SUBCOURSE
EN0054

EDITION
A

ENGINEER INTELLIGENCE & RECONNAISSANCE

AIPD

READINESS/
PROFESSIONALISM
THRU
GROWTH

THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT

ARMY CORRESPONDENCE COURSE PROGRAM

INTRODUCTION

Engineer intelligence is processed engineer information which is immediately or potentially significant in planning and making sound decisions to accomplish a specific mission.

The engineer, however, has a dual responsibility for producing engineer intelligence. He must furnish intelligence for engineer operations. He must also furnish intelligence to all branches for use in connection with the planning and operational needs of commanders and staffs.

Part of this subcourse is devoted to a discussion of the intelligence cycle, the procedures by which information is collected, processed into intelligence, and distributed to users. The remainder of the subcourse discusses the reconnaissance procedures upon which engineers rely to gather much of the data necessary for engineer intelligence.

This subcourse consists of four lessons and an examination as follows:

Lesson 1. Engineer Intelligence.

2. Engineer Reconnaissance.

3. Route Reconnaissance.

4. Reconnaissance Report Forms.

The lessons are not a test from USAES. You will be learning from them and then testing yourself. As soon as you feel ready to take the examination, send the request card to the U. S. Army Engineer School. The grade that you receive on the examination is the grade for the subcourse.

Twelve credit hours are allowed for this subcourse.

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LESSON 1

ENGINEER INTELLIGENCE

CREDIT HOURS 3

TEXT ASSIGNMENT .... Attached programmed text.

LESSON OBJECTIVES .... Upon completion of this lesson, you will be able to:

1. Define military, strategic, combat, and engineer intelligence and describe the relationships between them.

2. Describe the intelligence cycle.

3. Discuss the principles and scope of engineer intelligence.

4. Describe how the intelligence cycle is applied to engineer requirements from the standpoint of planning, collection of data, processing, and dissemination.

5. Describe ways in which engineer intelligence is applied in various military situations.

INSTRUCTIONS TO STUDENTS

How To Study Programmed Instruction.

This is a programmed instruction text in which the information is broken down into small steps called "frames". Each frame contains teaching point, and to let you prove to yourself that you hub learned this point, a response section with blank spaces is provided. Fill in the blanks of the response and then check your answers by the answer line placed **just above the next frame**. The filling in of the blanks is a necessary part of the programmed instruction technique. Also, correct any wrong answers you may make, as this will help you remember the teaching point. Illustrations, charts, and tables are called "panels" and the related frames will direct you to them for study.

Notice that the pages of the lessons are divided into 2 parts by a horizontal line. Start with the first frame at the top of the page and continue numerically through the frames at the top; then return to the front of the lesson and complete the frames in the bottom half of the page and so on.

As you proceed through the frames, try to **pace yourself** in your study. Take breaks at convenient stopping points or the completion of topics, such as at the end of a set or lesson.

Self-Tests

At the end of each lesson is a self-test. This is a series of questions covering the lesson as a whole. Answer each one and then verify your answers by referring to the solutions and frames listed at the end of each lesson. This review is an important part of the learning process.

*** * * IMPORTANT NOTICE * * ***

THE PASSING SCORE FOR ALL ACCP MATERIAL IS NOW 70%

PLEASE DISREGARD ALL REFERENCES TO THE 75% REQUIREMENT.

Set 1-1. DEFINITION AND CATEGORIES OF INTELLIGENCE

FRAME 1-1.

Military intelligence is information about a possible or actual enemy or area of operations which has been collected, evaluated, analyzed, and interpreted.

Stated another way, we can say that **intelligence** is **processed information.**

To be considered intelligence, ________________________ must be ___________________________________ _________________ .

Set 1-4. ESSENTIAL ELEMENTS OF INFORMATION

(intelligence cycle; engineer) (1-27)

FRAME 1-28.

The **planning** and **collection** of engineer information is based on the need for essential elements of information, usually abbreviated to **EEI**.

Essential elements of information form the basis for the _____________________ and ____________________ of engineer information.

(information; intelligence) (1-54)

FRAME 1-55.

Processing consists of **recording**, **evaluating**, and **interpreting** the collected information.

To be processed into intelligence, information must ________________________ , _____________________ , and ________________ .

(letter; accuracy) (1-80)

FRAME 1-81.

In Panel 1-6, the evaluation rating system is explained in detail. On the basis of this information, how would you rate the reliability of a new source of information on whom there was no record of previous experience? ______

(information; processed) (1-1)

FRAME 1-2.

Processing consists of recording, evaluating, and interpreting ________________________________ to convert it to _________________________________ .

(planning; collection) (1-28)

FRAME 1-29.

Essential elements of **information** are the specific facts which a commander must know to accomplish a particular mission. They vary according to the situation and the level of command which requires them.

The specific facts which a commander needs for a particular mission are called, _________________________ ____.

(recorded; evaluated; interpreted) (1-55)

FRAME 1-56.

Recording, evaluating, and interpreting the collected information comprise the ____________________ step of the ________________ ________________ .

(F, reliability cannot be judged) (1-81)

FRAME 1-82.

If the information provided by the source described in Frame 1-81 proved to be confirmed by other sources rated as A and B, how would you then evaluate the information both as to reliability and accuracy?

____

(information; intelligence) (1-2)

FRAME 1-3.

When information has been recorded, evaluated, and interpreted, it becomes ____________________________ .

(essential elements of information) (1-29)

FRAME 1-30.

Essential elements of information for any particular collection plan vary according to the _______________________ and the _________________________ ______ ___________________________ .

Set 1-8. RECORDING

(processing; intelligence cycle) (1-56)

FRAME 1-57.

Recording is the initial step in processing. Information is recorded in various ways. Among these are journals, worksheets, situation maps, and files or lists of special subjects.

The first step in processing is the ____ of information.

(F-1) (1-82)

FRAME 1-83.

As you can see, the evaluations of reliability of source and accuracy of information are independent of each other. Only after repeated experience has developed a basis for judgment would the reliability rating of a new source of information be changed.

What would the rating C-3 indicate about the rated information?

(intelligence) (1-3)

FRAME 1-4.

Intelligence is information that has been __________________________ , _______________________________ and ___________________ .

