOING EAST, .02 MILE LONG	305100 - 294150	
2	SERIES OF SHARP CURVES	305100 - 294150 TO 305500 - 294300	
3	STEEP GRADE - 7% DOWN HILL GOING EAST	308000 - 293850	

DA FORM 1 JUL 55 1248 PREVIOUS EDITION OF THIS FORM IS OBSOLETE.

Front of form.

Figure 6. Examples of a standard road reconnaissance form.



Back of form.

Figure 6—Continued.

symbols (fig. 2). The mileage chart is on the reverse side of DA Form 1248 (fig. 6). This chart is used to show the location of the salient features and classification elements of the road, starting at the bottom of the page and proceeding up the chart at the desired scale. If the English system of measurement (miles, yards, feet) is used, the opposite metric side of the chart may be used for additional information and vice versa if the metric system is used.

Section VI. BRIDGE RECONNAISSANCE

19. General

a. A bridge is defined as a structure which carries a road or railway over a gorge, river, or any other obstacle. Railway bridges are often decked over to serve as highway bridges.

b. The purpose of bridge reconnaissance is to collect the bridge information necessary for planning and operations. The limiting features of bridges are of basic importance to the selection of a route or road for normal movement of troops and equipment. Limiting features include clear roadway width, horizontal clearance above the curbs, overhead clearance, length, load-carrying capacity, traffic movement possibilities, estimated repair or reinforcement required, and posting needs.

20. Types of Reconnaissance

There are two methods of bridge reconnais-

sance, depending upon the amount of time and qualified personnel available.

a. Hasty Reconnaissance. Hasty reconnaissance is made to determine the immediate trafficability of the bridge. The information to be obtained from this type of reconnaissance is similar to that for deliberate reconnaissance, except that time and other limitations preclude complete coverage. Therefore, hasty reconnaissance attempts only to gain the exact information necessary to allow immediate use of the bridge with reasonable safety.

b. Deliberate Reconnaissance. Deliberate reconnaissance is made when sufficient time and qualified personnel are available to determine all of the features necessary for a thorough analysis and classification of the bridge to include necessary repairs or demolition procedures. The information to be obtained by deliberate reconnaissance is detailed.

21. Requirements

So far as is practicable or as directed, the following three categories of information should be observed and recorded during the performance of both methods of bridge reconnaissance:

a. Essential Bridge Information. Essential bridge information is acquired mainly for engineer purposes. The elements of essential information are—serial number; location; military load classification; overall length; roadway width; overhead clearance; bridge bypasses (par. 22); hori-

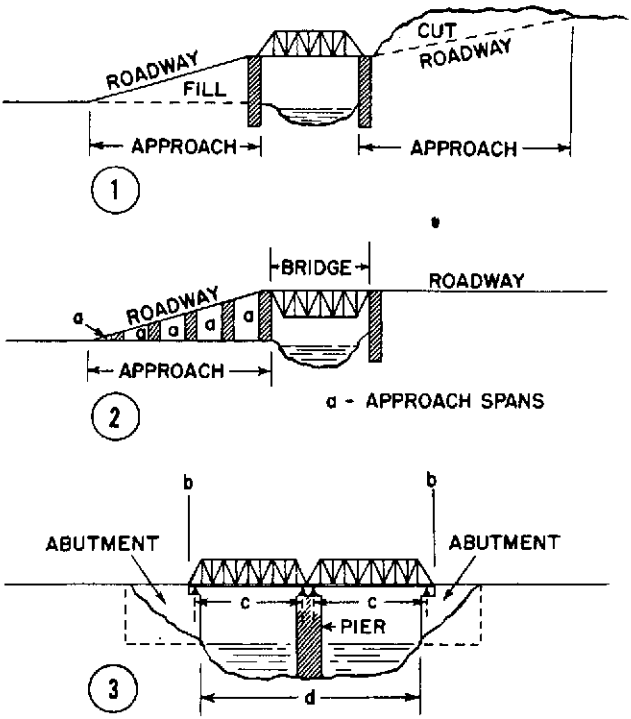
zontal clearance; underbridge clearance; and a description of each span to include type and material of span construction, span length, and other special information.

b. Limited Bridge Information. Limited bridge information includes those elements of essential bridge information necessary for planning normal road movement. These elements are serial number, location, military load classification, overall length, roadway width, overhead clearance and bridge bypasses (par. 22).

c. Additional Bridge Information. Additional bridge information includes those items of description, in addition to the essential elements, considered desirable to know in planning the use of a bridge. This category of information includes descriptions of the approaches to the bridge (fig. 7), and characteristics of the feature spanned by the bridge including stream bottom materials. Also included are descriptions of abutments, intermediate supports, and bridge structural data such as type and material of construction including critical dimensions, repairs required, demolition information, and alternate crossing sites.

22. Bridge Bypasses

Bridge bypasses are local detours necessary to avoid an obstruction to military traffic at a bridge site on the normal course of a route. They are classified as *easy, difficult,* or *impossible.* Each



b–b OVERALL LENGTH
c–c LENGTH, BEARING TO BEARING
d LENGTH, ABUTMENT TO ABUTMENT

Figure 7. Typical bridge approaches, abutments, and piers.

classification is shown by its own symbol (fig. 2) and each is defined as follows:

a. Bridge Bypass Easy. This is a local detour by means of road or cross-country movement to

an alternate crossing site which can be made by all types of traffic in a time that represents not more than 15 minutes or 4 miles (6.5 km) increase on the time for the direct route. This type of bypass requires *less* than 4 hours for 35 men, with the appropriate engineer equipment, to improve or construct.

b. Bridge Bypass Difficult. This type of bypass differs from bridge bypass easy only in that *more* than 4 hours are required for 35 men, with the appropriate engineer equipment, to improve or construct it.

c. Bridge Bypass Impossible. This situation exists when—

(1) No alternate bridge is available within and acceptable distance;
(2) The terrain prohibits off-road movement or temporary road construction;
(3) Characteristics of the stream to be crossed prohibit fording or construction of temporary crossing means;
(4) Depth or slope of obstacle prohibits construction of approaches to the crossing site.

Section VII. BRIDGE RECONNAISSANCE REPORT

23. General

The Bridge Reconnaissance Report (DA Form 1249) is used to report bridge information. The instructions for making the reconnaissance should indicate the amount of detail required so as to guide the reconnaissance party. Short forms or

worksheets may be designed and produced by the unit making the reconnaissance when needed for rapid fieldwork. In general, bridge information is grouped under two major headings for convenience. These headings are *essential bridge information* and *limited bridge information*, described in paragraphs 24 and 25.

24. Essential Bridge Information

Certain elements of essential bridge information will be recorded in the columns of a bridge reconnaissance report form (fig. 11) as follows:

a. Column 1. The arbitrarily assigned number of the bridge will be recorded.

b. Column 2. Bridge location will be recorded by means of military grid coordinates (type of grid plus grid values).

c. Column 3. Horizontal clearance will be recorded. This is an expression in feet of meters of the minimum clear distance between the inside edges of the bridge structure, measured at a height of 12 inches or more above the surface of the roadway. Where the horizontal distance between the inside of the curb and the inside of the bridge structure is less than 10 inches, the indicated horizontal clearance will be underlined. Unlimited horizontal clearance will be indicated by the symbol "∞".

d. Column 4. Underbridge clearance will be recorded. This is an expression in feet or meters of the minimum clear distance between the underside of the bridge and the surface of the ground

or of the water at mean level. Mean water level can be determined from gaging station records or approximated by observation of high and low water marks or information from local inhabitants.

e. Column 5. Information on each span will be recorded. The number of consecutive identical spans will be recorded. When only one span is described, the number need not be shown. Spans will usually be listed in sequence starting from the west. In cases where the orientation of the bridge is due north and south or is so close to north and south as to create uncertainty on the map as to which is the west abutment of the bridge, the letter "N" will be inserted in column 5 preceding the number of spans. In this case, spans will be listed in sequence starting from the north.

f. Column 6. Type of span construction (fig. 8 and app. III) will be recorded by a number symbol as applicable. The type may also be written in full, if desired. The number symbols for this purpose are—

Type of span construction	*Number symbol*
Truss	1
Girder	2
Beam	3
Slab	4
Arch (closed spandrel)	5
Arch (open spandrel)	6
Suspension	7
Floating	8
Others	9

Other types of span construction such as cantilever, swing, lift, bascule, retractile, and composite types will be specified by name.

g. Column 7. The material of construction of each span will be shown by the following letter symbol system:

Material of span construction	*Letter symbol*
Steel or other metal	a
Concrete	k
Reinforced concrete	ak
Prestressed concrete	kk
Stone or brick	p
Wood	n

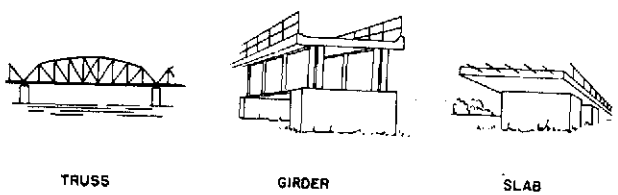


Figure 8. Common types of span construction.

h. Column 8. Span length is recorded in feet or meters. This is the center to center distance between supports. The following special information is also recorded:

(1) Spans which are not usable because of damage or destruction will be indicated by the symbol "※" placed after the dimension of the span length.

(2) Spans which are over water will be indicated by placing the symbol "W" after the dimension of the span length.

i. Unknown Information. Any item of information which is not known will be accounted for by placing a question mark "?" in the appropriate space on the bridge reconnaissance report.

25. Limited Bridge Information

The elements of limited bridge information are reported by means of bridge symbols described in *a* and *b* below. Bridge symbols are shown on maps or overlays near the bridge location with a line leading to the exact location. Any item of information which is not known will be accounted for by placing a question mark "?" in the appropriate position on the symbol. Examples of the uses of bridge symbols are given in figures 9 and 10.

a. The *full bridge symbol* (fig. 9) consists of a circle divided by a horizontal line. The items reported on this bridge symbol are listed below along with their definitions (where needed) and

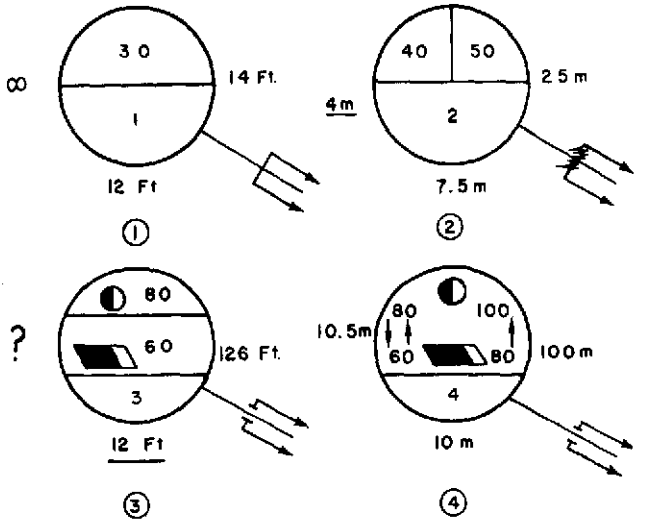
an explanation of their proper positions on the symbol:

(1) The *location* of the bridge is shown by a line extending from the bridge symbol to the specific bridge location on the map or overlay.

(2) The *bridge number* is arbitrarily assigned for easy reference to the bridge. Numbers must not be duplicated within any one map sheet or document. Reference must be made to the map sheet number when referring to a bridge by *its* number. The number is recorded in the bottom part of the symbol.

(3) The *military load classification* number of the bridge is shown in the top part of the circle. This number indicates the carrying capacity of the bridge and, on this symbol, may be used for one- or two-way bridges. In those instances where bridge classification indicates the need for a separate classification for the bridge for wheeled and tracked vehicles, the bridge classification will include the information prescribed for standard bridge markings (fig. 78).

(4) The *overall length* of the bridge is the distance between the extreme end points of the structure at the end walls or dams on the abutments measured along the



1. This symbol represents a one-way bridge, Class 30, assigned the arbitrary number 1, with an overall length of 14 feet, roadway width of 12 feet, unlimited overhead clearance, and easy bypass conditions.

2. This symbol represents a two-way bridge, Class 40 two-way and Class 50 one-way, assigned the arbitrary number 2, with an overall length of 25 meters, roadway width of 7.5 meters, overhead clearance 4 meters and difficult bypass conditions. The overhead clearance of 4 meters is restrictive in this case and the dimension is, therefore, underlined.

3. This symbol represents a one-way bridge assigned the arbitrary number 3 which is Class 80 for wheeled vehicles and Class 60 for tracked vehicles, with overall length of 126 feet, roadway width of 12 feet, overhead clearance unknown, and impossible bypass conditions. The roadway width is restrictive in this case and the dimension is, therefore, underlined.

4. This symbol represents a two-way bridge assigned the arbitrary number 4, which is Class 80 two-way and Class 100 one-way for wheeled vehicles, Class 60 two-way and Class 80 one-way for tracked vehicles, with overall length 100 meters, roadway width of 10 meters, overhead clearance 10.5 meters, and impossible bypass conditions.

Figure 9. Examples of the full bridge symbol.

bridge centerline. This dimension is shown by a value to the right of the circle and is expressed in feet or meters.

(5) The *minimum roadway width* (table VII) is the clear distance between curbs. It is shown by a value below the circle and is expressed in feet or meters. Any roadway width less than the minimum required for the class of a bridge will be underlined (par. 63*a*).

(6) *Vertical clearance* is the least distance between the roadway surface and any obstruction above it. It is shown by a dimension to the left of the circle and is expressed in feet or meters. Any vertical clearance less than the minimum required for the class of a bridge will be underlined (par. 63*b*). Unlimited overhead clearance will be indicated by the symbol ∞.

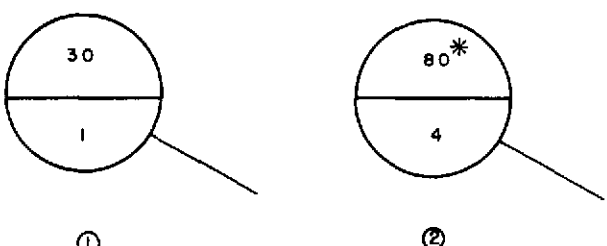
(7) *Bridge bypasses* are described in paragraph 22.

b. If the scale of the map or size of the document is too small to accommodate the full bridge symbol, an *abbreviated symbol* may be used (fig. 10). This necessitates expansion of DA Form 1249 (fig. 11) to include columns for military load classification, overall length, roadway width, vertical clearance, and bridge bypasses. The abbreviated symbol consists of a circle divided by

a horizontal line. Items to be reported and their positions on the abbreviated symbol are given below. Examples are shown in figure 10.

(1) The location and number for an abbreviated bridge symbol will be presented in the same manner as for the full bridge symbol, described in *a*(1) and (2) above.

(2) The military load classification to be shown in abbreviated bridge symbols is the one-way classification and is shown in the upper part of the circle. Where there are different one-way



1. This symbol represents a one-way bridge, Class 30, assigned the arbitrary number 1. The elements of essential bridge information about this bridge will be found in the standard bridge reporting form.

2. This symbol represents a bridge assigned the arbitrary number 4, in which the lower one-way classification is Class 80. The asterisk denotes that there are other classifications for the bridge which can be found in the standard bridge reporting form, as will the remaining elements of essential bridge information.

Figure 10. Examples of the abbreviated bridge symbol.

classifications for tracked and wheeled vehicles, the lower classification will be shown. When a bridge has more than one classification, the number shown in the abbreviated symbol will be marked by an asterisk.

26. Sketches

Sketches should be used to show as many items of information as possible. The back of DA Form 1249 is designed for this purpose (fig. 11). The sketches should show at least the following detail:

a. A side elevation should show the general features of the bridge including the number of spans, piers, and abutments and their type and material of construction. Dimensions such as span length, height above stream bed, water level, and panel length are also noted on the side elevation. A cross section of the obstacle (stream, gorge, and so on) may be shown in this sketch.

b. The critical span (the span with the least load-carrying capacity) should be sketched in cross section, showing sufficient details of construction upon which to base a computation of its classification and details of maintenance, reinforcement, and destruction requirements. This includes such items as width of span, materials, type of construction, and design detail. Tables II and III outline necessary dimension requirements for each of the seven basic types of bridges.

c. Cross sections of critical members should be sketched in sufficient detail to provide a basis for calculating the strength of individual members.

d. The site plan sketch shows the location of the bridge; the alinement of the bridge relative to approaches and the obstacle crossed; the location of unusual features such as damage or obstructions; the classification, dimensions, and gradient of the approaches; the direction of flow of the stream; and sufficient topographic detail to trace waterways and locate possible fords.

Table II. General Dimension Data Required for Each of the Seven Basic Types of Bridges

Number on figure	Dimension data	Basic type of bridge						
		Simple stringer (fig. 62)	Slab (fig. 60)	T-beam (fig. 60)	Truss (fig. 70)	Girder (fig. 77)	Arch (fig. 80)	Suspension (fig. 89)
1	Overall length	x	x	x	x	x	x	x
2	Number of spans	x	x	x	x	x	x	x
2	Length of spans	x	x	x	x	x	x	x
2a	Panel length	-------	-------	-------	x	-------	-------	x
3	Height above streambed	x	x	x	x	x	x	x
3a	Height above estimated normal water level.	x	x	x	x	x	x	x
4	Width of roadway	x	x	x	x	x	x	x
5	Vertical clearance (over)	-------	-------	-------	x	-------	-------	x
6	Horizontal clearance	x	x	x	x	x	x	x

Notes.

1. The figures referred to are outline drawings of the basic type of bridges.
2. The letter "x" indicates that the dimension is required.

27. Photographs

DA Form 1249 should be supported by up-to-date photographs, if possible. Both ground and aerial photographs are desirable. The minimum photographic support should include a side view, a view from the bridge roadway, and a view underneath the deck.

28. Additional Bridge Information

Items of information *in addition to* the Essential Bridge Information which should be collected and recorded when practicable or when required are included in the following paragraphs:

a. Approaches. This includes limiting factors (par. 57*a*(1)), width, surface material, and obstructions.

b. Nature of Crossing or Obstacle. This includes naming the geographical feature under the bridge and giving its width, and depth or height. If the crossing is over a water obstacle, additional helpful information includes flow conditions, width and depth at mean water, tidal conditions, flood susceptibility, proximity of dams, locks, etc., nature and slope of banks, and nature of the stream bed.

c. Abutments. This includes foundation conditions, type and material of construction, and bearing areas.

d. Intermediate Supports. This includes foundation conditions, type and material of construction, bearing areas, height above ground or mean

Table III. Capacity Dimension Data Required for Each of the Seven Basic Types of Bridges

Letter designation	Capacity [a] dimension data	Basic types of bridge: Simple stringers — Timber: Rectang.	Timber: Log	Steel: I-beam	Steel: Channel	Steel: Rail	Slab (fig. 60)	T-beam (fig. 60)	Truss (fig. 70)	Girder (fig. 77)	Arch (fig. 80)	Suspension (fig. 89)
a	Thickness of wearing surface	x					x	x	x	x	x	x
b	Thickness of flooring, deck, or depth of fill at crown.	x					x	x	x	x	x	x
c	Distance, c-to-c, between T-beams, stringers, or floor beams.	x	x	x	x	x		x	x	x	x	x
d	Number of T-beams or stringers	x	x	x	x	x		x	x	x		x
e	Depth of each T-beam or stringer	x	(b)	x	x	x		x	x	x		x
f	Width of each T-beam or stringer	x		(c)	(c)	(c)		x	x	x		x
g	Thickness of web of I-beams, WF-beams, channels, or rails.			x	x	x			x	x		x
h	Sag of cable											x
i	Number of each size of cable											x
j	Thickness of arch ring										x	
k	Rise of arch										x	
l	Diameter of each size of cable											x
m	Depth of plate girder									x		
n	Width of flange plates									x		
o	Thickness of flange plates									x		
p	Number of flange plates									x		
q	Depth of flange angle									x		
r	Width of flange angle									x		
s	Thickness of flange angle									x		
t	Depth of web plate									x		
u	Thickness of web plate									x		
v	Average thickness of flange			x								

Note. "x" indicates required dimension.

[a] Capacity is computed by the use of formulas and data in bridge manuals.

[b] Diameter.

[c] Width of flange.

water level, horizontal clearance between supports at ground or mean water level, special design features such as ice breakers, for example, and critical dimensions needed for demolition and strength calculations.

e. Bridge Structure. This includes a detailed description of the type and material of construction to include wearing surface, deck or flooring, and supporting members. Also included are capacity dimensions where applicable (table III), engine and machinery for swing, lift, bascule, and retractile bridges; supply, utility, or communication lines supported by the bridge; civilian load class (system of classification to be specified); date of construction; and critical dimensions needed for demolition and strength calculations.

f. Repair Information. This includes a description of the nature of repair or the reinforcement required; an estimate of time, labor, and material required; availability of construction material nearby; and changes in essential bridge information to be expected as a result of the repairs or the reinforcements.

g. Demolition Information. This includes a description of the nature of the demolition procedure planned for the bridge and the expected effect; a description of any prior preparations already completed; and an estimate of time, labor, and material required to complete the demolition.

BRIDGE RECONNAISSANCE REPORT

DATE: 12 January 1960

SIGNATURE: James L Huggins, Capt, CE

TO: S-2, 185th EGB

FROM: Capt James L Huggins, 185th EGB

ROUTE (Country, route and sheet number or name): VIRGINIA, Alexandria, 1:25,000; Sheet 5561

DATE/TIME GROUP (DTG effective): 1016 30R

ESSENTIAL BRIDGE INFORMATION

SERIAL NO	LOCATION	CLEARANCE: OVERHEAD	CLEARANCE: UNDER BRIDGE	SPANS: NUMBER	SPANS: TYPE OF CONSTRUCTION	SPANS: TYPE OF FLOOR	SPANS: LENGTH AND DESCRIPTION	ADDITIONAL BRIDGE INFORMATION (Use remarks or sketch)
1	LA 471627	00	6ft	1	T	h	12.5 ft W	
2	LA 118751	15m	5m		T	K	4m	
					T	d	4m W *	
					T	K	4m W	
3	LA 165550	00	23	5	T	K	25	
4	LA 156643	105	85	3	T	K	10	
				2	T	d	20 W	
				3	T	K	10	

DA FORM 1249 — PREVIOUS EDITION OF THIS FORM IS OBSOLETE.

① Form used in conjunction with the full bridge symbol.

Figure 11. Bridge reconnaissance report.

BRIDGE RECONNAISSANCE REPORT (TM 5-261)

DATE: 12 January 1961 | SIGNATURE: H E Greathouse, Capt, CE

TO: (Unit/station ordering reconnaissance): S-2 185th ECB

FROM: (Name, grade, and unit of officer or NCO making reconnaissance): Capt H.E. Greathouse 185th ECB

MAPS (Country, scale and sheet number or name): Virginia, Allendale, 1:25000; Sheet 5561

DATE/TIME GROUP (DI expression): 10/6 30R

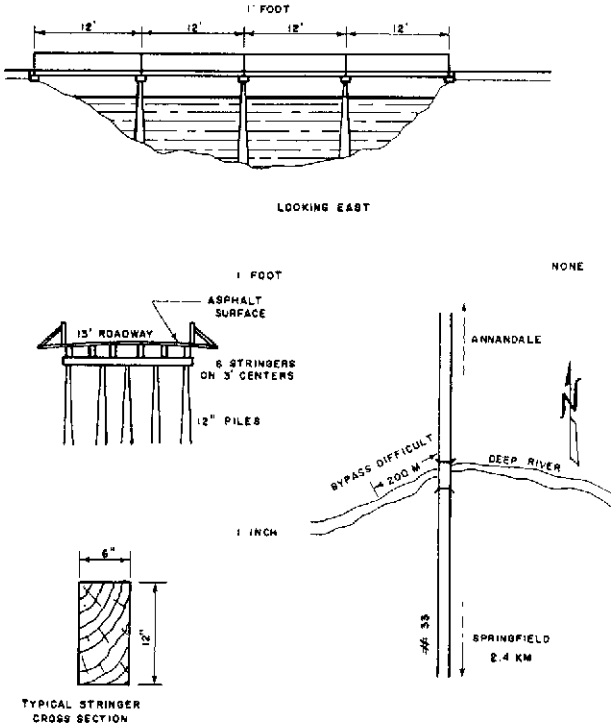
ESSENTIAL BRIDGE INFORMATION

ITEM NO.	LOCATION	CLEARANCE: HORIZONTAL	CLEARANCE: UNDER BRIDGE	SPANS: NUMBER	SPANS: TYPE OF CONSTRUCTION	SPANS: TYPE OF CONSTRUCTIONAL MATERIAL	SPANS: LENGTH AND DIMENSION	ADDITIONAL BRIDGE INFORMATION: MILITARY LOAD CLASS	OVERALL LENGTH	ROADWAY WIDTH	VERTICAL CLEARANCE	BRIDGE BY-PASS	REMARKS
1	LA 072687	∞	46ft	1	S	h	13.5ft W	30	14ft	12ft	∞	Easy	
2	LA 118757	9.5m	6.5m		4	k	4 M	40 50	25m	7.5m	4m	Difficult	
					1	a	16 mid ✱						
					4	k	4 MW						
3	LA 155680	∞	23	5	3	2k	25	80 60	12.6	12	7'	Impossible	
4	LA 15CL443	10.5	8.5	3	C	K	10	80 100 60 80	100	10	10.5	Impossible	
				2	2	a	20 W						
				3	C	K	10						

DA FORM 1249 PREVIOUS EDITION OF THIS FORM IS OBSOLETE.

② Form used in conjunction with abbreviated bridge symbol.

Figure 11—Continued.



③ Back of form, used for sketching.

Figure 11—Continued.

h. Alternate Crossing Sites. This includes approaches; the type of crossing (whether it is a ford, floating bridge, or other); and an estimate of the time, labor and materials needed to make the alternate crossing.

29. Use of the Standard Bridge Reconnaissance Report Form

a. DA Form 1249 should be placed in the same document or on the same map sheet as the bridge symbol. Where the report form and bridge symbol are recorded in separate documents, each must be cross-referenced.

b. Figure 11 ① illustrates the use of the reporting form when the full bridge symbols are used (par. 25*a*).

c. Figure 11 ② illustrates the use of the reporting form when the abbreviated symbols are used (par. 25*b*).

d. Additional bridge information may also be shown on the form by adding columns or remarks in the space provided.

e. Figure 11 ③ shows the back of DA Form 1249, which is designed for recording sketches (par. 26).

Section VIII. TUNNEL RECONNAISSANCE

30. General

a. A tunnel is an underground passageway which is on an approximately horizontal plane, is open at both ends, and provides for the passage of a trail, a road, a railroad, or a waterway or combinations of these features.

b. The purpose of tunnel reconnaissance is to determine the limiting features of a tunnel used as a portion of a route. Tunnels are sometimes

used for storage, maintenance assembly, or other purposes.

31. Requirements

Information to be obtained by tunnel reconnaissance is detailed. It includes the approaches, the identification of the tunnel by its map location, its name, the name of the terrain feature it cuts through, its location by highway name and number or by railroad line, and other distinguishing features. It includes also a description of the tunnel by type of cross section of its bores, the bore lining, the portals, the kind of earth or rock through which it passes, its principal and also its limiting dimensions, and the clearance. It finally includes a description of its physical condition, and repairs, if any, needed for its effective use for whatever purpose is specified in the reconnaissance order.

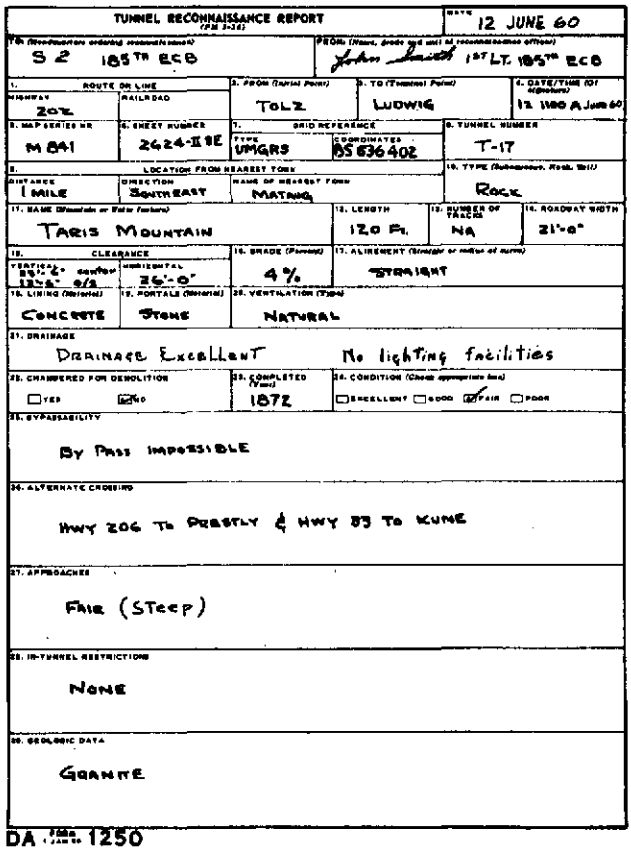
Section IX. TUNNEL RECONNAISSANCE REPORT

32. General

DA Form 1250 (fig. 12) Tunnel Reconnaissance Report, is used to report tunnel information. The instructions for making the reconnaissance should indicate the amount of detail required so as to guide the reconnaissance party. Short forms of worksheets for field work may be designed and produced by the units making the reconnaissance.

33. Use of DA Form 1250

Unless otherwise directed, information is centered on the tunnel reconnaissance reporting form as follows:



TUNNEL RECONNAISSANCE REPORT (FM 5-36)

DATE: 12 JUNE 60

TO: S 2 185TH ECB

FROM: 1ST LT. 185TH ECB

1. ROUTE OR LINE		2. FROM (Tactical Point)	3. TO (Tactical Point)	4. DATE/TIME (Of Reconnaissance)
HIGHWAY: 206	RAILROAD:	TOLZ	LUDWIG	12 1100 A June 60

5. MAP SERIES NR	6. SHEET NUMBER	7. GRID REFERENCE		8. TUNNEL NUMBER
		TYPE	COORDINATES	
M 841	2424-II SE	UMGRS	BS 636 402	T-17

9. LOCATION FROM NEAREST TOWN

DISTANCE	DIRECTION	NAME OF NEAREST TOWN	10. TYPE (Submarine, Rock, Soil)
1 MILE	SOUTH EAST	MATING	ROCK

11. NAME (Mountain or Water Feature)	12. LENGTH	13. NUMBER OF TRACKS	14. ROADWAY WIDTH
TARIS MOUNTAIN	120 Ft.	NA	21'-0"

15. CLEARANCE		16. GRADE (Percent)	17. ALINEMENT (Straight or radius of curve)
VERTICAL: 23'-6" center 13'-6" s/s	HORIZONTAL: 26'-0"	4%	STRAIGHT

18. LINING (Material)	19. PORTALS (Material)	20. VENTILATION (Type)
CONCRETE	STONE	NATURAL

21. DRAINAGE: DRAINAGE EXCELLENT — NO LIGHTING FACILITIES

22. CHAMBERED FOR DEMOLITION	23. COMPLETED (Year)	24. CONDITION (Check appropriate box)
☐ YES ☒ NO	1872	☐ EXCELLENT ☐ GOOD ☒ FAIR ☐ POOR

25. BYPASSABILITY: BY PASS IMPOSSIBLE

26. ALTERNATE CROSSING: HWY 206 TO PRESTLY & HWY 83 TO KUNE

27. APPROACHES: FAIR (STEEP)

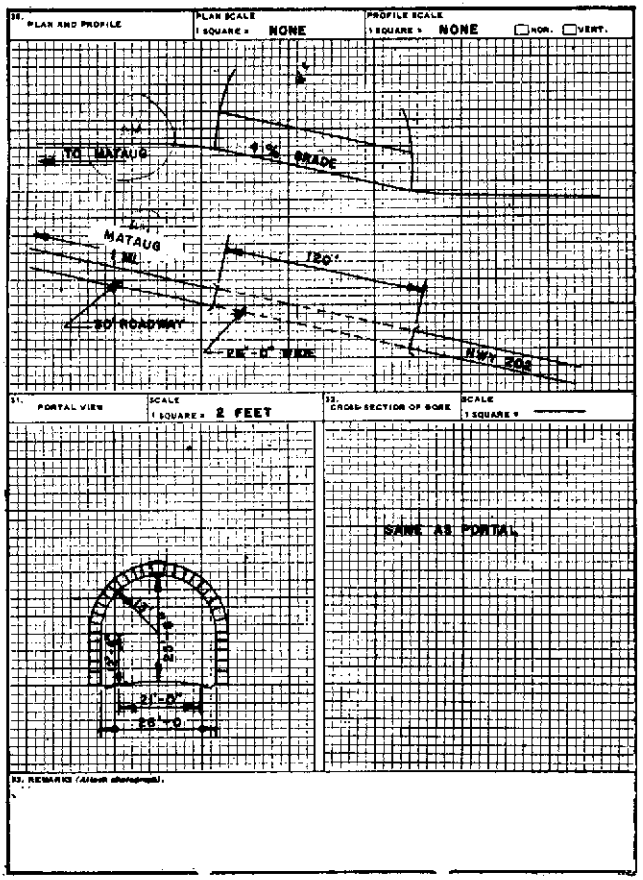
28. IN-TUNNEL RESTRICTIONS: NONE

29. GEOLOGIC DATA: GRANITE

DA FORM 1250

1. Front of form

Figure 12. Tunnel reconnaissance reporting form.



2. Back of form

Figure 12—Continued.

a. Identification (*items 1–11*). Enter all information which establishes positive identification of the tunnel by route number, route location,

map series and sheet number, grid reference, tunnel number, type of tunnel, and geographic reference name.

b. Dimensions (*items 12–17*). Enter overall tunnel dimensions as indicated in figure 13. Design characteristics and guides for measuring tunnel dimensions are given in appendix VII. This applies also to tunnels which branch off the main tunnel.

c. Specifications (*items 18–21*). Enter the type of lining material, type of portal material, type of ventilation, and drainage means. Under item 21, also record any lighting facilities available; if none, so state.

d. Special Considerations (*items 22–29*). Enter here whether the tunnel is chambered for demolition, the date of completion of the tunnel, and its present condition. Enter also feasibility of bypassing; opportunities for alternate crossing; the gradient and passability of the approaches; in-tunnel restrictions; and any geological information pertinent to maintenance, improvement, or safety.

e. Sketches (*items 30–32*). Draw a plan and profile, a portal view, and a cross section of the bore.

(1) The plan includes geographic positioning of the tunnel, approach and departure routes, and terrain features in the immediate area of the tunnel with emphasis on special features which may

affect alternate crossings. Tunnel alinement must be shown, including straight sections, angles, and curves. The profile shows the gradient to and from the tunnel, the gradient of the tunnel floor

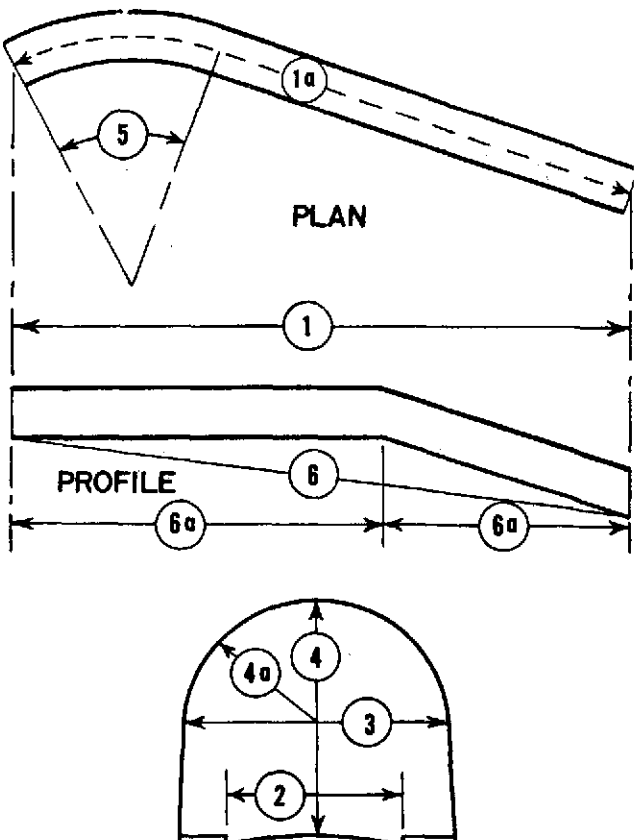


Figure 13. Standard dimensional data for tunnels.

1. Portal-to-portal length of tunnel.

1*a*. Centerline distance of tunnel.

2. Effective width of the roadway, curb-to-curb.

3. Horizontal clearance, being the minimum width of the tunnel bore measured at least four feet above the roadway.

4. Vertical clearance, being the distance between the top of the roadway and the lower edge of the tunnel ceiling or any obstruction below the ceiling, such as trolley wires or electric light wires.

4*a*. Rise of tunnel arch (radius of curved portion).

5. Radius of curvature of the roadway either measured or estimated.

6. Gradient, being the percentage of rise of the roadway between portals.

6*a*. Change in gradient within the tunnel (percentage of rise each way from break of grade).

Figure 13—Continued.

(designating any change in grade), and the relation of the tunnel to the terrain through which it passes.

(2) The portal view shows the mouth of the tunnel, the material of which it is constructed, and its position in relation to the surrounding terrain. It further shows a limited section of the approaching route.

(3) The cross section of the tunnel bore shows detailed information regarding the allowable traffic width, the shape of the bore as it may affect load heights and widths, and possible manmade or natural obstructions.

f. Remarks (*item 33*). Include here any pertinent information not covered above and attach photograph, if available.

Section X. FORD RECONNAISSANCE

34. General

A ford is a shallow place in a stream or other body of water where the physical characteristics of the bottom and the approaches to the stream or other body of water permit the passage of personnel and vehicles. These physical characteristics are discussed in paragraph 35.

35. Physical Characteristics

a. Trafficability. Fords are classified according to their crossing potential for foot, wheeled and tracked movement. Trafficability of fords are indicated for vehicles and foot troops in table IV. Fordable depths for vehicular traffic indicated in table IV can be increased by suitable waterproofing. For streams of high current velocity, the relationship of the position of the tank to the current has a direct effect on the depth which may be forded. The length of time the tank is exposed to the current also has an appreciable effect. Forty-eight inches is the design fording depth of modern U.S. tanks. Experience indicates that tanks can ford slightly greater depths for short distances without going out of action.

Table IV. Trafficability of Fords

Type of traffic	Fordable depth (feet)[1]	Minimum width (feet)	Type bottom	Maximum desirable slope on approaches[2]
Foot	3½	3 = (single file) 7 = (column of 3's).	Firm enough to prevent sinking.	1:1
Trucks and truck-drawn artillery	2	12	Firm and smooth.	3:1
Light tank	1 to 3	14		2:1
Medium tanks	2 to 4	14		2:1
Heavy tanks	4 to 6	14		2:1

[1] Moderate current.

[2] Based on hard, dry surface. If wet and slippery, slope must be less.

b. Approaches. Approaches may be paved with concrete or a bituminous surface material but are usually unimproved, consisting of sand and gravel. The composition and the slope of the approaches to a ford should be carefully noted to permit a determination of its trafficability in inclement weather.

c. Stream Bottom. The composition of the stream bottom of a ford determines its passability. It is important, therefore, to indicate if it is composed of sand, gravel, silt, clay, rock, a combination of two or more of these, or other material.

d. Ford Bottom. In some cases, the natural river bottom at a ford has been paved to improve its load-bearing capacity, and to reduce the depth of the water. Improved fords may have gravel or concrete floors, layers of sand bags, steel mats, or wooden planking.

e. Climatic Conditions. Seasonal floods, excessive dry seasons, freezing, and other extreme weather conditions materially affect the fordability of a stream. For this reason, the climatic effect to which a ford may be subjected should be recorded.

f. Current. The swiftness of the current and the presence of debris are recorded in order to determine their effect, if any, on the condition and passability of the ford. The speed of the current is estimated as swift (more than 5 feet per second), moderate (3 to 5 feet per second), or slow (less than 3 feet per second).

g. Dimensions. The standard dimensional data used in describing fords are illustrated in figure 14.

36. Measurement of Stream Width

a. Using a Compass (1, fig. 15). From a point on the near shore, close to the water's edge, the azimuth to a point near the water's edge on the opposite side of the stream is determined and recorded. *Another* point is established on the near shore, close to the water's edge (either upstream or downstream from the previously marked point), from which the azimuth to the point on the far shore is 45° at variance with the previously recorded azimuth. The distance between the two points on the near shore is equal to the distance across the stream.

b. Using a Surveying Instrument (2, fig. 15).

(1) *Measuring angles.* Using a transit or alidade, the angle between two points a known distance apart on the near shore and a third point directly across the river from one of these points is measured. The distance across the stream is computed using the trigonometric relation of the angle to the known side as described in TM 5–232, Elements of Surveying.

(2) *Using stadia formula.* A man is sent across the stream with either a stadia rod or range pole. Using either a transit or a level, the intercept between

the stadia hairs is determined and the distance computed using the stadia formula as described in TM 5–232.

(3) *Using string.* One man holds an end of the string on the near shore or else the end of the string is otherwise secured. Another man or the same man if the string is tied on the near shore, crosses to the opposite shore and pulls the string tight. The appropriate length of string is then measured. The measuring tape

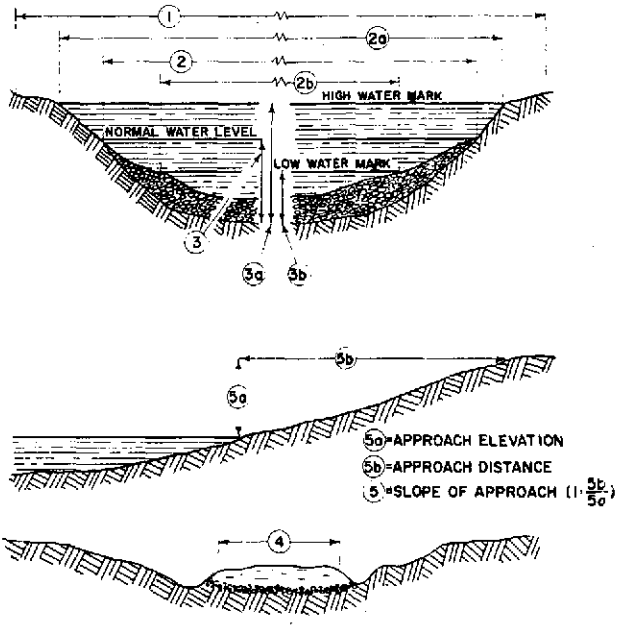


Figure 14. Standard dimensional data for fords.

