GENERAL

1 PURPOSE.—Suspension bridges (fig. 1) are used to carry light loads over long spans where swift or deep streams, deep ravines, and difficult approach roads or trails make impracticable the use of standard bridging equipage.

2 ADVANTAGES.—Suspension bridges for light loads have four advantages over other military bridges:

A For a given capacity they are lighter in weight per foot of bridge.

B They can be built to span gaps up to 400 feet with no intermediate supports.

C All bridge parts, with the exception of main cables and suspenders, can be built from local timber.

D Cable and equipment for construction can be divided into light, compact loads.

3 TYPES OF BRIDGE.—Three general types of suspension bridge are used in military operations:

A *Standard suspension bridge.*—A standard suspension bridge is built with standard equipage and material to carry specified loads. At present there are two types—a suspension footbridge and a light-equipment suspension bridge. These are covered in Chapters 2 and 3.

B *Nonstandard suspension bridge.*—A nonstandard suspension bridge is similar in design and construction to a standard bridge. It is built when heavier loads must be

crossed or when more permanent construction is desired. Design of nonstandard bridges is covered in Chapter 5.

C *Expedient suspension bridge.*—An expedient suspension bridge is built hastily, principally of local materials, and is used until a standard or nonstandard bridge can be constructed. Expedient bridges are described in Chapter 4.

4 STANDARD SUSPENSION BRIDGES.—A *Capacity.*— 1 - The suspension footbridge will carry one concentrated live load not exceeding 2,000 pounds. Three live loads of 1,000 pounds each are allowed on the bridge at one time provided they are separated by at least one-third the span length. For a detailed discussion of capacity see paragraph 9.

2 - The light-equipment suspension bridge will carry twice the live load of the suspension footbridge. See paragraph 56 for details.

B *Working party and construction time.*—Under favorable conditions a platoon of men requires 10 to 12 daylight hours to build a 300-foot suspension footbridge, while 12 to 15 daylight hours are required to build a 300-foot light-equipment suspension bridge. This does not include time to pack equipment and move to the bridge site.

C *Equipment.*—Special materials and equipment are available in engineer depots. Other equipment is organic with engineer platoons. Lists of materials and equipment used in constructing the standard bridges are given in Appendix I.

5 NONSTANDARD SUSPENSION BRIDGES.—A *Capacity.*—Since these bridges are designed to fit a particular situation the capacity varies with the design. Generally they are relatively heavy bridges. Chapter 5 describes three typical nonstandard bridges.

B *Working party and construction time.*—Heavier nonstandard bridges may require one engineer company. Construction time normally exceeds that required for the other two types of bridge. Five days to two weeks is required to build a 200- to 400-foot bridge for light vehicles.

C *Equipment.*—Normally materials are available in engineer depots. A portable sawmill and blacksmith forge and tool set may be necessary to make maximum use of local materials.