(situation; level of command) (1-30)

FRAME 1-31.

For example, a river crossing is included as part of the offensive drive of a division, which of the following would constitute EEI for the crossing operation?

a. location of port facilities

b. slope and composition of banks

(recording) (1-57)

FRAME 1-58. INFORMATION FRAME.

Refer to Panel 1-3 at the end of this lesson. This is a typical journal. As you can see, it covers a 24-hour period and is a log of activities of concern to the S2. It contains summaries of messages, orders, reconnaissance reports, incidents, conferences, and anything else that might contribute to the intelligence effort, in their order of occurrence. It also notes any actions taken, and the disposition of documents.

(fairly reliable source; information possibly true) (1-83)

FRAME 1-84

In the processing step of the intelligence cycle, evaluating information means determining its ______________________________ , ______________________________ , and ________________________________ .

(recorded; evaluated, interpreted) (1-4)

FRAME 1-5.

Information differs from intelligence in that it has not been ________________________________ . It may be true or false, accurate or inaccurate, confirmed or unconfirmed, pertinent or not pertinent. It becomes intelligence after it has been _______________________________ , ____ , and ________________________________ .

(b. slope and composition of banks) (1-31)

FRAME 1-32.

On the other hand, if a theater commander required information about the transportation system of a country, the location of port facilities on the river would definitely be included as EEI, while the slope and composition of the banks would be irrelevant.

Thus it can be seen that the information that comprises EEI depends upon the ___________________________ and the_______________________ _______ ________________________ .

(Go on to next frame) (1-58)

FRAME 1-59.

As they occur, items are recorded in the ____ kept by the S2.

Set 1-10. INTERPRETATION

(pertinence, reliability, accuracy) (1-84)

FRAME 1-85.

The final step in processing is the **interpretation** of the evaluated information. Interpretation is the critical judgment involving analysis (taking apart), integration (putting together), and deduction (forming conclusions).

Analysis, integration, and deduction are the three steps involved in the __________________________________ of information.

(processed; recorded; evaluated; interpreted) (1-5)

FRAME 1-6.

Military intelligence generally falls into two basic categories, **strategic**, and **combat** (or tactical).

There are two basic categories of military intelligence, ______________________ and _____________________.

(situation; level of command) (1-32)

FRAME 1-33.

Essential elements of information are the specific _________________________________ which the commander must know to accomplish a particular ______________________________________ . The EEI vary according to the ____________________________ and the ________________________ of command.

(journal) (1-59)

FRAME 1-60.

The journal is a record of items of intelligence interest in order as they occur. If you wished to prepare a report on a particular **subject**, say minefields, you would need records organized by **subject**. The **worksheet** is the record information by **subject**.

Information is recorded by ______________________________ on the ____________________________ .

(interpretation) (1-85)

FRAME 1-86.

The final step of processing, ______________________ of information, involves ____________________ , __________________ , and ___________________ .

(strategic; combat) (1-6)

FRAME 1-7.

Strategic intelligence is oriented on **national** objectives. Combat intelligence is more concerned with **tactical** operations.

The orientation of strategic intelligence is ______________________________ ; that of combat intelligence is ____________________ .

(facts; mission, situation; level) (1-33)

FRAME 1-34.

The **commander** designates the items to be included as essential elements of information in the collection plan prepared by the staff engineer. He is assisted by his intelligence officer and his staff engineer.

The designation of EEI for any particular collection plan is the responsibility of the ____________________ .

(subject: worksheet) (1-60)

FRAME 1-61.

Refer to Panel 1-4. This is the way worksheets are generally organized. The index tabs are usually labeled to correspond with the headings of the engineer periodic reports. Obsolete items are deleted.

After an item has been recorded in the journal, it is posted on the ______________________________ by ______________________ .

(interpretation; analysis; integration; deduction) (1-86)

FRAME 1-87.

Analysis is the sifting and sorting of evaluated information to isolate significant elements with respect to the mission and operations of the command.

Isolating significant elements of evaluated information is the purpose of ________________________ .

(national; tactical) (1-7)

FRAME 1-8.

Strategic intelligence helps to determine realistic **national** objectives and how to accomplish them. Factors which influence the military strengths, weaknesses, and probable courses of action of nations are considered components of strategic intelligence.

Strategic intelligence is oriented toward ______________________________ objectives.

(commander) (1-34)

FRAME 1-35.

The list of EEI and other requirements for engineer intelligence and information form the basis for the collection plan drawn up by the engineer.

The collection ____________________ is based on the list of ____________________ .

(worksheet; subject) (1-61)

FRAME 1-62.

Notice that each entry is cross-referenced to the journal on which it was originally recorded, together with the date of source. To prepare your report on minefields, you would look up "minefields" in the ____________________________ , where information is recorded by __________________________ .

(analysis) (1-87)

FRAME 1-88.

In **integration**, facts are put together logically, rather than separated, as is analysis. **Integration** is the combination of those elements isolated by analysis with other known information to form a logical hypothesis concerning either the enemy or the area.

Putting together various elements of analyzed and known information to form a hypothesis is ______________________________ .

(national) (1-8)

FRAME 1-9.

Combat intelligence is evaluated information about the enemy, weather, and terrain required by a commander in the planning and conduct of **tactical** operations.

Combat intelligence is oriented towards ______________________________ operations.

Set 1-5. PLANNING THE COLLECTION EFFORT

(plan; EEI) (1-35)

FRAME 1-36.

Refer to Panel 1-2. This is a typical collection plan, intended, in this case, to provide for the gathering of necessary data for a river crossing operation. How many essential elements of information are listed in the plan? ______________________ .

(worksheet; subject) (1-62)

FRAME 1-63.

In the situation map, information is pictured, or **graphically recorded**. It may be a sketch, an overlay to an existing map, or a combination of sketches and overlays. Its function is to present a picture or ________________ ______________________________ of the situation.

(integration) (1-88)

FRAME 1-89.

The hypothesis developed by analysis and integration of evaluated information forms the basis for **deduction** of meaning. **Deduction** of the meaning of the information with relation to the situation is the object of processing information into intelligence.

The last step in the interpretation of information is the __________________ of meaning from the analyzed and integrated data.