1. The *width of stream bed* from bank to bank.

2. The actual *width of the water* measured at normal stage. In addition, maximum width 2*a* and minimum width 2*b* are estimated, based on local observations or records of high water and low water, and then recorded.

3. The actual *depth of the stream* at normal water level.

3*a*. Estimated *maximum water depth* based on local observations or records.

3*b*. Estimated *minimum water depth* based on local observations or records.

4. The *width of the approach*. It is the effective width of the travelled way of the roads leading to the ford.

5. The *slope of the approaches*. It is the shape of the stream banks through which the approach roads are cut. This is expressed as the ratio between elevation 5*a* and distance 5*b*. For example, a slope of 1:1 means that the approach road drops one foot for every foot of length.

Figure 14—Continued.

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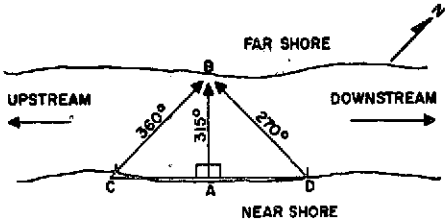
can be used directly instead of the string if of sufficient length.

37. Determination of Stream Velocity

(3, fig. 15)

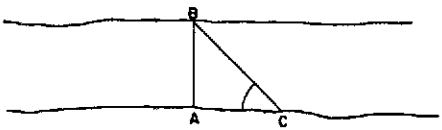
A distance is measured along the riverbank. A light object which will float is thrown into the stream and the time the object requires to float the measured distance is determined. The velocity of the stream in feet per second is computed using the following formula:

$$\frac{\text{Measured distance (ft)}}{\text{Time (sec)}} = \text{Stream velocity in f.p.s.}$$



A IS THE POINT ON THE NEAR SHORE
B IS THE POINT ON THE FAR SHORE
AB IS THE DISTANCE TO BE MEASURED
AZIMUTH OF LINE AB IS 315°
AZIMUTH OF LINE CB IS 360°
AZIMUTH OF LINE DB IS 270°
DIFFERENCE BETWEEN AZIMUTH AB & AZIMUTH CB = 45°
DIFFERENCE BETWEEN AZIMUTH AB & AZIMUTH DB = 45°
DISTANCE ALONG EITHER AD OR AC EQUALS DISTANCE ALONG AB

(1) MEASURING STREAM WIDTH USING A COMPASS

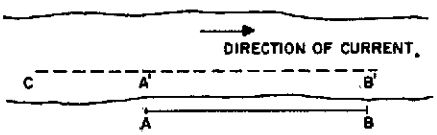


THE ANGLE AT C IS MEASURED

$$\text{TAN } C = \frac{AB}{AC}$$

$$AB = \text{TAN } C \times AC$$

(2) MEASURING STREAM WIDTH USING SURVEYING INSTRUMENT



DISTANCE AB IS MEASURED
FLOATING OBJECT IS THROWN INTO STREAM AT C
TIME REQUIRED FOR FLOATING OBJECT TO FLOAT DISTANCE A'B' IS DETERMINED

$$V(\text{FPS}) = \frac{AB \text{ (FEET)}}{\text{TIME TO FLOAT } A'B' \text{ (SEC)}}$$

(3) DETERMINING STREAM VELOCITY

Figure 15. Methods of measuring stream width and velocity.

Section XI. FORD RECONNAISSANCE REPORT

38. General

A report of each ford reconnaissance will be made on DA Form 1251, (Ford Reconnaissance Report) (fig. 16). Short forms or worksheets for rapid field work may be designed and produced by the unit making the reconnaissance.

39. Use of DA Form 1251

Details to be entered on the Ford Reconnaissance Report form follow:

a. Identification (*items 1–10*). Enter all data which will establish positive identification of the ford as to route, map sheet, grid reference, ford number, geographic location, and name of stream or crossing.

b. Characteristics of Crossing (*item 11*). Record the width and depth of the crossing and the velocity of the stream at present water level and at low, mean, and high level. Also give date, season, or month(s) for each of these. Figure 14 indicates the dimensions to be recorded at each water level.

c. Description (*items 12–17*). Record the composition of the stream bottom, composition and slope ratio of approaches, type of pavement (if any) of approaches and ford, usable width of approaches and ford, and any hazards, such as flash floods or quicksand, which would affect the trafficability of the ford. Figure 14 illustrates the method of computing slope ratio of approaches.

d. Remarks (item 18). Enter here any other pertinent data not recorded elsewhere on the report. This should include description of approach roads, guide markers, depth gages, availability

FORD RECONNAISSANCE REPORT (FM 5-34)

DATE: 13 JUNE 1960

TO: (Headquarters ordering reconnaissance): S2 185TH ECB

FROM: (Name, grade, and unit of reconnaissance officer): John Smith 1ST LT. 185TH ECB

1. ROUTE NUMBER	2. FROM (Initial Point)	3. TO (Terminal Point)	4. DATE/TIME (Of departure)
23	RED DOG, VA.	LITTLE RENO, VA.	131530 R JUNE 60

5. MAP SERIES NUMBER	6. SHEET NUMBER	7. GRID REFERENCE: TYPE	GRID REFERENCE: COORDINATES	8. FORD NUMBER
V 834	5561	UMGRS	UT132838	118

9. LOCATION FROM NEAREST TOWN

DISTANCE	DIRECTION	NAME OF NEAREST TOWN
2.2 mi	SOUTH	HAMVILLE, VA.

10. CROSSING (Name of stream or other body of water): STONNER'S CREEK

11. CHARACTERISTICS OF CROSSING

WATER LEVELS	WIDTH	DEPTH	VELOCITY	DATE	SEASON OR MONTHS
TODAY	32'	24"	3 FPS	13 JULY 54	SUMMER
LOW	28'	18"	2 FPS	6 SEP 52	FALL
MEAN	32'	24"	3 FPS		
HIGH	45'	36"	5 FPS	9 MAY 51	SPRING

12. BOTTOM: ☐ SAND ☐ GRAVEL ☐ STONE ☑ OTHER (Specify): SANDY GRAVEL

13. APPROACHES: ☐ FIRM ☑ SOFT ☐ PAVED

14. SLOPE RATIO: 1 : 1

15. TYPE OF PAVEMENT: NONE

16. USABLE WIDTH: 20'

17. HAZARDS (Flash floods, quicksand, etc.): UNKNOWN

18. REMARKS (Description of Approach Roads, Guide Markers, Depth Gages, etc.)

SHARP TURN ON E. BANK 70' FROM FORD

NO DEPTH GAGE

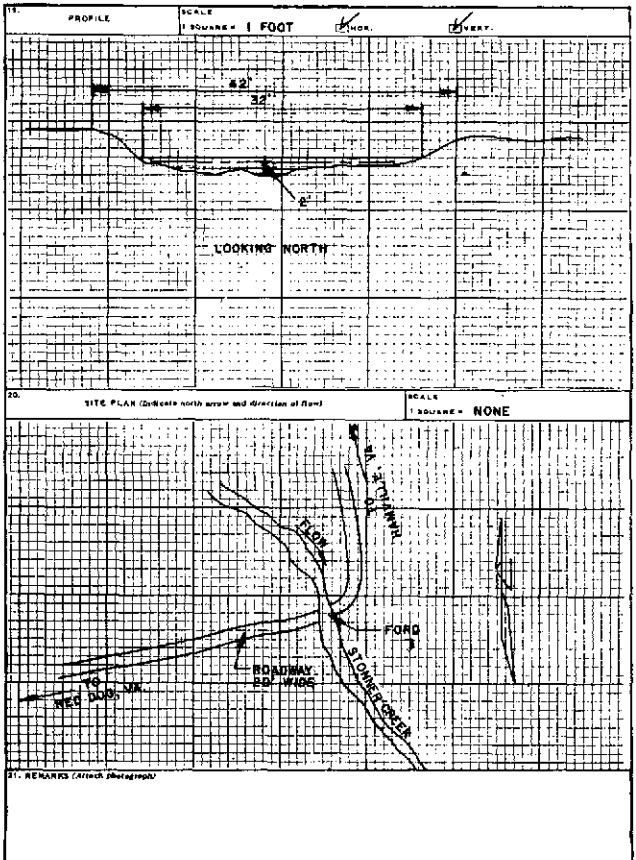
NEED SOME ROCK FILL AND LANE MARKERS FOR EASIER CROSSINGS

DA FORM 1251

1. Front of form

Figure 16. Ford reconnaissance reporting form.

of and distances to detours and alternate crossings, and any other information which may assist in the trafficability classification of the ford.



2. Back of form

Figure 16—Continued.

e. Sketches (items 19 and 20). Draw sketches on the ford, showing both a profile and a site plan.

(1) The profile sketch indicates the water level and the elevation of the stream bottom and approaches.

(2) The site plan gives the alinement of the ford and its approaches, with appropriate dimensions. Terrain and other site features in the immediate area of both banks should be shown. Also indicate the north arrow and the direction of flow of the stream.

f. Remarks (item 21). Attach appropriate

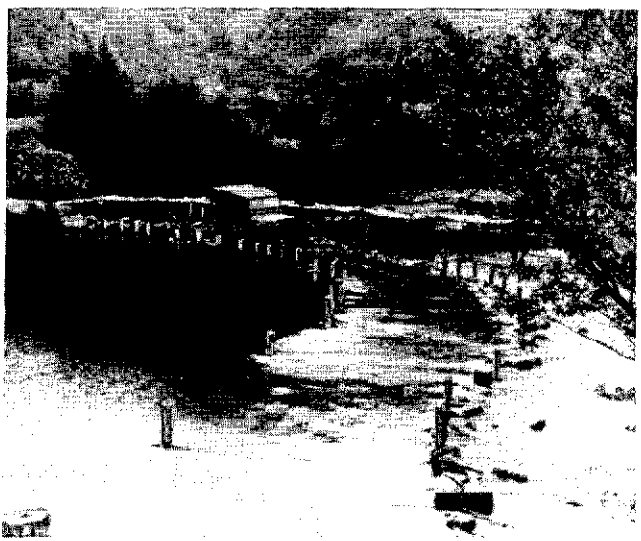


Figure 17. Typical ford crossing.

photographs to the Ford Reconnaissance Report, if available.

40. Photographs

Whenever a ford is reconnoitered, it should be photographed, in support of the DA Form 1251. Photographs should show the banks, the approaches, and the stream in one view. The photograph should be taken while a military vehicle is crossing, to give an indication of water depth and the location of the ford (fig. 17).

Section XII. FERRY RECONNAISSANCE

41. General

A ferry site is a place or passage where traffic and cargo are conveyed across a river or other water obstacle by a floating vehicle which is called a ferry or ferryboat. Ferries encountered in route reconnaissance may vary widely in physical appearance and capacity, depending upon the width, depth, and current of the stream or body of water, and the character of the traffic to be moved. Propulsion of ferries may be by oars, rope and pulleys, poles, or by steam, gasoline, or diesel engines. They may also be propelled by a cable stretched across the stream or body of water, by hand, or by power-operated winches. Construction of ferryboats varies through wide limits. They may be made of wood or metal, and range from expedient rafts to ocean-going vessels.

42. Examples of Ferries

a. A trail ferry consists of a cable stretched across the stream and properly anchored on each bank. The assembly includes necessary hauling and maneuvering lines. The raft or rafts to be ferried are attached to the ferry cable, usually by a traveler, for ease and safety of movement. The method of construction and operation of a trail ferry is illustrated in figure 18.

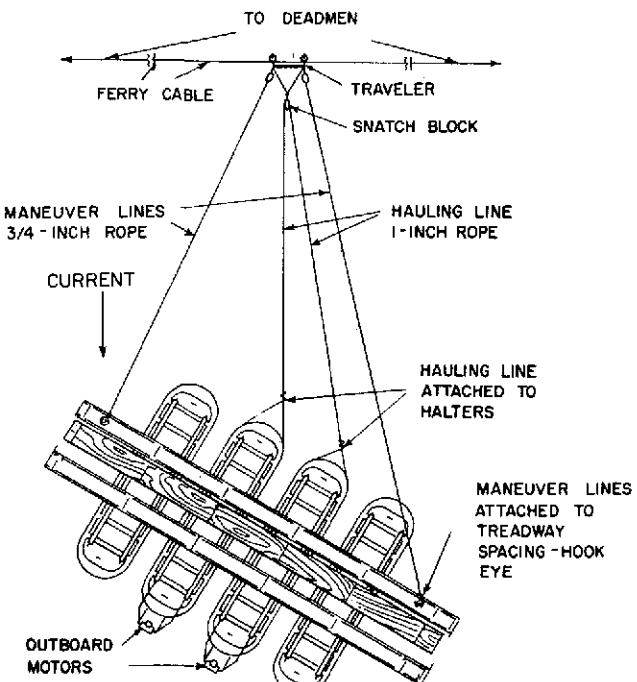


Figure 18. Trail ferry.

b. A flying ferry is a current-operated ferry held in the stream by an anchor well upstream from the crossing site; as the ferry moves shore to shore it describes an arc of a circle, the center of which is the anchor.

43. Requirements

a. The capacity of a ferryboat is given in tons, if civilian, and as a class number, if military, and as the total number of passengers and vehicles it can safely transport. When more than one ferryboat is employed for a given route, the capacity of each is given individually.

b. Ferry slips, or piers, are provided at landing places on the shore to permit easy loading of passengers, cargo, and vehicles. The slips may vary from simple log or plank piers on wooden piles or trestle bents to elaborate terminal buildings, constructed of concrete or masonry and containing facilities such as ticket offices, waiting rooms, and cargo and freight-handling equipment. The distinguishing characteristic of a ferry slip is the floating pier which can be quickly adjusted to the height of the ferryboat deck above the stream surface. This permits prompt loading and unloading of the ferryboat. The load-carrying capacity of the ferry slip determines the maximum weight of individual loads that can be moved across it and onto the ferryboat and should be recorded.

c. Approach roads to ferry slips have an important bearing on the use of the ferry route.

Therefore, the carrying capacity and condition of the approach roads must be determined and recorded.

d. Determining of dimensions of certain limiting features of ferries are necessary for adequate reconnaissance.

(1) Width of the stream or body of water from bank to bank at normal water level, is determined and recorded. In cases where the ferryboat does not cross at the narrowest point, the distance in miles traveled by the ferryboat from the ferry slip on one side to the ferry slip on the other side is determined and recorded.

(2) Depth of the stream at estimated normal water level at each ferry slip is determined and recorded.

e. Climatic conditions, from season to season, have a marked effect on ferry operations. Fog and ice substantially reduce the total traffic-moving capacity and increase the hazard of the ferry route. Therefore, data on tide fluctuations, freezing periods, floods, excessive dry spells, and their effects on ferry operation are determined and recorded.

Section XIII. FERRY RECONNAISSANCE REPORT

44. General

For each ferry reconnoitered, DA Form 1252 (Ferry Reconnaissance Report) (fig. 19) is com-

pleted. Short forms of worksheets for rapid field work may be designed and produced by the unit making the reconnaissance.

45. Use of DA Form 1252

Details to be entered on DA Form 1252 follow:

a. Identification (*items 1–11*). Enter all information which establishes positive identification of the ferry by route, map sheet, grid reference, ferry number, class, geographic location, and the name of the stream or body of water the ferry crosses.

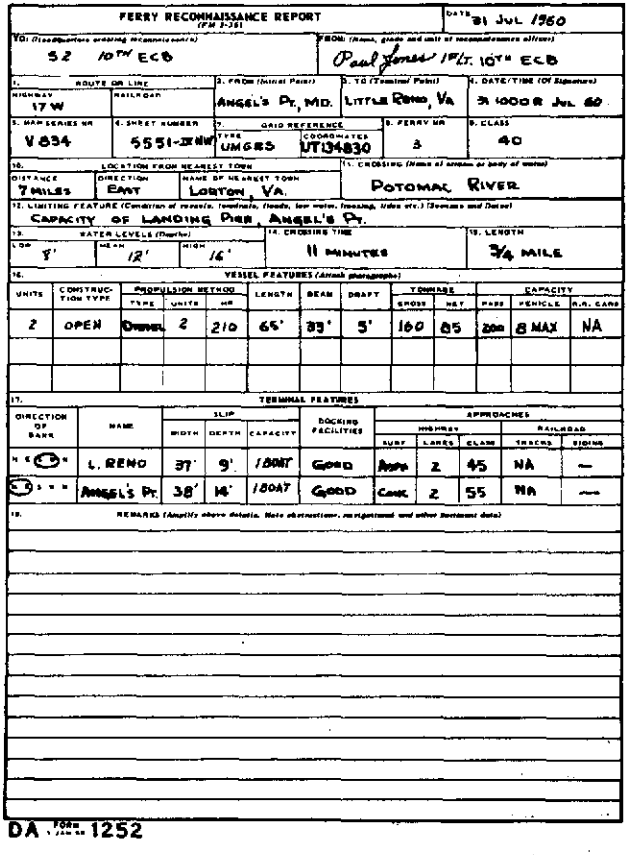
b. Limiting Features (*item 12*). Enter any limiting features which would affect ferry operations, such as condition of vessels, terminals, floods, low water, freezing and tides. Also give seasons and dates for any such limiting climatic conditions.

c. Description (*items 13–15*). Record the depth of the stream or body of water at low, mean, and high water levels; the crossing time; and the length of the course.

d. Vessel Features (*item 16*). Record the pertinent design features of the vessel(s) used. This information includes the number and construction type of units, the method and power of propulsion, length, beam, draft, gross and net tonnage, and capacity.

e. Terminal Features (*item 17*). Designate the geographic direction of the banks by circling the appropriate letters (NESWN). Enter the name, the dimensions of the slips, and specific docking

facilities. For highway approaches, note the type of surface, the number of lanes leading into the slip, and the class. Enter any additional pertinent information in item 18. For railroad ap-



FERRY RECONNAISSANCE REPORT (FM 5-36)

DATE: 31 JUL 1960

TO: (Headquarters ordering reconnaissance): S2 10TH ECB

FROM: (Name, grade and unit of reconnaissance officer): Paul Jones 1ST LT. 10TH ECB

1. ROUTE OR LINE		2. FROM (Initial Point)	3. TO (Terminal Point)	4. DATE/TIME (Of Departure)
HIGHWAY: 17 W	RAILROAD:	ANGEL'S PT, MD.	LITTLE RENO, VA	31 1000 R JUL 60

5. MAP SERIES NR	6. SHEET NUMBER	7. GRID REFERENCE: TYPE	COORDINATES	8. FERRY NR	9. CLASS
V 834	5551-II NW	UMGRS	UT134830	3	40

10. LOCATION FROM NEAREST TOWN: DISTANCE	DIRECTION	NAME OF NEAREST TOWN	11. CROSSING (Name of stream or body of water)
7 MILES	EAST	LORTON, VA.	POTOMAC RIVER

12. LIMITING FEATURE (Condition of approach, roadblocks, floods, low water, freezing, tides etc.) (Seasons and Hours): CAPACITY OF LANDING PIER, ANGEL'S PT.

13. WATER LEVELS (Feet): LOW	MEAN	HIGH	14. CROSSING TIME	15. LENGTH
8'	12'	16'	11 MINUTES	3/4 MILE

16. VESSEL FEATURES (Attach photographs)

UNITS	CONSTRUCTION TYPE	PROPULSION METHOD: TYPE	UNITS	HP	LENGTH	BEAM	DRAFT	TONNAGE: GROSS	NET	CAPACITY: PAX	VEHICLE	M.L. CARS
2	OPEN	DIESEL	2	210	65'	33'	5'	160	85	200	8 MAX	NA

17. TERMINAL FEATURES

DIRECTION OF BANK	NAME	SLIP: WIDTH	DEPTH	CAPACITY	DOCKING FACILITIES	APPROACHES: HIGHWAY: SURF	LANES	CLASS	RAILROAD: TRACKS	SIDING
N E O S W	L. RENO	37'	9'	180AT	GOOD	ASPH	2	45	NA	—
O S E W	ANGEL'S PT	38'	14'	180AT	GOOD	CONC	2	55	NA	—

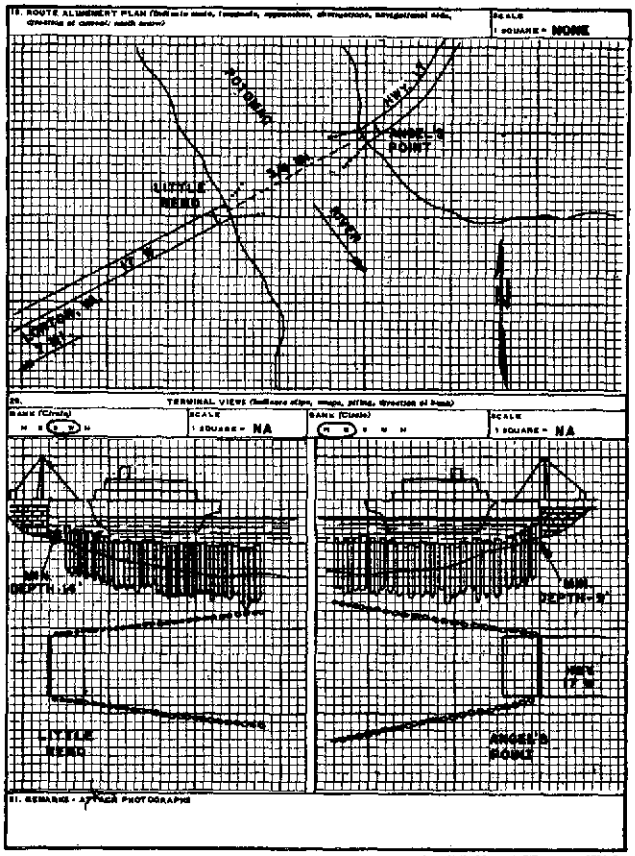
18. REMARKS (Amplify above details. Note obstructions, navigational and other pertinent data)

DA FORM 1252

1. Front of form

Figure 19. Ferry reconnaissance reporting form.

proaches, give the number of tracks approaching the slip and the number of sidings. Facilities for transferring freight and detailed information, in



2. Back of form

Figure 19—Continued.

exceptional cases where railroad cars are loaded directly on the ferry, should be given in item 18.

f. Remarks (item 18). Use this space to amplify details given in paragraphs above. Note obstructions, navigational aids, availability of and distances to alternate crossings, and any other pertinent data not recorded elsewhere.

g. Sketches (items 19 and 20). Draw a sketch showing the route alinement plan and two sketches showing terminal views on both sides of the crossing.

(1) The route alinement plan indicates the geographical course of the ferry, terminals and approaches to the slips. Particular care is taken in recording obstructions. Navigational aids such as buoys and lights are shown. The position of the highway or rail approaches, including surrounding terrain features, should be included in this sketch.

(2) Two separate sketches are made showing each terminal. These sketches show the geographical position of each bank and include details of the slips, ramps, and bumper piles.

h. Remarks (item 21). In addition to photographs of vessels mentioned in item 16 of this form, photographs which illustrate other details given in the report should be attached.

46. Photographs

Photographs should be taken of all ferries

reconnoitered in support of DA Form 1252. These photographs should include the ferry site, the ferry slips, the ferryboats, and the approach roads. If the ferryboats are not self-propelled, the photographs should include auxiliary equipment such as cables, towers, and winches. If photographic equipment is not available, sketches showing the same items are adequate.

Section XIV. RECONNAISSANCE FOR ADDITIONAL FACTORS

47. Crossings on Ice

a. Conditions Governing Crossing on Ice. Crossing a stream on ice depends on weather conditions and intensity of enemy operation. Sudden rises in temperature may weaken the ice. Artillery fire or bombing may break the ice. However, under favorable conditions, crossing streams on ice is practicable, and can be successful for large bodies of troops and for heavy equipment.

b. Load-Bearing Capacity of Ice. The strength of ice varies with the structure of the ice; the purity of the water from which it is formed; the cycle of formation, or freezing, thawing, and refreezing; temperature; snow cover; and water currents. Clear, newly frozen ice is stronger than old, porous ice. Ice coatings are stronger when the ice is in intimate contact with the water underneath. Warm weather quickly reduces the carrying capacity of an ice layer, even though thickness remains the same, since the ice becomes

porous in warm weather. The load-bearing capacity of ice is not definitely determined, but experience and tests provide reliable capacity figures for ice of good quality. Load-bearing capacity figures for ice of varying thickness are given in table V. Methods of reinforcing and maintaining ice for crossing purposes are discussed in TM 5–260.

Table V. Estimated Load-Bearing Capacity of Ice Layers in Direct Contact With Water Beneath

Load	Minimum thickness of ice (in.)	Minimum interval between tracks, or distance between elements (ft.)
Single rifleman on skis or snowshoes	1½	16
Infantry columns, single horses, motorcycles, unloaded sleds.	4	33
Single light artillery piece; ¼-ton truck 4 x 4.	6	49
Light artillery, passenger cars, total load of 3 tons.	8	65
2½-ton trucks, light loads	10	82
Closed columns of all arms except armored force and heavy artillery.	12	98
Armored scout cars, light tanks	14	115
20-ton vehicles	16	131

48. Causeways, Snowsheds, and Galleries

Causeways, snowsheds, and galleries are not usually encountered as often in route reconnaissance as are other crossing means discussed in

this chapter. When such structures constitute an obstruction to the movement of traffic along the route, a reconnaissance report is made. Data required for such a report is limited to clearances and load-carrying capacity. Where possible, the information is supported by photographs or a sketch of each structure. Sufficient descriptive information is also included in the reconnaissance report to permit an evaluation of the structures in respect to their strengthening or removal.

a. A *causeway* is a raised way across wet or unstable ground. When a causeway is considered an obstruction or an approach, reconnaissance is reported as outlined above.

b. A *snowshed* is a shelter which protects something from snow, such as a long structure over an exposed part of a road or railroad. A reconnaissance report, when required, is completed as detailed above.

c. A *gallery* is any sunken or cut passageway covered overhead as well as at the sides. A gallery may, in some cases, constitute an obstruction to the movement of traffic along the route; and, if so, a reconnaissance report should be made as specified above. However, in a combat area, a gallery may become important not because it is an obstruction, but for the additional protection it may afford.

CHAPTER 3
CLASSIFICATION

Section I. GENERAL

49. Routes, Roads, and Bridges

The classification of routes, roads, and bridges is discussed in this chapter. References to appendixes and other manuals are made where appropriate.

50. Vehicles

The classification of standard vehicles of the NATO armed forces is also discussed in this chapter.

Section II. ROUTE CLASSIFICATION

51. General

a. The classification of a route is designed to assist staff officers in evaluating road networks and planning a normal road movement. It is usually carried out by the appropriate engineer staff who will make certain that the information needed is provided on road classification reports.

b. Route classification is the responsibility of the appropriate engineer officer of a command.

c. It should be clearly understood that the basic route classification principles are established for use under favorable lighting conditions. Condi-

tions of blackout restrict the usage of roads in general and create special requirements for lighting road signs (par. 97) and also for lighting vehicles, both singly and in column movement (par. 101).

52. Basis of Route Classification

Routes are classified according to the factors of width, type, and military load classification, including load-bearing capacity as described in appendix II, and obstructions, if any, as explained below:

a. Width. The width of the route refers to the width of the narrowest road making up the route and is expressed in meters (m) or feet (ft).

b. Type. The type of route is categorized according to the least desirable type of road making up the route. The types of surfacing indicated under (1) below (type X) are considered hard surface and the other types (Y and Z) are considered loose or light surface. The type of road (X, Y, and Z) is based on the materials used. The theater commander may desire to shift materials from one category to another to reflect the general road situation in the theater. For example, if the best roads in a theater are crushed rock or waterbound macadam, they could be classed as type X, instead of class Y as in (2) below. The lower classes would therefore move up to types Y and Z.

(1) *Type X—All-weather road.* An all-weather road is any road which, with

reasonable maintenance, is passable throughout the year to a volume of traffic never appreciably less than its maximum dry-weather capacity. This category of road has a waterproof surface which is only slightly affected by rain, frost, thaw, or heat. At no time is it closed to traffic by weather effects other than snow or flood blockage. The following are examples of types of road which will normally fall in this category:

(*a*) Concrete
(*b*) Bituminous surface
(*c*) Brick or stone pavement

} On strong foundations

(2) *Type Y—Limited all-weather road.* A limited all-weather road is any road which with reasonable maintenance can be kept open in all weather, but sometimes only to a volume of traffic which is considerably less than its maximum capacity. This type of road does not usually have a waterproof surface. It is considerably affected by rain, frost, thaw, or heat. Traffic is completely halted for periods of a day or so at a time. Heavy use during adverse weather conditions may lead to complete collapse of the road. The following are examples of types of road which will normally fall into this category:

(*a*) Crushed rock or waterbound macadam.
(*b*) Gravel or lightly metalled surface.

(3) *Type Z—Fair-weather road.* A fair-

weather road is any road which quickly becomes impassable in bad weather and cannot be kept open by maintenance short of reconstruction or re-alinement. This category of road is so seriously affected by rain, frost, thaw, or heat that traffic is brought to a complete halt for long periods. Examples of types of roads in this category are—

(*a*) Natural or stabilized soil.
(*b*) Sand-clay.
(*c*) Shell.
(*d*) Cinder.
(*e*) Disintegrated granite.

c. Military Load Classification. The military load classification of the route is considered to be the maximum class of vehicle which can use the route in a convoy. This usually corresponds to the classification of the weakest bridge on the route.

d. Obstructions. Obstructions are factors which limit the traffic capacity of a road.

53. Route Classification Formula

The route classification formula is developed from symbols expressed in the order of width, type, and military load classification. The use of the formula is illustrated in figure 1 and by the following examples:

a. 20 ft Y 50. This describes a route with a minimum width of 20 feet, limited all-weather type, and a military load classification of Class 50.

b. 10.5m X 70. This describes a route with a

minimum width of 10.5 meters, all-weather type, and a military load classification of Class 70.

c. 20 ft Y 50 (Ob). This describes a route with a minimum width of 20 feet, limited all-weather type, and a military load classification of Class 50. In addition, (Ob) at the end of the above formula indicates an *obstruction* or *obstructions* along the route. The effect of a single obstruction on a long route or temporary obstruction on a route should not be the limiting factor for classifying the route but should be noted in the formula, as above. In addition, the obstruction or obstructions should be described completely in an accompanying report or on an overlay.

d. 20 ft Y 50 (T). "(T)" at the end of this formula represents *snow blockage* where it is regular, recurrent, and serious along a route. The effects of snow blockage on military traffic depends entirely on the snow clearance capability available. This depends on various factors such as availability of machines and labor and the severity of the season.

e. 20 ft Y 50 (W). "(W)" at the end of this formula represents *flooding* where it is regular, recurrent, and serious along a route. The effect of flooding which may affect traffic capacity of routes is not taken into account when classifying a route, but is reported as above.

54. Relation of Route Classification to Vehicle and Bridge Classification

Route classification utilizes the vehicle class

numbers and the bridge class numbers to determine the safe load-carrying capacity of a route and its branches. The vehicle classification system represents, by a whole number, the effect a vehicle will have on a bridge when crossing it. This effect depends upon the gross weight of the vehicle and its weight distribution to the axles or tracks, the out-to-out distance of tires or tracks, tire size, and tire pressure. The bridge classification system represents, by a whole number, the safe load-carrying capacity of a bridge under normal crossing conditions. The load-carrying capacity of a route is expressed by the classification number of the highest class vehicle that can use the route in convoy, taking into consideration the classification of the weakest bridge on the route.

55. Route Numbering

a. One route number is used to designate each axial route and each lateral route throughout their entire lengths.

b. Axial routes are given odd numbers.

c. Lateral routes are given even numbers.

d. Responsibility for allotting blocks of route numbers to army groups and other units operating in any theater rests with the theater commander.

Section III. ROAD CLASSIFICATION

56. General

Road classification is based upon a considera-

tion of road characteristics, obstructions, snow blockage and floodings, limited bridge information, civil or military road designation, and vegetation cover alongside the road. The classification of a road is expressed by a basic formula (par. 57).

57. Road Classification Formula

a. Expression of Formula. The road classification is expressed by a basic formula, extensively utilizing symbol systems. The characteristics of the road will be expressed in accordance with prescribed definitions and symbols in the following order: limiting factors, width, and construction material (length in addition, if desired).

(1) *Limiting factors.* The formula will be prefixed by the symbol "A" if there are *no limiting factors,* and by the symbol "B" if there are *one or more limiting factors.* If a limiting factor is unknown, it will be expressed by a question mark inclosed in parentheses, as (?). On maps or overlays the terminal points defining the road sector will be indicated by the symbol "V" (fig. 1). A listing of limiting factors, criteria for determining them, and the symbols for their presentation in the formula are given in table VI.

Table VI. Criteria for Determination of Limiting Factors

Limiting factor	Criteria	Symbol
Sharp curves	Sharp curves with radius less than 100 feet (30 meters) cause some slowing of convoy traffic and will in addition be reported as obstructions.	c
Steep gradients	Steep gradients, 7% or steeper, cause some slowing of convoy traffic. Gradients steeper than 7% and excessive changes in gradients will also be reported as obstructions.	g
Poor drainage	Inadequate ditches, crown/camber, or culverts; culverts and ditches blocked or otherwise in poor condition.	d
Weak foundation	Unstable, loose or easily displaced material.	f
Rough surface	Bumpy, rutted or potholed to an extent likely to reduce convoy speeds.	s
Excessive camber or superelevation.	Falling away so sharply as to cause heavy vehicles to skid or drag toward the road side.	j

(2) *Width.* The width of the road (traveled way) is expressed in feet or meters followed by a "slash" and the width of the traveled way and the shoulders combined, as $14\frac{1}{16}$ ft. The condition of the shoulders should be given in a separate written note giving the surface of the shoulders (grass, metaling, etc.) condi-

tion, width, vegetation, and critical side slopes.

(3) *Road construction materials.* Road construction materials are also expressed by a symbol system. Symbols to be used for this purpose are listed in table VII. Table VII also relates the various road materials to the X, Y, Z classification system (par. 52) used in route classification.

(4) *Length.* The length of the road may be shown, if desired, in parentheses at the end of the road classification formula. This value is expressed in miles (mi) or in kilometers (km).

Table VII. Symbols for Types of Surface Materials

Symbol	*Material*	*Normal road type*	
k	Concrete	Type (X); generally heavy duty	X
kb	Bituminous or asphaltic concrete (Bituminous plant mix).	Type (X); generally heavy duty	X
p	Paving brick or stone	Type (X); generally heavy duty	X
rb	Bitumen penetrated macadam waterbound macadam with superficial asphalt or tar cover.	Type (X); or type (Y); generally medium duty	X
r	Waterbound macadam, crushed rock or coral.	Type (Y); generally light duty	Y
l	Gravel or lightly metalled surface	Type (Y); generally light duty	Y
nb	Bituminous surface treatment on natural earth, stabilized soil, sand-clay or other select material.	Type (Y) or (Z); generally light duty	Y
n	Natural earth stabilized soil, sand-clay, shell, cinders, disintegrated granite or other select material.	Type (Z); generally light duty	Z
v	Various other types not mentioned above.	(Indicate length when this symbol is used.)	Z

In addition to the symbols shown above, the symbol "b" (bituminous surface) may be used alone when the type of bituminous construction cannot be determined.

(5) *Obstructions.* Existence of obstructions along a road is expressed by placing the symbol "(Ob)" at the end of the formula. Details of obstructions affecting the traffic capacity of a road are not shown in the formula, but are shown by appropriate symbols on maps or overlays. Obstructions to be reported include—

(*a*) Overhead obstructions having less than 14 feet (4.25 meters) overhead clearance such as tunnels, bridges, overhead wires and overhanging buildings. In areas where the standard overhead clearance is other than 14 feet (4.25 meters), the standard figure will be specified. A special reconnaissance will be required for loads which will not clear the overhead obstructions.

(*b*) Reductions in road widths which limit the traffic capacity of a road, such as craters, narrow bridges, archways, and buildings projecting into the roadway. Critical road widths will be specified by the commander concerned.

(*c*) Gradients of 7 percent or steeper and excessive changes in gradients.

(*d*) Curves (radius less than 100 feet or 30 meters) which probably cannot be negotiated by heavy vehicles with trailers.

(*e*) Fords, indicating crossing width, depth, and nature of bottom.

(*f*) Ferries, indicating crossing width and capacity.

(*g*) The effects of snow blockage and flooding are to be considered in the classification of roads. Where snow blockage is regular recurrent, and serious, the road classification formula will be followed by "(T)". Where flooding of a road is regular and sufficiently serious to impede traffic flow, the road classification formula will be followed by "(W)."

b. Examples of Road Classification Formula. Correct usage and proper order of presentation of information are illustrated by the following examples of the road classification formula:

(1) *A 5.0/6.2 m k.* This formula describes a concrete surface road with a traveled way 5.0 meters wide and a combined width of traveled way and shoulders of 6.2 meters. This road has no limiting factors.

(2) *Bgs* $1\frac{1}{16}$ *ft. 1 (Ob).* This formula describes a gravel or lightly metalled surface road with a traveled way 14 feet wide and a combined width of traveled way and shoulders of 16 feet. This road has steep gradients, a rough surface, and obstructions.

(3) *Bc (f?) 3.2/4.8 m p (4.3 km) (T).* This formula describes a paving brick or stone surface road with a traveled way 3.2 meters wide and a combined width

of traveled way and shoulders of 4.8 meters. This road has sharp curves and the foundation is unknown. It is 4.3 kilometers long and is subject to snow blockage.

c. Limited Bridge Information. Bridge information will not be included in the formula for road classification. Instead, this information will be expressed by means of appropriate symbols on a map or an overlay (par. 25).

Section IV. BRIDGE CLASSIFICATION

58. General

a. Bridge classification is the military method of evaluating bridges by their safe load-carrying capacity under normal crossing conditions. For normal military convoy movements within the United States and its possessions it is not necessary to establish bridge classes because the approval of the appropriate state highway department must be obtained prior to the movement of vehicles which exceed the legal load limit. In a state of emergency, bridge classes are established by the engineer of the command intending to use the bridge.

b. Standard equipment bridges, intended for vehicular use, are classified by the Chief of Engineers. Classes of standard equipment bridges for normal, caution, and risk crossings are given in TM 5–260. A bridge designed in the field is classified by the engineer unit which designed it. Existing domestic bridges, foreign civilian bridges, and

foreign military bridges are classified by the engineer unit supporting the units using the bridges.

59. Class Number

The bridge class number is *only* a number and not a weight that the bridge will carry. It is determined by calculation or load testing, so as to insure safe passage of the desired vehicle across the bridge. For example, the bridge is evaluated by successive approximations either by testing or by calculations to determine what hypothetical vehicle, either wheeled or tracked, can cross the bridge. Such load tests or calculations may indicate a classification which falls in between the classification of two standard hypothetical vehicles. The bridge is usually given a classification number corresponding to the lower of these two standard classes. Military equipment bridges may require an interpolated classification number. Methods of determining a temporary classification number are given in TM 5–260.

60. Special Class Numbers

A special class number is a number which represents the load-carrying capacity of a bridge under special crossing conditions. Under exceptional operating conditions in the field, the theater commander or local civil authorities, in areas under their control, may authorize vehicles to cross bridges when the bridge classification number is less than the vehicle classification number. Special class numbers may be for either *caution* or *risk crossings.*

a. A *caution crossing number* is the number

obtained by multiplying the normal single lane crossing class number of either a single lane or multilane nonstandard bridge by 1.25. Standard equipment bridge caution class numbers may be found in TM 5–260 or other applicable manuals.

b. A *risk class number* is a number which pertains only to standard prefabricated fixed or floating bridges and is obtained from TM 5–260.

61. Safety Factor

a. Bridges are classified so as to withstand an unlimited number of crossings by the rated class of vehicles. Civil ratings for bridges usually contain large safety factors. This safety margin may be reduced for military traffic to the extent approved by the country in which the bridge is located.

b. Impact allowances must be taken into account when considering the passage of hypothetical vehicles across a bridge. These allowances should conform with the civil practice of the country in which the bridge is located.

62. Bridge Width

a. One-Way Traffic.

(1) The minimum clear roadway widths between curbs are given in table VIII.

(2) If the width values of a bridge are less than those given in table VIII, it does not mean that the classification of the bridge will be lowered. Instead, the bridge width will be appropriately marked and posted (fig. 36).

b. Two-Way Traffic.

(1) Bridges wide enough for two-way traffic will be rated both for one-way traffic of the maximum rating located anywhere on the bridge deck, and not more than two lanes of traffic, each occupied at the same time with vehicles of a class equal to the maximum lane load the bridge can accept.

(2) In certain cases, such as damaged bridges or bridges which have been strengthened to take extra loads such as tramways, it may be desirable to classify the bridge on the basis of one-way traffic of the maximum rating, travelling in a re-

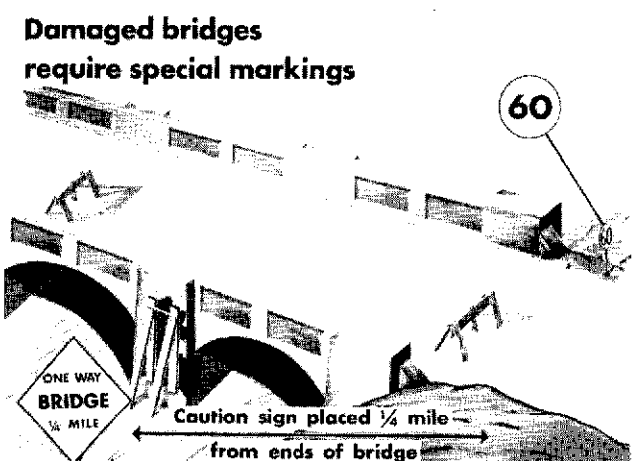


Figure 20. Example of damaged bridge.

stricted lane and appropriately marked (fig. 20).

(3) The minimum clear roadway widths between curbs to qualify for two-way classifications are given in table VIII.