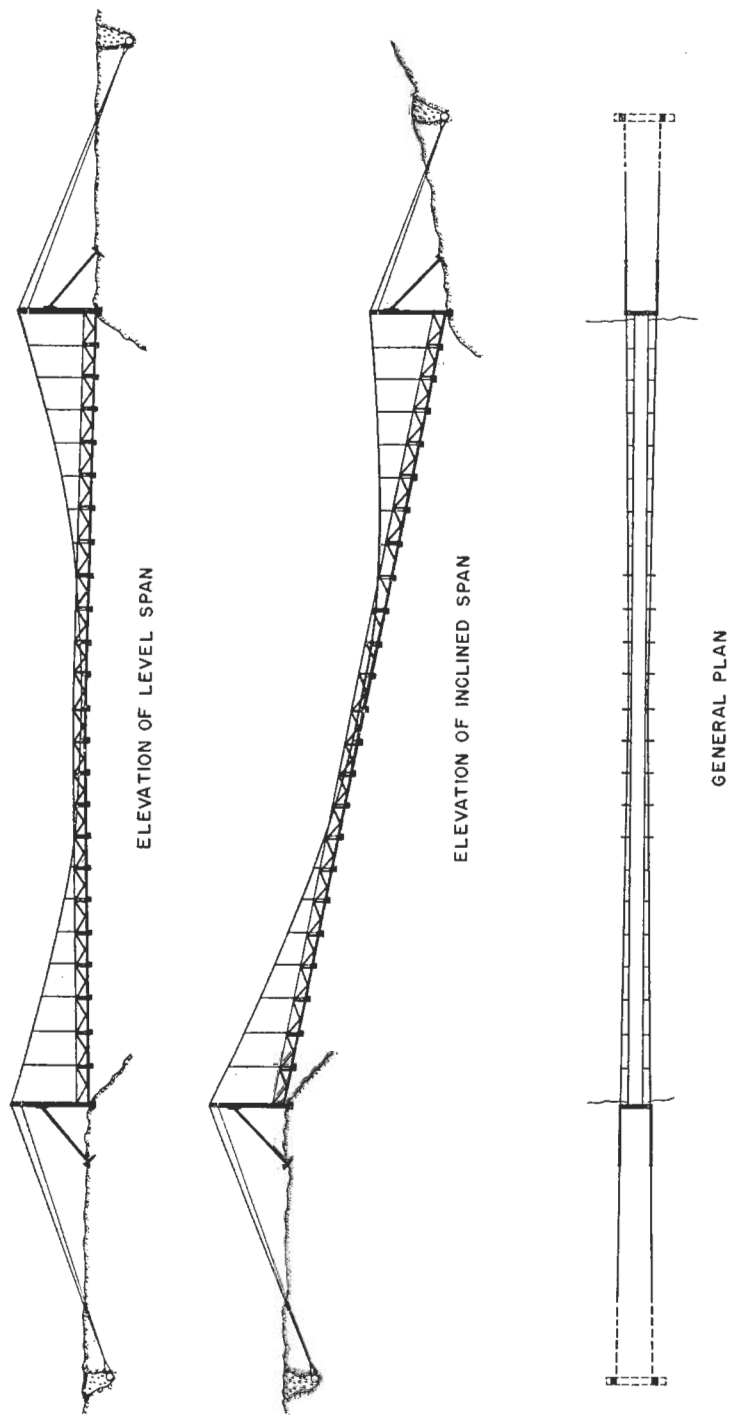

FIGURE 1. *Schematic diagram of standard suspension bridge. Spans from 40 to 300 feet can be built.*

6 EXPEDIENT SUSPENSION BRIDGES.—A *Capacity.*—These carry foot troops and pack animals only. Specific loads for illustrative types are given in Chapter 4.

B *Working party and construction time.*—Expedient bridges are constructed rapidly. One hundred feet of three-rope footbridge can be constructed by one squad in one-half hour; 100 feet of decked footbridge by one platoon in 3 hours.

C *Equipment.*—Local materials and tools from squad pioneer and carpenter sets are used.

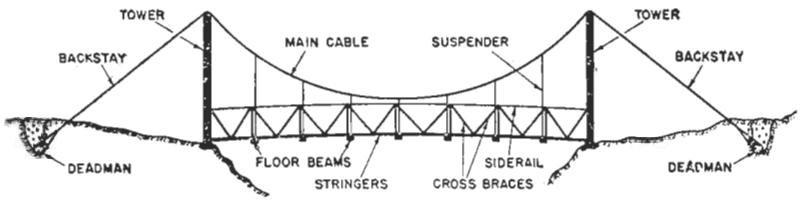

FIGURE 2. *Nomenclature of suspension bridge. This nomenclature is used throughout. Backstay and main cable are portions of a continuous cable.*

7 NOMENCLATURE (fig. 2).—A A suspension bridge is a *roadway* hung from two or more *main cables* stretched from bank to bank over towers and fastened to *deadmen.*

B Those portions of the main cables extending from the towers to the anchorages are called *backstays.*

C The roadway is supported by *suspenders* hung from the main cables.

D The suspenders are attached to *floor beams* which support the *stringers* on which the decking of the roadway is placed.

E To stiffen the bridge the live load is spread to several suspenders by the truss action of a section of siderail and its *cross braces.* Such a section is called a *stiffening truss.*

8 DESIGN FACTORS (fig. 3).—A *Dip* [fig. 3 (1)] is the amount of sag in the main cable; i.e., the vertical distance from the midpoint of a main cable to a line drawn between its points of support on the towers.

B *Span* is the horizontal distance between towers.