(tactical) (1-9)

FRAME 1-10.

The differences between strategic and combat intelligence are essentially in **scope** and point of view. They are concerned with the same subject matter, and are collected and processed by the same methods. They overlap in many ways.

Strategic and combat intelligence differ primarily in ___________________________ .

---

(8) (1-36)

FRAME 1-37.

There is no rigidly prescribed form for the collection plan, but it normally includes the following:

a. requesting unit

b. time and date due

c. where to submit reports

d. a list of EEI

e. agencies which are to collect each EEI

According to the collection plan in Panel 1-2, where and when were the reports to be submitted? ____

(graphic record) (1-63)

FRAME 1-64. INFORMATION FRAME.

Panel 1-5 is a sample of a situation map, in this case, a sketch of friendly and enemy positions. Standard military symbols are used, in accordance with FM 21-30. Significant topographic symbols, such as hills, rivers, roads, and bridges, are shown when they influence the military situation. At least two grid intersections are plotted, to aid in relating the sketch or overlay to existing topographic maps. The types, sizes, numbers, and positions of enemy and friendly units are indicated, along with front line boundaries, and the type, numbers, and positions of enemy weapons.

(deduction) (1-89)

FRAME 1-90.

The interpretation of information involves ________________________ , _________________________ , and ______________________ to establish the relation of the information to the intelligence picture already established.

(scope) (1-10)

FRAME 1-11.

Strategic intelligence is ______________________ in scope; ____________________ intelligence is aimed at tactical operations.

(to the Bn S2 at 1730 hours, 19 July 1972) (1-37)

FRAME 1-38.

Again referring to Panel 1-2, notice that at least two agencies have been directed to collect each element of information. On this particular plan, the preparing engineer has noted with an "X" those agencies capable of obtaining each EEI. A circled X indicates those actually directed to take the action.

Of the agencies listed in the plan, how many were capable of locating suitable sites for minefields and road blocks after the crossing? ____________________________

(Go on to next frame) (1-64)

FRAME 1-65.

Military symbols for enemy units are drawn with a double outline, with sizes indicated at the tops of the symbols. Company-sized units are shown with a short single line perpendicular to the outline. How many enemy armored infantry companies have been identified and located on the map? ________________________________

Set 1-11. REVIEW OF PROCESSING

(analysis; integration; deduction) (1-90)

FRAME 1-91.

Let us briefly review the steps which make up the processing portion of the intelligence cycle. Processing consists of three basic operations, ____________________________ , __________________________ , and ______________________ .

Set 1-2. INTELLIGENCE CYCLE

(national; combat) (1-11)

FRAME 1-12. INFORMATION FRAME.

Regardless of the scope and orientation of intelligence operations, they follow a four-step procedure known as the **intelligence cycle**. The four steps are:

a. Planning the collection effort and preparing orders.

b. Collecting the information.

c. Processing the collected information.

d. Disseminating and using the resulting intelligence.

The intelligence cycle is continuous. New information is constantly fed into the system as other information is being processed and used.

(six) (1-38)

FRAME 1-39.

Of the agencies capable of siting minefields and road blocks, how many were directed to report this information? ______________________________

(four) (1-65)

FRAME 1-66.

Information is shown in graphic form on the ______________________________ .

(recording; evaluating; interpreting) (1-91)

FRAME 1-92.

In evaluating information, you must determine its ________________________ , __________________________ , and _____________________ .

(go on to next frame) (1-12)

FRAME 1-13.

The four steps of the **intelligence** cycle are:

a. planning the collection effort

b. collecting the information

c. processing the information

d. disseminating the intelligence

The four steps of planning, collecting, processing, and dissemination make up the ____________________ _________________________ .

(three) (1-39)

FRAME 1-40.

Which agencies were directed to report on the identification of enemy minefields? ________________________

(situation map) (1-66)

FRAME 1-67.

Intelligence **files** are necessary to permit ready access to available information.

Information is made accessible to users by well-arranged ____________________ .

(pertinence, reliability; accuracy) (1-92)

FRAME 1-93.

After the information is evaluated, it must be ________________________________ by ____________________________ , _______________________ , and _______________________ .

(intelligence cycle) (1-13)

FRAME 1-14.

The intelligence cycle consists of:

a. ________________________the collection effort

b.________________________the information

c.________________________the information

d.________________________the intelligence

(S2; Co. D) (1-40)

FRAME 1-41.

How many elements of information was Co. C directed to report? ______________________________

(files) (1-67)

FRAME 1-68.

Some of the files of engineer interest are the journal file, which holds a record copy of each message or document noted in the journal; files on friendly and enemy minefields, photographic negative files, and records of target locations. Files organize information and make it **accessible** to the unit personnel who need it.

Files make information ___________________________ to users.

(interpreted; analysis; integration; deduction) (1-93)

FRAME 1-94.

So far we have discussed three of the four steps in the intelligence cycle. They are _____________________ , ______________________ , and ____________________________ .

(planning; collecting; processing; disseminating) (1-14)

FRAME 1-15.

Panel 1-1 at the back of this lesson is an outline of the four steps of the intelligence cycle and their component elements. Refer to this panel from time to time as you study the rest of this lesson to help you in your responses.

How many of the steps of the intelligence cycle deal with actual intelligence?

(three) (1-41)

FRAME 1-42. SUMMARY FRAME.

The collection plan usually includes a list of the EEI, the requesting unit, and purpose of the request. To implement the plan, the engineer then designates the agencies responsible for obtaining each EEI, and specifies the time and place for submission of reports. Organizing the collection effort in this way insures that all of the needed information is obtained in time to be of value and is delivered to the element which will process it, usually the S2 or G2.

(accessible) (1-68)

FRAME 1-69.

Let us summarize the methods of recording information in the processing step of the intelligence cycle:

a. ___________________________: a 24-hour log of items or events of intelligence interest listed in order of occurrence.

b.___________________________: a record of items arranged by subject.

c.___________________________: a graphic portrayal of the situation.

d.___________________________: orderly arrangements of information intended to make it readily accessible to users.

Set 1-12. DISSEMINATION

(planning; collecting; processing) (1-94)

FRAME 1-95.

The last step in the intelligence cycle is the **dissemination** of intelligence to users.