Table VIII. Minimum Widths of Bridges Used in Bridge Class Computations

Bridge class range	Minimum widths between curbs	
	One-lane	Two-lane
4–12	9 ft (2.75 meters)	18 ft (5.50 meters)
13–30	11 ft (3.35 meters)	18 ft (5.50 meters)
31–60	13 ft 2 in (4.00 meters)	24 ft (7.30 meters)
61–	14 ft 9 in (4.50 meters)	27 ft (8.20 meters)

63. Bridge Clearance and Vehicle Spacing

a. Horizontal Clearance. A minimum clear distance of 10 inches (25 cm) is required between the inside of the curb and the inside of the bridge structure, at a height of 12 inches (30 cm) above the bridge surface and higher.

b. Vertical Clearance. The minimum desirable headroom for bridges is as follows:

(1) Through Class 70—14 feet (4.25 m).

(2) Above Class 70—15 feet, 6 inches (4.70 m).

A bridge with less than the vertical clearance indicated in (1) and (2) above will not have its

load class reduced. Instead, it will be appropriately marked with a sign giving the restricting height (fig. 36) and also with a telltale (fig. 37).

c. Spacing of Vehicles. Bridges will be rated for vehicles of the appropriate class in convoys with 100 feet (30.5 m) between ground contact points of the vehicles.

64. Short Bridges and Foreign Bridges

a. Bridges with spans of less than 25 feet (7.6 m) require special attention during classification if the computed class, due to shear, is higher than the computed class due to bending moment (TM 5–260).

b. Foreign civilian and foreign military bridges require classification in accordance with the procedures given in TM 5–260.

65. Masonry or Brick Arches

Masonry or brick arches should be checked for maximum single-axle load (app. VI) on short arches with span lengths up to 30 feet (9.1 m), since the class determined by the single-axle load will usually be less than the class determined for the tracked vehicle.

66. Dual Bridge Classifications

a. Short-span bridges or certain other bridges, regardless of span, may accept wheeled vehicles of a higher class than that of the tracked vehicles. For example—

(1) A short-span bridge may be able to support Class 80 axle loads, but cannot take tracked loads above Class 60.

(2) A bridge of any span length, because of the capacity of its decking, may be able to carry Class 80 axle loads, but cannot take tracked loads above Class 60.

(3) Such bridges will be marked so as to indicate that they can carry wheeled vehicles up to Class 80 but that they cannot take tracked vehicles above Class 60 (fig. 35).

b. TM 5–260 shows the differences in bending moment caused by wheeled and tracked vehicles on spans of various lengths. The dual classification figures for such bridges are indicated.

c. Dual classifications will not apply to bridges of Class 50 and below. Such bridges must be capable of taking either the tracked or the wheeled vehicles of the rated class.

d. Bridges of classes above 50 may be marked with a single sign. They must, in this case, accept both wheeled and tracked vehicles of the rated class.

67. Classification of Rafts and Their Landing Stages

Classifications for rafts and their landing stages will be determined on the same basis as for bridges.

68. Traffic Control Over Bridges and Other Crossing Means

Traffic control over bridges and other crossing

means is needed to prevent failure of bridges and ferries and the blocking of tunnels, fords, causeways, snowsheds, and galleries.

a. Engineer responsibility for traffic control over bridges and other crossing means is limited to the supply and posting of appropriate markings after the completion of the necessary reconnaissance and the resulting evaluation.

b. Provost marshal responsibility for traffic control over bridges and other crossing means includes the following:

(1) Establishment of traffic control policies.

(2) Performance of traffic control reconnaissance.

(3) Establishment of traffic control posts.

(4) Operation of traffic control posts.

(5) Enforcement of traffic regulations.

(6) Local rerouting in emergencies.

c. Military police responsibility for traffic control over bridges and other crossing means includes the following:

(1) Enforcing traffic regulations.

(2) Enforcing speed regulations.

(3) Enforcing vehicle interval limits.

(4) Enforcing crossing limitations such as weight of vehicles, lanes to be used, priority on crossing single-lane bridges, priority on crossing two-lane bridges when a single lane crossing is required by vehicle weight.

(5) Supervising special crossings.

69. Types of Crossings

There are two types of crossings: normal and special.

a. Normal Crossings. Normal crossings may be made whenever the vehicle class number is equal to or less than the bridge class number. Only normal convoy discipline must be imposed on the vehicles making a normal crossing, that is, a minimum spacing of 30 yards (27.4 m) and a maximum speed of 25 miles per hour (fig. 21). There are two types of normal crossings, normal one-way and normal two-way.

(1) *Normal one-way.* This type of crossing is possible when the vehicle class number is equal to or less than the number posted on a single-lane bridge or the one-way class number of a two-lane bridge. If a one-way crossing is made on a two-lane bridge the vehicle should be driven down the middle of the roadway.

(2) *Normal two-way.* This type of crossing is possible when the vehicle class number is equal to or less than the two-way class number of a multilane bridge. Two-way traffic may be maintained with this type of crossing.

b. Special Crossings. Special crossings are classified as caution crossings and risk crossings. A special crossing may be authorized under exceptional operating conditions in the field by the theater commander or local civil authorities to

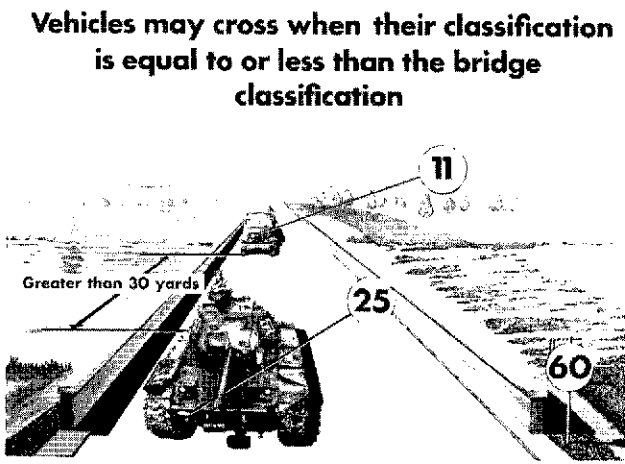


Figure 21. Example of a normal crossing.

permit a vehicle to cross a bridge or other crossing means whose class number is less than that of the vehicle.

(1) A caution crossing is a bridge crossing where vehicles with a classification up to 25 percent above the posted bridge loadings are allowed to proceed cautiously across the span (fig. 22). A caution class number is the number obtained by multiplying the normal crossing class number of either a single lane or multilane nonstandard bridge by 1.25. For standard prefabricated bridges, the vehicle class number must not exceed the published caution bridge class number. Caution crossings apply to single lane

bridges and to multilane bridges when the vehicle remains on the centerline of the bridge, maintains a 50-yard (45.7 m) distance from the vehicle in front, does not exceed a speed limit of 8 miles per hour, does not stop, is not accelerated, and does not have its gears shifted on the bridge or other similar crossing means.

(2) A risk crossing may be made only on prefabricated fixed and floating bridges (fig. 23). Risk crossings may be made only in the gravest emergencies where excessive losses will otherwise result and where the vehicle remains on the centerline of the bridge; does not exceed a speed limit of 3 miles per hour; is the only vehicle on the span; does not stop; is not accelerated; and does not have its gears shifted. Tanks, on risk crossings, must be steered by using their clutches only. Risk crossings, under these conditions, are permitted only if the vehicle class number does not exceed the published risk class.

c. Examples of Special Crossings.

(1) A tracked vehicle with classification 73 approaches a bridge which has a tracked vehicle classification of 60. The vehicle may be allowed to cross, using the bridge as a single lane bridge, being centered on the two lanes.

(2) A tracked vehicle with classification 73 approaches an aluminum deck-balk fixed

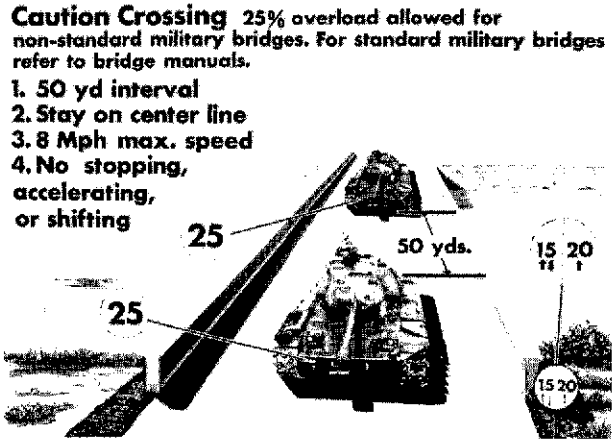


Figure 22. Example of a caution crossing.

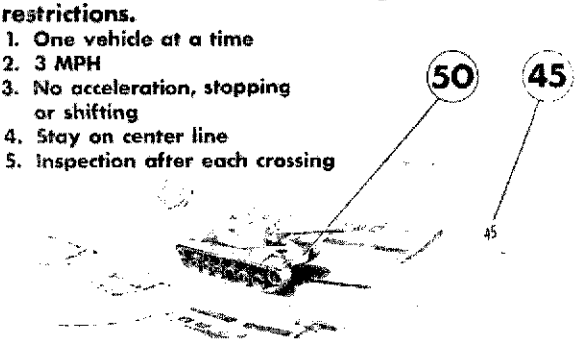


Figure 23. Example of a risk crossing.

bridge. The overall span of the bridge is 30 feet (9.1 m). The normal crossing classification is 60. The caution crossing classification is 75. Therefore, the vehicle is allowed to cross; but it must remain on the centerline of the bridge, must not exceed a speed limit of 8 miles per hour, must not be stopped or accelerated, and must not have its gears shifted while on the bridge.

(3) A tracked vehicle with classification 73 approaches a 70-foot span panel bridge, Bailey type, M2 with 150-inch roadway. The risk crossing classification of this bridge is 75. The vehicle may be allowed to cross this bridge in a grave emergency if the vehicle remains on the centerline of the bridge, does not exceed a speed of 3 miles per hour, is the only vehicle on the span, is not stopped or accelerated, does not have its gears shifted while on the bridge, and is steered by the use of its clutches.

Section V. VEHICLE CLASSIFICATION

70. General

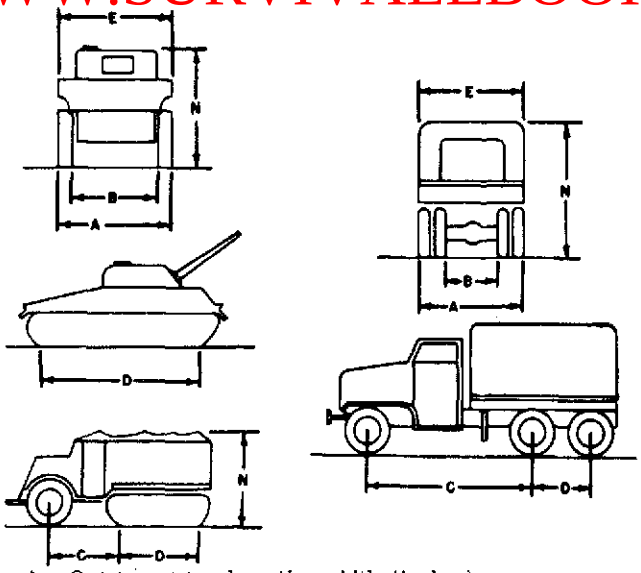
a. The basis of the vehicle classification system is the effect a vehicle has on a bridge while crossing the bridge. The effect is the result of a combination of factors which includes the gross weight of the vehicle, the distribution of this weight, the out-to-out distance of tires or tracks, tire size and pressure, the speed at which the vehicle crosses the

bridge, and the resulting impact on the bridge. The excessive loads common to military vehicles, such as heavy artillery, tanks, and heavy engineer equipment, make vehicle classification an extremely important factor in determining the suitability of a given route. These critical loads are applicable not only to individual wheeled vehicles, but involve also consideration of track-laying vehicles, towed vehicles, and vehicles being moved by transporter. In order to compute the total classification of some of these combinations, each separate vehicle must be evaluated.

b. Standard military vehicles are classified by the Chief of Engineers. A list of standard vehicles, their weights, and classifications are given in appendix IX. Nonstandard vehicles, which include enemy vehicles and other nonstandard vehicles obtained in the field, are classified by the engineer of the nearest division or higher headquarters. Temporary classification, in an emergency, may be made by the using unit by comparing the axle loads, gross weight, and dimensions of the unclassified vehicle with those of a similar classified vehicle. The temporary classification thus derived may be used; however, the using unit notifies the engineer of the nearest division or higher headquarters as soon as possible so as to have the temporary classification verified.

71. Data Required for Vehicle Classification

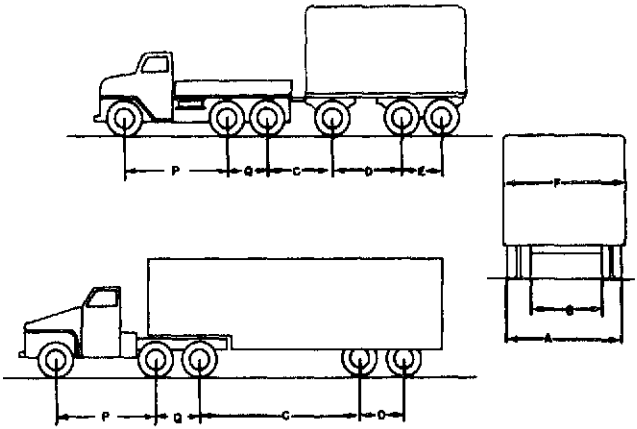
a. The single vehicle dimensional data required for vehicle classification are shown in figure 24① for both wheeled and tracked vehicles.



A—Out-to-out track or tire width (inches)
B—In-to-in track or tire width (inches)
C—Distance from front axle to first rear axle or track (inches)
D—Ground contact of track or distance between rear axles (inches)
E—Overall width (inches)
F—Net weight (tons)
G—Gross weight:
  1 Cross-country
  2 On-highway
H—Axle loads:
  1 Empty
  2 Cross-country
  3 On-highway
I—Tire size
J—Tire pressure
K—Dimension from rear tire to towing pintle or lunette
L—Track width and track load
M—Pay loads:
  1 Cross-country
  2 On-highway
N—Overall height

①

Figure 24. Dimensional data required for vehicle classification.



A—Out-to-out tire width of trailer (inches)
B—In-to-in tire width of trailer (inches)
C—Distance from rear axle of towing vehicle to first axle of trailer (inches)
D—Distance from first to second axle of trailer (inches)
E—Distance from second to third axle of trailer (inches)
F—Overall width of trailer (inches)
G—Gross weight of trailer (tons)
H—Net weight (tons)
I—Axle loads:
1 Empty
2 Cross-country
3 On-highway
J—All spacing between tires
K—Tire sizes
L—Tire pressure
M—Trailer load distribution to tractor
N—Pay load:
1 Cross-country
2 On-highway
O—Dimensions from nearest tire to lunette
P—Distance between front axle and first rear axle of towing vehicle
Q—Distance between dual axles of towing vehicle

(2)

Figure 24—Continued.

(1) Vehicles are to be classified for empty, cross-country, and on-highway loading when possible.

(2) Other data required for vehicle classification is as follows:

(*a*) Total loads, axle loads, track loads, fifth-wheel loads, pintle and lunette loads for empty, cross-country and on-highway loadings.

(*b*) Tire size, number of tires per axle, tire pressure, and maximum load on one tire.

(*c*) Distance from nearest axle to lunette or pintle.

b. The trailer dimensional data required for vehicle classification are indicated in figure 24②. Only wheeled trailers are shown. For other data required for trailer classification see *a*(1) above.

72. Classification Numbers

a. Classification numbers assigned to vehicles, are whole numbers ranging from 4 through 150. These classification numbers have been developed from studies of hypothetical vehicles having characteristics approximately the same as those of actual United States and NATO nations military vehicles. The classification number indicates a relationship between the load-carrying capacity of a bridge and the effect produced upon a bridge by a vehicle (fig. 25). The effect of a vehicle upon a bridge depends on the gross weight of the vehicle, the weight distribution to the axles, and the speed at which the vehicle crosses the bridge. *It is*

emphasized that the classification number is only a number and not a weight. If the vehicle classification number is less than or equal to the classification number of the bridge or raft and its landing stage, the vehicle can cross the bridge or be embarked on the raft. Otherwise, the vehicle will not be able to cross. Under exceptional operational conditions, this restriction may be lifted by specific authority of the theater commander in the operational zone, or on that of civil authorities in areas under their control. Failure to properly consider bridge-carrying capacities can invite disaster (fig. 26).

b. Narrow vehicles have an outside-to-outside tire width, or track width, narrower than that of the hypothetical vehicles of the classes which would otherwise apply, are given a higher vehicle

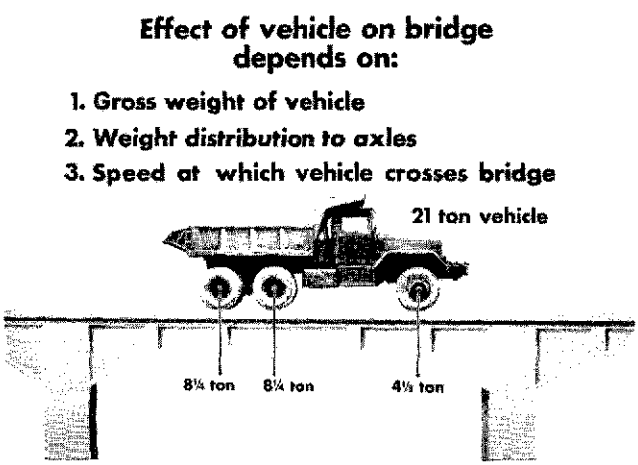


Figure 25. Effect of vehicle on bridge.

Failure to consider bridge carrying capacity means disaster

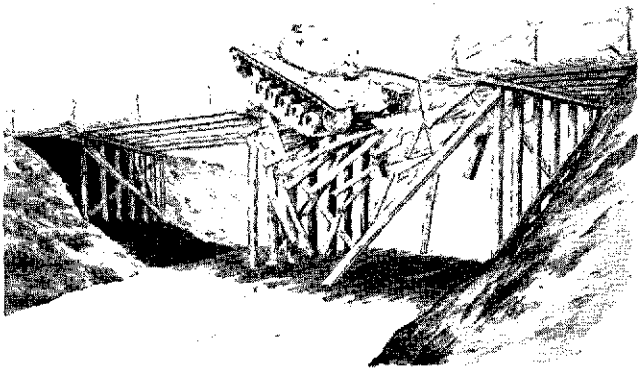


Figure 26. Example of bridge failure.

classification, and the opposite for wider outside-to-outside tire or track widths.

c. Unloaded vehicles are sometimes given temporary classification numbers. Unloaded combination vehicles, where the payload is a substantial amount of the vehicle weight, may also be given a temporary classification number.

d. Each single vehicle or combination of vehicles should have a classification for empty, cross-country, and on-highway loading.

73. Vehicles Which Are Classified

a. Standard military vehicles include all items of equipment which habitually move on land and which are mounted on wheels, tracks, or combina-

tions of wheels and tracks. Therefore, military vehicles are further described as wheeled or tracked. For classification purposes, military vehicles are divided into two categories: single vehicles and combination vehicles.

(1) A single vehicle is any military vehicle which has only one frame or one chassis. Examples are prime movers, tanks, full trailers, and gun carriages.

(2) A combination vehicle is a military vehicle consisting of two or more single vehicles which are connected together and which move as one unit. Examples are prime movers pulling semitrailers supported on the "fifth wheel" of the prime mover, prime movers or trucks towing full trailers, gun carriages, and tongue or pole trailers; or nonstandard combinations such as a single vehicle towing any other single vehicle at a distance of less than 30 yards apart (fig. 27).

b. Classification numbers are assigned to all single vehicles in military use which have a gross weight exceeding 3 tons, and to all trailers in military use which have a rated payload exceeding 1½ tons. Baggage and other pole-type trailers with a rated capacity of 1½ tons or less will normally be combined with their towing vehicles for classification purposes although optional classification numbers may be assigned.

c. Separate classification numbers are assigned to each single vehicle when one tows another and

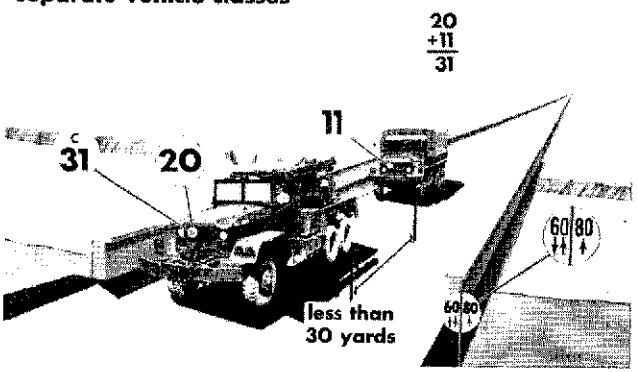


Figure 27. Nonstandard combination of vehicles.

the distance between them is greater than 30 yards. If the vehicles are closer than 30 yards and both are on one bridge span at the same time then they are classed as a combination vehicle. In this case the class of the combination is the sum of the classification numbers of the two vehicles.

d. Temporary classification numbers may be assigned under special conditions, as indicated below.

(1) When two single vehicles, one towing the other, are classed as a combination vehicle, a temporary classification sign is then carried by the leading vehicle.

(2) When cargo vehicles used exclusively on highways are permitted increased payloads, the commander authorizing the in-

creased loads must insure that the *normal* vehicle classification signs are replaced with *temporary* vehicle classification signs which increase the normal classification number by the amount of the authorized overload in tons. For example, a 5-ton truck with classification number 20, carrying an authorized on-highway load of 8-tons, has a 3-ton overload and is therefore given a temporary classification number 23 (fig. 28).

(3) Unloaded single vehicles may be given a temporary classification number. It is computed by subtracting the rated payload in tons from the normal classification number. For example, a 5-ton truck with classification number 20 is given a

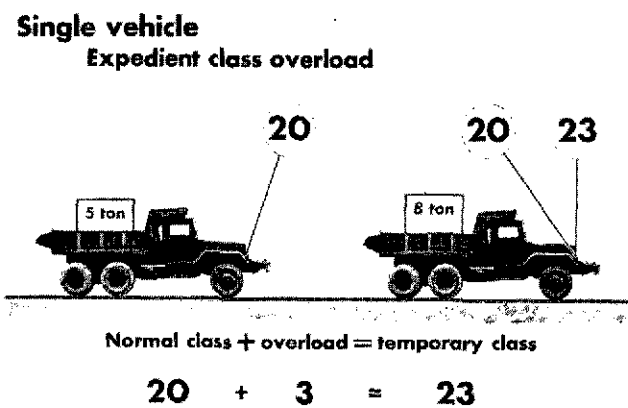


Figure 28. Example of classification of an overload.

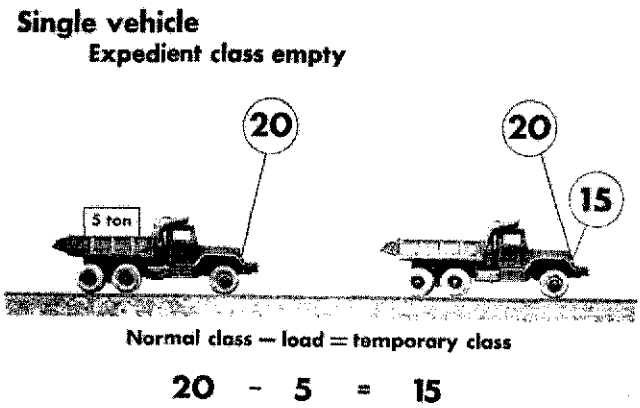


Figure 29. Example of classification of an empty vehicle.

temporary classification number 15 when unloaded (fig. 29).

(4) Combination vehicles, where the payload is a substantial part of the gross weight, are assigned unloaded classification numbers. The unloaded classification number is shown on a detachable classification sign when the combination is unloaded.

(5) Methods of classifying vehicles are given in TM 5–260.

CHAPTER 4
MILITARY SIGNS AFFECTING ROUTES

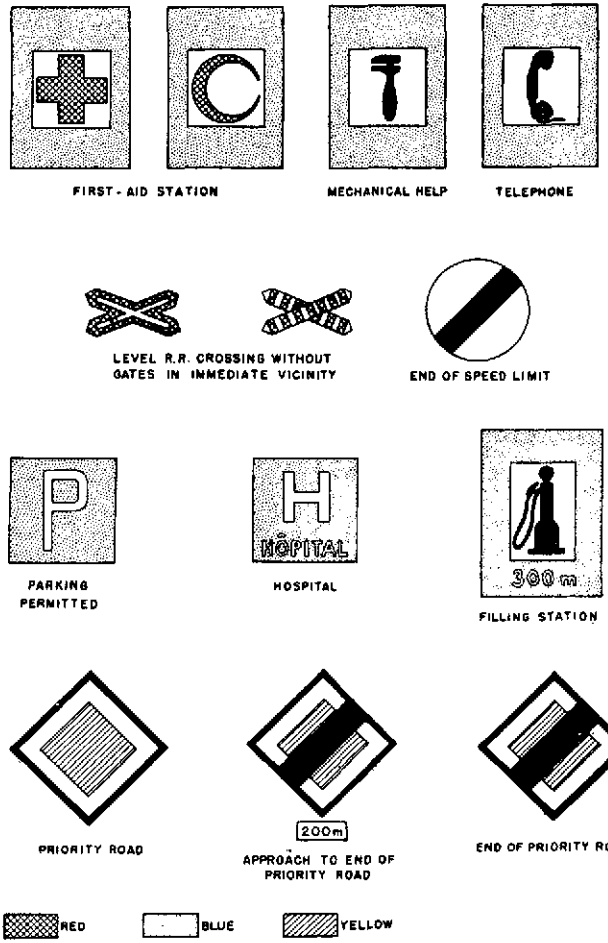
Section I. GENERAL

74. Purpose and Responsibility

The system of military route signing is designed to enable Armed Forces of the North Atlantic Treaty Organization to move without difficulty on any territory whether controlled by the operational military command or a national authority. This system can be integrated with any existing civil system to meet any military requirement for which no civil sign is provided. Signs affecting routes include those specifically posted for the normal movement of troops and supplies (route signs), and signs designed to inform and to regulate traffic. Making and posting road signs is a Corps of Engineers responsibility. Sign posting is coordinated with the appropriate provost marshal and the highway traffic regulation officer of the Transportation Corps regarding location and the number used. Operational responsibility for road signing is a command function.

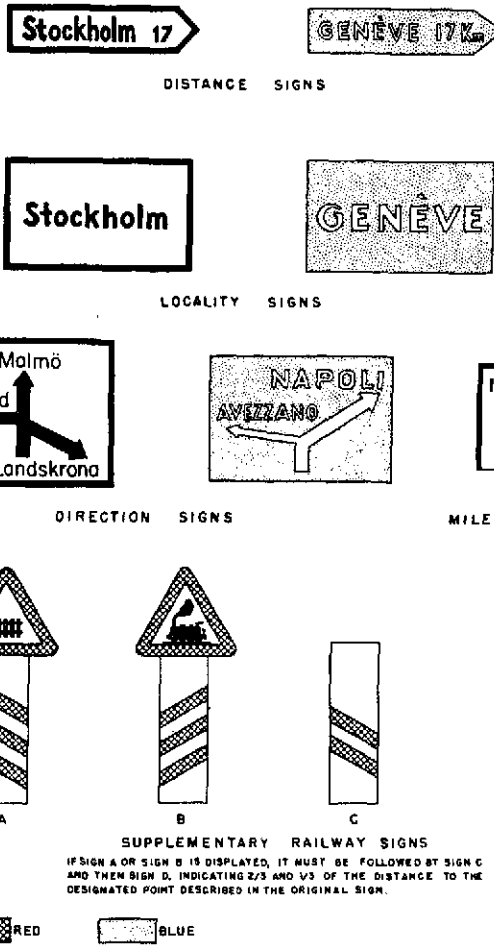
75. Size

In general, signs will not be of standard sizes but they must be sufficiently large to be easily read under poor lighting conditions. The only



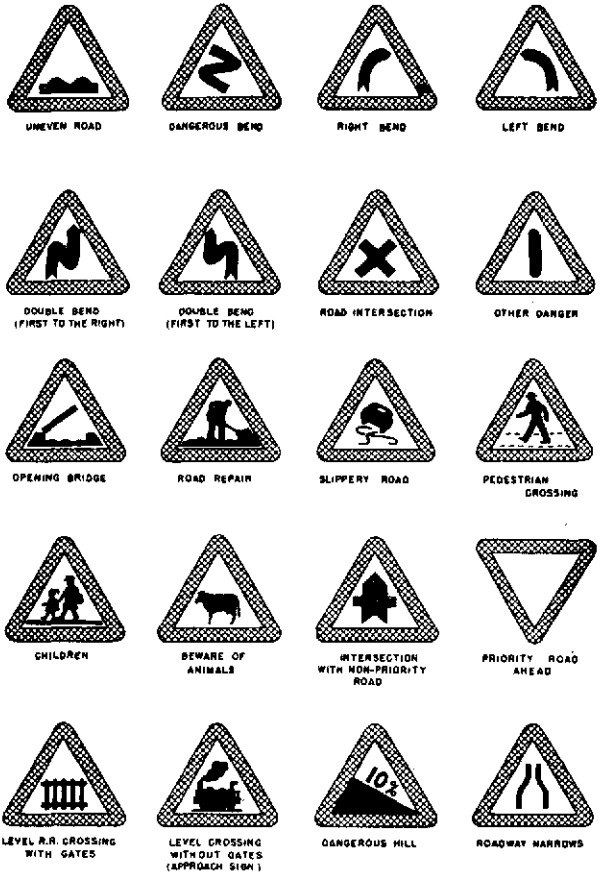
1 Informative signs

Figure 30. Examples of international road signs.



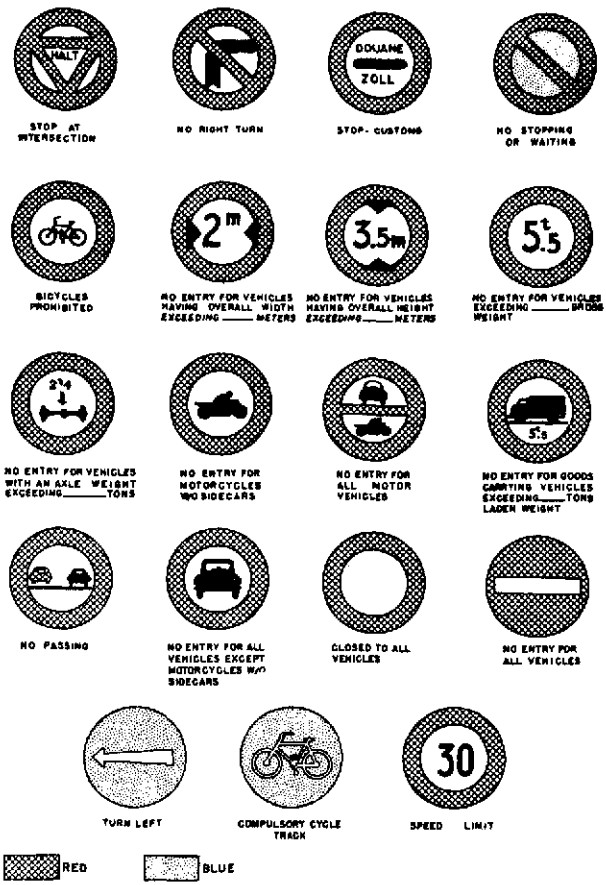
2 Information signs

Figure 30—Continued.



3 Danger signs

Figure 30—Continued.



4 Definite instructions

Figure 30—Continued.

exceptions to this are the bridge classification signs (par. 80) for which dimensions are specified. Signs for international use normally will not be less than 16 inches square. The exceptions to this are directional disks (par. 92). See figure 30 for examples of international road signs.

76. Snow Conditions

During prolonged snow conditions or *permanently* in areas subject annually to prolonged snow falls, yellow may be used instead of white on all purely military signs.

Section II. GENERAL TYPES AND APPLICATION OF SIGNS

77. General

Standard route signs are grouped into three general types: *hazard signs, regulatory signs,* and *guide signs.* Applications of the three general types are listed in table IX.

Table IX. General Road Signs—Applications

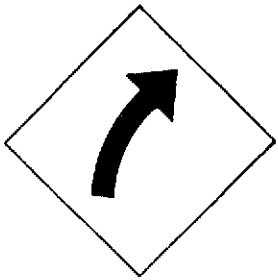
Type	Application
Hazard	Advance warning of stop signs and traffic signals. Bumps. Changes in road width. Crossroad. Curves. Danger or hazard. Dangerous corner. Dips. Junction T. Junction Y.

Table IX—Continued

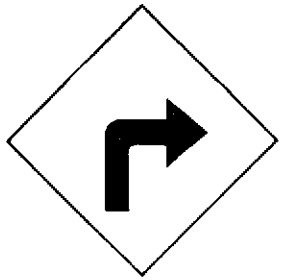
Type	Application
Hazard—Con.	Level railroad crossing, advance warning.
	Men working.
	Railroad crossing.
	Road construction repairs.
	Road narrows.
	Slippery road.
	Steep grades.
	Steep hill.
	Turns.
Regulatory	No entry.
	One way.
	Parking restriction.
	Specific regulations for vehicles.
	Speed limit.
	Stop.
	Bridge classification.
Guide	Detour.
	Detour begins.
	Detour ends.
	Directions.
	Distances.
	Information to help driver.
	Locations.
	Route number.

78. Definitions of General Types of Signs

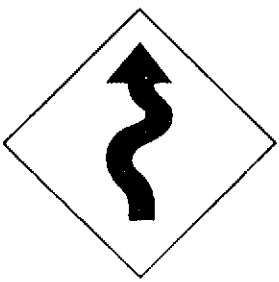
a. Hazard Signs. Military hazard signs are used to indicate traffic hazards. These signs should be used in a communication zone area according to the agreement existing with the national authorities. Hazard signs are *square* in shape and will



CURVE TO RIGHT

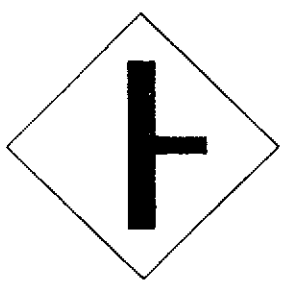


SHARP CURVE TO RIGHT

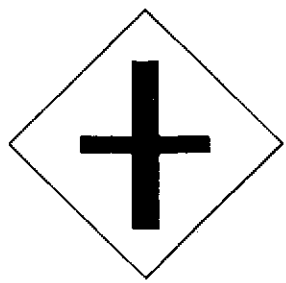


WINDING CURVES

RAILROAD CROSSING



T-JUNCTION



PRIMARY ROAD CROSSING
SECONDARY ROAD

Figure 31. Examples of hazard signs not included in the Geneva Convention (yellow background and black symbols or letters).

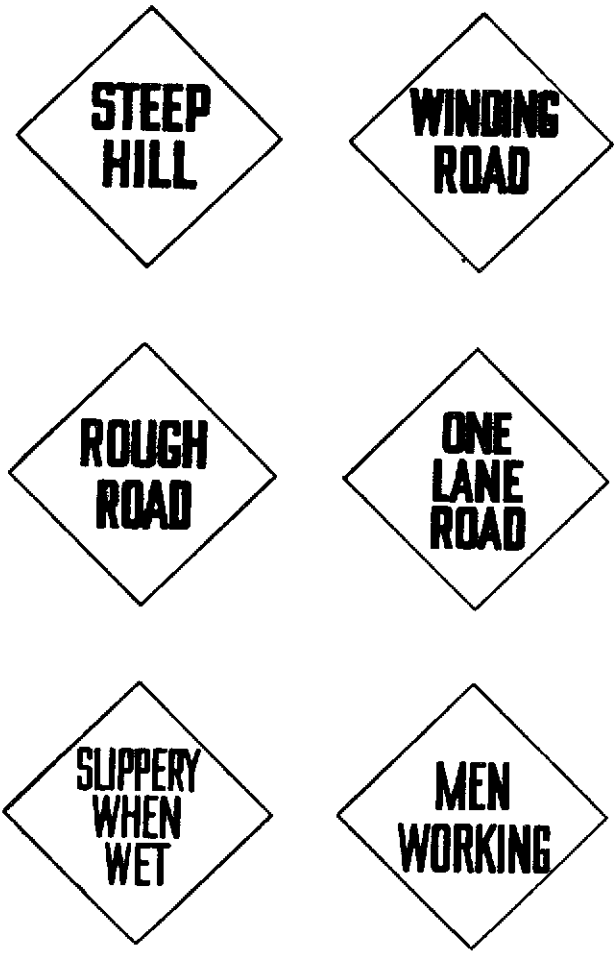


Figure 31—Continued.

be placed with *one diagonal in a vertical position.* A purely military sign not included in the Geneva Convention or in the system of the host country will have a yellow background with the legend or symbol inscribed in black (fig. 31). The necessary wording on these signs will be in the language or languages determined by the authority erecting the sign. If a sign is included in the Geneva Convention or in the sign system of the host country, the appropriate sign will be superimposed on the same yellow background (fig. 32).

b. Regulatory Signs. Regulatory signs are used by the appropriate authority to regulate and control traffic. Square regulatory signs will be posted with the sides horizontal and vertical (fig. 33). Regulatory signs have a black background on which the legends or symbols are superimposed in white, with the exceptions of bridge classification signs (par. 80), stop signs (par. 85), no entry signs (par. 85), and signs applicable to civilians (par. 85).

c. Guide Signs. Guide signs are grouped into two general categories: guide signs for specific military routes and other guide signs. Details of guide signs are discussed and illustrated in paragraphs 79 through 94. Additional route guide signs may be erected within friendly national areas, provided arrangements are made mutually between the commanders concerned.

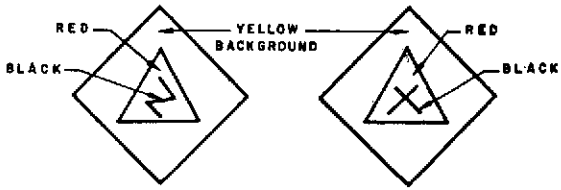


Figure 32. Examples of hazard signs included in the Geneva Convention.

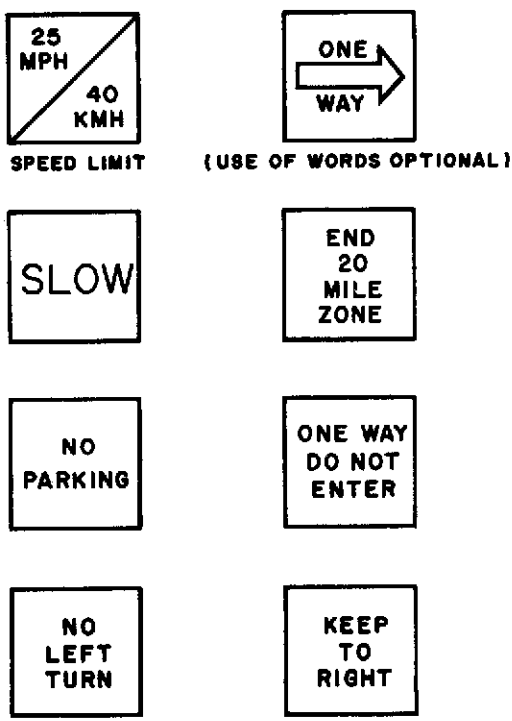


Figure 33. Examples of regulatory signs.

Section III. SPECIFIC TYPES AND APPLICATION OF SIGNS

79. General

This section presents descriptions and specific application of signs not covered in paragraphs 77 and 78.

80. Bridge Classification Signs

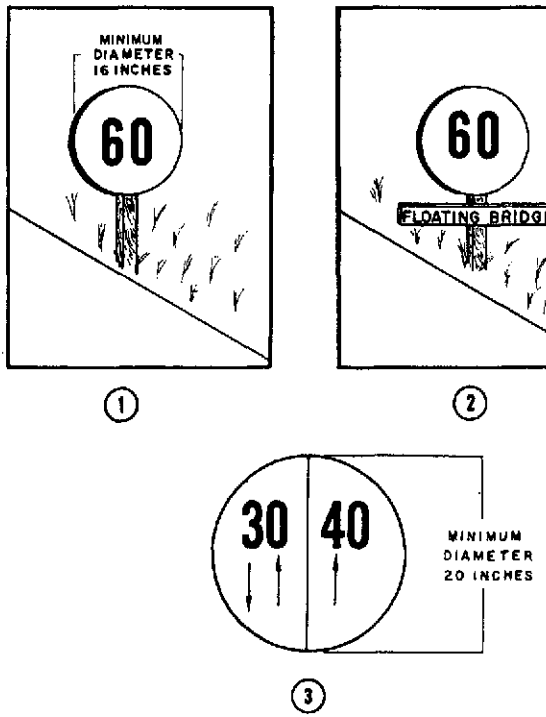
The Armed Forces of the North Atlantic Treaty Organization have agreed to adopt the system of marking bridge classifications presented below and the corresponding marking of vehicles (par. 104). Special arrangement may be made by the theater commanders to indicate vehicles of exceptional width or to indicate exceptionally low overhead obstructions. There are two general types of standard bridge signs. These are *circular* and *rectangular* in shape.

a. Circular Signs. All bridges will have circular signs indicating the military bridge classification. These signs will have a yellow background, bearing black symbols. The legend will be as large as the diameter of the sign allows. Circular signs are of two types: *normal* circular signs and *special* circular signs.

(1) *Normal circular signs.*

(*a*) For one-way bridges, the signs will be a minimum of 16 inches in diameter (fig. 34).

(*b*) Signs for two-way bridges will be a minimum of 20 inches in diameter. They will be divided into two parts by



1. Single lane bridge.
2. Floating bridge.
3. Two-lane bridge used as two-lane or single-lane.

Figure 34. Typical bridge class and information signs.

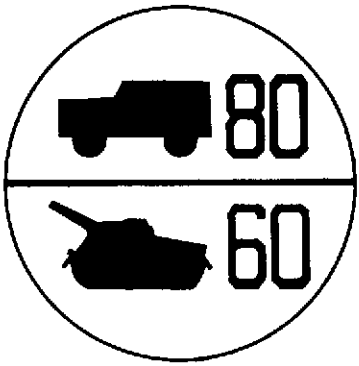
a vertical line. The classification for two-way traffic will be shown on the left half with two parallel vertical arrows beneath the number and the classification for one-way traffic will be shown on the right half of the sign with one vertical arrow beneath the number (fig. 34).