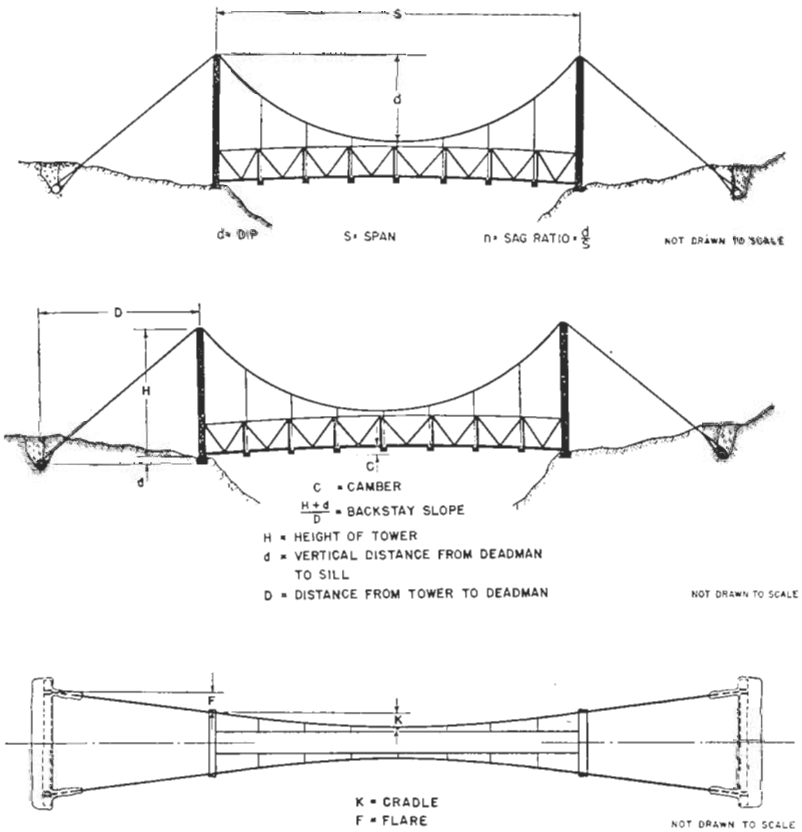

FIGURE 3. *Design factors of suspension bridges.* (1) *Dip and sag ratio. Dip and sag control the strength and stability of the bridge.* (2) *Camber and backstay slope. Camber allows for deflection under load. Backstay slope governs the stress in the cable; a cable on a flat slope takes small stress.* (3) *Cradle and flare help steady the bridge.*

C *Sag ratio* [fig. 3 (1)] is the ratio of the dip to the span. It varies from 1/20th or 5 percent to 1/6th or 16⅔ percent. If the main cables have a flat curve with low sag ratio, the bridge has more vertical stability but cable stress is high and strong anchorages are required. If the sag ratio is high there is less stress in the main cable and the anchorages may be placed closer to the towers. The sag ratio of the standard bridges described in Chapters 2 and 3 is 7 percent.

D *Camber* [fig. 3 (2)] is the vertical distance from the top of the floor beam in the middle of the span to a straight line drawn between the tops of the tower sills. The standard

bridges have a camber equal to 0.67 percent of the span length.

E *Cradle* [fig. 3 (3)] is the horizontal distance from the midpoint of a main cable to the straight line drawn between its points of support on the towers. Cradle increases lateral stability of the bridge. Usually it is 1.25 percent of the half-span length. It is fixed at 2 feet in the suspension footbridge and at 2 feet 3 inches in the light-equipment suspension bridge no matter what the span length.

F *Flare* [fig. 3 (3)] is the horizontal distance from the cable support on the towers to the cable at the anchorage. Flare increases the lateral stability of the bridge. Backstays are flared 2.5 to 3.5 percent of horizontal backstay length.

G *Backstay slope* [fig. 3 (2)] is the ratio of the difference in level between deadman and tower support of a main cable to the horizontal distance from the deadman to the tower. The full strength of the cable is utilized if the backstays make the same angle with the towers as the main cables. The standard suspension bridges use a backstay slope of 1 to 2½.

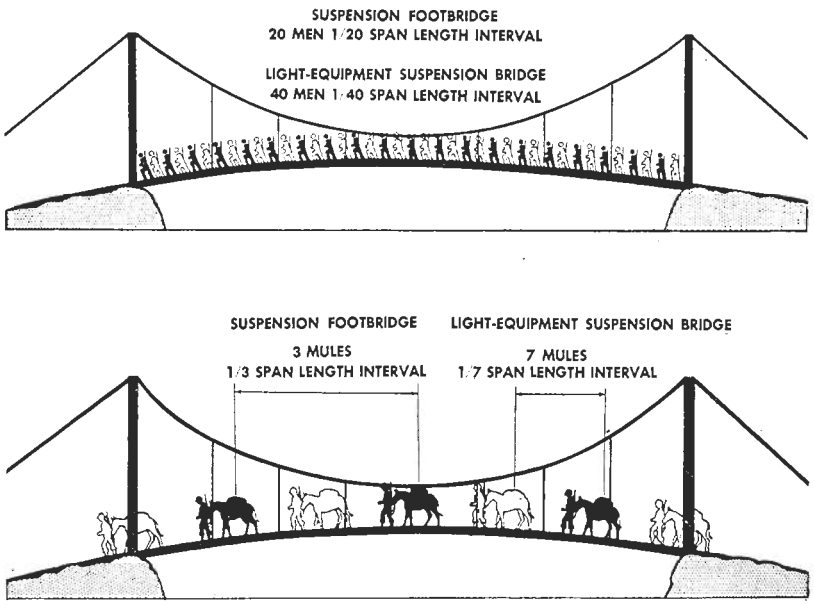

FIGURE 4. *Capacity of standard suspension bridges. The footbridge will carry the black figures only. The light-equipment bridge will carry both black and white figures.*