After information is planned for, collected, and processed into intelligence, it must be______________________ to users.

(one) (1-15)

FRAME 1-16.

Only one step of the intelligence cycle, the last one (dissemination) deals with intelligence. Remember that information does not become intelligence until it has been ______________________________________ .

(go on to next frame) (1-42)

FRAME 1-43.

The collection plan is drawn up by the __________________________________ of the command, based on the list of _____________________ . He designates the collecting _________________ and the __________________ and ________________________ to submit reports.

Set 1-9. EVALUATION

(journal; worksheet; situation map; files) (1-69)

FRAME 1-70.

After the collected information has been **recorded**, it is ready to be **evaluated**. Evaluation is the second step in processing information into intelligence.

In processing information, it is first __________________________ , then ____________________________ .

(disseminated) (1-95)

FRAME 1-96.

One of the more important aspects of dissemination is timeliness. Intelligence is useless if it is not gotten to the user **in time** to be of value.

Intelligence must be received ____ to serve its intended purpose.

(processed) (1-16)

FRAME 1-17.

In which step of the intelligence cycle does information become intelligence? ____________________________

Set 1-6. COLLECTION OF INFORMATION

(engineer; EEI, agencies; time; place) (1-43)

FRAME 1-44.

As we have seen, the first step in the intelligence cycle is planning the collection effort. The next step in the cycle is the **collection** of information. This is the step in which engineer EEI are systematically obtained and readied for further processing.

Information is obtained during the _____________________________________ phase of the intelligence cycle.

(recorded; evaluated) (1-70)

FRAME 1-71.

Evaluation includes determining the **pertinence** of the information, the **reliability** of the source and the collecting agency, and the **accuracy** of the information.

The determination of ________________________ , __________________________ , and ________________ of information is known as ___________________________ .

(in time) (1-96)

FRAME 1-97.

When the need for certain information is urgent, it is better to forward unprocessed or partially processed information **in time**, than to provide completely processed intelligence too late to be of value to a commander.

Intelligence must be disseminated __________________________ to be useful.

(Step 3, processing) (1-17)

FRAME 1-18.

In the third step, ______________________________ the information, the collected information is converted into intelligence, ready to be ______________________________ and used.

(collection) (1-44)

FRAME 1-45.

Generally, engineer information is obtained in three ways:

a. reconnaissance

b. study of documents

c. interrogation of individuals

Engineer information is collected through ______________________ , ____________ ______ ______________ , and ______________ _______ ______________________ .

(pertinence; reliability; accuracy; evaluation) (1-71)

FRAME 1-72.

Information is evaluated with respect to its ____________________________ , __________________________ , and _______________________ .

(in time) (1-97)

FRAME 1-98.

The **form** and **detail** in which intelligence is disseminated is another important consideration. Generally, the lower the echelon, the greater the detail needed.

In addition to timeliness, it is important to disseminate intelligence in __________________________________ and _______________________________________ appropriate to the needs of the user.

(processing, disseminated) (1-18)

FRAME 1-19.

The procedure for obtaining intelligence is known as the ____________________ ________________ . It consists of the following four steps:

a.________________________

b.________________________

c. ________________________

d.________________________

(reconnaissance; study of documents; interrogation of individuals) (1-45)

FRAME 1-46.

Reconnaissance can be conducted directly by **ground** or **aerial observation**, or indirectly by the study of **maps** and **aerial photographs.**

Reconnaissance can be conducted by ____________________________ or ______________________________ observation, or by studying ________________________ and ______________________ ______________________ .

(pertinence; reliability; accuracy) (1-72)

FRAME 1-73.

To establish the pertinence of information, you must determine whether or not the information

a. concerns the enemy, or area characteristics.

b. is needed immediately, and by whom.

c. is of possible present or future value, and to whom.

In determining the need for information on a particular subject, you establish its ________________________ .

(form; detail) (1-98)

FRAME 1-99.

For example, the existence, type, and general locations of enemy weapons are of interest to an army commander and would be reported in standard intelligence documents. A lower echelon commander, however, needs to know the exact location of each weapon, preferably plotted on a situation map.

Intelligence must be disseminated in such _________________________ and ___________________________ as to be of maximum use to each echelon.

Set 1-3. ENGINEER INTELLIGENCE

(intelligence cycle; planning; collecting; processing; disseminating) (1-19)

FRAME 1-20. INFORMATION FRAME.

Within the broad categories of strategic and combat intelligence, there are many specialized types which pertain primarily to the missions of various arms of the service. Engineer intelligence is processed information needed in the conduct of engineer operation in a theater. It is required at all echelons for tactical, technical, and strategic purposes. Although it is gathered by and for engineers, it also provides an important contribution to the overall intelligence effort.

(ground; aerial; maps; aerial photographs) (1-46)

FRAME 1-47. INFORMATION FRAME.

Regardless of the method used, reconnaissance has as its main purpose the examination of a specific geographic area or feature, such as a road or bridge, to provide detailed engineering information about the feature or area.

The reconnaissance methods commonly used by engineer personnel are discussed in more detail in lessons 2 and 3 of this subcourrse.

(pertinence) (1-73)

FRAME 1-74.

Information is considered pertinent if it concerns a particular ____________________________________ and is _______________________________ , either immediately or for future use.

(form; detail) (1-99)

FRAME 1-100.

The dissemination **means** to be used is based on the timeliness and importance of each item of intelligence. These factors include the amount of detail, the pertinence, and the urgency of the information, the user's resources for further evaluation and interpretation, his needs for planning and initiating action, and the capabilities of available communication.

The timeliness and importance of the intelligence determine the _____________________________________ of dissemination.

(go on to next frame) (1-20)

FRAME 1-21.

Engineer intelligence is broad and comprehensive, and includes data on almost all **natural** and **man-made** terrain features of military significance. Its products include:

maps

map products, such as photomosaics

ground control

area studies

terrain studies

reconnaissance reports

Engineer intelligence is concerned with ___________________________ and ____________________________ features of the terrain.

(go on to next frame) (1-47)

FRAME 1-48.

Documents and many forms of published material provide information which can contribute to the total intelligence picture. The acquisition and study of **documents** is a continuous part of the collection effort.