(2) *Special circular signs.*

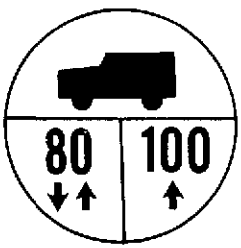
(*a*) Where a need exists for classification of a bridge for wheeled and tracked vehicles, a special circular sign which indicates both classes will be used for one-way traffic bridges (fig. 35). The sign will be a minimum of 20 inches in diameter. It will be divided into two parts by a horizontal line. On the top half, the wheeled classification will be shown along with a symbol representing a wheeled vehicle. On the bottom half, the tracked classification will be shown along with a symbol representing a tracked vehicle.

(*b*) Where similar requirements pertain to a two-way traffic bridge, the normal sign for two-way bridges and the special sign for one-way wheeled and tracked traffic may be combined at the discretion of the commander concerned (fig. 35).

b. Rectangular Signs. Additional instructions and technical information are inscribed on rectangular signs. Rectangular signs will be a mini-



(1) Limiting wheeled vehicle class and limiting tracked vehicle class



(2) Combination of dual class and two-way bridge class signs

MINIMUM DIAMETER 20 INCHES

Figure 35. Typical dual class bridge signs.

mum of 16 inches in height or width. They will have a yellow background upon which the appropriate letters, figures, or symbols will be inscribed in black. The inscription on the sign will be as large as the sign allows. Separate rectangular signs will be used if necessary to show width limitations, height limitations, or other technical information (fig. 36). Width and height signs are not required on bridges where existing civilian

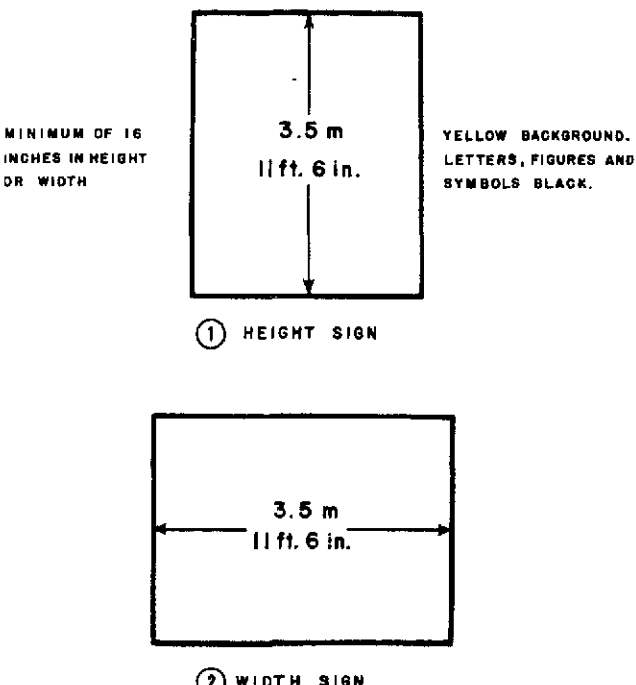


Figure 36. Height and width signs.

signs are already in place and are sufficiently clear. In countries which are parties to the Geneva Convention of 1949, the Military Authorities may use the convention approved signs for expressing height or width.

81. Positioning of Bridge Signs

Bridge signs are positioned so as to help maintain an uninterrupted flow of traffic across the bridge. The locations of circular and rectangular signs, special class numbers, and appropriate warning signs are as follows:

a. Circular bridge classification signs will be placed at both ends of the bridge in such a position as to be clearly visible to all oncoming traffic.

b. Rectangular signs other than those indicating height restrictions will be placed immediately below the bridge classification (circular) signs.

c. Signs which indicate height restrictions will be placed centrally on the overhead obstruction itself as in civilian practice.

d. Special class numbers are never posted on standard bridge marking signs, but may be posted on supplementary signs.

e. Appropriate advance warning signs will be placed at the approaches to the bridges as required.

82. Marking Restricted Bridge Lanes

a. Where it is necessary to confine traffic to restricted lanes on damaged bridges, physical barriers such as posts, barrels, etc. are used to define the lane. Whenever necessary, such barricades will

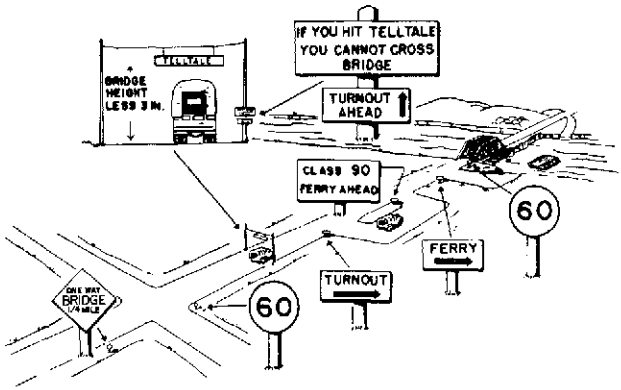


Figure 37. Typical single-lane bridge applications of bridge class and information signs and road guide signs.

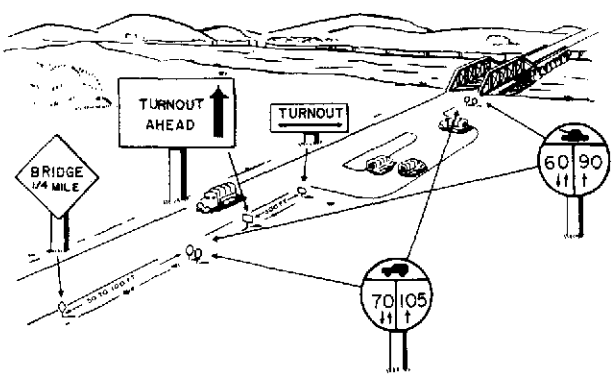


Figure 38. Typical two-lane bridge applications of bridge class and information signs and road guide signs.

extend throughout the length of the bridge and along the approach roadways in such a manner as to prevent traffic congestion. Adequate warning signs are also to be used.

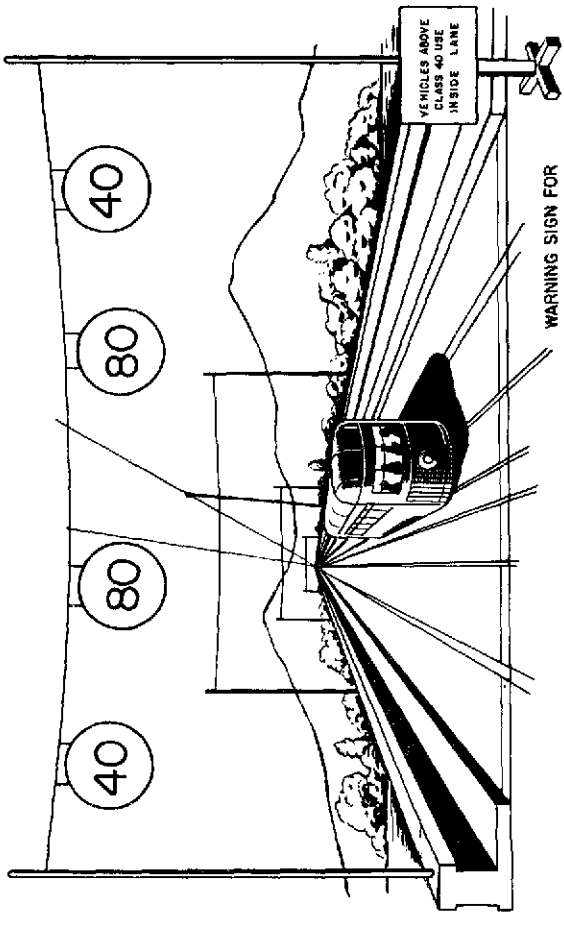


Figure 39. Typical multilane bridge applications of bridge class signs and road regulatory signs.

b. In the case of certain bridges, heavier loads can be taken on a restricted lane (such as centerline of the bridge or the line of the rails on a road and rail bridge) than on other lanes. These restricted lanes are to be marked by painted lines, studs, etc. and rectangular explanatory signs will be placed at approaches to the bridge (fig. 39).

83. Examples of Markings of Bridges and Approaches

Examples of signs pertaining to regulation of traffic crossing bridges are given in illustrations as follows:

a. Typical bridge class and information signs are shown in figure 34.

b. Typical dual class bridge sign for the limiting wheeled vehicle class and the limiting tracked vehicle class is shown in figure 35.

c. Typical dual class bridge signs indicating combination of dual class and two-way bridge class signs are shown in figure 35.

d. Typical height and width restriction signs are indicated in figure 36.

e. Typical use of single lane bridge class and information signs and road guide signs is illustrated in figure 37.

f. Typical use of two lane bridge class and information signs and road guide signs is illustrated in figure 38.

g. Typical bridge class and road regulatory signs for multilane bridges are illustrated in figures 37 and 38.

84. Administrative Procedures

Design and specifications for materials of signs for bridges and other crossing means are responsibilities of the Chief of Engineers. The supply of signs for marking bridges and other crossing means is an engineer responsibility. Posting signs, regarding location and the number to be used, for bridges and other crossing means is an engineer responsibility coordinated with the appropriate provost marshal and the highway traffic regulation officer of the Transportation Corps. Operational responsibility for the marking of bridges and other crossing means is a command function.

85. Other Exceptions to Standard Coloring of Regulatory Signs

a. Stop Signs. Stop signs will have an octagonal (8-sided) shape. They will have a yellow background. The word STOP will be superimposed in black (fig. 40).

b. No Entry Signs. No entry signs will have the Geneva Convention Sign superimposed (fig. 40).

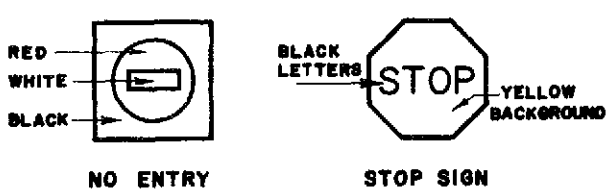


Figure 40. Exceptions to standard coloring of regulatory signs.

c. Application to Civilians. When the military must erect signs to be complied with by civilians and which are already provided for by the Geneva Convention, or host country system, such signs will be used.

86. Other Applications of Bridge Marking Principles

a. Ferries. Marking for ferries is done according to the appropriate and applicable instructions for marking bridges. Hazard, regulatory, and guide signs, as appropriate and applicable, are posted on approach roads and at ferry slips (fig. 41).

b. Tunnels. Marking of tunnels is done in accordance with the appropriate and applicable instructions for marking bridges.

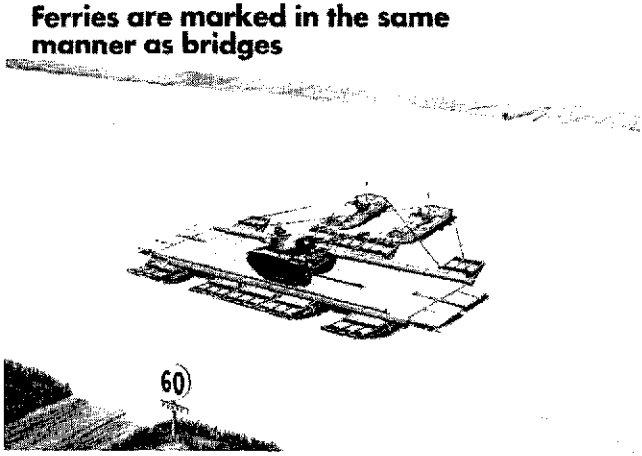


Figure 41. Example of marking for ferries.

c. Fords. Marking of fords is done in accordance with the appropriate and applicable instructions for marking bridges. In addition, the width of the ford is marked by suitable posts erected on the shores at high water level on both sides of the streams. Maximum depth of the ford should also be posted on both shores. Appropriate signs are erected on both shores to remind drivers that the brakes of vehicles driven through the ford are wet and must be appropriately dried.

87. Guide Signs for Specific Military Routes

a. Military route guide signs will be rectangular in shape and will be posted with the long axis vertical (figs. 42 and 43). The legend on these signs will consist of the route number (par. 88) and the appropriate directional disk (par. 92). Route guide signs will have a black background with white letters or symbols.

b. Route guide signs may also show the direction of traffic. For axial routes, differentiation between the traffic moving to the front and the traffic moving away from the front will be by means of a traffic disk with *barred* arrow showing the stream of traffic to the rear (fig. 42). On route signs of lateral routes, the standard letter N, E, S, W, NE, SE, NW, and SW will be used to indicate the general direction of movement of each traffic stream (fig. 43).

c. In the event of necessity, such as a shortage of materials, the military route guide sign may consist only of a directional disk used in conjunc-

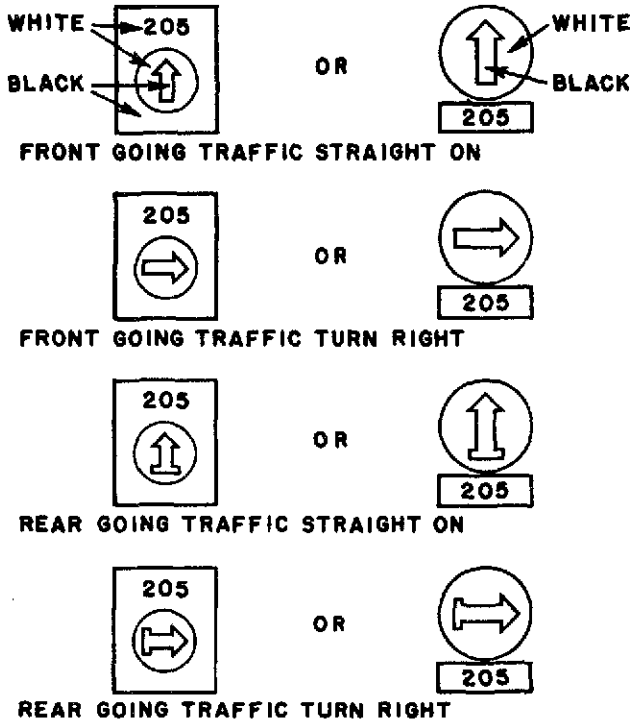


Figure 42. Examples of guide signs for specific axial military routes.

tion with a rectangular panel showing the route number (figs. 42 and 43).

88. Route Numbers

Axial and lateral military routes will each be allotted one route number which will be used to describe the route throughout its length. As previously stated, axial routes will be given odd num-

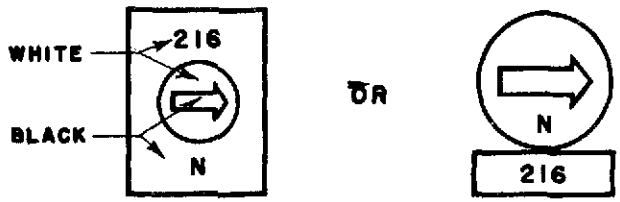


Figure 43. Examples of guide signs for specific lateral military routes.

bers and lateral routes will be given even numbers. The theater commander is responsible for allotting blocks of numbers in his theater. Formation (U. S. regiment or equivalent and above) routes may be signed as follows:

a. In the case of routes of the maneuver network (axials or laterals) by supplementing the route numbers with a separate and removable formation sign, letter, color, or emblem; these additional signs should be used only as a temporary measure.

b. In all other cases, with the removable formation sign, letter, color, or emblem.

89. Other Guide Signs

In addition to guide signs for specific military routes, other guide signs are helpful or necessary. These signs will show such information as location, distance, direction, civilian route numbers, and destination of road. They are rectangular in shape. They will usually have a black background and white letters or symbols. This type of guide

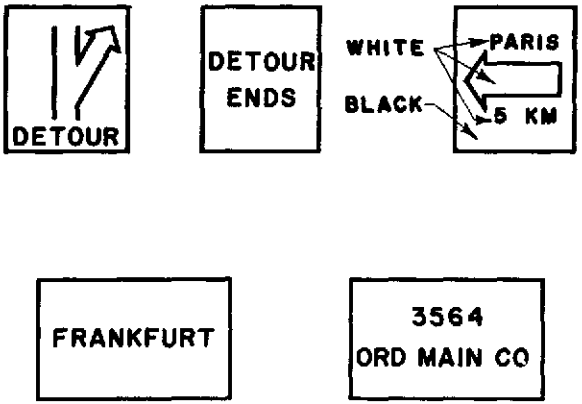


Figure 44. Examples of other guide signs.

sign will be posted with the sides vertical, with the long axis in the position which best accommodates the lettering of the sign (fig. 44).

90. Routes to Headquarters, Dumps, and Similar Installations

a. Guide signs for these purposes will be rectangular in shape and will be posted with the sides vertical to indicate location, distance, direction, civilian route numbers, etc. The symbol will be *white* on *black* background (fig. 44).

b. Whenever it is necessary to mark headquarters, an appropriate military symbol (FM 21–30) will be used. The symbols and letters will be black, superimposed on a yellow background. The basic symbol may be supplemented by national distinguishing symbols or letters (app. VIII) and any other markings desired. For divisional or higher

headquarters, the nation will always be indicated. Symbolic colors are prohibited for international use, except for national distinguishing symbols. Each army will make such arrangements for night lighting as are deemed necessary. When the interests of security so demand, all or any headquarters markings may be covered or removed at the discretion of the field commander or his superior.

91. Guide Signs for Casualty Evacuation Routes

a. On a rectangular white background the following information will be shown in *red* (fig. 45).

(1) Directional arrow.
(2) Red cross.
(3) Unit or subunit designation in letters or military symbols (only if required).
(4) Additional information such as formation or national markings can also be shown if desired. Instead of using a rectangular white background as indicated above, it is also permissible to use, as an alternate background, a directional disk (par. 92), four segments of which are cut out to give it a cruciform shape. The same information as above may be shown in *red* or *white*.

b. Signs for casualty evacuation routes of Turkish Armed Forces will be a red crescent on white rectangular background. The following information is shown in red:

(1) Directional arrow.
(2) Red crescent.

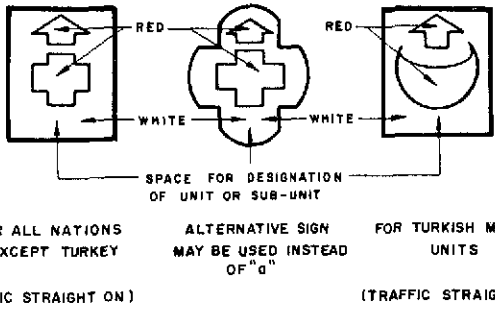


Figure 45. Examples of guide signs for casualty evacuation routes.

(3) Unit or subunit designation in letters or military symbols (only if required).

92. Directional Disks

a. Directional disks will be used to supplement other guide signs to indicate the direction of a route. In addition, they are to be used as an appendage to any major unit or formation sign indicating the route to that unit. The use of the disk is restricted to axial and lateral routes. It is emphasized that directional disks do not in any way supersede any standard regulatory sign. Regulatory signs will be used in addition to the disks, which only indicate a route to be followed. Battalions and smaller size units are *not* permitted to put up directional disks. The object of this restriction is to insure that minor units are not allowed indiscriminate use of directional disks because of the resulting confusion which might

occur. Units not allowed to use directional disks may use any arrow sign providing they are of different coloring and shape from directional disks. For examples of disks see figure 46.

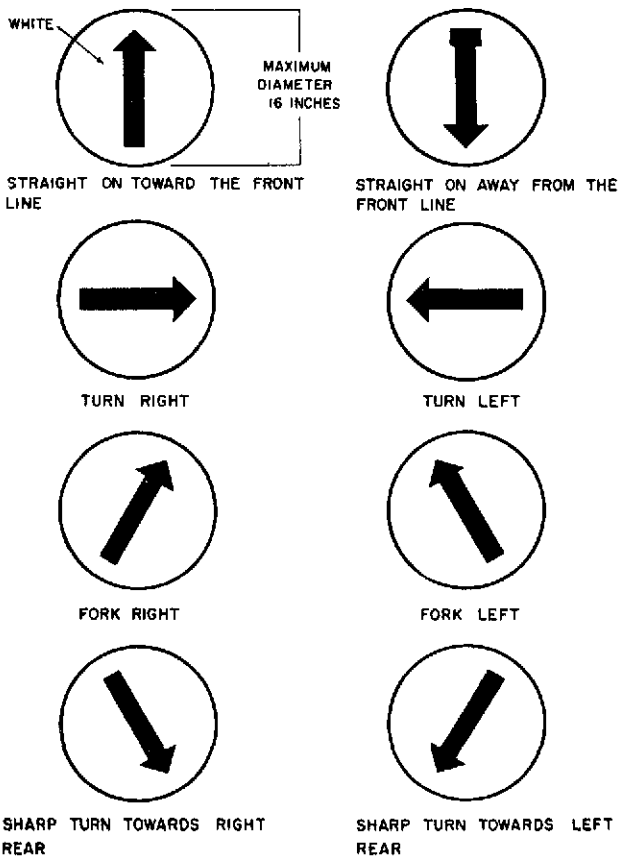


Figure 46. Examples of directional disks.

b. The normal disk consists of a fixed black arrow, with or without bar, on a white background. The disk itself may be used on a black background. Eight equally spaced holes around the edges of the circumference allow the disk to be nailed with the arrow pointing in the desired direction. Disks should not be larger than 16 inches in diameter.

c. Normal directional disks will be used in all cases except for detours which will be marked with a special sign (par. 93).

93. Detour Signs

Detour signs (fig. 47) consist of a blue square showing a white arrow, barred or not. The sign will be placed with one diagonal in the vertical position. The number of the diverted axial route will be shown either by painting it on the square over the arrow, or by adding it under the square by means of the small panel provided for guide signs for routes. Detour signs are also used in conjunction with the one illustrated in figure 44.

94. Road Signs in Arctic Regions

Arctic conditions require special attention to posting road signs. Permanent routes are designated by durable markers. In open country, poles of appropriate height with direction markers, snow markers, wisps of straw, brushwood, rock cairns, or flags serve the purpose. Numbering the markers sequentially and placing them at equal distances from each other on tangents, with closer spacing on curves, are effective safety measures.

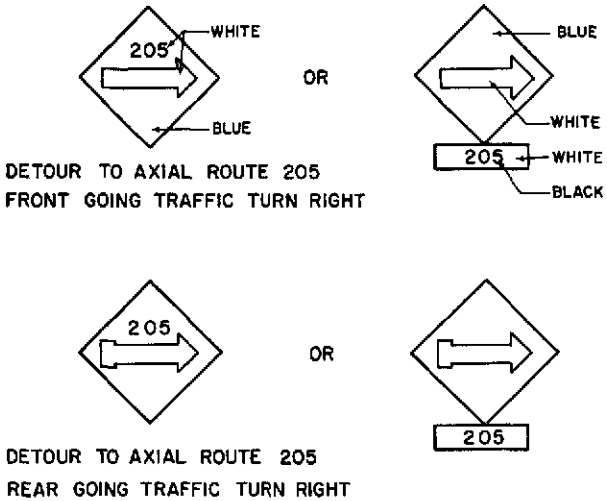


Figure 47. Examples of detour signs.

Markers should be erected at least 3 feet off the traveled road to avoid damage by the traffic. If complete road marking is impossible, arrow sign posts should be erected at prominent points to indicate the direction of the road or the route and the distance to the objective. Road markers used for long periods in arctic regions are checked frequently because their positions can be altered readily by an enemy.

Section IV. LIGHTING OF MILITARY ROUTE SIGNS

95. General

The appropriate military authority in the area will specify those signs which must be lit, primary consideration being given to signs placed

with the object of avoiding accidents, and change of direction signs.

96. Lighting Conditions

Requirements for lighting signs vary for different lighting conditions, as follows:

a. Normal Lighting Conditions. Under normal lighting conditions it is the responsibility of each army to insure that the standard signs are visible during nighttime and in adverse conditions of light as may be applicable.

b. Reduced Lighting Conditions. Under reduced lighting conditions, responsibility is the same as in *a* above. In addition, the positioning of the signs and the methods adopted to make them visible (illumination, reflection) must enable personnel to see them from oncoming vehicles fitted with screening devices.

c. Blackout Conditions. In a blackout zone, the requirements for any system of illuminating military route signs are as follows:

(1) The signs must not be visible from the air at a distance greater than 330 yards (300 m).

(2) They must be visible to the drivers of vehicles moving either with all lights out, or with blackout lights. It is also desirable that they conform as closely as possible to the following:

(*a*) They should not be visible at a distance greater than 330 yards (300 m) on the ground.

(*b*) They should be visible, as a sign, to approaching drivers at a distance of 110 yards (100 m), and should be readable to them at a distance of 33 yards (30 m).

97. Characteristics Required for Road Sign Lighting

a. The system of lighting employed must afford visibility to the degree specified in paragraph 96*c* for a minimum of 15 hours without, where applicable, refuelling or charge of batteries. Where the source of light is of the expendable type (e.g., battery, liquid fuel, etc.), it must be such that quiet and easy replacement is possible under combat conditions.

b. Where the method of illumination is based upon an independent light source, the equipment must be of light weight, easy to store, and easy to transport in small vehicles. Likewise the system of lighting must be shock resistant, fireproof, damp and weatherproof, simple to operate, and easy to place in position.

Section V. MILITARY VEHICLE LIGHTING

98. General

The conditions under which military traffic will move at night will be determined by the Command in relation to the enemy threat and in so far as possible, with due regard to regulations in force in the host country. Such conditions may be directly imposed on operators by this threat

(especially in the case of air-raid warnings). These conditions may be as follows:

a. Normal lighting conditions.

b. Reduced lighting conditions.

c. Blackout conditions.

99. Normal Lighting Conditions

Normal lighting is as prescribed by the law of a given country without restrictions for military reasons for military reasons. The following details regulate vehicle lighting:

a. Driving Lights. Every military motor vehicle, other than a motorcycle with or without sidecar, shall be equipped with two white or yellow driving lights (excluding any other color), fitted in front, capable of adequately illuminating the road for a minimum distance of 110 yards (100 m) in front of the vehicle at nighttime in clear weather. The use of nonblinding lights is particularly important.

b. Passing Lights. Every military motor vehicle other than a motorcycle with or without sidecar, shall be equipped with two white or yellow passing lights (excluding any other color) fitted at the front of the vehicle and capable when necessary of adequately illuminating the road at night in clear weather in front of the vehicle for a minimum distance of 33 yards (30m) without causing glare or dazzle to other road users, whatever the direction of the traffic may be. Driving lights and passing lights may be combined in one unit.

c. Motorcycles. Every motorcycle, with or without sidecar shall have at least one driving light and one passing light, white or yellow (excluding any other color), conforming to the provisions of *a* and *b* above.

d. Side Clearance Lights. Every military vehicle other than a motorcycle without sidecar shall be equipped with two white or yellow side clearance lights (excluding any other color) at the front. Trailers which are wider than the towing vehicle will also be provided with these lights. The lights shall be—

(1) visible at nighttime in clear weather at a minimum distance of 165 yards (150m) from the front of the vehicle without causing glare or dazzle to other road users,

(2) positioned as near as practicable to an in no case further than 16 inches (400mm) from the extreme outer edges of the vehicle so that the width thereof is indicated to traffic approaching from the opposite direction. However, providing they meet the above requirements, side clearance lights may be combined with the driving lights and passing lights in one unit.

e. Rear Lights. Every military motor vehicle other than a motorcycle without sidecar and every trailer at the end of a combination of vehicles shall be equipped at the rear with at least two red lights as close to the extreme outer edges

of the vehicle as possible and in no case to be further than 16 inches (400mm) from the outer edges of the vehicle. These lights are to be visible at nighttime in clear weather at a minimum distance of 165 yards (150m) from the rear of the vehicle.

f. Red Reflectors. Red reflectors, visible at nighttime in clear weather from a minimum distance of 110 yards (100m) when illuminated by means of driving lights shall be fitted as follows:

(1) two at the rear of every military vehicle (except motorcycles with sidecars) and every trailer, on each side of the vehicle as near as practicable to the extreme outer edges and in no case further than 16 inches (400mm) from the extreme edges of the vehicles,

(2) one at the rear of every motorcycle.

g. Registration Numbers. The principle of illuminating the military registration or identification number at the rear of a military vehicle or a trailer is agreed, and will be implemented by all nations as soon as possible. The number should be illuminated so that it is readable at night in clear weather, at a minimum distance of 20 yards (or 20m) from the rear.

h. Vehicles To Be Equipped. All military vehicles, except as in *i* below, shall conform to the above provisions when operating at night on roads carrying civil traffic, irrespective of whether they are moving singly or in column.

i. Exceptional or Awkward Loads. It is recognized that *the above provisions will not apply to* a number of exceptional vehicles, either when loaded or unloaded, *owing to their characteristics (speed, weight or dimensions)*. In such cases, a special ruling will be made by the authority responsible for traffic control, in so far as possible, with due regard to any relevant legal requirements or regulations of the country in which the vehicles are operating.

j. Stoplights and Direction Indicators.

(1) With the exception of motorcycles, every military motor vehicle, and every trailer at the end of a combination of vehicles shall be equipped with at least one stoplight at the rear showing a red or amber light. This light shall be caused to glow upon application of the service brake of the motor vehicle. If the stoplight is red in color and is either incorporated in, or associated with, the rear red light, its intensity shall be greater than that of the rear red light. The stoplight shall not be required on trailers and semitrailers when their dimensions are such that the stoplight of the drawing vehicle remains visible from the rear.

(2) When a military vehicle is equipped with direction indicators, such indicators shall be one of the following:

(*a*) A movable arm protruding beyond each side of the vehicle and illuminated

by a steady amber light when the arm is in the horizontal position;

(*b*) A constantly blinking or flashing amber light affixed to each side of the vehicle;

(*c*) A constantly blinking or flashing light placed at each side of the front and rear of the vehicle. The color of such lights shall be white or orange towards the front and red or orange towards the rear.

(3) No lights, with the exception of direction indicators, shall be flashing or blinking lights. If a vehicle is equipped with several lights of the same kind, they shall be of the same color and, except in the case of motorcycles with sidecars, two of these lights will be placed alongside each other, with one on each side of the longitudinal axis of the vehicle.

100. Reduced Lighting Conditions

The expression "reduced lighting conditions" implies that the brightness of all exterior and interior vehicle lights be reduced by power reduction or screening in such a way that the direct or reflected light visible by an aerial observer is limited to the minimum compatible with the safe operation of the vehicles. It is essential that the use of reduced-lighting devices on military vehicles, whether single or in column, permit the drivers—

a. To travel as fast as possible, compatible with safety;

b. To brake in time;

c. To see the side of the road.

101. Blackout Conditions

The expression "blackout conditions" implies either a total blackout, in which all lights are extinguished, or movement by night with lights which cannot be spotted by enemy observation, but which help avoid collisions by showing the position of the vehicle to other road users.

a. Visibility Requirements. Blackout lighting on military vehicles will conform to the following requirements (clear weather, at night, total darkness):

(1) lights shall be visible at a minimum distance of 55 yards (50m) from the vehicle;

(2) lights shall not be visible at a distance greater than 330 yards (300m) either to ground or air observation.

b. Lights To Be Displayed. Vehicles moving with lights under blackout conditions will, except as provided in *c* below, display the following lights:

(1) Two white or yellow lights at the front;

(2) Two red lights at the rear;

(3) The lights in (1) and (2) above must be positioned so that the width of the vehicle is delineated to traffic approaching either from the front or the rear.

c. Movement of Columns. For the movement of columns the requirement concerning blackout conditions will be considered as complied with if the following lights are displayed:

(1) Two white or yellow lights at the front of the first vehicle of each serial;

(2) Two red lights at the rear of the last vehicle of each serial;

(3) At least one "convoy" or "station keeping" light at the rear of each vehicle. "Convoy" or "station keeping" lights which should conform to the requirements of *a* above, are those placed at the rear of any vehicle of a column moving under blackout conditions, to permit the driver of the following vehicle to judge the proper distance which he must keep behind the preceding vehicle. Under such conditions it is desirable that—

(*a*) Traffic be one-way, with no passing permitted;

(*b*) The side clearance (position) lights of the widest vehicles be lit.

(4) Special lighting and traffic measures by the military authority are necessary for the movement of *special vehicles* with respect to their dimensions or their load. Care must be taken to comply with the general requirements listed above.

d. Blackout Safety Device. It is desirable that a device be incorporated in the vehicle lighting

switch, in order to prevent the driver from accidentally switching on the driving lights, passing lights, or direction indicators when the vehicle is operating under blackout conditions.

102. Visibility of Military Traffic Control Personnel at Night

It will be the responsibility of each NATO country to insure that military traffic control personnel, when on duty, are *readily visible* to drivers at night, whether under *normal lighting, reduced lighting* or *blackout conditions.* Traffic control personnel, when on duty shall be equipped with a *luminous appliance* for directing the movements of traffic. This appliance must comply with the visibility requirements appropriate to the conditions of movement at night in force at the time.

CHAPTER 5

MARKING OF MILITARY VEHICLES

Section I. GENERAL

103. NATO Agreement

The Armed Forces of the North Atlantic Treaty Nations agree to use standard marking of vehicles, when it is considered necessary to mark vehicles. Trailers will be marked in the same way as their prime movers, except that there is no need for marking the front of trailers.

104. Responsibility for Marking

When security interests make it necessary, by direction of the field commander or his superior, the markings may be covered or removed. Registration numbers or a combination of letters and numbers will be used as determined by the authorities of the nations concerned. Also speed limit markings will be placed on vehicles as directed by the national authority concerned.

105. Administrative Procedures

a. Design and specification for materials of vehicle classification signs are responsibilities of the Chief of Ordnance.

b. Initial application or attachment of vehicle

classification signs is a responsibility of the Chief of Ordnance.

c. Procurement of vehicle signs is on a regular ordnance item-of-supply basis.

d. Maintenance of vehicle classification signs and marking of them is a command responsibility.

e. Replacement of lost or destroyed vehicle classification signs is governed by existing supply and maintenance regulations, as most of them are detachable. However, this does not relieve the commander of the responsibility for maintaining vehicle classification signs for all vehicles in his command. Therefore, use of expedient materials and local fabrication of expedient signs may become necessary.

106. Vehicles to be Marked

All vehicles in use by the forces of the North Atlantic Treaty Organization will be marked except that the following marking will be optional:

a. Vehicles having a gross weight of 3 tons or less.

b. Baggage or other pole type trailers with a rated capacity of 1½ tons or less.

Section II. SPECIFIC MARKINGS AND THEIR APPLICATION

107. General

The vehicle markings standardized for vehicles included vehicle classification signs, national distinguishing symbols, general officer markings, tac-

tical markings, air to ground recognition markings, special markings, priority vehicles, and marking of movement serials.

108. Standard Vehicle Classification Signs

There are two types of vehicle signs—*front signs* and *side signs*. Both signs are circular in shape and will be marked in contrasting colors consistent with camouflage requirements. As a rule black figures on a yellow background will be used. These signs apply to the use of bridges and other crossing means. A typical vehicle classification sign is shown in figure 48.

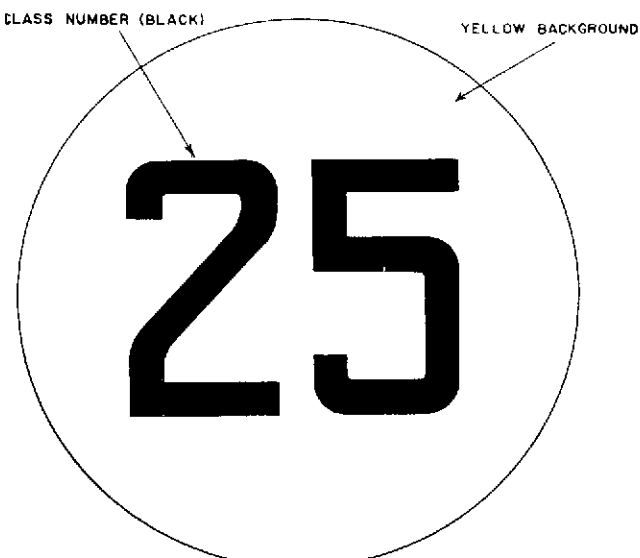


Figure 48. Example of vehicle classification sign.

a. Front Signs. The front signs will be used on *all* vehicles except trailers. This sign will be 9 inches in diameter and, whenever possible, will be placed or painted on the right side of the front of the vehicle facing forward, above or on the bumper, but below the driver's line of vision (fig. 49). Except on *towing vehicles* and *tank transporters*, the front sign will indicate the loaded, solo class of the vehicle. On *towing vehicles*, the front sign will indicate the combined load class of the train. Above this number, the letter C will be written to indicate the vehicle as a towing vehicle (fig. 50). On *tank transporters* and similar type vehicles the fixed front sign will show

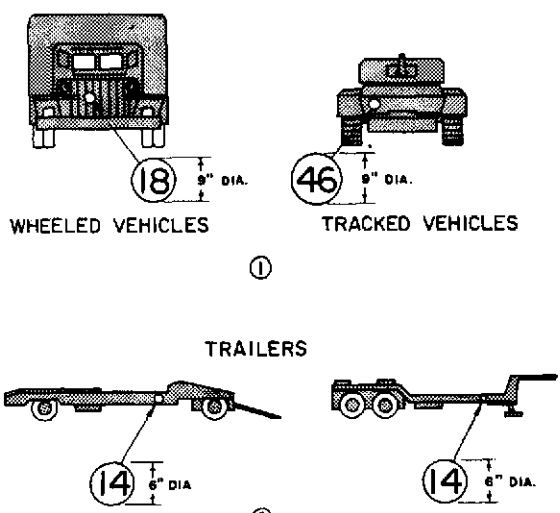


Figure 49. Markings and typical locations of classification signs for single vehicles.

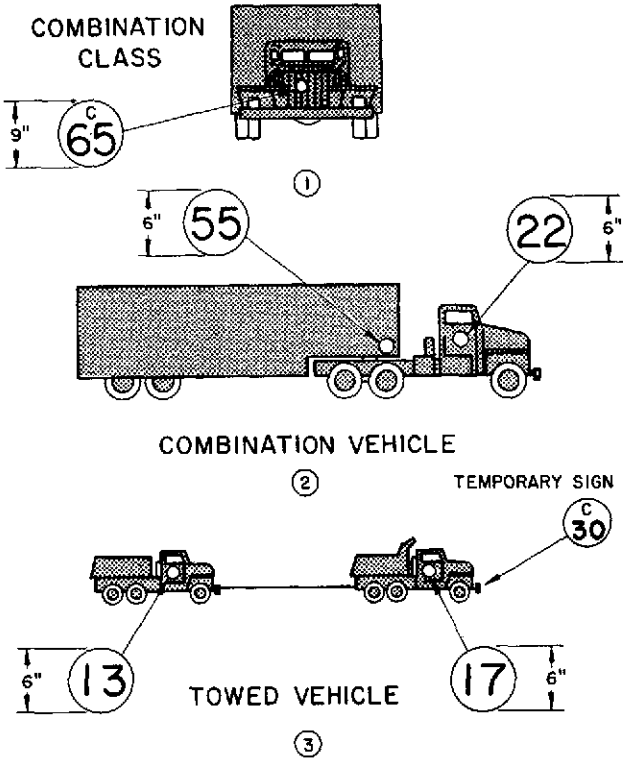


Figure 50. Markings and typical locations of classification signs for combination towed vehicles.

the maximum classification of the loaded vehicle. In addition, one alternative front sign may be carried which will be placed so as to cover the fixed front sign when necessary, to show the class of the vehicle when unloaded.

b. Side Signs. The side signs are used only on prime movers of combination vehicles and trailers

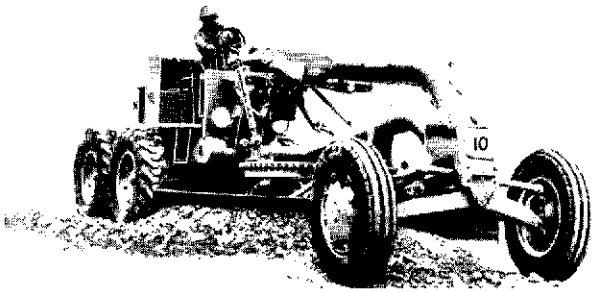


Figure 51. Location of classification sign on grader, road, motorized.

(figs. 49 and 50). This sign is 6 inches in diameter and indicates the loaded solo class of the prime mover or trailer. It is placed or painted on the right side of the vehicle, facing away from the vehicle.

109. Classification Signs Related to Various Vehicles

a. Single vehicles (including tank transporters) carry the front sign only.

b. Towing vehicles carry both front and side signs.

c. Trailers carry side signs only.

d. Special purpose vehicles such as road building equipment are marked. For examples, see figures 51 through 53.

110. National Distinguishing Symbols

The appropriate national symbol (app. VIII)

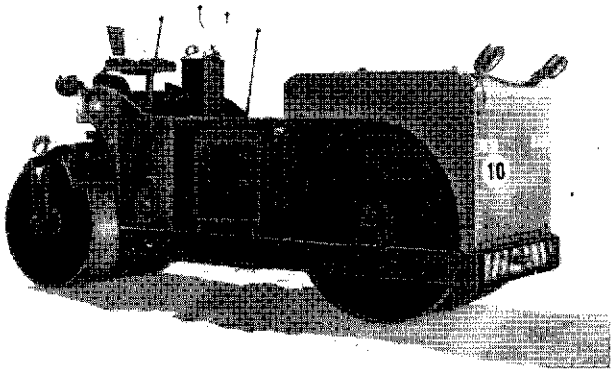


Figure 52. Location of classification sign on roller, road, engine driven.

Figure 53. Location of classification sign on scraper, road, motorized.

will be used to identify vehicles of each country. These symbols will be shown on the front and on the rear. Service symbols may be superimposed upon the national distinguishing symbols or shown separately as an additional symbol.

111. General Officer Markings

a. Vehicles carrying general officers or their equivalent will be marked with X's or stars on a plate. The plates will be positioned at the right end of the front bumper and at the left end of the rear bumper, and will be appropriately marked, as follows:

(1) General of the Army or equivalent—optional.

(2) General or equivalent—4 symbols.

(3) Lieutenant General or equivalent—3 symbols.

(4) Major General or equivalent—2 symbols.

(5) Brigadier General or equivalent—1 symbol.

b. Symbols will be arranged in a horizontal line, and will be approximately 2 inches by 2 inches centered on the plate. The plate will be approximately 6 inches high and 12 inches wide. Color of the plate will be optional with symbols superimposed in white or silver. Symbols will be constructed as demonstrated in figure 54.

c. In addition, flags indicating rank or function of general officers may be flown at the discretion of the field commander or national authority concerned.

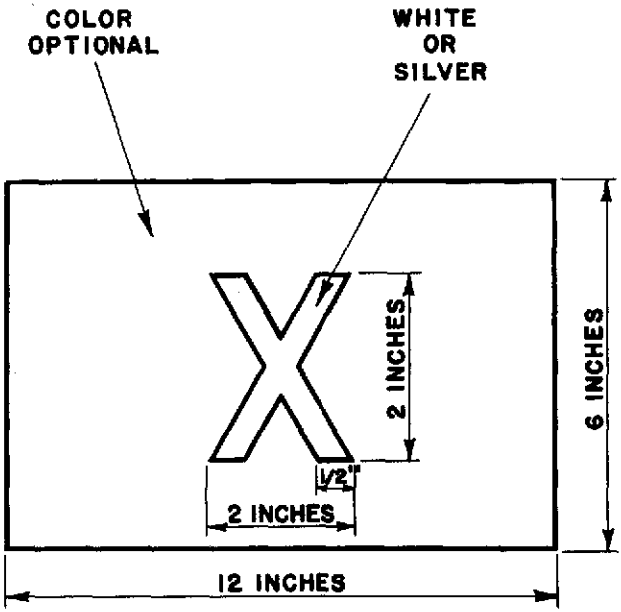


Figure 54. Example of dimensions of symbols for general officer plates.

112. Tactical Markings

Tactical markings serve in general as identification markings within units, and consist of strips and geometrical figures or combinations thereof, and may also include a name. Colors may be used, if necessary. The markings should be large enough to make ground to ground identification of vehicles possible, primarily for easy battlefield recognition. The design and position of such markings will be prescribed by the field commander requiring their

use. They will be removed when vehicles are permanently released from the jurisdiction of the commander prescribing their use.

113. Air to Ground Recognition Markings

Red and yellow fluorescent panels, equipped with tie cords will be used for air to ground recognition markings. The panels will be approximately 6 feet by 2 feet 3 inches. Theater commanders will prescribe the arrangement of panels and the conditions under which they will be used.

114. Special Markings

Military police and traffic control vehicles will be marked prominently front and rear by means of signs bearing the military police or traffic control conventional symbol. Ambulances and other vehicles provided exclusively for medical purposes will be marked in conformity with the rules of the Geneva Convention. One red cross or crescent on a square, white background will be painted on side body panels, roof of body, roof of driver's cab and rear doors or panels. Vehicles of bomb disposal units will have all mudguards painted red. *A red flag flown from any vehicle indicates danger.*

115. Priority Vehicles

Any vehicle which for any reason requires priority over other vehicles may be so marked by any commander having area responsibility. Such priority markings will be valid only in the area of the commander concerned. The marking will con-

sist of an equilateral triangle (fig. 55) having red border lines on a white background. Positioning of the marking will be on the front and rear of the vehicle, and will be marked inside the triangle with red symbols. The symbol inside the triangle will indicate the commander authorizing the use of the priority sign. This sign must be removable in order to avoid misuse and normally will be used only on direct orders of the commander concerned. A single priority sign may be used if visible from both front and rear. The size of the vehicle concerned will govern the size of a priority sign.

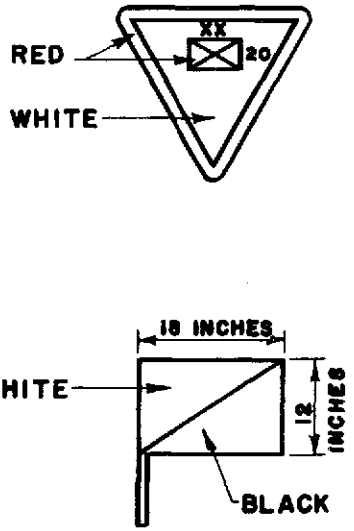


Figure 55. Example of a priority marking and serial flag (commander).

116. Marking of Movement Serials

a. A movement serial is an element or group of elements within a series which is given a numerical or alphabetical designation for convenience in planning, scheduling, or control of movement.

b. The leading vehicle of each movement serial will carry a blue flag. The rear vehicle in the serial will carry a green flag. A vehicle that cannot maintain its position in a convoy may indicate this condition by displaying a yellow flag.

c. The vehicle of a movement serial commander will display a white and black flag (fig. 55). The leading vehicle will carry a blue flag and the rear vehicle will carry a green flag. Flags should be approximately 12 inches by 18 inches in size. In areas where vehicles drive on the left side of the highway the flag will be mounted on the right side of the vehicle and vice versa where vehicles are driven on the right side.

d. The number or letter assigned to a movement serial will be marked on the front and both sides of each vehicle in the movement. The marking will be clearly visible from the ground and will be so placed as to avoid interference with other prescribed markings.

APPENDIX I

REFERENCES

1. Field Manuals

FM 5–5	Engineer Troop Units
5–6	Operations of Engineer Troop Units
5–30	Engineer Intelligence
5–34	Engineer Field Data
5–35	Engineers' Reference and Logistical Data
19–5	Military Police
19–25	Military Police Traffic Control
21–5	Military Training
21–6	Techniques of Military Instruction
21–26	Map Reading
21–30	Military Symbols
25–10	Motor Transportation, Operations
30–5	Combat Intelligence
30–10	Terrain Intelligence

31–71	Operations in the Arctic
100–5	Field Service Regulations; Operations
100–10	Field Service Regulations; Administration
101–5	Staff Officers' Field Manual; Staff Organization and Procedure
101–10	Staff Officers' Field Manual; Organization, Technical, and Logistical Data.

2. Technical Manuals

TM 5–232	Elements of Surveying
5–250	Roads and Airfields
5–260	Principles of Bridging
9–2800	Military Vehicles
9–2800–1	Military Vehicles (Ordnance Corps Responsibility)
30–246	Tactical Interpretation of Air Photos

3. Other Military Publications

AR 220–50	Regiments; General Provisions
AR 220–60	Battalions, Battle Groups, Squadrons; General Provisions
AR 220–70	Companies; General Provisions

AR 320–5	Dictionary of United States Army Terms
AR 320–50	Authorized Abbreviations and Brevity Codes
DA Pam 108–1	Index of Army Motion Pictures, Film Strips, Slides, and Phono Recordings.
DA Pam 310–1	Index of Administrative Publications (Army Regulations, Special Regulations, Department of the Army Pamphlets, General Orders, Bulletins, and Circulars).
DA Pam 310–2	Index of Blank Forms.
DA Pam 310–3	Index of Training Publications; Field Manuals, Reserve Officers' Training Corps Manuals, Training Circulars, Army Training Programs and Mobilization Training Progams, Army Subject Schedules, Army Training Tests, War Department and Department of the Army Posters, and Firing Tables and Trajectory Charts.
DA Pam 310–4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.

APPENDIX II

GUIDES FOR DETERMINING LOAD-BEARING CAPACITY OF ROADS

1. General

a. Guides for determining the load-bearing capacity of roads require an elementary knowledge of the structure and the design of roads (TM 5–250).

b. A road is an open way provided for the convenient passage of personnel, vehicles, and animals.

c. The load-bearing capacity of a road is its ability to support traffic. It is expressed in the same manner as vehicle classification, i.e., by a numerical value.

2. Roads

The component parts of a road are usually a pavement or surface, a base course, and a subgrade (fig. 56).

a. The surface or pavement of a road is the top portion of the road structure. It comes into direct contact with the wheel load or tracked load. It is intended to resist traffic wear and dusting and to prevent surface water from infiltrating into the road structure. It may consist of such materials as—

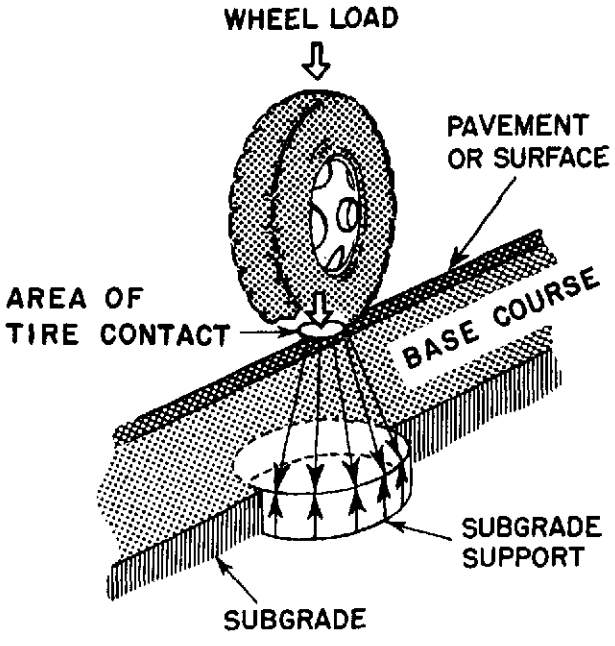


Figure 56. Section of road and wheel loading.

(1) Earth,
(2) Sand-clay,
(3) Gravel,
(4) Bituminous mixes,
(5) Concrete, or
(6) Paving brick, block, or stone.

b. The base course of a road is the intermediate portion of a road structure which distributes the induced stresses from the wheel or tracked load

so that they will not exceed the strength of the subgrade. Base courses are usually made from selected gravel or crushed rock.

c. The subgrade is the foundation of a road structure. It supports the load placed upon the surface of the road. Improved roads usually have a subgrade composed of selected material found in the immediate vicinity of the road.

3. Surfaces

Surfaces of roads may be flexible or rigid.

a. Flexible road surfaces may be composed only of the natural earth material of which the road is constructed; may be composed of this earth material stabilized with oil, cement, or other material; or may be a bituminous pavement.

b. Rigid road surfaces are usually made of portland cement concrete. Brick, block, and stone may also be considered rigid surfaces.

4. Soils

Soils form the basis for the vast majority of roads. Elevated roadways are a notable exception. Soils, briefly, are considered here according to their type, their classification, and their allowable foundation bearing pressure. Soil types are listed and described in table X. A soil classification chart is given in table XI. Allowable foundation bearing pressures for various kinds of soil under specified conditions are given in table XII.

Table X. Principal Soil Types

Name	Description
Gravel	A mass of detached rock particles, generally waterworn, which pass a 3-inch sieve and are retained on a No. 4 sieve (0.187 inches).
Sand	Granular material composed of rock particles which pass a No. 4 sieve (0.187 inches) and are retained on a No. 200 sieve (0.0029 inches). It is difficult to distinguish sand from silt when the particles are uniformly small. Dried sand, however, differs from silt in that it has no cohesion and feels more gritty.
Silt	A fine, granular material composed of particles pass the No. 200 sieve (0.0029 inches). It lacks plasticity and has little dry strength. To identify: prepare a pat of wet soil and shake it horizontally in the palm of the hand. With typical inorganic silt, the shaking action causes water to come to the surface of the sample, making it appear glossy and soft. Repeat tests with varying moisture contents. Squeezing the sample between the fingers causes the water to disappear from the surface and the sample quickly stiffens and finally cracks or crumbles. Allow sample to dry, and test its cohesion and feel by crumbling with the fingers. Typical silt shows little or no dry strength and feels only slightly gritty in contrast to the rough grittiness of fine sand.
Clay	Extremely fine-grained material composed of particles which pass the No. 200 sieve (0.0029 inches). To identify: work a sample with the fingers, adding water

Table X. Principal Soil Types—Continued

Name	Description
Clay—Continued	when stiffness requires. Moist sample is plastic enough to be kneaded like dough. Make further test by rolling ball of kneaded soil between palm of hand and a flat surface. Clay can be rolled to a slender thread, about ⅛ inch in diameter, without crumbling; silt crumbles, without forming a thread. Measure hardness of dry clay by finger pressure required to break a sample. It requires much greater force to break dry clay than dry silt. Clay feels smooth in contrast to the slight grittiness of silt.
Organic	Soil composed of decayed or decaying vegetation; sometimes mixed with fine-grained mineral sediments, such as peat or muskeg. Identified by coarse and fibrous appearance and odor. Odor may be intensified by heating. Plastic soils containing organic material can be rolled into soft, spongy threads.

Table XI. Soil Classification Chart

Major divisions	Sub-divisions	Soil groups and typical names	Group symbols	Compressibility and expansion	Value as foundation when not subject to frost action
Coarse-grained soils.	Gravels and gravelly soils.	Well-graded gravel and gravel-sand mixtures; little or no fines.	GW	Almost none	Excellent.
		Well-graded gravel-sand-clay mixtures, excellent binder.	GC	Slight	Good.
		Poorly graded gravel and gravel-sand mixtures, little or no fines.	GP	Almost none	Good to excellent.
		Silty gravels, gravel-sand-silt mixtures.	GM	Very slight	Good to excellent.
		Well-graded sands and gravelly sands, little or no fines.	SW	Almost none	Good.

	Sands and sandy soils.	Well-graded sand-clay mixtures, excellent binder.	SC	Slight to medium.	Fair to good.
		Poorly graded sands, little or no fines.	SP	Almost none	Fair to good.
		Silty sands, sand-silt mixtures.	SM	Very slight to medium.	Fair to good.
Fine-grained soils.	Fine-grained soils.	Silts (inorganic) and very fine sands, Mo, rock flour, silty or clayey fine sands with slight plasticity.	ML	Slight to medium.	Fair to good.
		Clay (inorganic) of low to medium plasticity, sandy clays, silty clays, lean clays.	CL	Medium	Fair to poor.
	LL <50	Organic silts and organic silt-clay of low plasticity.	OL	Medium to high.	Poor.

Table XI—Continued

Major divisions	Sub-divisions	Soil groups and typical names	Group symbols	Compressibility and expansion	Value as foundation when not subject to frost action
Fine-grained soils—Con.	Fine-grained soils. LL <50	Micaceous or diatomaceous fine sandy and silty soils, elastic silts.	MH	High	Poor.
		Clays (inorganic) of high plasticity, fat clays.	CH	High	Poor to very poor.
		Organic clays of medium to high plasticity.	OH	High	Poor to very poor.
Highly organic soils.		Peat and other highly organic soils.	Pt	Very high	Not suitable.

Note. C—clay; F—fines-material less than 0.1 mm; G—gravel; H—high compressibility; L—low to medium compressibility; M—very fine sand, silt, rock flour; Mo—fine-grained sand with little or no plasticity; O—organic matter; P—poorly graded; Pt—peat; S—sand; W—well-graded; LL—liquid level.

Table XII. Allowable Foundation Bearing Pressures

Soil			Maximum allowable pressure (lb per sq ft)
General description	Classification	Condition	
Fine grained soils		Soft, unconsolidated, having high moisture content.	1,000
Clay, silts, very fine sands or mixtures of these containing a few coarse particles of sand or gravel.	MH, CH OH, ML	Stiff, partly consolidated medium moisture content.	4,000
	CL, OL	Hard, well consolidated, low moisture content, slightly damp or dry.	8,000
Sands and well-graded sandy soils, containing some silt, and clay.	SW, SC	Loose, not confined	3,000
	SP	Loose, confined	5,000
	SF	Compact	10,000

Table XII. Allowable Foundation Bearing Pressures—Continued

Soil			Maximum allowable pressure (lb per sq ft)
General description	Classification	Condition	
Gravel and well-graded gravelly soils containing some sand, silt, and clay.	GW	Loose, not confined	4,000
	GC	Loose, confined	6,000
	GP	Compact	12,000
	GF	Cemented sand and gravel	16,000
Rock		Poor quality rock, soft and fractured, also hardpan.	10,000
		Good quality; hard and solid	[1] 20,000

[1] Minimum.

5. Load-Bearing Capacity

a. The load-bearing capacity of a road, considered by itself, is measured in pounds of allowable wheel load. It is expressed in a series of whole numbers between 4 and 150 in the same manner as vehicle classification numbers. These numbers and their significance are given in table XIII.

b. An approximation of the load-bearing capacity of a road with a flexible pavement may be obtained from the data in figure 57.

c. Computation of the approximate load-bearing capacity of a road, considered by itself, can be made from a determination of the thickness of the surface course or pavement, the thickness of the base course, and the type of subgrade material. By applying this information to tables X, XI, XII and the curves in figure 57, the approximate load-bearing capacity is obtained. The accuracy of this method is entirely dependent on the experience and judgment of the reconnaissance personnel.

Table XIII. Hypothetical Vehicle Classification Numbers and Their Significance

Hypothetical vehicle classification number	Maximum single axle load (tons)	Maximum single wheel load (pounds)
4	2.5	2,500
8	5.5	5,500
12	8.0	8,000
16	10.0	10,000
20	11.0	11,000
24	12.0	12,000
30	13.5	13,500

Table XIII. Hypothetical Vehicle Classification Numbers and Their Significance—Continued

Hypothetical vehicle classification number	Maximum single axle load (tons)	Maximum single wheel load (pounds)
40	17.0	17,000
50	20.0	20,000
60	23.0	23,000
70	25.5	25,500
80	28.0	28,000
90	30.0	30,000
100	32.0	32,000
120	36.0	36,000
150	42.0	42,000

d. The California Bearing Ratio (CBR) (fig. 57) is a measure of the shearing resistance of a soil under carefully controlled density and moisture conditions, which is used with empirical curves for designing flexible road pavements. It is expressed as a ratio of the unit load required to force a piston into the soil, to the unit load required to force the same piston the same depth into a standard sample of crushed stone.

e. An example of the computation of the load-bearing capacity of a road follows:

(1) By field inspection, it is determined that the road has a 10-inch compacted gravel base course and a 3-inch bituminous surface course or pavement. This is a combined thickness of 13 inches. By use of the identification method given in table X it is determined that the subgrade consists of well-consolidated, fairly dry clay.

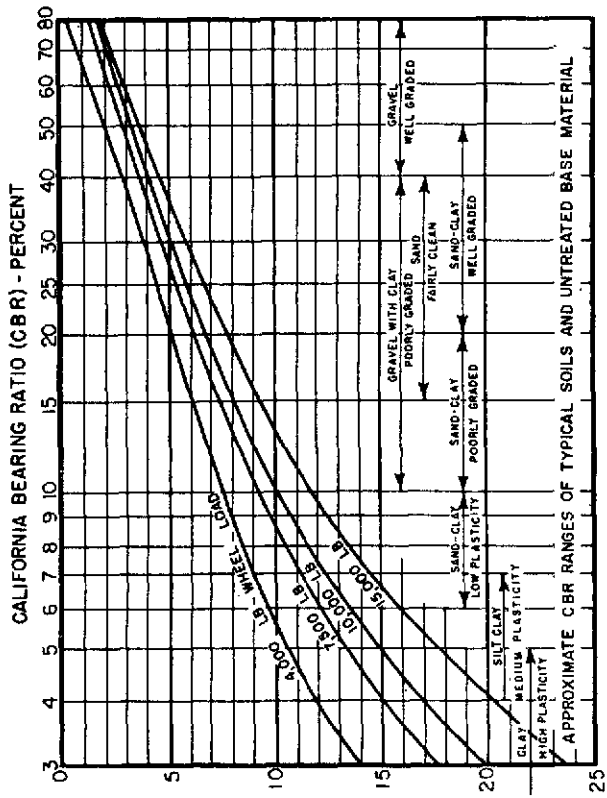


Figure 57. Load-bearing capacity of roads with flexible pavements.

(2) Fairly dry clay, well-consolidated, is shown in table XI to be in the ML–CL range of soil grouping.

(3) Experience with similar soils indicates that a safe California Bearing Ratio (CBR) value is approximately 8 percent.

(4) Reference to figure 57 shows that for a 13-inch combined thickness of pavement and base course the permissible wheel load is about 13,000 pounds.

(5) Reference to table XIII shows that this wheel load corresponds to a vehicle classification number 30.

(6) The road is given the classification number 30.

f. When the road classification number is larger than the classification number for the weakest bridge on a route, the bridge classification number limits use of the route.

APPENDIX III
BRIDGE SPANS

1. General

Bridge spans may be divided into two general classes: fixed bridges and movable bridges, as enumerated below.

a. Fixed bridge spans (fig. 8) are further divided into eight types according to structure design. These types, which are discussed in more detail in paragraphs 2 through 9 of this appendix, are cantilever, slab, beam (simple or continuous stringer), truss, girder, arch, suspension, and ponton (floating).

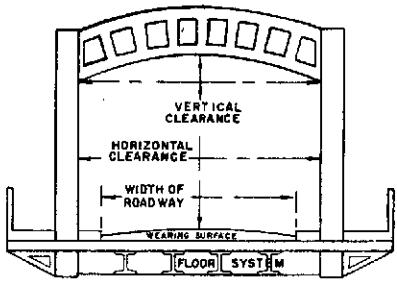
b. Movable bridges are discussed in paragraph 10 of this appendix.

c. Principal bridge span dimensional data are illustrated in figure 58, and principal dimensional requirements are given in table I.

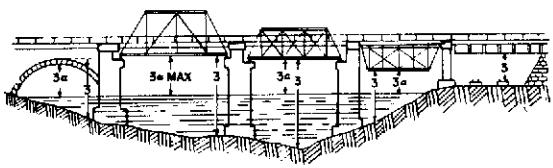
d. Capacity dimension data requirements are presented in table II.

2. Cantilever Bridges

A cantilever bridge is one in which two self-supporting beams or trusses, project from piers toward each other, with no intermediate support. These beams are either joined directly to one another or are connected by a suspended span. Figure



(1) MEASURING WIDTH OF ROADWAY AND CLEARANCES



DIMENSION 3 - HEIGHT ABOVE STREAMBED (GROUND)
DIMENSION 3a - HEIGHT ABOVE NORMAL WATER LEVEL

(2) MEASURING HEIGHT ABOVE STREAM BED AND NORMAL WATER LEVEL.

Figure 58. Principal bridge span dimensional data.

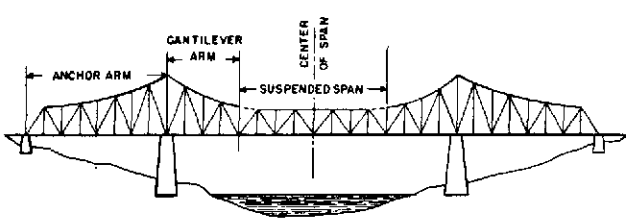


Figure 59. Typical cantilever bridge.

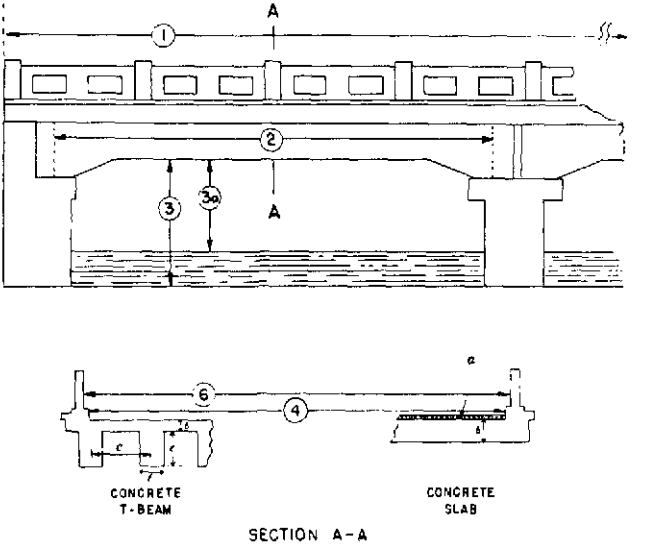


Figure 60. Standard dimension data guide for concrete bridges.

59 illustrates a cantilever bridge and designates its sections.

3. Slab Bridges

a. Slab bridges are short span bridges consisting primarily of a reinforced concrete slab resting directly on the abutments or intermediate supports. A wearing surface of bituminous material, gravel, or wooden planks is usually laid over the concrete, but sometimes the upper side of the slab is the wearing surface.

b. A standard dimension data guide for concrete

bridges is given in figure 60. A typical concrete slab bridge is illustrated in figure 61.

4. Beam Bridges

a. The majority of all bridges with short spans are simple stringer bridges. Stringers are generally constructed of steel, concrete, or wood. A standard dimension data guide for simple stringer bridges is given in figure 62. The most common types of stringers are as follows:

(1) Wooden stringers.
  (a) Rectangular timber (fig. 63).
  (*b*) Log (fig. 64).
(2) Steel stringers.
  (*a*) I-beam (figs. 65 and 66).
  (*b*) Wide flange (WF) beam.
  (*c*) Channel.
  (*d*) Rail.
  (*e*) Plate girder.

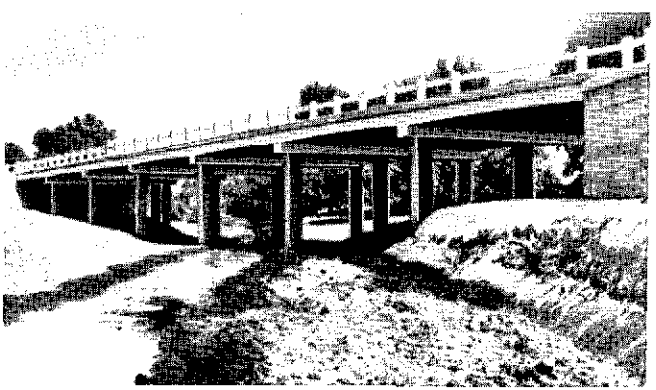


Figure 61. Typical concrete slab bridge.

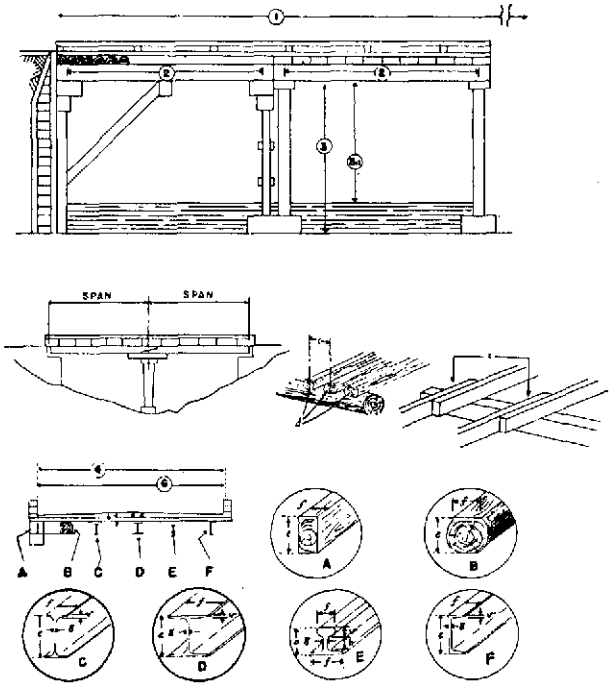


Figure 62. Standard dimension data guide for simple stringer bridges.

b. Beam span bridges are reinforced concrete bridges in the form of slabs resting on a series of rectangular beams. Beams and slabs are poured integrally. The beams may be reinforced with standard rods, steel T-beams, I-beams, or channels. The wearing surface of the roadway may consist of bituminous material or wooden planking laid on top of the concrete slab. A standard dimension

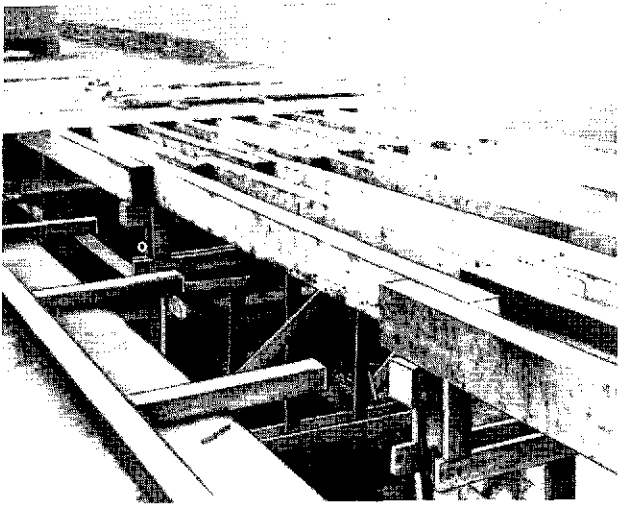


Figure 63. Simple stringer bridge with rectangular timber stringers.

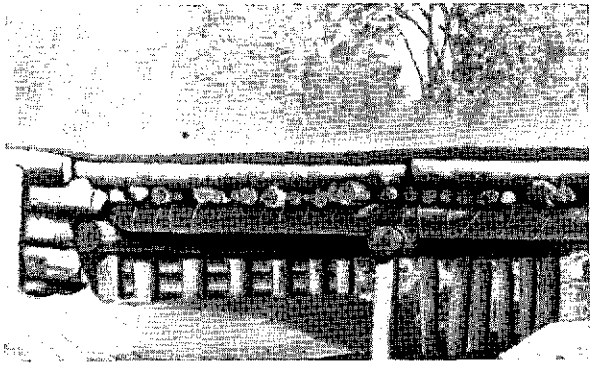


Figure 64. Simple stringer bridge with log stringer.

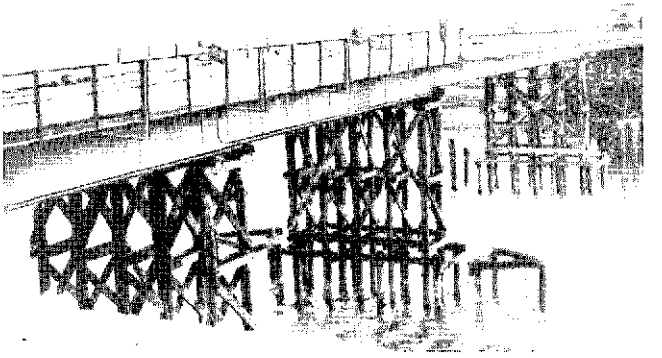


Figure 65. Simple stringer bridge with steel I-beams and timber flooring.

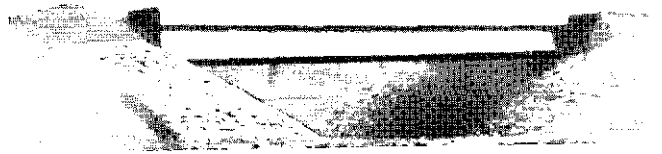


Figure 66. Simple stringer bridge with steel I-beams and concrete slab flooring.

data guide for concrete bridges is given in figure 60. Typical single span and multispan concrete bridges are illustrated in figures 67, 68, and 69.

5. Truss Bridges

a. Truss span bridges are used for spans which

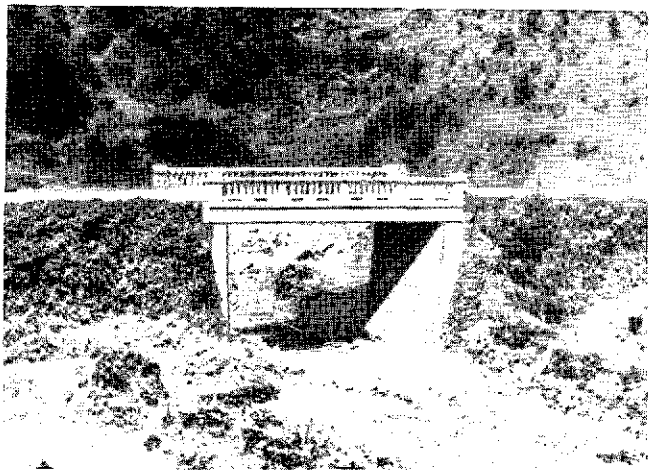


Figure 67. Typical single span concrete bridge.

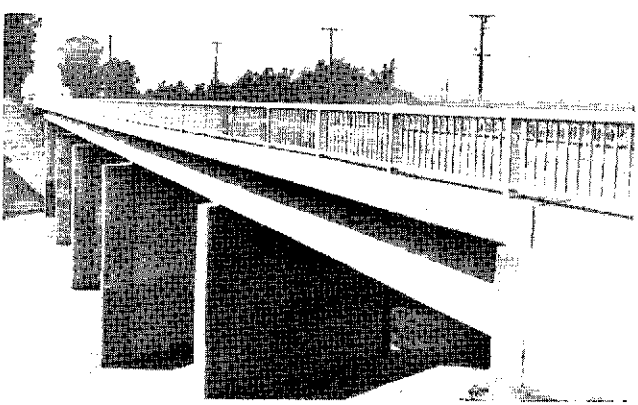


Figure 68. Typical concrete bridge.

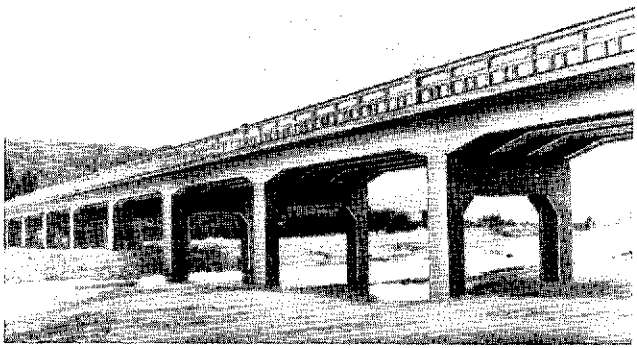


Figure 69. Typical multispan concrete T-beam bridge.

are too long for simple stringer or girder bridges. The truss is a compound beam in which the parts are arranged to form one or more triangles in the same plane, It carries the roadway loads, transmitted from the bridge flooring to the abutments and intermediate supports. Trusses are usually constructed of steel, although wood truss bridges are found in or near areas where timber is abundant.

b. A standard dimension data guide for truss bridges is given in figure 70.

c. Classification of truss types, by the position of the roadway (fig. 71), follows:

(1) *Deck truss.* The roadway is located above or on the top chord.

(2) *Through truss.* The roadway is situated near the bottom chord, and overhead bracing (crosswise) is frequently provided.

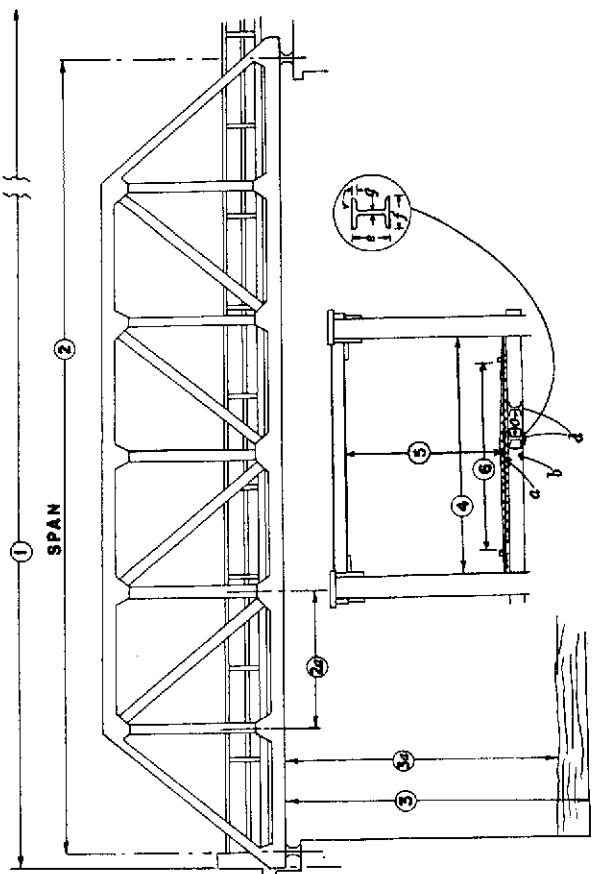
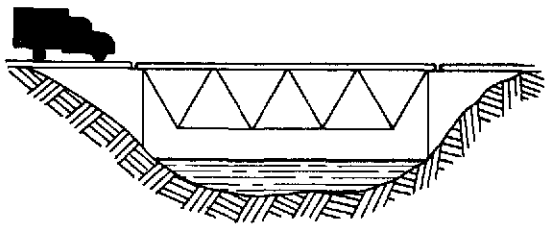
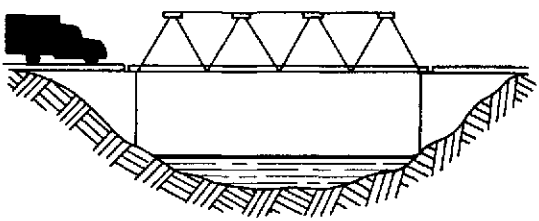


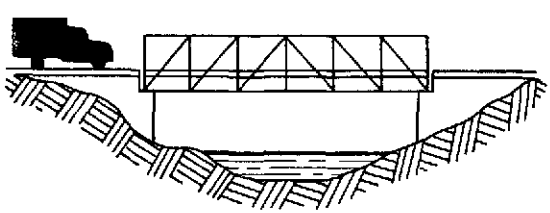
Figure 70. Standard dimension data guide for steel truss bridges.



DECK TYPE



THROUGH TYPE



HALF-THROUGH OR PONY TYPE

Figure 71. Classification of truss types by position of roadway.

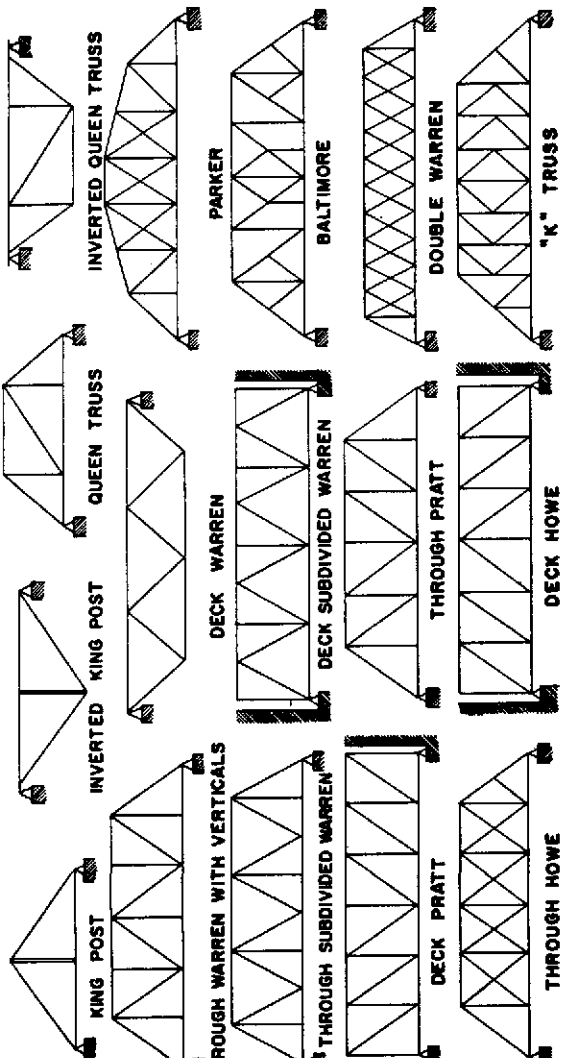


Figure 72. Common types of bridge trusses.

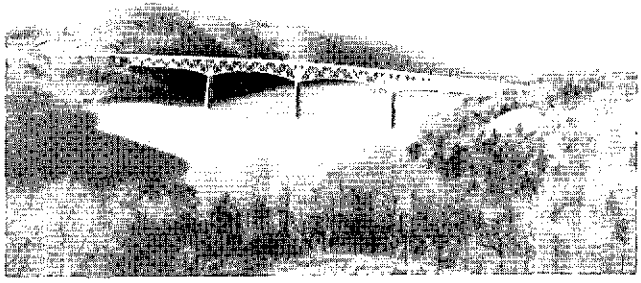


Figure 73. Typical steel deck truss bridge.

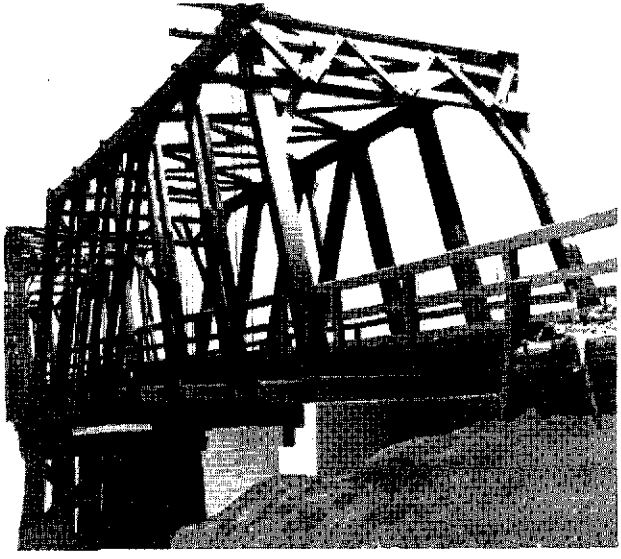
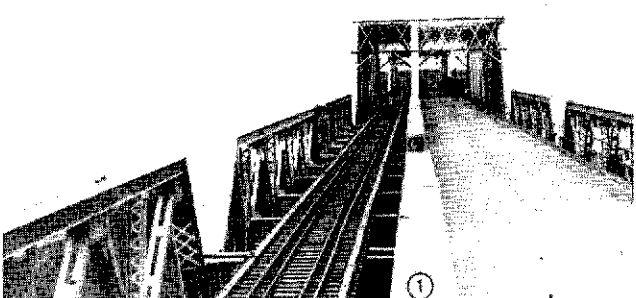


Figure 74. Typical timber truss bridge.

(3) *Pony (half-through) truss.* The roadway is located close to the top chord, and no overhead bracing (crosswise) is provided.

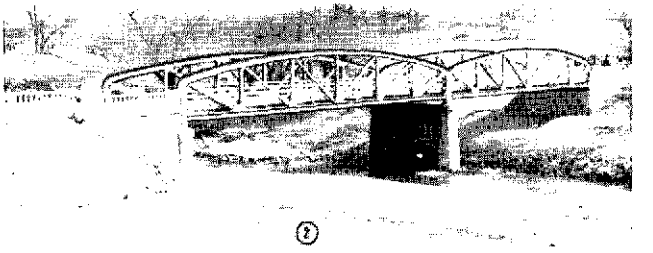
d. Common types of bridge trusses are illustrated in figure 72, but it is not generally necessary to include their names in bridge reconnaissance reports.

Figure 75. Typical steel through truss bridge (Warren type).



1 Pony truss and through truss forming combination bridge

Figure 76. Typical pony truss spans.