Another way to collect information is to study ____________________________ .

(subject; needed) (1-74)

FRAME 1-75.

An important part of evaluating information is to determine the reliability of both the sources and the collector.

The sources of information and the collection agency are evaluated for ______________________________ .

(means) (1-100)

FRAME 1-101.

Priority communications should be used with restraint, and only when the need for information is urgent. Habitual and unnecessary use of such communications for routine dissemination can interfere with the mission itself.

The means of dissemination depends upon the ______________________ and ____________________________ of the intelligence.

(natural; man-made) (1-21)

FRAME 1-22.

Some of the subjects included in engineer intelligence are:

Natural:

Geology, soils, surface, configuration, vegetation, ground conditions
Hydrology, water supply, hydrography
Weather and climate
Natural resources that can be developed
Sources of construction materials
Suitability for airfield, highway, and underground construction

Man-Made:

Routes of communication, including roads, railroads, inland waterways, ports, beaches, and airfields
Rural and agricultural development
Urban areas, industrial works, hydraulic structures, excavations, electric power, pipelines, defenses, and other works of man

As you can see, engineer intelligence is broad and comprehensive, and covers most ______________________ and ______________________ terrain features.

(documents) (1-48)

FRAME 1-49.

Captured enemy documents contain much information of value to intelligence specialists. Published intelligence and terrain studies are also useful. Even public material such as texts, periodicals, and technical papers, contribute important information.

An important source of information is the study of ___________________________________ .

(reliability) (1-75)

FRAME 1-76.

Reliability is usually evaluated on the basis of previous **experience**. If a source has proved to be reliable in the past, it can generally be accepted as still reliable. The headquarters closest to the collecting agency is usually the best judge of its reliability.

The most common basis for evaluating reliability is past ______________________________________ .

Set 1-13. REVIEW OF INTELLIGENCE CYCLE

(timeliness; importance) (1-101)

FRAME 1-102.

Dissemination is the final step in the intelligence cycle. The others are _______________________________ , _____________________ , and ______________________ .

(natural; man-made) (1-22)

FRAME 1-23.

The intelligence cycle applies to the production of engineer intelligence. The four steps which produce engineer intelligence are as follows:

a. Collection **plan**, prepared by the engineer of the command

b. Collection effort, including map, aerial, and ground reconnaissance

c. Processing engineer information

d. Disseminating engineer intelligence to requesting element and other users as needed

The engineer intelligence cycle consists of ___________________________ , ___________________________ , ___________________________ , and _____________________ .

(documents) (1-49)

FRAME 1-50.

The study of documents is continuous, and contributes most significantly to the **strategic** intelligence effort. However, if documentary information is processed quickly enough, it can also be important to the conduct of **tactical** operations.

Information derived from the study of documents is important to both ___________________________________ and ________________________ intelligence.

(experience) (1-76)

FRAME 1-77.

Once the pertinence of the information and the reliability of its sources have been established, there remains the need to determine its **accuracy**.

In processing information into intelligence, there is a need to determine not only its pertinence and reliability, but also its ________________________ .

(planning; collecting; processing) (1-102)

FRAME 1-103.

The collection plan for engineer intelligence is based on __________________ ___________________of ______________________ .

(planing; collection; processing; dissemination) (1-23)

FRAME 1-24.

Because of the broad and varied nature of engineer intelligence, the collection of pertinent information is a **continuous** operation.

The collection effort, as it pertains to engineer information, is ____ .

(strategic; tactical) (1-50)

FRAME 1-51.

The interrogation of individuals is the third source of information utilized during the collection phase. These individuals may be prisoners of war, deserters, local civilians, refugees, military returnees, and others.

Information is also obtained by ____________________________ of individuals.

(accuracy) (1-77)

FRAME 1-78. INFORMATION FRAME.

Judgment of the accuracy of information is based on the answers to the following questions:

a. Is the reported fact or event **possible**?

b. Is the report **consistent** within itself?

c. Is the report **confirmed** or corroborated by information from other sources or agencies?

d. Does the report **agree** with other information known to be true?

e. If the report conflicts with other information, which is more likely to be true?

(essential elements; information) (1-103)

FRAME 1-104.

Information becomes intelligence in the ________________________________ step of the intelligence cycle. This step consists of ___________________ , _________________________ , and ________________________ information.

(continuous) (1-24)

FRAME 1-25.

A collection **plan** is drawn up when a specific need or request for specialized engineer information arises.

The collection of engineer information is continuous, but when the need arises, it can also be a carefully directed effort, made according to ______________________ .

(interrogation) (1-51)

FRAME 1-52.

To summarize, information is collected by three methods, __________________ , _______________ ________ ________________________ , and _____________ ______ ______________________ .

(Go on to next frame) (1-78)

FRAME 1-79.

Many factors affect the accuracy rating of information. It is judged as to possibility, consistency, ____________________ by others, and most importantly, by its agreement with known facts. All of these factors are considered in order to determine its _______________________ .

(processing; recording; evaluating; interpreting) (1-104)

FRAME 1-105.

To evaluate information, you must determine its _____________________ , the _________________________ of the _____________________ , and its __________________________ .

(plan) (1-25)

FRAME 1-26.

Planning the collection of engineer information at any level of command is the responsibility of the **engineer** of the command.

When any directed effort for obtaining engineer information is made, the planning is the responsibility of the ________________________________ of the command.

Set 1-7. PROCESSING INFORMATION

(reconnaissance; study document; interrogation of individuals) (1-52)

FRAME 1-53.

After engineer information has been collected, it must be **processed** before it can be disseminated to users. Processing is the step in the intelligence cycle in which information becomes **intelligence**.

Information must be __________________________ before it becomes ______________________________ .

(confirmation; accuracy) (1-79)

FRAME 1-80.

The evaluation of each item of information follows a standard system. **Reliability** is shown by a **letter**; **accuracy**, by a **number**.

The notation used by intelligence specialists to evaluate information indicates reliability by a ____________________________ ; a number is used to indicate __________________________________ .

GO BACK TO BOTTOM OF PAGE 1-4 FOR FRAME 1-80.

(pertinence; reliability; source; accuracy) (1-105)

FRAME 1-106.