2 Pony truss highway bridge

Figure 76—Continued.

e. Typical truss bridges are illustrated as follows:

(1) Typical steel deck truss bridge (fig. 73).
(2) Typical timber truss bridge (fig. 74).
(3) Typical steel through truss bridge (Warren type) (fig. 75).
(4) Typical steel pony truss span on combination streetcar and highway bridge (fig. 76).

6. Girder Bridges

a. Girder span bridges are composed of girders and a floor system. The girder is a compound steel beam, built up of plates, shapes (such as angles, channels, and Z-sections), lattice work, bars, and other elements, which transmit the roadway loads to the intermediate supports and abutments. The floor system is composed of stringers, floor beams, flooring, and a roadway. Normally, girder spans are constructed of steel,

but occasionally they are made of prestressed concrete.

b. A standard dimension data guide for plate girder spans is given in figure 77.

c. Identification of girder bridges is difficult. They may be mistaken for truss bridges or simple stringer bridges. Therefore, it is important to make close inspection of girder bridges and to identify their component parts accurately when capacity calculations are involved. The common types of plate girders are single plate or box type girders. The bridges constructed of these girders are deck plate girder bridges or through plate girder bridges.

(1) *Plate girder span.* The plate girder span is the most common type. The roadway is usually located above the top flange plate of the girder. A typical multispan plate girder bridge is illustrated in figure 78.

(2) *Through type girder span.* If the floor system is carried at or near the level of the lower chords so that the traffic passes between or through the girder, the structure is called a through type girder bridge. This type is illustrated in figure 79.

7. Arch Bridges

a. Arch span bridges are constructed in many types and variations. Basically, an arch bridge consists of an arch (including an arch ring), a crown, a fill and hinges, and a floor system. A

standard dimension data guide for arch bridges is given in figure 80. Common types of arch construction used in bridges are illustrated in figure 81. Nomenclature of arch bridges is given in figure 82.

b. Classification of arch spans, for reconnaissance report purposes, may be given as follows:

(1) Masonry arch (solid earth-filled) and deck type (fig. 83). Appendix VI describes in detail the requirements for classifying masonry arch bridges.

(2) Concrete arch, either solid (earth-filled) or open (spandrel) type, with the roadway usually supported above the arch ring by a series of columns, posts, or small arches (figs. 84 and 85).

(3) Steel arch, either deck type with the roadway resting on the top (horizontal) member of a trussed steel arch, or through type (arch) with the roadway suspended from the arched member (truss or beam) by a series of bars, I-beams, or webbed (latticed) vertical members (figs. 86, 87, and 88).

8. Suspension Bridges

a. Suspension spans have the bridge roadway suspended by means of vertical cables or ropes from two or more suspension cables, which pass over towers and are anchored at the ends. Suspension bridges are usually employed where the construction of intermediate supports is impracticable

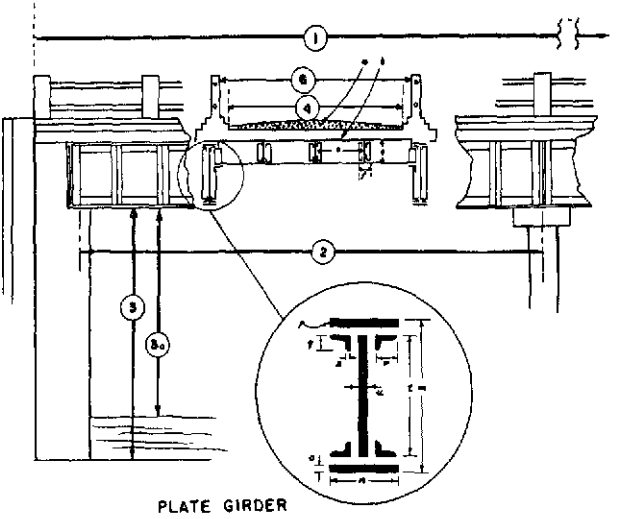


Figure 77. Standard dimension data for plate girder bridges.

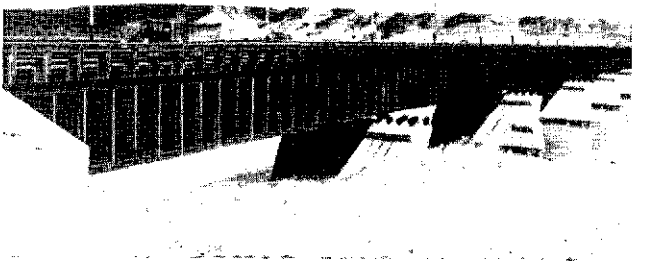


Figure 78. Typical multispan plate girder bridge.

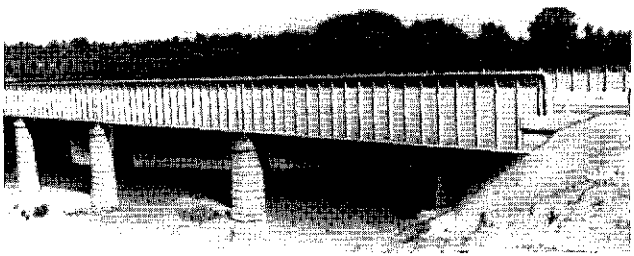


Figure 79. Through type girder bridge.

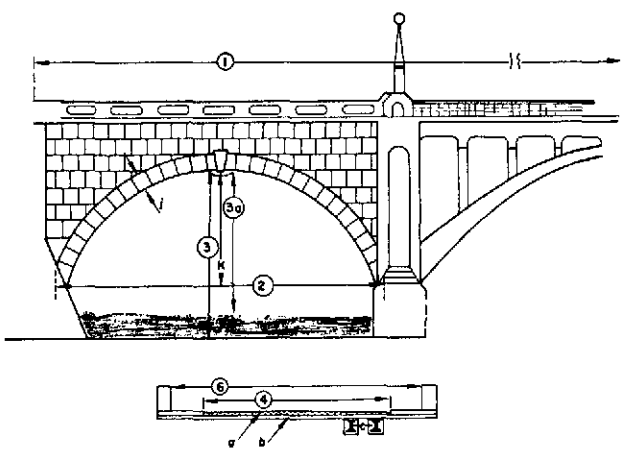


Figure 80. Standard dimension data guide for arch bridges.

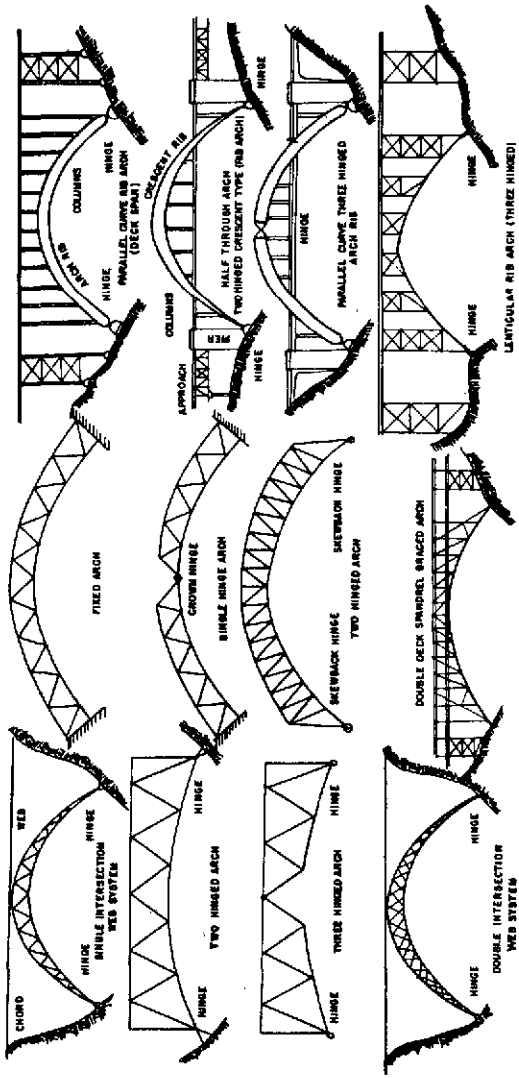


Figure 81. Common types of arch construction.

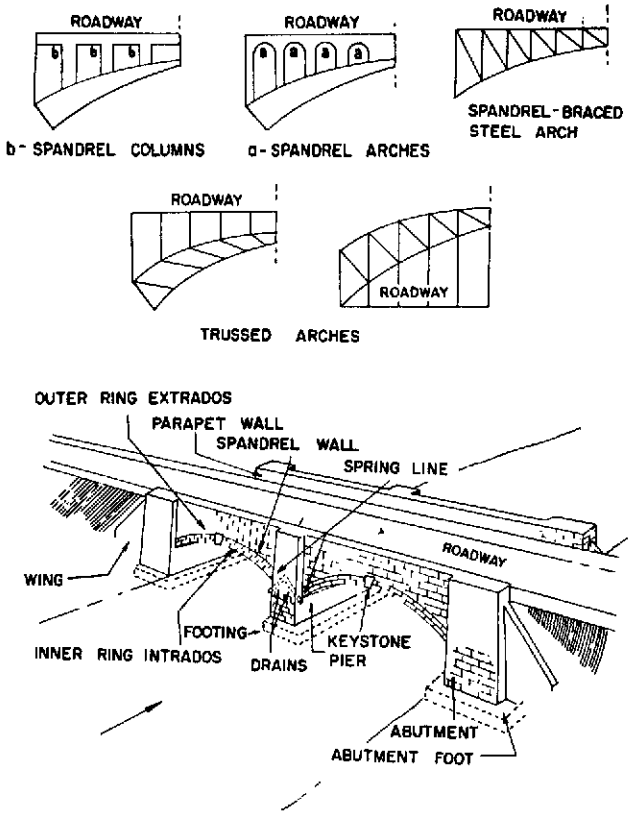


Figure 82. Nomenclature of arch bridges.

due to the depth of the bridge gap, or where navigation must pass under the bridge.

b. A standard dimension data guide for suspension bridges is given in figure 89. Typical suspension bridges are illustrated in figures 90, 91, and 92.

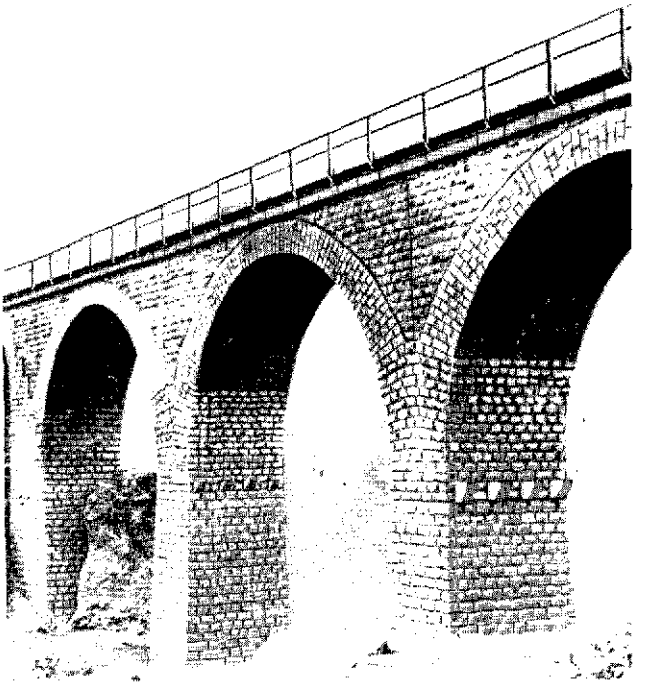


Figure 83. Typical solid masonry arch bridge.

9. Ponton (Floating) Bridges

A ponton (floating) bridge (fig. 93) is a temporary bridge which is supported by low, flat-bottomed boats or other floating structures. The major components are the floats, saddle assembly, and the superstructure which carries the roadway. Some types of military bridges are provided with a ramp or trestle to facilitate the approach. Ponton bridges should be replaced as soon as possi-

Figure 84. Typical solid concrete arch bridge.

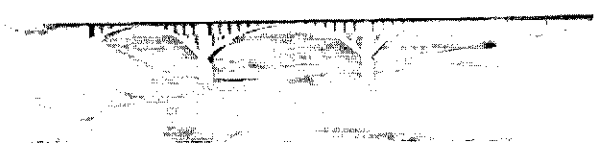


Figure 85. Typical open type (spandrel) concrete arch bridge.

ble by more permanent structures. Although they are essentially fixed bridges of a temporary nature, they may be released at one end to allow passage of ships.

Figure 86. Parallel curve, steel rib, arch bridge.

10. Movable Bridges

a. Movable bridges (fig. 93) may be classified as follows:

(1) Swing bridges.
(2) Lift bridges.
(3) Bascule bridges.
(4) Retractile bridges.

b. Reconnaissance of movable bridges requires the assignment of a special engineer detail.

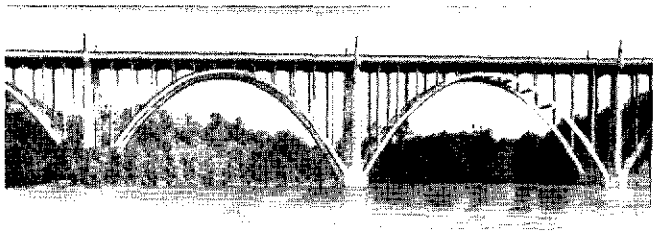


Figure 87. Steel trussed deck arch bridge.

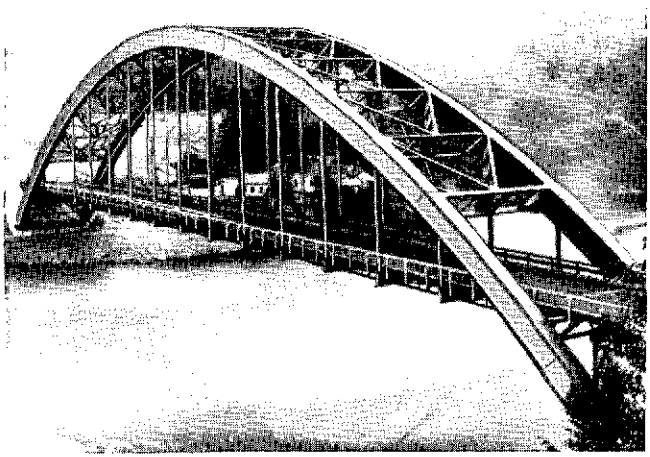


Figure 88. Steel arch bridge, through type.

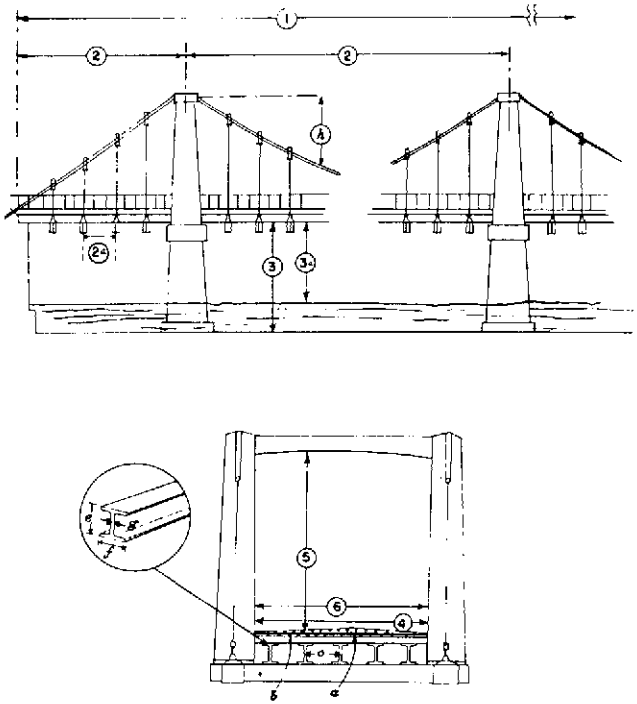


Figure 89. Standard dimension data guide for suspension bridges.

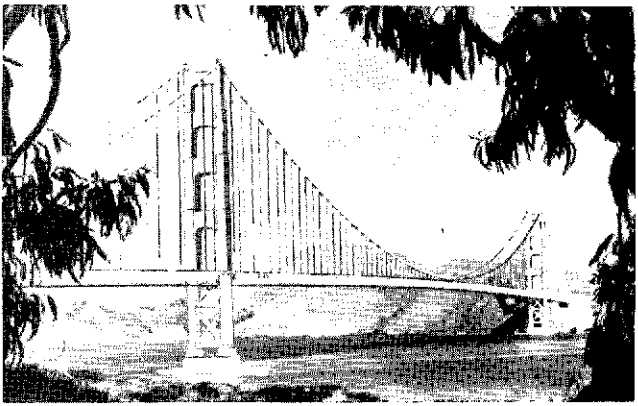


Figure 90. Suspension bridge with steel cable, steel reinforcing truss, steel floor beams, and external sway bracing.

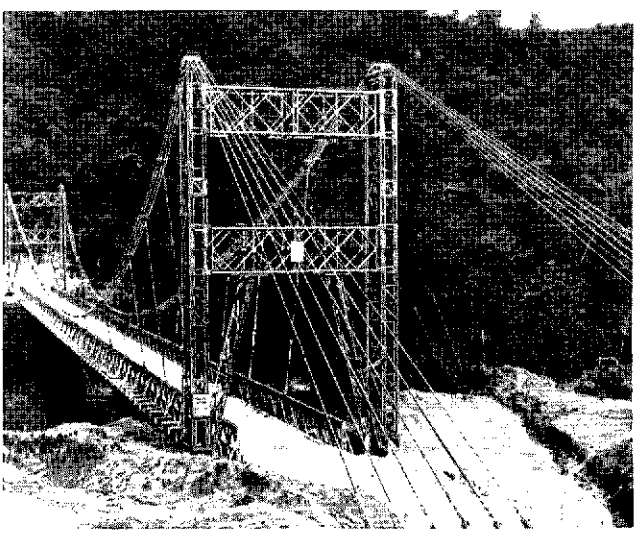


Figure 91. Bailey type suspension bridge.

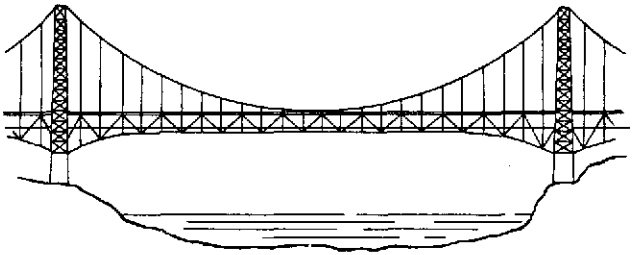
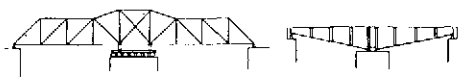
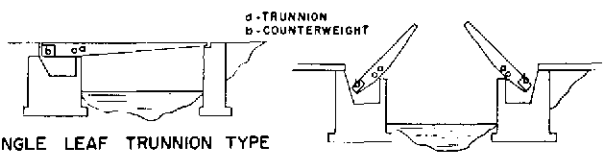
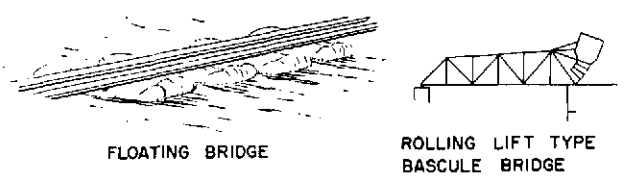


Figure 92. Steel suspension bridge.







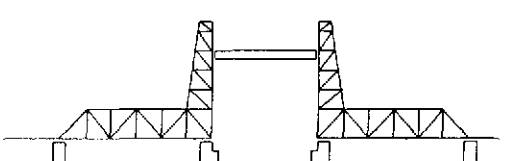


Figure 93. Classification of movable bridges (by type of movable structure) and ponton (floating) bridge.

APPENDIX IV
BRIDGE INTERMEDIATE SUPPORTS

Intermediate supports for bridges are ground supports between abutments. They may be log pile bents (fig. 94), trestle bents (fig. 95), timber trestle bents (fig. 96), timber trestle piers (fig. 97), timber pile piers (fig. 98), crib piers (fig. 99), masonry piers (fig. 100), prefabricated steel trestle piers (fig. 101), open type concrete piers (fig. 102), or solid concrete piers (fig. 103).

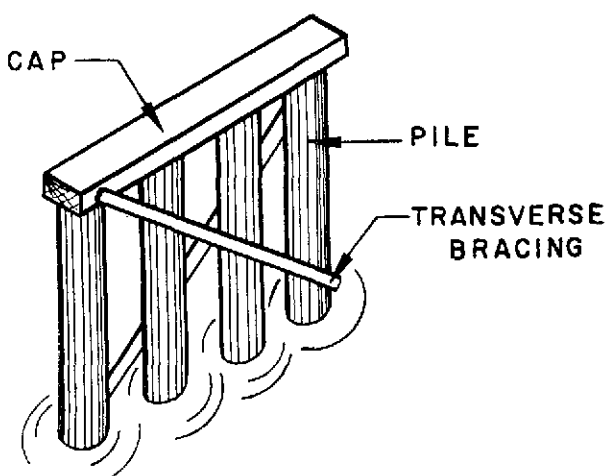


Figure 94. Pile bent.

Figure 95. Typical log trestle bent.

Figure 96. Shaped timber trestle bent.

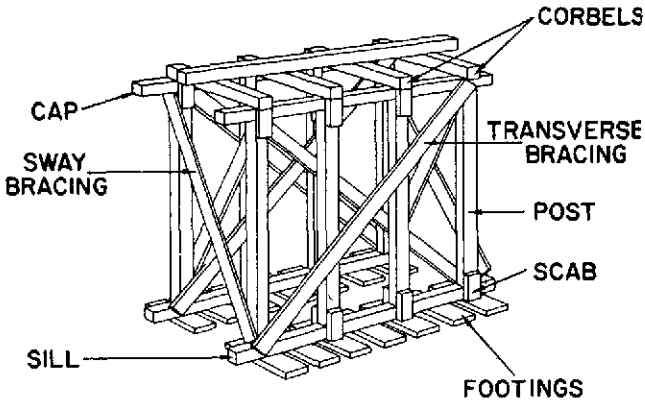


Figure 97. Timber trestle pier.

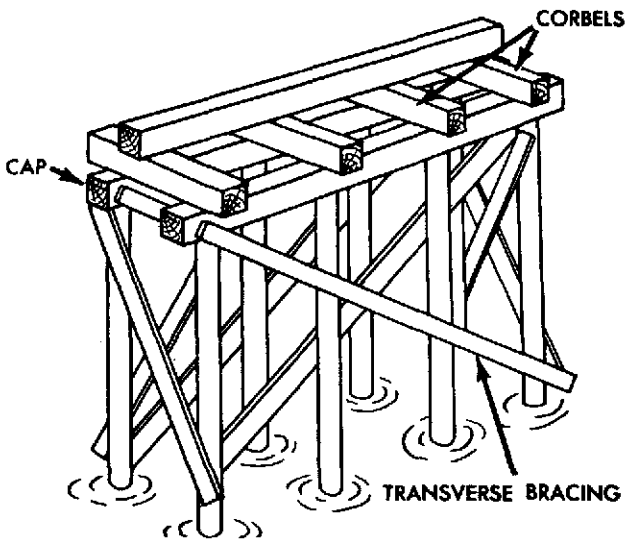


Figure 98. Timber pile pier.

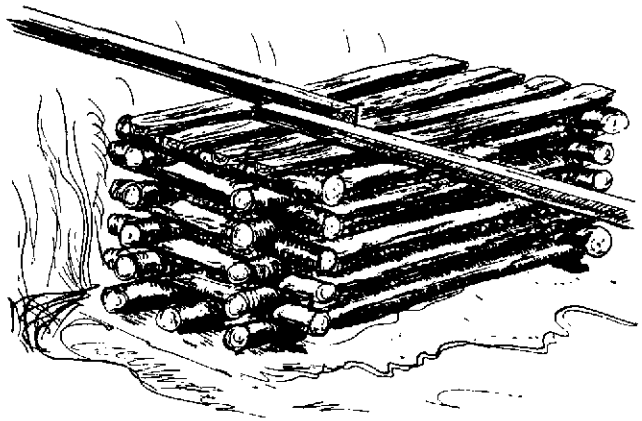


Figure 99. Typical crib pier.

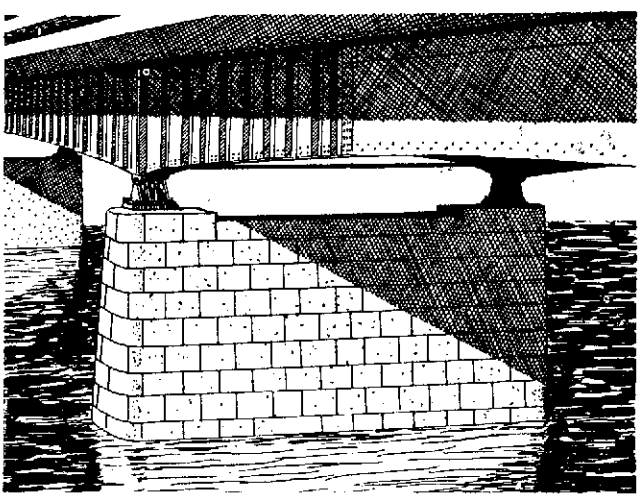


Figure 100. Typical masonry pier.

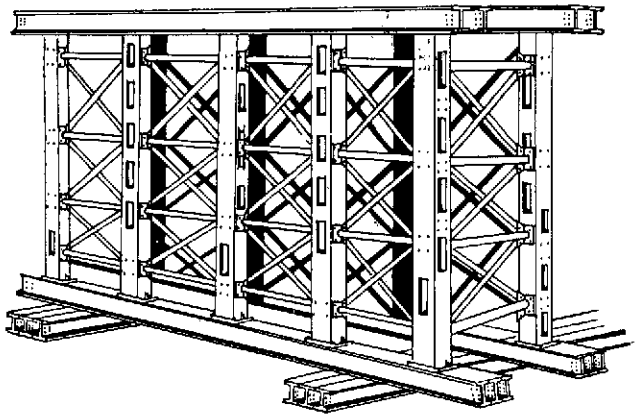


Figure 101. Typical prefabricated steel trestle pier.

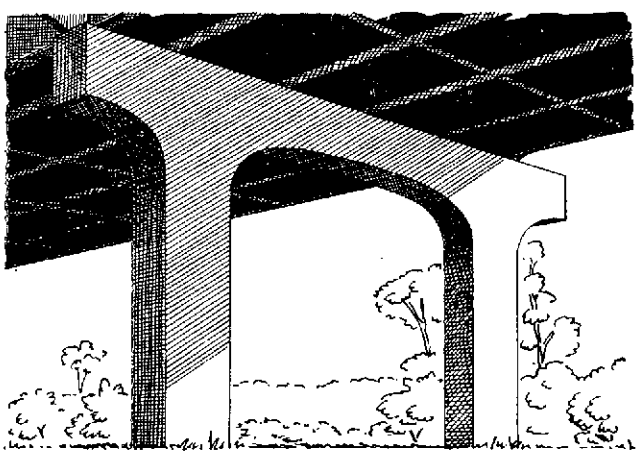


Figure 102. Typical open type concrete pier.

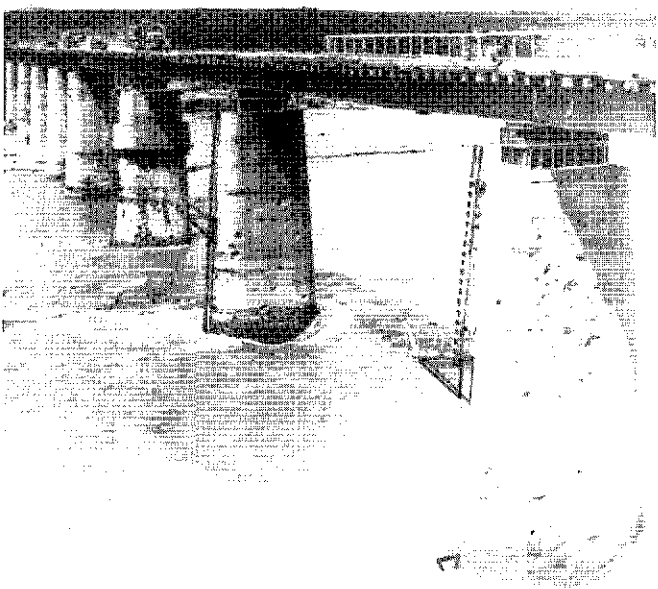


Figure 103. Typical solid concrete pier.

APPENDIX V

BRIDGE ABUTMENTS

Bridge abutments (fig. 104) are the ground supports at the shore ends of a bridge. They may be constructed of concrete, masonry, or earth with a wooden end wall and abutment sill. Typical abutments are as follows:

1. Straight abutment (fig. 105).
2. T-type abutment (fig. 106).

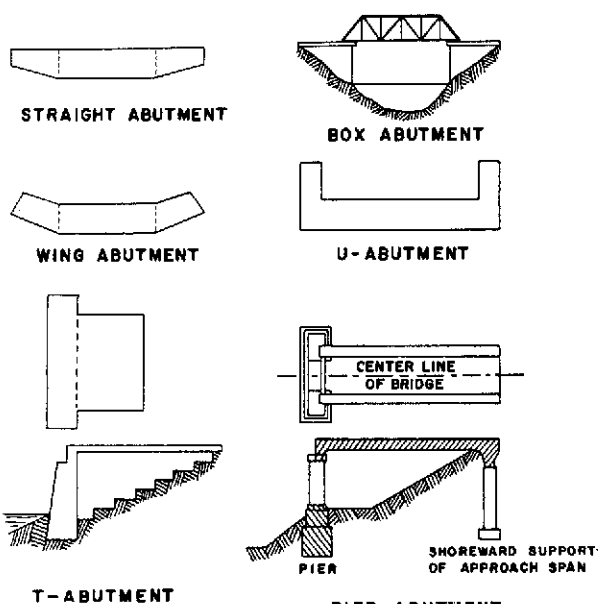


Figure 104. Common types of abutments.

3. U-type abutment (fig. 107).
4. Wing type abutment (fig. 108).
5. Earth abutment, with timber abutment sill and end wall (fig. 109).
6. Pier abutment (fig. 104).
7. Box abutment (fig. 104).

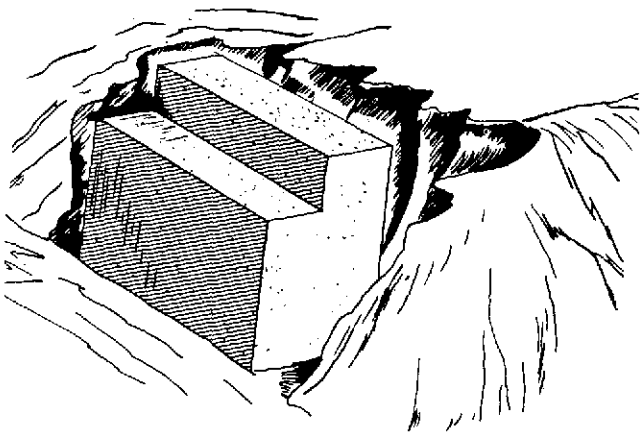


Figure 105. Typical straight abutment.

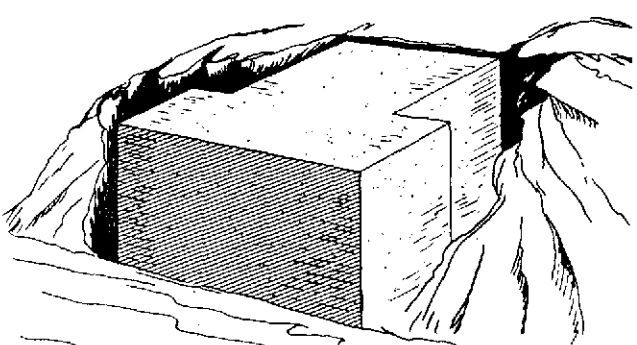


Figure 106. Typical T-type abutment.

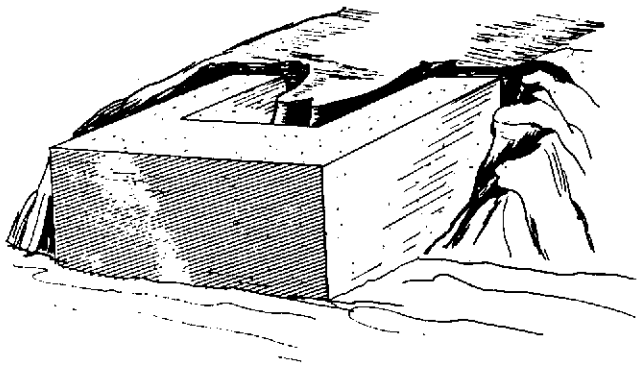


Figure 107. Typical U-type abutment.

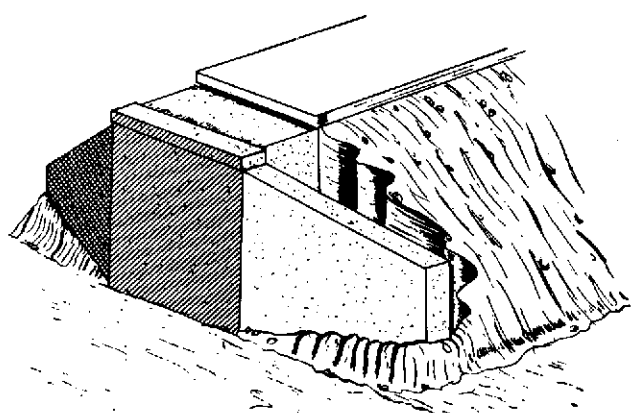


Figure 108. Typical wing type abutment.

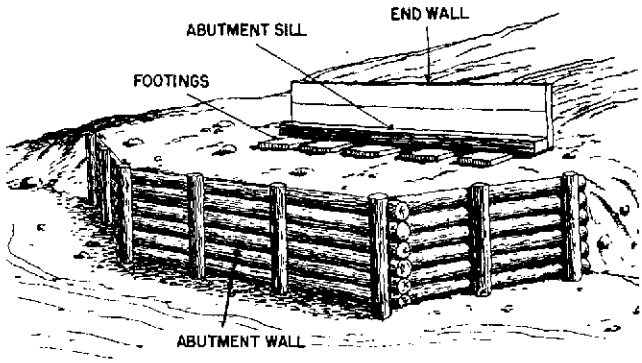


Figure 109. Typical earth abutment, with timber abutment sill and end wall.

APPENDIX VI

DETAILED REQUIREMENTS FOR CLASSIFICATION OF MASONRY ARCH BRIDGES

1. Measurement and Inspection

Technical terms for masonry arch bridges are illustrated in figures 82 and 110. There are two things to be done—

a. Measure the leading dimensions of the bridge.

b. Examine the bridge to determine its condition, construction, and the state of the abutments.

2. Measurement

The following dimensions must be measured (fig. 111).

a. The span (clear span) _____ ② feet

Note. In the case of skew spans, measure parallel to the axis of the roadway.

b. The rise of the arch ring at the crown _____ *k* feet

c. The thickness of the arch ring at the crown _____ *j* feet

d. The depth of fill between the road surface and the arch ring at the crown__ *b* feet

e. The width (in feet) of the bridge between parapets (roadway width).

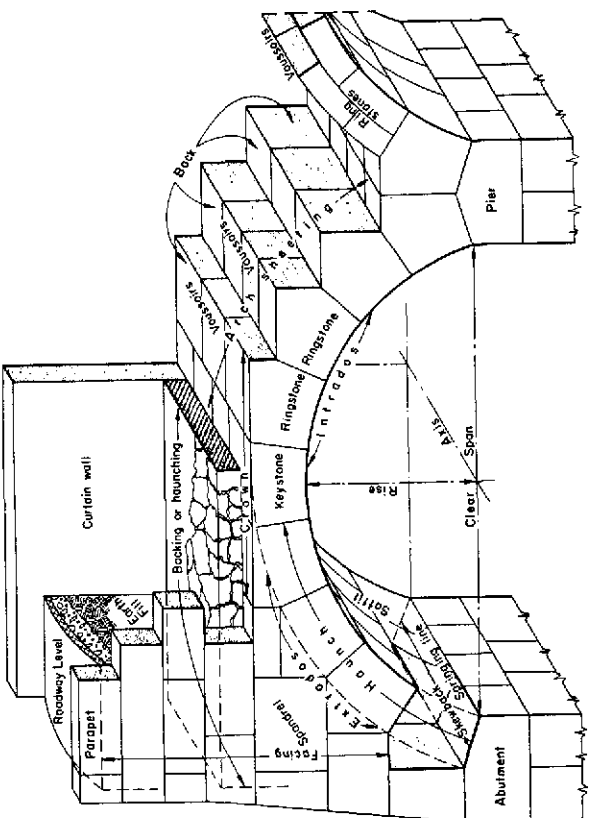


Figure 110. Technical terms for masonry bridges.

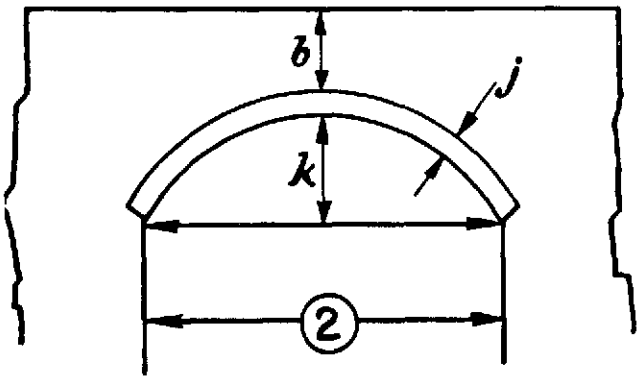


Figure 111. Measurement of masonry arch bridge.

3. Inspection

a. Normally, only exterior features can be examined. Determining and evaluating interior features of construction will be necessary only on important routes where the strength of the bridge is in doubt.

b. Outward appearances can be misleading, for the following reasons:

(1) The thickness of the arch ring under the parapet can be measured, but it does not follow that this thickness is consistent under the roadway.

(2) Some old bridges have been strengthened by removing the fill and replacing it with concrete.

(3) The depth and nature of the backfill to the abutment plays a large part in the stability of the arch.

(4) The arch ring may have dropped away from the fill, so that the latter alone carries the load.

c. Attention must be paid to the following:

(1) *The arch ring.*

(*a*) Nature and condition of the brickwork or masonry.

(*b*) Thickness of the joints.

(*c*) Condition of the mortar.

(*d*) Deformation of the arch ring from its original shape.

(*e*) Presence of cracks — their width, length, number, and position.

(2) *Parapet and spandrel walls.*

(*a*) Sagging of the parapet.

(*b*) Cracks.

(*c*) Outward movement of the parapet relative to the arch ring.

(3) *Abutments.*

(*a*) Failure of the abutment walls by cracking, settlement, or movement.

(*b*) Adequacy of the abutments to resist horizontal arch thrust.

(*c*) Adequacy of the wing walls to restrain the spread of the backfill.

(*d*) Nature of the backfill. This can be discovered only by probing.

(*e*) Nature of the foundation—discovered only by probing.

4. Classification Procedure

A *provisional load class* based solely on span and

thickness of the crown is first obtained. This is then modified by various factors, selected in accordance with the dimensions, construction, and condition of the bridge. The result, termed the *adjusted load class*, is modified to the nearest standard load class to give the *final load class*.

5. Provisional Load Class

Refer to the alinement chart figure 112. Mark the bridge span on column A and the total crown thickness ($j + b$ = ring + fill) on column B. Line through these points to column C, and read off the provisional load class.

6. Profile Factors

Flat arches are not so strong under a given loading as those of steeper profile. A very large rise, however, does not necessarily add to the strength, as failure can occur through the crown of the arch, acting as a smaller arch of flatter rise. For this reason, a span-rise ratio of 4 and less is assumed to give optimum strength, and has a profile factor of 1. When the span-rise ratio is greater than 4, reference is made to figure 113, which gives the appropriate profile factor for the different ratios.

7. Material Factors

To determine material factors (table XIV), the following must be noted (figs. 82 and 110):

a. The material used for the ring.

b. The type of construction—i.e., whether the voussoirs are in courses or laid at random.

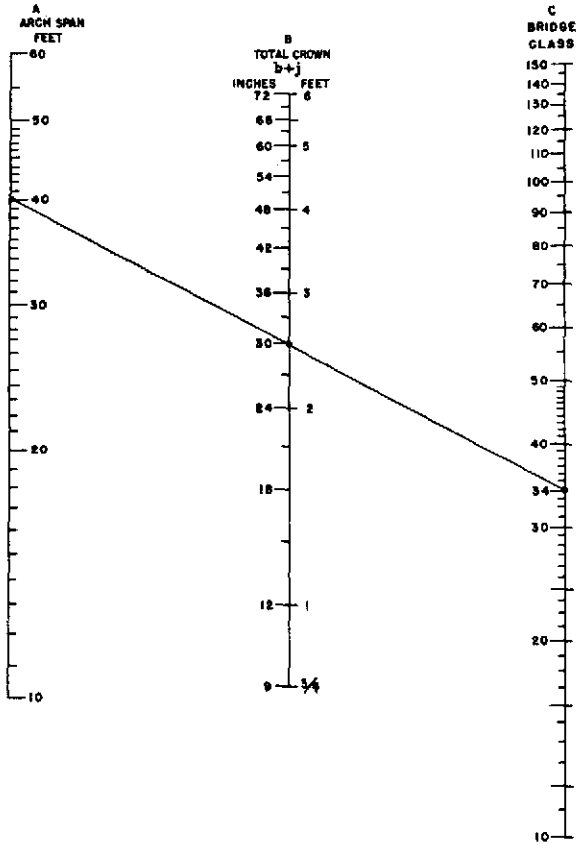


Figure 112. Alinement chart for determining the provisional load classification of masonry arch bridges.

c. The condition of the material—i.e., whether there is much spalling (chipping), and whether the voussoirs are sound or deteriorating due to weathering.

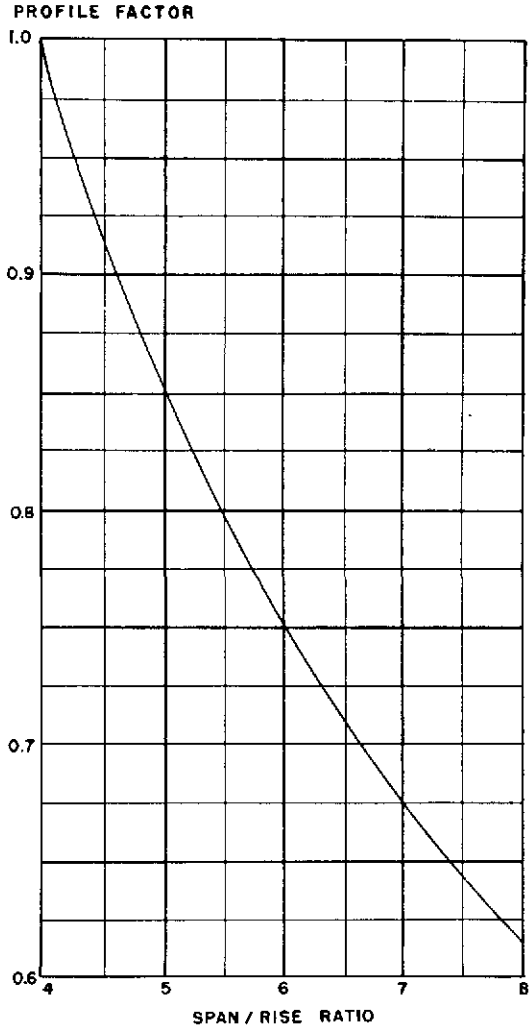


Figure 113. Profile factors for masonry arch bridges.

d. Examine the soffit, and look for signs of disintegration and cracks. Usually the first signs of failure occur at the quarter-points on the intrados.

8. Joint Factors

The strength and stability of the arch ring depend to a large extent on the size and condition of the joints. In this connection, it is necessary to distinguish between cement and lime mortar as a jointing material (table XV). Lime mortar is commonly used in brick construction, particularly on old bridges, and although it is softer than cement mortar and has less strength, this is compensated for by better joint-filling properties and good distributing power under load. Partially-deteriorated cement mortar must not be confused with lime mortar in good condition.

Table XIV. Material Factors for Masonry Arch Bridges

Condition	Material factor
1. Granite, whinstone, and built-in course masonry with large, shaped voussoirs.	1.5
2. Concrete or blue engineering bricks	1.2
3. Limestone, good random masonry, and building bricks in good condition.	1.0
4. Masonry of any kind or brickwork in poor condition (many voussoirs flaking or badly spalling, shearing, etc.). Some discretion is permitted if the dilapidation is only moderate.	0.7–0.5

9. Crack Factors

a. General. The age of cracks is of great importance. Old cracks no longer operating, and which probably occurred soon after the bridge was built, can be ignored. Recent cracks, on the other hand, usually show clean faces, with perhaps small loose fragments of masonry. Although cracks may appear as shear of the bricks or masonry, they normally follow an irregular line through the mortar; care must be taken to observe whether they are cracks and not merely deficiencies of the pointing material.

Table XV. Joint Factors for Masonry Arch Bridges

Type of joint	Joint factor
1. Thin joints, 1/10 inch or less in width	1.25
2. Normal joints, with width up to ¼ inch, regular, straight with mortar in good condition and well pointed.	1.00
3. Ditto, but with mortar unpointed	.90
4. Wide joints, generally over ¼ inch wide and usually irregular; mortar in good condition.	.80
5. Ditto, but with mortar containing voids deeper than one-tenth of the ring thickness.	.70
6. Very wide joints, ½ inch or more in width, with poor mortar having voids deeper than one-tenth of the ring thickness, and so deteriorated that it has the properties of sand alone.	.50

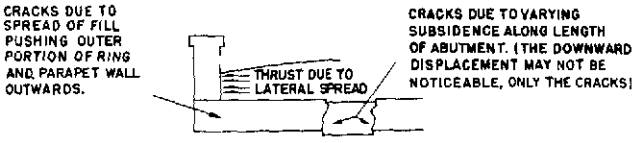


Figure 114. Longitudinal cracks in arch ring.

b. Types of Cracks. Crack factors are given in table XVI. The following are the more important types:

(1) Longitudinal cracks within 2 feet of the edge of the arch, caused by lateral spread of the fill, producing an outward force on the parapet walls and pushing the outer portion of the ring away from the center portion (fig. 114).

(2) Longitudinal cracks within the center third of the bridge, due to varying amounts of subsidence in different places along the length of the abutment. These are dangerous if large, because they indicate that the ring has broken up into narrower independent rings (fig. 114).

Table XVI. Crack Factors in Masonry Arch Bridges

Type of crack	Crack factor
1. Small longitudinal cracks within 2 feet of the edge of the arch, i.e., less than ⅛ inch in width and less than one-tenth of the span in length.	1.0
2. Large longitudinal cracks within 2 feet of the edge of the arch, i.e., greater than ¼	1.0

Table XVI. Crack Factors in Masonry Arch Bridges—Con.

Type of crack	Crack factor
inch in width and longer than one-tenth of the span in length: For bridges having widths greater than 20 feet.	
3. Longitudinal cracks within the center third of the bridge.	0.9–0.7
a. One small crack less than ⅛ inch in width and less than one-tenth of the span in length.	1.0
b. One large crack greater than ¼ inch in width and longer than the above.	0.5
c. Several narrow cracks, i.e., three or more.	0.5
4. Small lateral and diagonal cracks, i.e., less than ⅛ inch in width and shorter than one-tenth of the arch width.	1.0
5. Large lateral and diagonal cracks greater than ¼ inch in width and longer than the above.	Maximum load class: 12; or the figure derived by calculation, using the other factors, whichever is the less.
6. Cracks between the arch ring and parapet wall greater than one-tenth of the span, due to lateral spread of the fill.	0.9
7. Cracks between the ring and spandrel, due to a dropped ring.	Reclassify from the alinement, on the assumption that the crown thickness is that of the ring alone.

(3) Lateral cracks, usually found near the quarter-points, due to permanent deformation of the arch, which may be caused by partial collapse of the arch or movement at the abutments.

(4) Diagonal cracks normally start near the sides of the arch at the springing line and spread towards the center of the bridge at the crown. They are probably due to subsidence at the sides of the abutment, and indicate that the bridge is in a dangerous condition.

(5) Cracks between the arch ring and the spandrel or parapet walls. These are due to two causes—

(*a*) Spread of the fill, so that the parapet wall is pushed out relative to the arch ring (fig. 115).

(*b*) Movement of a flexible ring away from a stiff fill, so that the two act independently. This type of failure frequently produces cracks in the spandrel wall near the quarter-points (fig. 116).

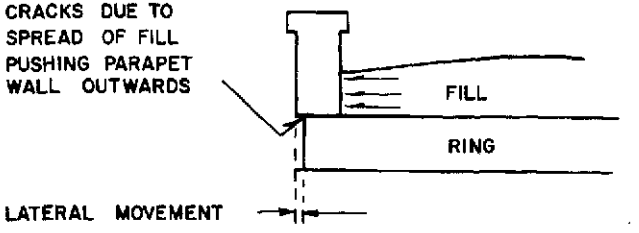


Figure 115. Cracks between arch ring and parapet wall.

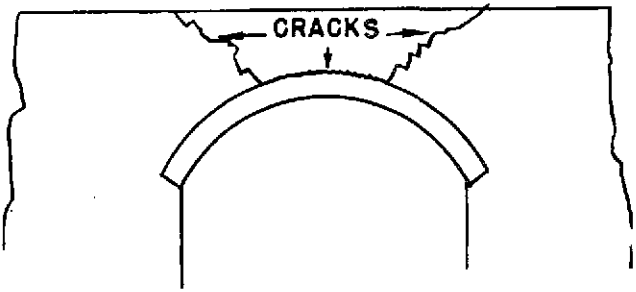


Figure 116. Movement of arch ring away from stiff fill.

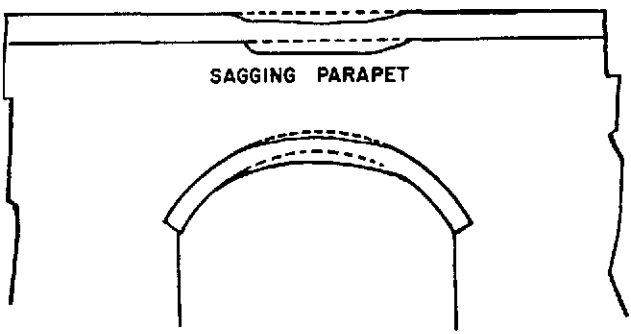


Figure 117. Deformation of arch ring.

10. Deformation Factors

a. General. Failure of the arch ring is observed in the ring itself, and is frequently accompanied by a sag of the parapet over approximately the same length (fig. 117). Deformation of the arch ring may be due to two causes.

(1) Partial failure of the arch ring.

(2) Movement at the abutment.

b. Deformation Factors. Deformation factors are given in table XVII.

Table XVII. Deformation Factors for Masonry Arch Bridges

Degree of deformation	Deformation factor
1. Deformation limited so that the rise over the the affected portion is always positive.	Discard profile factor already calculated and apply span-rise ratio of affected portion to the whole arch.
2. Distortion so that there is a flat section of profile.	Maximum load class: 12.
3. Large deformation so that a portion of the ring is sagging.	Maximum load class: 5; but only if fill at crown exceeds 18 inches.

11. Abutment Factors

a. General. In the assessment of the abutments it is necessary to apply two factors. The first takes account of the size and shape of the abutment as an adequate support for the arch, and always applies. The second applies to faults in the abutment, i.e., cracks, movements, etc.

b. Abutment Size Factors. Abutment size factors are given in table XVIII. One or both of the abutments may be considered inadequate to resist the full thrust of the arch. This may occur when—

(1) The bridge is on a narrow embankment, particularly if the approaches slope down steeply from the bridge;

(2) The bridge is on an embanked curve;

(3) The abutment wing walls are very short and suggest little solid fill behind the arch;

(4) In the case of multispan bridges, each span is considered separately and abutment factors are applied in accordance with whether the arch is supported on one abutment and one pier, or on two piers.

Table XVIII. Abutment Size Factors for Masonry Arch Bridges

	Abutment size factor
1. Both abutments satisfactory	1.00
2. One unsatisfactory abutment	.95
3. Both abutments unsatisfactory	.90
4. Both abutments massive, but a clay fill is suspected.	.70
5. Arch supported on one abutment and one pier.	.90
6. Arch supported on two piers	.80

c. Abutment Fault Factors. Abutment fault factors are given in table XIX.

12. Application of the Factors

The profile, material, and joint factors, together with the abutment size factor, are applied in every case. The remaining three factors, namely those for cracks, deformation and faults in the abutments, are applied with discretion. Clearly, if the arch is deformed and cracked due to a fault in the

abutments, it is unrealistic to downgrade the bridge for all three of the latter factors operating together. In such a case, the load class worked out by applying these factors in turn to the provisional load class (as modified by the first four factors) and adopting the lowest figure so obtained. After applying the various factors to the provisional load class, the figure obtained is rounded off to the nearest standard load class, to give the final classification.

13. Two-Way Classification

Bridges which are wide enough to accept two lanes of traffic may be given a two-way load class equal to 0.9 of the one-way class.

Table XIX. Abutment Fault Factors for Masonry Arch Bridges

Nature of fault	Abutment fault factors
1. *Inward movement of one abutment*, shown by hogging of the arch ring and the parapet at the crown, and, possibly, open cracks in the intrados between the quarter-point and the springing. Old movement, with well-consolidated fill and slight hogging of the ring.	0.75–0.50 (depending on degree). Not more than class 30 or class 12, according to degree.
2. *Outward spread of abutments.* This usually causes change in the profile. If the movement has not been excessive and appears to have ceased, determine the	

Table XIX. Abutment Fault Factors for Masonry Arch Brigdes—Continued

Nature of fault	Abutment fault factors
nature of the fill behind the abutments and allow factors varying from 1 to 0.5, according to the nature and condition of the fill.	
3. *Vertical settlement of one abutment.* Investigate the ground under each abutment, and apply factors ranging from 0.9 for slight movement to 0.5 where the materials under each abutment are dissimilar.	

14. Example of Classification Procedure

a. Data.

Span	40 feet
Rise	8 feet
Arch ring thickness	18 inches
Depth of fill at crown	12 inches
Width between parapets	15 feet
Material	Limestone in good condition.
Joints	Mortar, with some deterioration and small voids; close joints.
Cracks	There is a large longitudinal crack in the arch under one parapet wall.
Abutments	One approach is up a narrow embankment.

b. Provisional Load Class.

Mark span 1 = 40 feet on column A, figure 112.

Total crown thickness (ring + cover) = 2.5 feet.
Mark this on column B, figure 112.

Line through these two points across column C, and read off the provisional load class, which in this instance is 34.

c. Adjusted Load Class. The provisional class is now amended by the various factors, as follows:

(1) *Profile factor.*

$$\text{Span-rise ratio} = \frac{40}{8} = 5.$$

From figure 113 the profile factor is 0.86.

(2) *Material factor.* From table XIV, for limestone in good condition, the material factor is 1.0.

(3) *Joint factor.* From table XV, the joint factor is between 0.80 and 0.70—about 0.75.

(4) *Crack factor.* From table XVI, the one large longitudinal crack at the edge of the ring, for a bridge of this width, gives a crack factor of 0.9.

(5) *Abutment factor.* One abutment is considered unsatisfactory, owing to the narrow and steep approach. From table XVIII, this gives a factor of 0.95. Hence,

Adjusted load class = $34 \times 0.86 \times 1.0 \times 0.75 \times 0.90 \times 0.95 = 19$ for one-way traffic.

and $19 \times 0.9 = 17$ for two-way traffic.

APPENDIX VII

TUNNELS

A tunnel consists of a bore, a tunnel liner, and a portal. Common shapes of tunnel bores (fig. 118) are semicircular, elliptical, horseshoe, and square with arched ceiling. Tunnels may be un-

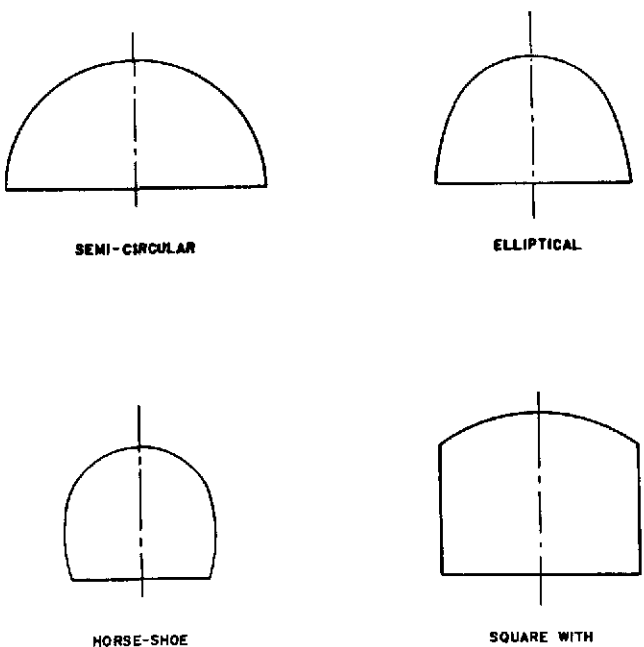


Figure 118. Common types of tunnel bores or cross sections.

Figure 119. Typical unlined tunnel.

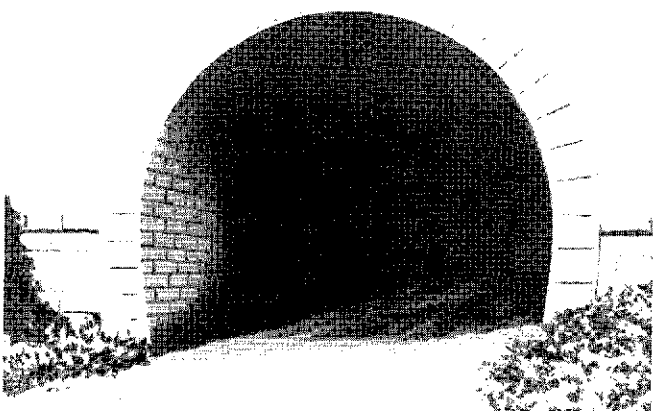


Figure 120. Typical masonry lined tunnel.

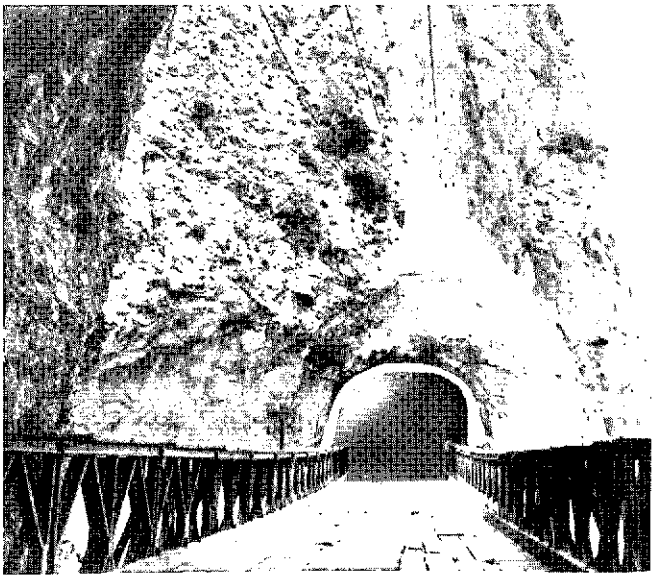


Figure 121. Typical concrete lined tunnel.

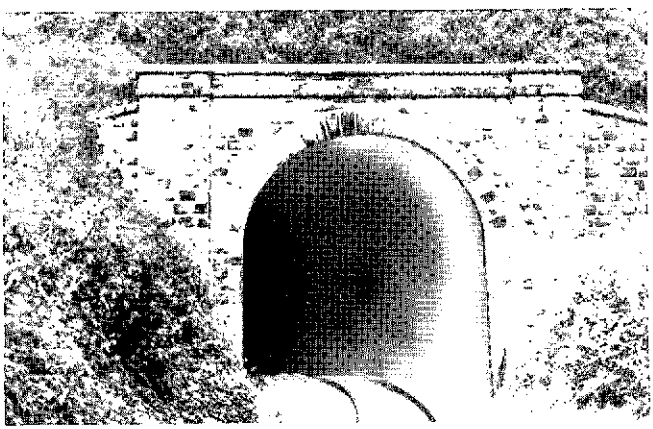


Figure 122. Typical masonry tunnel portal.

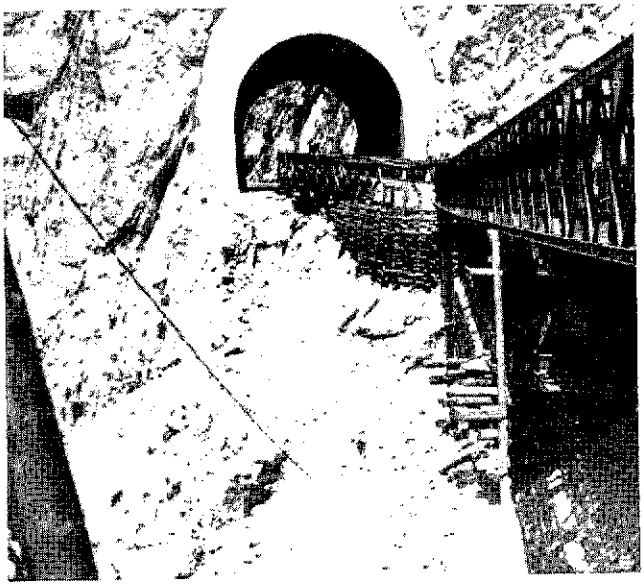


Figure 123. Typical concrete tunnel portal.

lined (fig. 119), masonry lined (fig. 120), and concrete lined (fig. 121). Portals may be made of masonry (fig. 122) or of concrete (fig. 123). Alinement of tunnels may be straight (fig. 124) or curved (fig. 125).

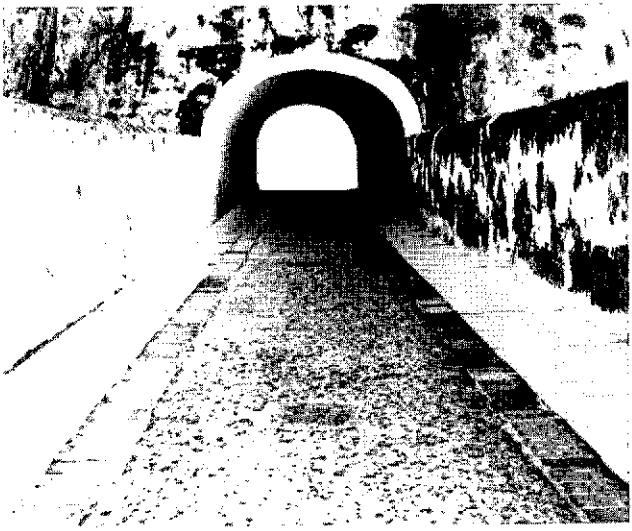


Figure 124. Tunnel with straight horizontal alinement.

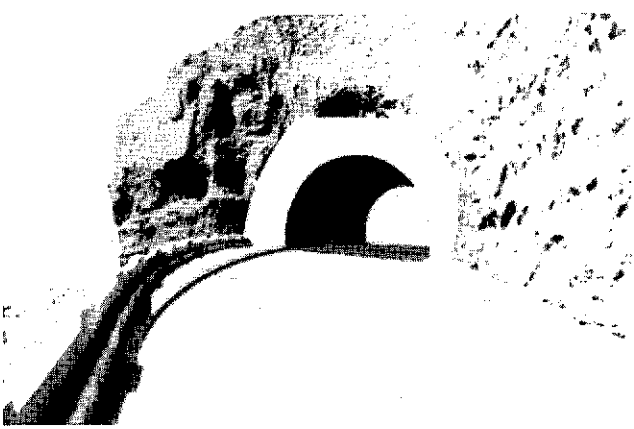


Figure 125. Tunnel with curved horizontal alinement.

APPENDIX VIII

NATIONAL DISTINGUISHING SYMBOLS FOR MARKING SERVICE VEHICLES

1. General

a. This appendix shows a national distinguishing symbol for marking vehicles of each member country of the North Atlantic Treaty Organization except Iceland. These basic national symbols may also carry appropriate superimposed service markings, except in the case of the German Federal Republic.

b. The distinguishing symbols for marking service vehicles are shown in figure 126. When used to identify a National Force or a component of a National Force, the Distinguishing Letters will be bracketed immediately following the Force, formation or unit, for example: 12 (US) Army Group; 5 (FR) Armored Division. National Distinguishing Letters for components of Army Forces smaller than a division will only be used when this is necessary to avoid confusion. Such symbols and most commonly used abbreviations for country names are included for the following countries, listed in alphabetical order:

(1) Belgium (BE) (fig. 126①).

(2) Canada (CA) (fig. 126②)—The National Distinguishing Letters for Canada will

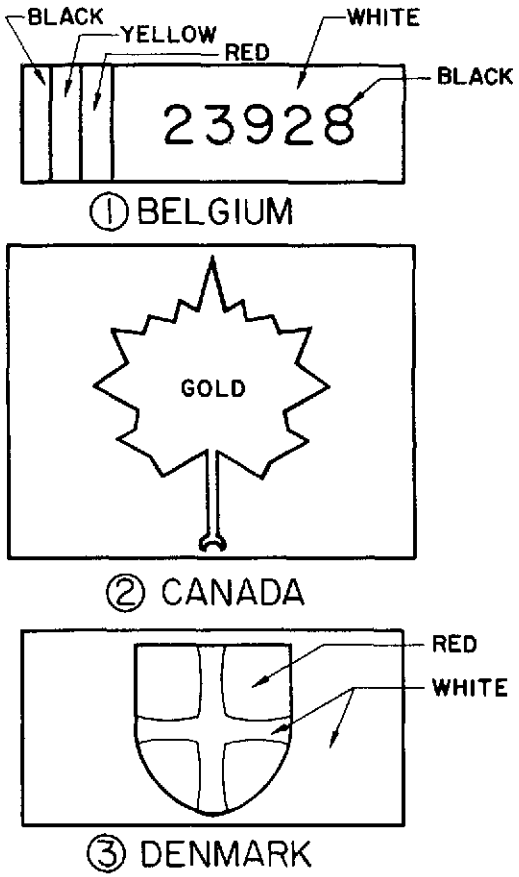
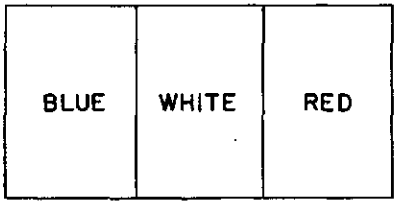
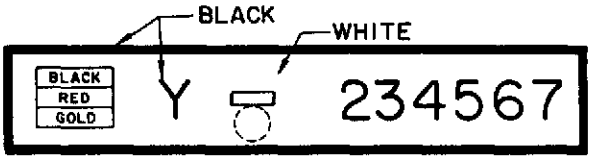


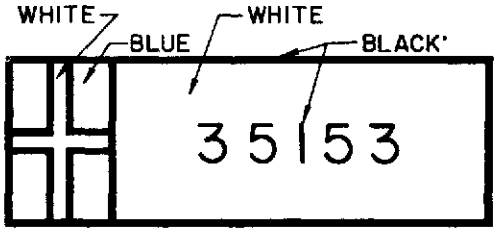
Figure 126. National distinguishing symbols for marking of service vehicles.



(4) FRANCE



(5) GERMAN FEDERAL REPUBLIC



(6) GREECE

Figure 126—Continued.

not be used to identify Canadian Army formations which have the word, "Canadian" in their official designation.

(3) Denmark (DA) (fig. 126③).

(4) France (FR) (fig. 126④).

(5) Germon Federal Republic (GE) (fig. 126⑤).

(6) Greece (GR) (fig. 126⑥).

(7) Italy (IT) (fig. 126⑦).

(8) Luxembourg (LU) (fig. 126⑧).

(9) Netherlands (NL) (fig. 126⑨).

(10) Norway (NO) (fig. 126⑩).

(11) Portugal (PO) (fig. 126⑪).

(12) Turkey (TU) (fig. 126⑫).

(13) United Kingdom (UK) (fig. 126⑬)—The letters "UK" denote the United Kingdom, or a force or part of a force provided solely from the United Kingdom. The letters "BR" may be used in special cases to denote a force comprising units or elements of more than one country of the British Commonwealth.

(14) United States (US) (fig. 126⑭).

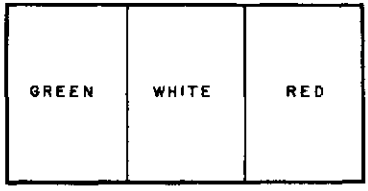
The abbreviation for Iceland is IC.

2. Descriptions of Individual National Distinguishing Symbols

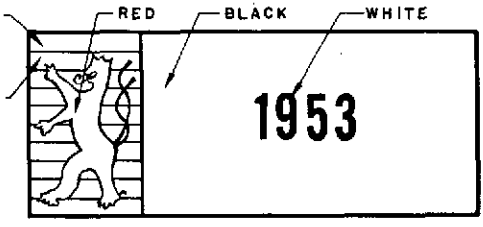
a. Belgium (fig. 126①). The basic symbol is rectangular in shape. It is a rectangular plate (or marking on combat vehicles) bearing a registration number in black figures on a white back-

ground, preceded by the national colors (black, yellow, and red) in the form of a strip placed at the end and across the whole width of the plate.

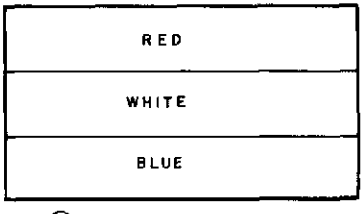
b. Canada (fig. 126②). The basic symbol is a gold-colored maple leaf.



⑦ ITALY

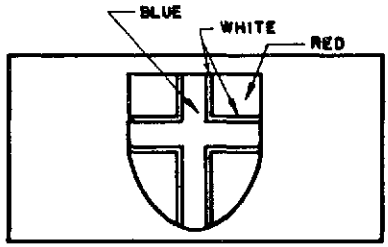


⑧ LUXEMBOURG

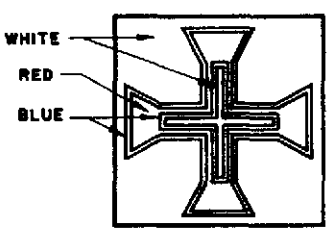


⑨ NETHERLANDS

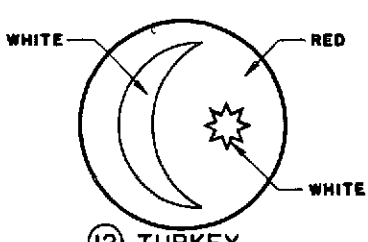
Figure 126—Continued.



⑩ NORWAY



⑪ PORTUGAL



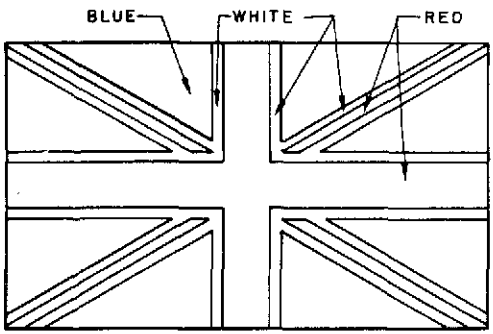
⑫ TURKEY

Figure 126—Continued.

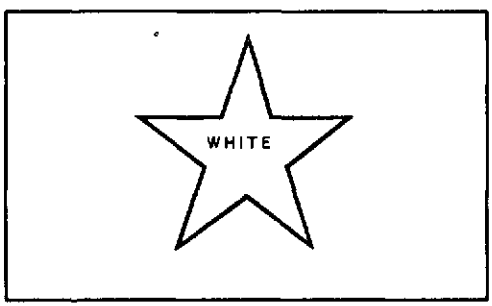
c. Denmark (fig. 126③). The basic symbol is a red shield with a white cross. The symbol is placed on a white background.

d. France (fig. 126④). The basic symbol is a tri-color flag (blue, white, and red, from left to right).

e. German Federal Republic (fig. 126⑤). The



⑬ UNITED KINGDOM



⑭ UNITED STATES

Figure 126—Continued.

basic symbol is rectangular in shape and is painted on semi- or full-tracked vehicles. All other military vehicles carry a rectangular plate. Placed within the rectangular shape in black on a white background, a hyphen with a stamp underneath it, and the registration number. The plate has a black edge. On the left side of the plate the national colors (black, red, and gold) are shown in horizontal stripes, with black on top.

f. Greece (fig. 126⑥). The basic symbol is rectangular in shape. It is a rectangular plate (or marking on combat vehicles) bearing a registration number in black figures on a white background, preceded by a white Christian cross on a blue background.

g. Italy (fig. 126⑦). This symbol consists of a tricolor flag (green, white, and red, from left to right).

h. Luxembourg (fig. 126⑧). This symbol consists of a rectangular plate bearing the registration number in white figures on a black background. This number is preceded by a red lion on a horizontally striped blue and white background.

i. Netherlands (fig. 126⑨). This symbol consists of a tricolor flag (red, white, and blue). The colors are in horizontal stripes with red on top, then white, and then blue. This symbol cannot be used in combination with the registration number.

j. Norway (fig. 126⑩). The basic symbol is a Norwegian flag on a shield.

k. Portugal (fig. 126⑪). The basic symbol is a white square bearing a Christian cross.

l. Turkey (fig. 126⑫). The basic symbol consists of a solid red circle bearing a white crescent and a white star as on the Turkish flag. The diameter of the circle is 17 centimeters.

m. United Kingdom (fig. 126⑬). The basic symbol is a replica of the national flag (Union Jack).

n. United States (fig. 126⑭). The basic symbol is a white five-pointed star.

APPENDIX IX
VEHICLE CLASSIFICATION DATA

E=Empty
C=Cross Country
H=Highway

Wheeled vehicles, prime movers	Weight (S. tons)			Class		
	E	C	H	E	C	H
Ambulance, metropolitan, 4-litter, ¾-ton	2.77	------	3.52	3	------	4
Amphibious, 5-ton, 6 x 6, T-118, XM148	20.70	25.70	25.70	19	24	24
Auger, earth, skid-mtd, gasoline engine driven	8.08	8.08	8.08	8	8	8
Bus, body on chassis, 29-passenger, 4 x 2	4.88	------	7.50	5	------	9
Bus, 29-passenger, 4 x 2	5.25	------	7.75	5	------	8
Bus, 37-passenger, 2½-ton, 4 x 2	7.31	------	12.16	6	------	11
Bus, body on chassis, 37-passenger, 4 x 2	5.99	------	8.99	6	------	10
Bus, ambulance, 18-litter, 4 x 2	9.04	------	10.79	8	------	9
Bus, 37-passenger, 4 x 2	7.60	------	11.95	7	------	12
Bus, integral, 37-passenger, 4 x 2	7.00	------	11.35	7	------	11
Chassis, truck, ¾-ton, 4 x 4, M53	2.68	------	------	3		
Chassis, truck, ¾-ton, 4 x 4 w/winch, M53	2.68	------	------	3		
Chassis, truck, ¾-ton, 4 x 4, w/winch, M56	2.73	------	------	3		

Wheeled vehicles prime movers—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Chassis, truck, 1½-ton, 4 x 2, Ford	2.52			3		
Chassis, truck, 1½-ton, 4 x 4	2.97			3		
Chassis, truck, 2½-ton, 4 x 2 (IH)	3.04			3		
Chassis, truck, 2½-ton, 6 x 6, w/winch, CCKWX 353.	4.40			4		
Chassis, truck, 2½-ton, 6 x 6, M44	5.33			5		
Chassis, truck, 2½-ton, 6 x 6, w/winch, M45	5.47			5		
Chassis, truck, 2½-ton, 6 x 6, w/winch, M46	5.64			5		
Chassis, truck, 2½-ton, 6 x 6, w/winch, M57	5.41			5		
Chassis, truck, 2½-ton, 6 x 6, w/winch, M58	5.43			5		
Chassis, truck, 2½-ton, 6 x 6, M133	5.58			5		
Chassis, truck, 2½-ton, 6 x 6, w/winch, M207	5.80			5		
Chassis, truck, 2½-ton, 6 x 6, w/winch, M209	5.60			5		
Chassis, truck, 4-ton, 6 x 6, w/winch, Diamond T, 968A.	7.40			7		
Chassis, truck, 5-ton, 4 x 2 (IH)	4.41			4		
Chassis, truck, 5-ton, 6 x 6, w/winch, M39	8.75			8		
Chassis, truck, 5-ton, 6 x 6, w/winch, M40	8.75			8		
Chassis, truck, 5-ton, 6 x 6, M61	9.02			8		

Chassis, truck, 5-ton, 6 x 6, M63	9.62	------	------	8		
Chassis, truck, 5-ton, 6 x 6, M139	9.80	------	------	8		
Compressor, air, truck-mtd, gasoline-driven, 105 cfm.	7.15	7.15	7.15	7	7	7
Crane, shovel, power unit, truck-mtd, two-engine drive, 2-ton cap at 15-ft rad.	9.20	9.20	9.20	8	8	8
Crane, shovel, power unit, truck-mtd, two-engine drive, 4- to 8-ton, ⅜ cu yd attach.	16.55	16.55	16.55	14	14	14
Crane, shovel, power unit, truck-mtd, two-engine drive, 10-ton cap at 10-ft rad, ½ cu yd.	18.44	18.44	18.44	18	18	18
Crane, shovel, power unit, truck-mtd, two-engine drive, 20-ton cap at 10-ft rad, ¾ cu yd.	31.48	31.48	31.48	35	35	35
Crane, truck-mtd, M2	26.75	26.75	26.75	30	30	30
Distributor, bituminous material, truck-mtd, 800-gal.	10.78	15.05	15.05	10	14	14
Grader, road, motorized diesel-driven, 12-ft mld bd.	12.03	12.03	12.03	10	10	10
Hearse, ¾-ton, 4 x 2	2.17	------	2.67	3	------	3
Landing vehicle, wheeled, 2½-ton, 6 x 6, M147	9.60	12.10	13.60	9	11	13
Launcher, rocket, 762mm, truck-mtd, M289	20.86	24.50	24.50	18	22	22
Loader, scoop, wheeled, diesel-driven, 1½ cu yd	8.00	8.00	8.00	9	9	9

Wheeled vehicles prime movers—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Mixer, rotary tiller, soil stabilization, self-propelled, diesel-driven, 7-ft mixing width.	6.40	------	6.40	7	------	7
Plow, snow, rotary, gasoline engine-driven, truck-mtd.	16.76	------	16.76	23	------	23
Roller, road, gasoline-driven, tandem, 2-axle retract wh, 5- to 8-ton.	8.82	------	8.82	10	------	10
Roller, road, gasoline-driven, tandem, 3-axle, 9- to 14-ton.	14.18	------	14.18	19	------	19
Scraper, road, motorized, cable-operated, 12 cu yd.	13.88	------	28.88	16	------	33
Shop equipment, motorized, emergency repair, M2.	3.88	------	3.88	4	------	4
Shop, equipment, motorized, heavy mach shop	7.70	------	7.70	8	------	8
Shop, equipment, motorized, welding	7.70	------	7.70	8	------	8
Shop, equipment, motorized, general purpose repair.	8.44	------	8.44	8	------	8
Shop, equipment, small tool repair, motorized, or tool and bench.	8.44	------	8.44	8	------	8

Tank, asphalt, steel, truck-mtd, w/heating flues.	9.55	------	13.15	9	------	12
Topographic reproduction set, truck-mtd, 2½-ton truck, 6 x 6, 4 dual wh, 190-inch wheelbase, van body, carrying one of the following sections:						
Photographic printing and processing section—set No. S–14.	------	------	12.13	------	------	11
Plate grainer section—set No. S–16	------	------	12.13	------	------	11
Press section—set No. S–17	------	------	12.13	------	------	11
Laboratory section—set No. S–18	------	------	12.13	------	------	11
Map layout section—set No. S–19	------	------	12.13	------	------	11
Plate process section—set No. S–20	------	------	12.13	------	------	11
Camera section—set No. S–22	------	------	12.13	------	------	11
Topographic photomapping equipment, motorized, mounted on a 2½-ton, 6 x 6 standard truck chassis (M–292), with van-type expansible body, carrying one of the following sections:						
Cartographic section—set No. S–51	------	------	11.13	------	------	10
Copy and supply section—set No. S–52	------	------	11.80	------	------	10
Rectifier section, 9 x 9 inches—set No. S–53.	------	------	12.10	------	------	11

Wheeled vehicles prime movers—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Map revision section—set No. S–54	------	------	10.90	------	------	9
Multiplex section—set No. S–55	------	------	12.10	------	------	11
Photomapping section—set No. S–56	------	------	10.90	------	------	9
Tractor, wheeled, ind, diesel, light	7.90	7.90	7.90	9	9	9
Tractor, wheeled, ind, diesel, light	21.20	21.20	21.20	33	33	33
Truck, ambulance, ¾-ton, 4 x 4, M43	3.58	4.28	4.28	3	4	4
Truck, ambulance, ¾-ton, 4 x 4	2.96	3.86	3.86	3	4	4
Truck, ambulance, ¾-ton, 4 x 4 (KD)	3.50	4.25	4.25	3	4	4
Truck, cargo, ¾-ton, 4 x 4, M37	2.96	3.96	3.96	3	4	4
Truck, cargo, 2½-ton, 6 x 4, CCW 353	5.02	7.70	9.63	4	7	9
Truck, cargo, 2½-ton, 6 x 6, w/winch	5.53	8.21	10.53	5	8	10
Truck, cargo, 2½-ton, 6 x 6, w/winch, M34	6.10	8.77	11.27	5	8	10
Truck, cargo, 2½-ton, 6 x 6, w/winch, M35	6.44	8.94	11.44	5	8	10
Truck, cargo, van, 2½-ton, 6 x 6, w/winch, M110.	7.63	10.31	11.88	7	9	11
Truck, cargo, 2½-ton, 6 x 6, w/winch, M135	6.37	9.04	11.54	6	9	11
Truck, cargo, 2½-ton, 6 x 6, w/winch, M211	6.79	9.47	11.97	6	9	11
Truck, cargo, 5-ton, 6 x 6, M41	9.92	15.09	17.59	9	15	18
Truck, cargo, 5-ton, 6 x 6, M55	12.03	17.21	22.03	10	16	21.