The final step in processing is to determine the significance of the information with regard to present and future missions. This step is called ____________________________ , and consists of _____________________________ , ______________________________ , and ______________________________ .

(engineer) (1-26)

FRAME 1-27.

Engineer intelligence is produced by using the four steps of the ______________________________ . The collection effort is planned by the ______________________________ of the command.

GO BACK TO BOTTOM OF PAGE 1-3 FOR FRAME 1-28.

(processed; intelligence) (1-53)

FRAME 1-54.

Processing is the step in the intelligence cycle in which ______________________________________ becomes __________________________ .

GO BACK TO TOP OF PAGE 1-4 FOR FRAME 1-55.

(interpretation; analysis; integration; deduction) (1-106)

FRAME 1-107. INFORMATION FRAME.

Panel 1-7 describes three examples of the items that an engineer intelligence officer may be called on to produce in connection with the planning and execution of military operations. Certain of these would enter into the planning of the commander and his staff, while others would be of interest primarily to the engineers themselves.

The three hypothetical military operations are a river crossing, seizure of an airhead, and establishment of a defensive position. Notice that many of the items are identical for the three operations, some are similar, and a few are needed only for the specialized operation. The collection effort is planned and conducted to meet the needs of the particular situation.

END OF FRAMES

OUTLINE OF INTELLIGENCE CYCLE

1. Planning the Collection Effort

a. Essential elements of information

b. Collecting plan

2. Collecting the Information

a. Reconnaissance

(1) Maps and photos

(2) Aerial

(3) Ground

b. Study of documents

c. Interrogation of individual

3. Processing Information

a. Recording

(1) Journal

(2) Work sheet

(3) Situation map

(4) Files

b. Evaluation

(1) Pertinence

(2) Reliability

(3) Accuracy

c. Interpretation

(1) Analysis

(2) Integration

(3) Deduction

4. Dissemination of Intelligence

PANEL 1-1. Outline of the Intelligence Cycle.

Unit: 1st Engr Bn

Information required in connection with proposed river crossing By: Bn S2
For: Div G2, Bn hq

Area to be studied: Triangle SHARON - PETERSVILLE - ALLIANCE bounded by State roads 106, 107, and 88

Limiting hour and destination of reports: 191730 Jul 72; Bn S2

Essential elements of information	Agencies (Check agencies to be employed): Request corps engr	Asst div engr	S2	S3	S4	Co A	Co B	Co C	Co D	Bn reconnaissance off
1. What are the sites on PEMBERTON RIVER between WAVERLY and NORTH SHARON suitable for: (1) assault boat crossings, (2) footbridges, (3) ferries, and (4) ponton bridges (three alternative sites for each)?				X		X	X	X	X	X
2. What in detail is the condition of: (1) the SHARON-WAVERLY road (State 106), (2) the SHARON-NORTH SHARON road (State 107), and (3) all roads between them?						X	X	X		
3. What information is obtainable on (1) the WAVERLY-ALLIANCE road (State 106), (2) the NORTH SHARON-PETERSVILLE road (State 107), and any roads that the enemy may have built in the area between State road 88 and the PEMBERTON RIVER; including information on the partially destroyed bridges over the river at WAVERLY and NORTH SHARON?		X	X						X	X
4. What natural cover, and what natural concealment, are available along both sides of the PEMBERTON RIVER between WAVERLY and NORTH SHARON?			X	X		X	X	X	X	X
5. What are suitable location for supply points, between State road 88 and the PEMBERTON RIVER, for dumping fortification materials to be used in organizing our position after the crossing?					X				X	X
6. What enemy minefields can be identified?			X						X	
7. What are suitable sites for minefields and road-blocks to be placed by our troops, while organizing the position after the crossing?				X		X	X	X	X	X
8. What are the locations and amounts of any engineer construction materials, especially sand, gravel, crushed stone, and milled lumber, suitable for use in the repair and constuction of roads and bridges?	X		X		X	X	X	X		

PANEL 1-2. Collection Plan.