Truck, cargo, van, 5-ton, 6 x 6, w/winch, M64	12.30	17.47	22.30	10	17	21
Truck, cargo, military bridging, 5-ton, 6 x 6	13.5	------	21.00	13	------	20
Truck, cargo, 6-ton, 6 x 6, M54	9.97	15.14	20.14	9	14	19
Truck, cargo, 10-ton, XM123	14.39	29.56	32.06	12	34	34
Truck, cargo, 10-ton, 6 x 6, XM125, E1	15.62	25.62	30.62	14	25	32
Truck, cargo, 10-ton, 6 x 6, XM125	25.80	25.80	30.80	14	25	33
Truck, carrier, cross-country, 2½-ton, 6 x 6, w/winch, T55.	3.75	------	6.25	3	------	6
Truck, carrier, cross-country, 2½-ton, 6 x 6, w/winch, T55E3.	4.50	7.00	7.50	4	7	7
Truck, command, ¾-ton, 4 x 4, M42	2.98	3.73	3.90	3	4	4
Truck, crane chassis, 6-ton, 6 x 6	11.21	------	------	9		
Truck, dump, 1½-ton, 4 x 2 (IH)	2.90	4.40	5.85	3	5	7
Truck, dump, 1½-ton, 4 x 2	2.94	4.44	6.25	3	5	8
Truck, dump, 2½-ton, 6 x 6, w/winch, M59	6.92	8.97	11.42	6	8	10
Truck, dump, 2½-ton, 6 x 6, w/winch, M215	7.44	9.49	11.94	7	9	11
Truck, dump, 2½-ton, 6 x 6, w/winch, XM342	7.97	10.64	13.14	7	9	12
Truck, dump, 5-ton, 6 x 6, M51	11.33	16.51	21.51	10	15	20
Truck, earth auger, 2½-ton, 6 x 6, V–18, MTQ	7.63	7.63	7.63	7	7	7
Truck, light wrecker, 2½-ton, 6 x 6, w/winch, M60.	11.98	12.73	13.90	11	12	13
Truck, medical, van, 2½-ton, 6 x 6, M132	7.64	10.31	11.39	7	9	10
Truck, shop, van, 2½-ton, 6 x 6, M109	7.62	10.29	11.37	7	9	10

Wheeled vehicles prime movers—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Truck, shop, van, 2½-ton, 6 x 6, w/winch, M145.	7.78	10.28	10.78	7	9	9
Truck, shop, van, 2½-ton, 6 x 6, M220	7.54	10.22	11.29	7	10	11
Truck, expansible, van, 5-ton, 6 x 6, M291	12.75	15.25	20.25	11	14	19
Truck, ponton, 4-ton, 6 x 6, w/winch	9.23	13.40	17.23	8	12	17
Truck, stake & platform, 1½-ton, 4 x 2	2.84	4.34	6.23	3	4	7
Truck, tank, gasoline, 2½-ton, 6 x 6, 750-gal, LWB.	5.38	8.05	8.05	5	7	7
Truck, tank, gasoline, 2½-ton, 6 x 6, M49	6.75	9.42	10.75	6	9	10
Truck, tank, gasoline, 2½-ton, 6 x 6, M217	7.17	9.82	11.17	7	9	10
Truck, tank, gasoline, 6-ton, 6 x 6, 2000-gal	11.91	17.91	17.91	10	18	18
Truck, tank, water, 2½-ton, 6 x 6, 700-gal	5.96	8.63	8.63	6	8	8
Truck, tank, water, 2½-ton, 6 x 6, M50	7.52	9.44	11.94	7	9	11
Truck, tank, water, 2½-ton, 6 x 6, M222	7.05	8.98	11.30	7	9	10
Truck, telephone maint & instal, ¾-ton, 4 x 4, K50B.	3.35	3.35	3.35	4	4	4
Truck, telephone maint & constr, 1½-ton, 4 x 4, K42, K43.	4.11	6.15	6.15	4	6	6

Truck, telephone constr & maint, 2½-ton, V–17A1MTQ.	8.28	9.42	11.42	8	9	11
Truck, tractor, 2½-ton, 4 x 2, GMC	3.74	3.74	3.74	3	3	3
Truck, tractor, 2½-ton, 4 x 2, (IH)	4.62	4.62	4.62	4	4	4
Truck, tractor, 2½-ton, 6 x 6, w/winch, M48	5.92	5.92	5.92	6	6	6
Truck, tractor, 2½-ton, 6 x 6, M221	6.23	6.23	6.23	5	5	5
Truck, tractor, 2½-ton, 6 x 6, w/winch, M275	5.80	5.80	5.80	5	5	5
Truck, tractor, 4- to 5-ton, 4 x 4, COE, Federal.	5.83	5.83	5.83	5	5	5
Truck, tractor, wrecker, 5-ton, 6 x 6, M246	16.42	16.42	16.42	15	15	15
Truck, tractor, ponton, 5- to 6-ton, 4 x 4, COE Auto.	8.33	------	------	8		
Truck, tractor, 10-ton, 6 x 6, M123	16.25	16.25	16.25	15	15	15
Truck, wrecker, medium, 5-ton, M62	17.01	20.51	23.01	16	21	24

Wheeled vehicles, Jupiter system	Weight (S. tons)			Class		
	E	C	H	E	C	H
SEMITRAILERS:						
Electronics shop, G&C checkout, AN/MSM–32.	5.88	------	9.90	5	------	9

Wheeled vehicles, Jupiter system—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Electronics shop, control components, AN/MSM–33.	5.88	------	10.17	5	------	9
Test station, stabilized platform, AN/MSM–2.	5.88	------	11.13	5	------	10
Supply office, guided missile system, SM–484.	4.33	------	7.09	4	------	6
TRAILERS:						
Guided missile repair parts, XM–487 -----	1.33	------	2.85	3	------	5
TRUCKS:						
Computer, missile programming data, AN/MJQ–1.	8.75	------	8.75	8	------	8
Guided missile repair parts, bulk material, XM–486.	6.44	------	7.56	6	------	7
Guided missile repair parts, XM–488 -----	6.44	------	8.56	6	------	8
Pneumatic shop, guided missile system, SM–477.	7.62	------	11.08	------	------	10
Preservation & packaging shop, XM–485 ----	6.40	------	7.32	6	------	7
Redstone trainer, guided missile, AN/MSQ–T2.	11.58	------	12.10	11	------	11

Full-track, self-propelled	Weight (S. tons)			Class		
	E	C	H	E	C	H
Bulldozer, earth-moving, M1, tank-mtd (on medium tank, M4 series, with 16⅝).	35.03	37.18	------	36	39	
Bulldozer, earth-moving, M2, tank-mtd (on medium tank, M4A3, 76mm gun).	36.64	38.58	------	39	41	
Bulldozer, earth-moving, M2, tank-mtd (on medium tank, M4A3).	37.28	39.43	------	40	42	
Bulldozer, earth-moving, M3, tank-mtd (for medium tank, M46).	49.40	51.50	------	51	54	
Bulldozer, earth-moving, M3E1, tank-mtd (for medium tank, 90mm gun, M47).	49.50	51.60	------	50	53	
Bulldozer, earth-moving, M4, tank-mtd (on light tank, M24).	20.70	22.05	------	20	22	
Bulldozer, earth-moving, tractor-mtd (crawler-type diesel engine driven M1).	11.78	11.78	------	15	15	
Bulldozer, earth-moving, T1, tractor-mtd, (for high-speed tractor, M4).	16.80	21.41	------	16	21	
Bulldozer, earth-moving, T2 (tractor-mtd, high-speed, M5).	15.05	17.45	------	15	17	

Full-track, self-propelled—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Bulldozer, earth-moving, tank-mtd, T7E3 (on medium tank, M4A3—10mm howitzer).	35.80	37.95	------	35	38	
Bulldozer, earth-moving, T7E4, tank-mtd (medium tank, M4A1—75mm gun).	36.47	38.32	------	38	41	
Bulldozer, earth-moving, T8 and T8E1, tractor-mtd, cargo tractor, M8.	18.75	26.57	------	17	25	
Bulldozer, earth-moving, T8E2 tractor-mtd, (magnesium) cargo tractor.	22.50	31.68	------	21	30	
Bulldozer, earth-moving, T8E4, tractor-mtd, cargo tractor, M8T2.	18.75	29.50	------	17	27	
Bulldozer, earth-moving, T9, tank-mtd (on light tank, M24).	20.20	21.55	------	19	21	
Bulldozer, earth-moving, T14, tractor-mtd (for cargo tractor, T44).	37.13	52.13	------	33	50	
Bulldozer, earth-moving, T14E1, tractor-mtd (for cargo tractor, T6E1).	50.74	56.55	------	48	55	
Bulldozer, earth-moving, T14E1, tractor-mtd (for cargo tractor, T44E1).	31.75	52.83	------	27	50	

Bulldozer, earth-moving, tank-mtd, T10, and snowplows for medium tank, M26.	44.97	47.21	------	43	48
Bulldozer, earth-moving, T13, tractor-mtd (magnesium) (for cargo tractor, T43E1).	13.07	17.55	------	12	17
Bulldozer, earth-moving, T16, tank-mtd (on light tank, 76mm gun, T41E1).	25.35	27.39	------	23	25
Bulldozer, earth-moving, T18, tank-mtd (for heavy tank, 120mm gun, T43E1).	58.50	66.58	------	57	67
Bulldozer, earth-moving, T18, tank-mtd (for medium tank, 120mm gun, T43).	55.80	63.00	------	54	61
Bulldozer, earth-moving, T18E1 (for medium tank, 90mm gun, M48).	46.08	49.38	------	44	47
Carrier, cargo, M29C (amphibious)	2.58	2.98	------	2	3
Carrier, cargo, amphibious, T46	3.77	5.75	------	4	5
Carrier, cargo, amphibious, T60	4.00	4.75	------	4	5
Carrier, cargo, amphibious, T46E1 (M76 det hrs CV1306).	4.16	6.02	------	4	6
Carrier, cargo, amphibious, T107	3.00	3.75	------	3	4
Carrier, 4.2-inch mortar, tracked, T64	20.77	22.00	------	20	21
Carrier, mortar, 4.2-inch, T38	15.80	19.25	------	15	18
Carrier, mortar, 8-in. gun, T93	62.75	65.00	------	63	66
Carrier, 81mm mortar, full-tracked, airborne (T113).	6.88	7.53	------	6	7

Full-track, self-propelled—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Carrier, 81mm, mortar, tracked, T62	20.50	21.75	------	20	21	
Carrier, 105mm, mortar, tracked, T63	20.77	22.00	------	20	21	
Carrier, personnel, full-tracked, airborne, T113 (steel armor).	7.76	9.41	------	7	9	
Carrier, personnel, full-tracked, airborne, T113 (aluminum armor).	6.67	8.29	------	6	8	
Carrier, personnel, full-tracked, self-propelled, T56.	6.80	7.83	------	6	7	
Carrier, personnel, full-tracked, self-propelled, T55.	5.30	6.05	------	5	6	
Carrier, personnel, full-tracked, self-propelled, armored combat vehicle, T73.	18.20	20.25	------	17	19	
Carrier, personnel, full-tracked, self-propelled, armored combat vehicle, M75.	18.34	20.75	------	17	20	
Carrier, personnel, full-tracked, self-propelled, armored combat vehicle, M59.	19.35	20.90	------	18	19	
Carrier, personnel, full-tracked, self-propelled, armored combat vehicle, T18E1.	19.37	21.00	------	19	20	

Carrier, universal, T16	3.87	4.72	------	4	5
Carrier, utility, full-tracked, self-propelled, armored, T18.	14.35	17.00	------	13	16
Carrier, utility, self-propelled, full-tracked, armored, M39.	16.61	17.75	------	15	17
Carrier, utility, full-tracked, self-propelled, armored, M44 (T16).	21.10	26.05	------	20	25
Carrier, utility, full-tracked, self-propelled, armored, M44E1.	21.10	25.50	------	20	24
Crane, crawler-mtd, revolving, gas and diesel engine driven, ½ cu yd 5- to 6-ton, class II.	14.75	14.75	------	15	15
Crane, crawler-mtd, revolving, gasoline engine driven, ¾ cu yd, 7- to 10-ton, class III.	21.16	21.16	------	19	19
Crane, crawler-mtd, revolving, diesel engine driven, 30- to 40-ton, class V.	51.50	51.50	------	58	58
Crane, tractor-mtd, revolving, crawler, diesel driven, 5,000-lb cap at 7-ft radius, 12- to 18-ft boom, telescopic.	9.5	9.5	------	15	15
Crane, tractor-mtd, revolving, crawler, diesel engine driven, 10,000-lb cap at 8-ft radius, 12- to 18-ft boom.	12.00	12.00	------	16	16

Full-track, self-propelled—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Crane, tractor-mtd, revolving, crawler, diesel engine driven, 12,000-lb cap at 8-ft radius.	20.92	20.92	------	21	21	
Crane, tractor-mtd, revolving, crawler, diesel engine driven, 1,200-lb cap at 12-ft radius, 30-ft boom.	21.69	21.69	------	31	31	
Crane, tractor-mtd, high speed, T9	41.89	46.44	------	41	47	
Engineer armored vehicle, T39	43.25	54.00	------	41	59	
Engineer armored vehicle, T39E1	52.00	54.00	------	55	59	
Flamethrower, mechanized, main armament, T65.	17.10	19.00	------	16	18	
Flamethrower, mechanized, auxiliary armament, T66.	47.50	50.00	------	47	52	
Flamethrower, mechanized, auxiliary armament, T67.	49.98	52.39	------	48	51	
Flamethrower, mechanized, main armament, T68.	34.10	35.00	------	33	34	
Howitzer, 75mm, M8	16.40	17.28	------	17	18	
Howitzer, 105mm, M37	19.32	23.00	------	18	22	

Howitzer, amphibian, 105mm	19.75	22.25	------	19	21
Howitzer, 105mm, T98	22.13	25.00	------	20	23
Howitzer, 105mm, M7B1	22.69	25.00	------	23	25
Howitzer, 105mm, M7	23.73	26.00	------	24	26
Howitzer, 105mm, T98E1	24.27	27.05	------	22	25
Howitzer, 105mm, M52 (T98E1)	24.90	26.50	------	23	25
Howitzer, 110mm, T195	16.18	19.25	------	14	19
Howitzer, 155mm, T194	27.50	30.50	------	25	28
Howitzer, 155mm, T99E1	28.35	30.00	------	26	28
Howitzer, 155mm, M44 (T194)	29.00	32.00	------	27	30
Howitzer, 155mm, T99	29.30	32.30	------	27	30
Howitzer, 156mm, T196	21.00	25.00	------	20	24
Howitzer, 240mm, T92	60.30	62.50	------	60	63
Howitzer, 8-in, T84	37.79	41.30	------	35	39
Howitzer, 8-in, M43	37.94	40.00	------	37	39
Howitzer, 8-in, T108	44.00	47.50	------	41	46
Howitzer, 8-in, T236	24.85	26.50	------	23	25
Howitzer, heavy, T195	12.92	16.11	------	11	14
Howitzer, heavy, T196	15.00	18.00	------	13	16
Gun, machine, cal 60, T100	19.38	22.00	------	18	20
Gun, 40mm, twin M42	22.15	24.9	------	20	23
Gun, 40mm, twin T141	18.75	21.5	------	17	20
Gun, 40mm, twin M19A1	16.88	19.25	------	16	18

Full-track, self-propelled—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Gun, 40mm, twin M19	17.19	18.50	------	16	17	
Gun, 76mm, M18	17.57	18.78	------	17	18	
Gun, 90mm, M36B1	32.75	34.00	------	33	35	
Gun, 90mm, M36B2	31.33	33.00	------	30	32	
Gun, 90mm, M36	28.82	30.50	------	29	31	
Gun, 90mm, T101	6.25	7.87	------	6	8	
Gun, 155mm, M41	18.71	21.25	------	18	20	
Gun, 155mm, T97	44.50	48.00	------	42	46	
Gun, 155mm	24.38	26.04	------	23	24	
Gun, 175mm, T162	48.25	51.75	------	46	49	
Gun, 175mm, T235	26.75	28.40	------	25	26	
Gun, 175mm, T162	49.25	53.50	------	46	51	
Gun, multiple, T77	17.00	19.00	------	16	18	
Landing vehicle, unarmored, MK4, LVT (4)	13.70	18.20	------	12	16	
Landing vehicle, armored, MK4 (A) (4)	17.72	20.00	------	15	18	
Loader, bucket-type, crawler-mtd, gasoline-driven, 3 cu yd, 18-ft 10-in boom.	8.25	8.58	------	9	9	

Loader, bucket-type, crawler-mtd, gasoline-driven, 3 cu yd, 17-ft 4-in boom.	9.92	10.20	------	11	12
Loader, bucket-type, crawler-mtd, gasoline-driven, 3 cu yd, 19-ft 10-in boom.	10.48	10.81	------	12	13
Paving machine, bituminous material, crawler-mtd, gasoline, 12-ft.	16.50	16.50	------	32	32
Rifle, 105mm, T166	5.65	6.30	------	5	6
Rifle, multiple, 105mm, T165	6.75	7.53	------	6	7
Rifle, multiple, 106mm, M50	8.06	8.84	------	8	9
Tank, combat, light, 37mm gun, M5A1	16.42	16.95	------	18	19
Tank, combat, medium, 75mm gun, wet, M4A3	33.63	34.78	------	35	36
Tank, combat, medium, 75mm gun, M4A3	32.63	34.78	------	32	34
Tank, combat, light, 75mm gun, M24	18.90	20.25	------	18	19
Tank, combat, medium, 75mm gun, M4	31.59	33.58	------	32	35
Tank, combat, medium, 75mm gun, M4A1	32.00	33.85	------	33	35
Tank, combat, medium, 75mm gun, wet, M4A3E2.	39.85	42.00	------	42	45
Tank, combat, light, 76mm gun, T71	16.58	18.70	------	16	18
Tank, combat, medium, 76mm gun, M4A1	35.38	36.80	------	35	37
Tank, combat, medium, 76mm gun, wet, M4A21.	35.13	36.72	------	37	39
Tank, combat, medium, 76mm gun, wet, M4A31.	33.77	35.58	------	35	37

Full-track, self-propelled—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Tank, combat, medium, 76mm gun, wet, M4A1.	33.72	35.32	------	35	37	
Tank, combat, light, 76mm gun, T41E1	23.35	25.39	------	21	23	
Tank, combat, light, 76mm gun, T37	21.34	24.14	------	20	23	
Tank, combat, light, 76mm gun, M41A1	22.35	25.90	------	21	24	
Tank, combat, light, 76mm gun, T41	22.99	25.80	------	21	25	
Tank, combat, medium, 76mm gun, M4A3	35.63	37.06	------	35	37	
Tank, combat, medium, 90mm gun, T48E2	49.60	52.50	------	47	51	
Tank, combat, medium, 90mm gun, M26 and M26A1.	43.76	46.00	------	42	45	
Tank, combat, medium, 90mm gun, M48E1	47.68	51.63	------	45	50	
Tank, combat, medium, 90mm gun, T69	36.00	38.00	------	37	42	
Tank, combat, medium, 90mm gun, T49	23.32	26.60	------	22	25	
Tank, combat, medium, 90mm gun, M48	41.70	45.00	------	38	42	
Tank, combat, medium, 90mm gun, M46 and M46A1.	46.40	48.50	------	45	48	
Tank, combat, medium, 90mm gun, M47	46.50	48.60	------	45	48	
Tank, combat, medium, 90mm gun, M48A1 and M48A2.	48.50	53.00	------	46	52	

with armored vehicle launched bridge, 40-ft.	------	------	55.00	------	------	56
with armored vehicle launched bridge, 60-ft.	------	------	62.50	------	------	62
Tank, combat, medium, M45 (105mm howitzer).	43.92	46.25	------	42	45	
Tank, combat, medium M4 (105mm howitzer).	32.54	34.69	------	33	36	
Tank, combat, medium, M4A3 (105mm howitzer).	34.28	36.43	------	34	36	
Tank, combat, medium, 105mm gun, T54E1	56.50	60.00	------	54	58	
Tank, combat, medium, 105mm gun, T54E2	50.00	53.50	------	48	53	
Tank, combat, medium, 105mm gun, T54	48.90	51.00	------	47	49	
Tank, combat, medium, 120mm gun, T43	55.80	60.00	------	54	58	
Tank, combat, medium, 120mm gun, T57	58.00	60.00	------	55	58	
Tank, combat, medium, 120mm gun, T77	54.00	56.00	------	52	54	
Tank, combat, heavy, 120mm gun, T43E1	58.50	62.25	------	57	61	
Tank, combat, heavy, 120mm gun, T43E2	57.80	62.00	------	55	60	
Tank, combat, heavy, 155mm gun, T58	63.14	66.00	------	62	66	
Tank, combat, medium, M26E1	43.50	47.30	------	42	46	
Tank, combat, medium, M26E2	42.25	45.75	------	40	45	
Tank, combat, medium, T26E4	44.00	48.00	------	42	47	
Tank, combat, superheavy, T28	90.30	95.00	------	86	94	

Full-track, self-propelled—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Tank, combat, heavy, T29	65.00	69.50	------	65	71	
Tank, combat, heavy, T30	65.50	70.00	------	66	72	
Tank, combat, heavy, T32 and T32E1	56.00	60.00	------	54	58	
Tank, combat, heavy, T34	66.00	70.50	------	66	72	
Tank, combat, medium, T40	44.18	47.50	------	43	46	
Tank, combat, light, T92	15.82	18.15	------	14	16	
Tank, combat, medium, gun, T95	37.85	41.00	------	36	40	
Tank, combat, medium, gun, T95E1	38.45	41.60	------	37	40	
Tank, combat, heavy, gun, T95E4	39.8	43.0	------	38	42	
Tank, combat, medium, gun, T96	41.70	45.00	------	38	42	
Tank, recovery vehicle, medium, M32, M32B1, M32B2, M32B3, M32B4, (T5) series and M32A1, M32A1B1, M32A1B2 and M32A1B3.	30.24	30.85	------	30	30	
Tank, recovery vehicle, medium, M74	44.30	46.87	------	46	51	
Tank, recovery vehicle, heavy, M51	56.25	60.00	------	54	58	
Tank, recovery vehicle, medium, T88	44.35	49.30	------	44	48	
Tractor, crawler, diesel engine driven	5.30	5.30	------	6	6	
Tractor, crawler, diesel engine driven	5.35	5.35	------	8	8	

Tractor, crawler, diesel engine driven, w/artillery towing attachments, w/winch, 1 drum, front-mounted.	6.89	6.89	------	8	8
Tractor, crawler, diesel engine driven, w/artillery towing attachments, w/winch, 1 drum, front-mounted.	6.36	------	------	8	------
Tractor, crawler, diesel engine driven, w/angle dozer.	7.96	7.96	------	11	11
Tractor, crawler, diesel engine driven, w/artillery towing attachment, w/winch, 1 drum, front-mtd.	8.75	8.75	------	11	11
Tractor, crawler, diesel engine driven	8.83	8.83	------	9	9
Tractor, crawler, diesel engine driven, w/artillery towing attachment, w/winch, 1 drum, front-mtd.	10.66	10.66	------	14	14
Tractor, crawler, diesel engine driven	12.73	12.73	------	14	14
Tractor, crawler, diesel engine driven, w/artillery towing attachment, w/winch, 1 drum, front-mtd.	12.75	12.75	------	15	15
Tractor, crawler, diesel engine driven	18.27	18.27	------	20	20
Tractor, crawler, diesel engine driven, w/artillery towing attachments, w/winch, 1 drum, front-mtd.	14.87	15.13	------	17	18

Full-track, self-propelled—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Tractor, earth-moving, crawler, diesel engine driven, No. 1.	16.05	16.05	------	17	17	
Tractor, crawler, gasoline, 20 DBHP	3.36	3.36	------	4	4	
Tractor, crawler, gasoline, 20 DBHP, T6	3.71	6.54	------	5	14	
Tractor, crawler, gasoline, 35 DBHP	4.27	6.43	------	5	9	
Tractor, crawler, gasoline, 35 DBHP	4.69	4.69	------	6	6	
Tractor, high-speed, 7-ton, M2	7.46	7.81	------	9	10	
Tractor, high-speed, 13-ton, M5	11.89	14.29	------	12	14	
Tractor, high-speed, 13-ton, M5A2	10.54	13.07	------	10	12	
Tractor, high-speed, 13-ton, M5A3	12.60	15.17	------	12	14	
Tractor, high-speed, 13-ton, M5A4	12.25	14.90	------	11	14	
Tractor, high-speed, 18-ton, M4, M4C, M4A1, and M4A1C.	13.56	15.70	------	13	15	
Tractor, high-speed, 18-ton, M4A2	16.80	18.90	------	16	18	
Tractor, high-speed, 38-ton, M6	34.30	38.00	------	32	37	
Tractor, high-speed, cargo, M8, T42	18.75	24.00	------	17	23	
Tractor, high-speed, cargo, M8A1	22.25	31.50	------	21	30	
Tractor, high-speed, cargo, M8E1	22.50	30.00	------	21	28	
Tractor, high-speed, cargo, M8E2	18.75	27.50	------	17	25	

Tractor, high-speed, cargo, T43E1	13.07	16.80	------	12	16	
Tractor, high-speed, cargo, T43E2	13.79	19.50	------	13	19	
Tractor, high-speed, cargo, T44	32.50	49.50	------	28	47	
Tractor, high-speed, cargo, T44E1	31.75	49.75	------	27	46	
Tractor, high-speed, cargo, T85	17.00	23.00	------	15	22	
Tractor, high-speed, cargo, T86	22.50	29.50	------	21	27	
Tractor, high-speed, cargo, T85	13.80	20.50	------	12	19	
Tractor, high-speed, cargo, T93 and T93E1	14.50	21.37	------	13	20	
Tractor, high-speed, cargo, T94	34.00	36.00	------	32	34	
Tractor, high-speed, wrecker, T4	32.15	33.40	------	30	31	
Tractor, high-speed, wrecker, T4E1	29.15	30.40	------	27	28	
Tractor, high-speed, wrecker, T5E1	16.50	18.00	------	15	17	
Tractor, high-speed, wrecker, T6E1	50.74	52.97	------	48	51	
Tractor, high-speed, wrecker, T6	51.00	52.97	------	49	51	

Towed vehicles, trailers	Weight (S. tons)			Class		
	E	C	H	E	C	H
Antenna, receiving and transmitting group, missile tracking, trailer-mtd, M260A1.	2.55	6.08	6.08	2	5	5
Compressor, air, trailer-mtd, 4W, steel tires, gasoline or diesel-driven, 315 cfm.	4.04	4.04	4.04	4	4	4

Towed vehicles, trailers—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Compressor, air, trailer-mtd, 4W, pneumatic tires, diesel-driven, 630 cfm.	5.30	5.30	5.30	5	5	5
Compressor, air, trailer-mtd, 4W, steel tires, diesel-driven, 500 cfm.	6.88	6.88	6.88	6	6	6
Compressor, air, trailer-mtd, 4W, pneumatic tires, diesel-driven, 315 cfm.	6.88	6.88	6.88	7	7	7
Conveyor, belt transfer, gasoline-driven, 24 in x 57 ft, barber-green, style "N".	4.10	4.10	4.10	5	5	5
Crushing and screening plant, 2-unit, gasoline engine driven, w/dolly, 25 cu yd/hr, unit No. 1, jaw crusher.	16.25	16.25	16.25	14	14	14
Crushing and screening plant, 2-unit, gasoline engine driven, 25 cu yd/hr, unit 2, roll crusher.	17.70	17.70	17.70	17	17	17
Director station, trailer-mtd, AN/M5A-7	3.42	7.15	7.15	3	6	6
Distributor, bituminous material, trailer mtd, 1,250 gal.	10.50	10.50	10.50	11	11	11
Dolly, trailer converter, 13-ton, 4-wh, M354	3.25	------	------	4		
Dolly, trailer converter, 18-ton, 4-wh, M199	3.85	------	------	4		

Dolly, trailer converter, 30-ton, 4-wh, M309	3.85	------	------	4		
Dryer, aggregate, dual drum, 80–120 ton/hr, trailer-mtd.	21.70	21.70	21.70	18	18	18
Electronics shop, trailer-mtd, shop #1	3.53	5.95	5.95	3	5	5
Electronics shop, trailer-mtd, shop #1, M304	3.53	5.95	5.95	3	5	5
Electronics shop, trailer-mtd, missile maint and spares, M304A1.	3.00	6.52	6.52	2	6	6
Generator and charging plant, hydrogen and carbon dioxide, trailer-mtd, girdler model 2657.	17.86	17.86	17.86	12	12	12
Trailer, generator, 2-ton, 4-wh, M47	4.22	4.22	4.22	5	5	5
Trailer, generator, 60KW, modified M–200 trailer (lightweight).	1.2	4.0	4.0	1	5	5
Trailer, low bed, antenna mount, M260	2.58	4.96	4.96	2	4	4
Trailer, power distribution, ¾-ton (lightweight).	0.7	1.2	1.2	1	1	1
Trailer, rocket transporter, M329	2.20	5.58	5.58	3	7	
Trailer, tank, fire-fighting, water, 2,000-gal, 4-wh.	2.6	11.2	11.2	3	12	12
Trailer, tilting type, searchlight, 60-inch, 4WM1.	4.59	4.59	4.59	5	5	5
Trailer, van, aft unit	2.9	4.2	4.2	4	5	5

Towed vehicles, trailers—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Trailer, van, director, 2-ton, 4-wh, M14 and M22.	4.45	4.45	4.45	4.45	6	6
Trailer, van, director-station, M259	3.53	5.98	5.98	3	5	5
Trailer, van, fire control, 2-ton, 4-wh, M244	3.56	6.04	6.04	4	6	6
Trailer, van, launching control, M262	3.49	6.25	6.25	4	6	6
Trailer, van radar tracking control, M258	3.53	5.98	5.98	3	5	5
Grader, road, towed leaning wheel, hand-controlled, 10-ft moldboard with dolly.	4.38	4.38	4.38	4	4	4
Trailer, guided missile, launcher control group, M258A1.	3.40	6.20	6.20	3	6	6
Gun, 90mm, M2 on mount, AA gun, 90mm M2	16.15	16.15	16.15	16	16	16
Gun, 120mm, M1 on mount, gun, 120mm M1	31.00	31.00	31.00	39	39	39
Howitzer, 8-in, M2 on carriage, howitzer, 8-in M1.	16.00	16.00	16.00	13	13	13
Missile trailer, booster	3.57	5.60	5.60	3	5	5
Mixer, asphalt, diesel-driven, travel or central plant, trailer-mtd 110- to 200-ton hr.	17.60	17.60	17.60	18	18	18
Mixer, concrete, gas-driven, trailer-mtd, 14 cu ft.	3.99	3.99	3.99	4	4	4

Scraper, earth moving, towed, 7½ cu yd	7.06	7.06	7.06	7	7	7
Scraper, earth moving, towed, 18 cu yd	20.01	20.01	20.01	16	16	16
Table, launching, roadable (light-weight)	2.8	2.8	2.8	2	2	2
Tank, asphalt, steel, trailer-mtd, w/steam coils, 1,500-gal.	5.00	11.38	11.38	5	11	11
Target tracking, radar, trailer-mtd	2.55	6.13	6.13	2	5	5
Tracking station, trailer-mtd, missile maint and spares, M304A1.	2.55	6.13	6.13	2	5	5
Trailer, battery, service, ¾-ton (lightweight)	0.7	1.0	1.0	1	1	1
Trailer, crane components, 2W	1.1	3.0	3.0	2	4	4
Trailer, cryptopographic, 4W, MSC–1, K–65, OA–73.	5.75	5.75	5.75	5	5	5
Trailer, flat bed, guided missile, M261	3.58	5.47	5.47	4	6	6
Trailer, generator, 2-ton, 4-wh, M18	4.10	4.10	4.10	5	5	5

Towed vehicles, semitrailer	Weight (S. tons)			Class		
	E	C	H	E	C	H
Alcohol tank 3,000 gal., 2W	4.2	12.2	12.2	5	13	13
Asphalt, plant, 10 to 30 T/PH unit No. 1, mtd, complete barber-green model 840.	5.30	5.30	5.30	8	8	8

Towed vehicles, semitrailer—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Asphalt, plant, 10 to 30 T/PH unit No. 2, dryer aggregate, barber-breen model 830.	4.35	4.35	4.35	6	6	6
Asphalt, plant, 10 to 30 T/PH unit No. 2, dryer, complete barber-breen model 839.	9.15	9.15	9.15	11	11	11
Asphalt, soil aggregate, mixing plant, 25 T/PH, unit No. 1 mixer, pugmill.	6.99	6.99	6.99	8	8	8
Asphalt, soil aggregate, mixing plant, 25 T/PH, unit No. 2.	7.30	7.30	7.30	6	6	6
Asphalt, soil aggregate, mixing plant, 25 T/PH, unit No. 3 stabilizer soil.	6.99	6.99	6.99	7	7	7
Auxiliary, 12-ton, 4W	17.9	21.5	21.5	15	18	18
Conveyer, belt, transfer, 24 in. x 57 ft. barber-green model 374.	4.94	4.94	4.94	7	7	7
Cooling tower, 4 sections, 240 GPM	------	8.2	8.2	------	7	7
Dry ice plant, 260 lbs/hr, mobile	------	15.0	15.0	------	18	18
Dryer, aggregate, single drum, central plant, DD trailer mtd, 80–120 T/PH barber-green model 837.	18.85	18.85	18.85	17	17	17

Generator, carbon dioxide, fuel oil type, 300 lbs/hr.	------	22.5	22.5	------	25	25
Generator & charging plant, acetylene, 750 cu ft/hr.	16.02	16.02	16.02	12	12	12
Generator & charging plant, set No. 1, oxygen-nitrogen 500 cu ft/hr.	17.90	17.90	17.90	16	16	16
Heater, asphalt, 3-car cap. 42 HP 8-ton	2.70	2.70	2.70	4	4	4
Liquid carbon dioxide transport and conversion unit 8-ton.	------	16.5	16.5	------	16	16
Generating and charging plant oxygen and nitrogen air source liquid 5-ton oxygen and 200-lb nitrogen per day.	------	27.0	27.0	------	23	23
Generating and charging plant oxygen and nitrogen, column liquid, 5-ton, 200-lb nitrogen per day.	------	26.5	26.5	------	23	23
Low bed, 12-ton, 4-wh, wrecker, M270 low bed, 12-ton, 4-wh, wrecker, M270A1.	8.75	20.75	28.75	8	17	24
Low bed, 60-ton, M17241	7.43	32.42	37.43	6	28	36
Low, 9-ton, 2W	8.8	18.8	17.8	7	16	16
Tank, gas, 6-ton, 2-wh, 2,000-gal, M30	3.38	9.48	9.48	3	9	9
Tank, gas, 6-ton, 5,000-gal, 4-wh, M131	7.43	17.24	22.70	7	16	21
Tank, gas, 6-ton, 5,000-gal, 4-wh, M131A1	7.14	16.96	22.45	6	16	21
Tank transporter, 45-ton, 8-wh, M15A1	21.19	66.19	66.19	16	59	59

Towed vehicles, semitrailer—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Tank transporter, 50-ton, 8-wh, M15A2	21.30	70.82	70.82	15	78	78
Telephone switchboard OA79, MSC–1	7.55	7.55	7.55	7	7	7
Telephone MDF OA77, MSC–1	6.70	6.70	6.70	8	8	8
Teletype operations OA78 MSC–1	6.00	6.00	6.00	7	7	7
Teletype switchboard OA76, MSC–1	6.51	6.51	6.51	7	7	7
Van, cargo, 6-ton, 2-wh, M118	3.57	9.57	11.67	4	9	11
Van, cargo, 6-ton, 2-wh, M119	3.59	9.59	11.69	5	9	11
Van, cargo, 6-ton, 2-wh, M118A1	3.55	9.55	12.55	4	8	11
Van, cargo, 6-ton, 2-wh, M119A1	3.59	9.59	11.69	4	8	10
Van, electronic, 6-ton, 2-wh, M348A2	5.00	11.00	13.00	5	10	11
Van, electronic, 6-ton, 2-wh, M373A2	5.25	11.25	13.25	5	10	11
Van, thrust unit	6.4	9.5	9.5	6	10	10
Van, warhead unit	------	8.8	8.8	------	9	9

Wheeled vehicles, combination	Weight (S. tons)			Class		
	E	C	H	E	C	H
Crane, mobile, 25-ton, 6 x 6—towing a trailer, crane components, 2W.	39.7	41.5	41.5	50	51	51
Tractor, wheeled, industrial, diesel, light, 4-wh, towing a scraper, earth-moving, towed, 7½-cu yd, with dolly.	14.96	26.06	------	11	21	
Tractor, wheeled, industrial, diesel, 4-wh, towing a scraper, earth-moving, towed, 18 cu yd with dolly.	41.20	73.70	------	32	104	
Truck, accessories, 2½-ton, 6 x 6 (lightweight)—towing a trailer, Power, distribution, ¾-ton (lightweight).	------	10.3	10.3	------	9	9
Truck, cargo, 2½-ton, 6 x 6 w and wo/winch, M35 in combination with trailer, cargo, 1½-ton, 2-wh, M104.	7.64	11.64	15.39	7	10	12
Truck, cargo, 2½-ton, 6 x 6, M35 w/winch-towing a trailer, van, aft unit.	9.3	13.1	15.6	8	10	13
Truck, cargo, 2½-ton, 6 x 6, M35, wo/winch-towing a trailer, van, aft unit.	9.1	12.9	15.4	8	10	12
Truck, cargo, 5-ton, 6 x 6 w and wo/winch,	11.17	17.84	24.09	9	15	20

Wheeled vehicles, combination—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
M54, in combination with trailer, cargo, 1½-ton, 2-wh, M104.						
Truck, erection, 2½-ton, 6 x 6, M46 (modified) (lightweight) towing a table, launching, roadable (lightweight).	8.4	12.3	12.3	7	10	10
Truck, fire control and test, van, 2½-ton, 6 x 6 towing a trailer, battery, service, ¾-ton (lightweight).	9.1	9.4	9.4	8	8	8
Truck, tractor, 5-ton, 6 x 6, M52—towing a semitrailer, alcohol tank, 3,000-gal, 2W.	13.2	21.2	21.2	10	18	18
Truck, tractor, 5-ton, 6 x 6, M52—towing a semitrailer, auxiliary, 12-ton, 4-wh.	26.9	30.5	30.5	21	25	25
Truck, tractor, 5-ton, 6 x 6, M52, semitrailer, cargo, 12-ton, 4-wh, M127A1.	15.68	27.78	33.78	12	23	29
Truck, tractor, 5-ton, 6 x 6, M52—towing a cooling tower, semitrailer, 4 sections, 240 GPM.	------	17.3	17.3	------	13	13

Truck, tractor, 5-ton, 6 x 6, M52—towing a dry ice plant, 260-lbs/hr. mobile, semitrailer.	-----	24.0	24.0	------	20	20
Truck, tractor, 5-ton, 6 x 6, M52—towing a semitrailer, test station, AN/MSM–2.	14.91	------	20.16	------	------	17
Truck, tractor, 5-ton, 6 x 6, M52—towing a semitrailer, electronics shop, AN/MSM–32.	14.91	------	18.93	------	------	16
Truck, tractor, 5-ton, 6 x 6, M52—towing a semitrailer, electronics shop, AN/MSM–33.	14.91	------	19.25	------	------	16
Truck, tractor, 5-ton, 6 x 6, M52—towing a semitrailer, generator, carbon dioxide, fuel-oil type, 300-lbs/hr.	-----	31.5	31.5	------	25	25
Truck, tractor, 5-ton, 6 x 6, M52—towing a semitrailer (column) generating and charging plant, oxygen and nitrogen, liquid, 5-ton, 200-lb.	------	35.5	35.5	------	30	30
Truck, fire control and test, van, 2½-ton, 6 x 6, towing a trailer, generator, 60KW, modified M–200 trailer (lightweight).	9.6	12.4	12.4	8	9	9
Truck, fire fighting, 1,500-gal pumper, class 1,500—towing a trailer, water tank, fire fighting, 2,000-gal, 4W.	15.1	29.2	29.2	12	24	24

Wheeled vehicles, combination—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Truck, guided missile repair parts, XM–488, towing a trailer, guided missile repair parts, SM–487.	7.77	------	11.44	------	------	10
Truck, tractor, 2½-ton, 6 x 6, M48, towing a semitrailer, cargo, can, 6-ton, 2-wh, M119.	9.51	15.51	17.61	8	12	15
Truck, tractor, 2½-ton, 6 x 6, M48, towing a semitrailer, crushing and screening plant, unit No. 2.	21.76	21.76	21.76	18	18	18
Truck, tractor, 2½-ton, 6 x 6, M221, towing a semitrailer, cargo, van, 6-ton, 2-wh, M119.	9.82	15.82	17.92	8	14	16
Truck, tractor, 2½-ton, 6 x 6, M221, towing a semitrailer, crushing and screening plant, unit No. 2.	20.63	20.63	20.63	17	17	17
Truck, tractor, 2½-ton, 6 x 6, M221, towing a semitrailer, crushing and screening plant, unit No. 2.	22.07	22.07	22.07	19	19	19
Truck, tractor, 2½-ton, 6 x 6, M275, with winch—towing a semitrailer, van, warhead unit.	------	14.6	14.6	------	12	12

Truck, tractor, 2½-ton, 6 x 6, M275, with winch—towing a semitrailer, van thrust unit.	12.2	15.3	15.3	9	11	11
Truck, tractor, 5-ton, 6 x 6, M52—towing a semitrailer, (air source) generating and charging plant, oxygen and nitrogen liquid, 5-ton oxygen and 200-lb nitrogen per day.	------	36.0	36.0	------	30	30
Truck, tractor, 5-ton, 6 x 6, M52—towing a semitrailer, 8-ton, liquid carbon dioxide transport and conversion unit.	------	25.5	25.5	------	22	22
Truck, tractor, 5-ton, 6 x 6, M52—towing semitrailer, low, 9-ton 2W.	17.9	26.9	26.9	14	22	22
Truck, tractor, 5-ton, 6 x 6, M52—towing a semitrailer, supply office, XM–484.	13.36	------	16.12	------	------	13
Truck, tractor, 5-ton, 6 x 6, M52—towing a tank, gasoline, 5,000-gal, 4-wh, M131.	16.46	26.27	31.73	13	22	28
Truck, tractor, 5-ton, 6 x 6, M52—towing a tank, gasoline, 5,000-gal, 4-wh, M131A1.	16.17	25.99	31.48	13	22	28
Truck, tractor, 5-ton, 6 x 6, M52—towing a tank, gasoline, 5,000-gal, 4-wh, M131A2.	15.25	25.40	30.48	12	20	26
Truck, tractor, 5-ton, 6 x 6, M52—towing a tank, fuel servicing, 5,000-gal, 4-wh, M131A1C.	16.30	27.49	33.55	13	24	30

Wheeled vehicles, combination—Continued	Weight (S. tons)			Class		
	E	C	H	E	C	H
Truck, tractor, 5-ton, 6 x 6, M52, towing a tank, fuel servicing, 5,000-gal, 4-wh, M131A2C.	16.36	26.95	32.61	12	22	28
Semitrailer, crushing and screening plant unit No. 1.	23.90	23.90	23.90	19	19	19
Semitrailer, crushing and screening plant unit No. 2.	25.34	25.34	25.34	21	21	21
Truck, tractor, 5-ton, 6 x 6, M52, towing a tank, fuel servicing, 5,000-gal, 4-wh, M131C.	16.58	27.77	33.86	13	24	30
Truck, tractor, 10-ton, 6 x 6, M123, in combination with semitrailer, tank transporter, 45-ton, 8-wh, M15A1.	37.44	------	82.44	26	------	66
Truck, tractor, 10-ton, 6 x 6, M123, in combination with semitrailer, tank transporter, 50-ton, 8-wh, M15A2.	37.55	------	87.07	25	------	78
Truck, tractor, 5-ton, 6 x 6, M246, in combination with semitrailer, low bed, 12-ton, 4-wh, M270A1.	25.17	37.17	37.17	19	27	27

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[AG 353 (31 May 60)]

By Order of *Wilber M. Brucker*, Secretary of the Army:

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For explanation of abbreviations used, see AR 320-50.

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