DAILY STAFF JOURNAL OR DUTY OFFICER'S LOG (AR 220-346 & FM 101-5)				PAGE NO	NO OF PAGES
				1	1

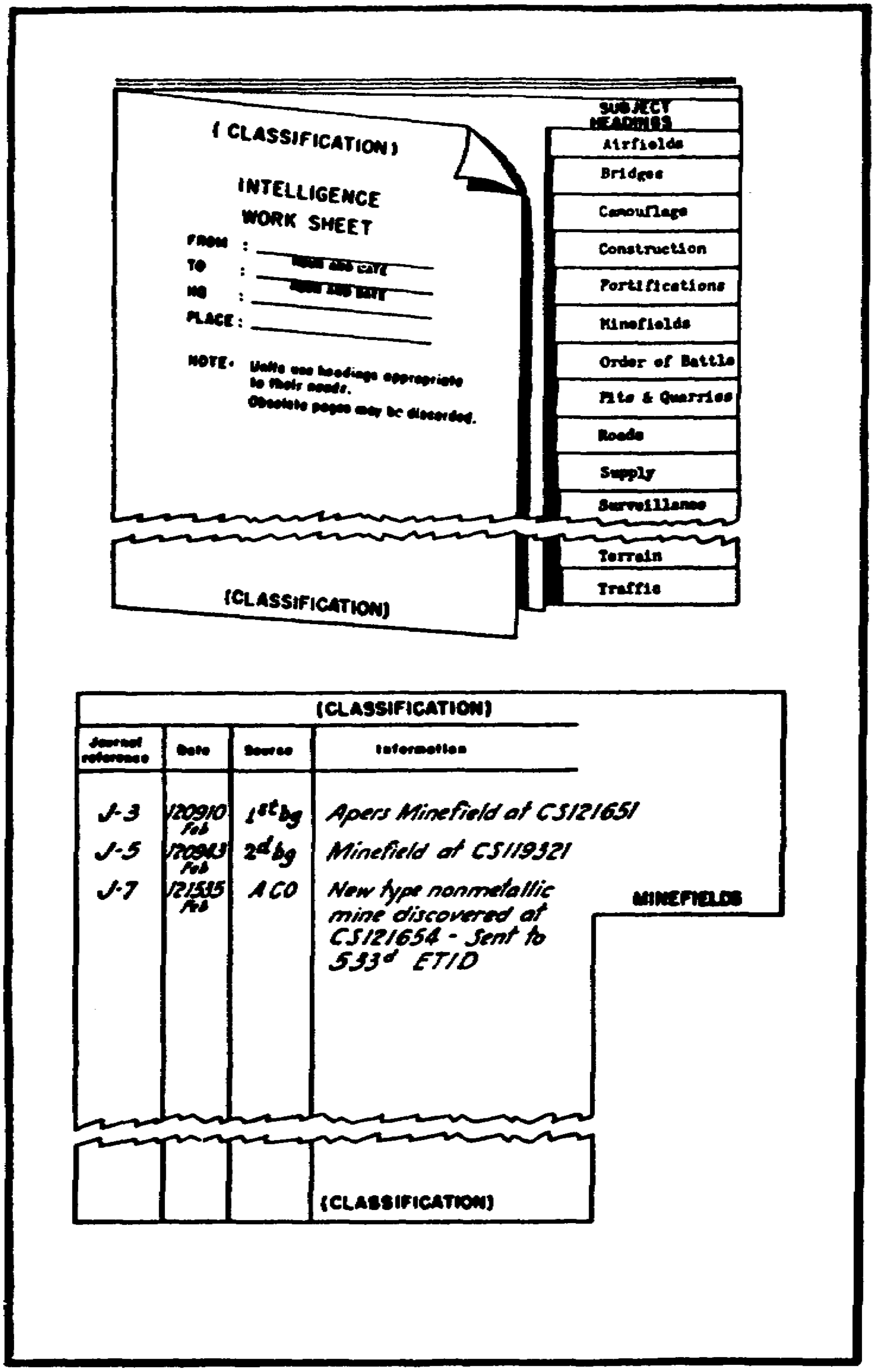
ORGANIZATION OR INSTALLATION	LOCATION	PERIOD COVERED			
		FROM		TO	
		HOUR	DATE	HOUR	DATE
S2, 319th Engr Bn	CHONJU, KOREA (CS 106344)	1800	11 Feb 73	1800	12 Feb 73

ITEM NO	TIME IN	TIME OUT	INCIDENTS, MESSAGES, ORDERS, ETC	ACTION TAKEN	INL
			Weather cold and clear, temperature below freezing		
1		0730	Issued recon orders to recon teams		ecR
2	0910		1st bde found enemy Apers minefield at CS 121651	M - S - F	ecR
3		0918	Requested B Co investigate minefield CS 121651	T	ecR
4	0943		2d bde reports enemy minefield at CS 119321	M - S - F	ecR
5		0950	Requested A Co investigate minefield at CS 119321	T	ecR
6	1535		A Co brought in new type nonmetallic mine discovered at CS 121654. Transmitted to Lt Jones, 533d ETID, by courier		ecR
7		1600	S2 took recon flight in helicopter, returned 1645	M - S	ecR
8	1630		Recon teams returned, submitted recon report	M - S - F	ecR
			* * * * * * * * * * *		
	Legend	M -	maps; S - staff; T - troops; F - file		

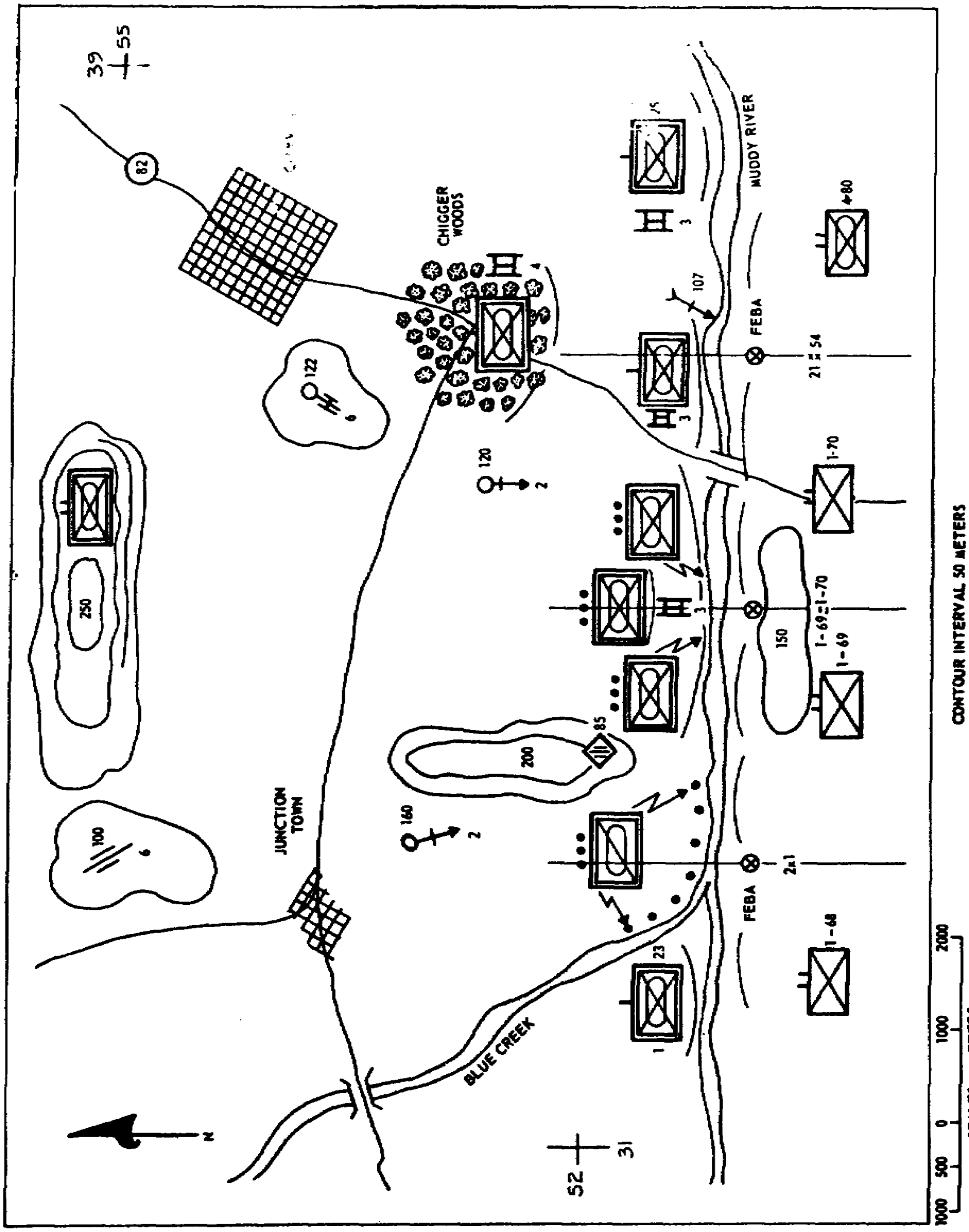
TYPED NAME AND GRADE OF OFFICER OR OFFICIAL ON DUTY	SIGNATURE
E. C. Rankin, Capt CE	E. C. Rankin

DA FORM 1 NOV 62 1594 PREVIOUS EDITION OF THIS FORM IS OBSOLETE.

PANEL 1-3. Journal.



PANEL 1-4. Worksheet



PANEL 1-5. Situation Map.

EVALUATION RATINGS

The evaluation of reliability is shown by a letter and the evaluation of accuracy by a numeral as depicted in the paragraphs to follow. Evaluation ratings are made at the lowest headquarters possible.

a. Reliability of source and agency is shown as follows:

A - Completely reliable

B - Usually reliable

C - Fairly reliable

D - Not usually reliable

E - Unreliable

F - Reliability cannot be judged

(1) An "A" evaluation of source is assigned under only the most unusual circumstances. For example, this evaluation may be given when it is known that the source has long experience and extensive background with the type of information reported. A rating of "B" indicates a source of known integrity. An "F" rating is assigned when there is no adequate basis for estimating the reliability of the source.

(2) Agencies are ordinarily rated A, B, or C. However, when the source of an item and the collecting-reporting agency are evaluated differently only the lower degree of reliability is indicated.

b. Accuracy of an item of information is indicated as follows:

1 - Confirmed by other sources

2 - Probably true

3 - Possibly true

4 - Doubtfully true

5 - Improbable

6 - Truth cannot be judged

(1) The statement that a report cannot be judged as to accuracy must always be preferred to an inaccurate use of the rating "1" to "5". If there is no sound basis for a rating of "1" to "5", because of the complete absence of other information on the same target, the rating "6" has to be given.

(2) It must be recognized that the scale "1" to "6" does not represent progressive degrees of accuracy. The stress must be given to the literal rating represented by the numeric symbol.

c. Although both letters and numerals are used to indicate the evaluation of an item of information, they are independent of each other. A completely reliable agency may report information obtained from a completely reliable source which, on the basis of other information, is judged to be improbable. In such a case, the evaluation of the information is A - 5. A source known to be unreliable may provide information that is confirmed by other sources and is undoubted accuracy. In such a case, a report is evaluated E - 1. A report evaluated F - 6 may be accurate and should not be arbitrarily discarded.

PANEL 1-6. Evaluation Ratings.

APPLICATIONS OF ENGINEER INTELLIGENCE

a. RIVER CROSSING. For a deliberate river crossing, the engineers would furnish data on the following:

(1) Weather to be expected during the operation, with special reference to possible flooding or the movement of ice or debris that could jeopardize the crossing.

(2) Topography and landforms on both sides of the river, including any natural barriers or obstructions to the advance of our troops other than the river itself.

(3) Location and trafficability of roads on both sides of the river; including bridges or large culverts that might be destroyed by the enemy.

(4) Trafficability of the soil under weather conditions that may be expected during the operation, with special attention to areas adjacent to the proposed crossing sites and along the approach routes

(5) Concealment and cover, especially on the friendly side of the river.

(6) Data on enemy defenses on both sides or in the river, including minefields and roadblocks. Whether or not the enemy can produce artificial flooding of the river.

(7) Possible sites for storm boat or assault boat crossing, footbridges, ferries, vehicular bridges (floating and/or fixed), and dummy bridges if contemplated. (It is often desirable to have alternate sites for each installation, with the advantages and disadvantages of each, and a recommendation as to which should be selected.)

(8) Avenues of approach to the assembly and parking areas, the crossing sites, and the successive objectives of the attacking force.

(9) Sites for engineer dumps, parks, and regulating points.

(10) Location, nature, and amounts of engineer construction and other materials located within the area of the operation.

(11) Water points for use during the operation.

(12) Data on enemy engineer troops within the area and their capabilities.

(13) Any special data needed in connection with the possible employment of nuclear weapons.

b. AIRHEAD. In connection with the seizure of an airhead, the engineers would furnish data on the following:

(1) Weather to be expected during the operation, with special reference to high winds, heavy rain or fog, or other conditions that might affect airlandings and airdrops. (Weather information supplied by engineer intelligence is based upon data from historic compilations; short-range meteorological forecast data is not an engineer responsibility.)

(2) Topography and landforms within the proposed airhead and along its perimeter, including also any prominent landmarks, visible from the air, that might guide the attacking force. If time permits, a terrain model of the airhead may be called for.

(3) Natural barriers and obstructions, especially any located along the perimeter of the airhead that may be adapted to defensive purposes.

(4) Location and trafficability of roads within the airhead and in the surrounding area; location of defiles and bridges or large culverts that might be destroyed by the enemy.

PANEL 1-7. Applications of Engineer Intelligence.

(5) Trafficability of the soil, under any weather conditions that may be expected during the capture and occupation of the airhead.

(6) Nature of the soil as affecting the installation of perimeter defenses and the construction of airstrips.

(7) Cover and concealment, both within the airhead and along its perimeter.

(8) Enemy defenses, including minefields and roadblocks, and other enemy military installations within the area.

(9) Enemy civilian installations within the area, such as towns, isolated buildings, public utilities, and the like, which might be of military significance.

(10) Existing landing fields and landing strips and proposed sites for drop zones and for additional airstrips needed, with estimates of their maximum absorption capacity in terms of aircraft and parachutists.

(11) Sites for engineer dumps and parks.

(12) Location and amounts of engineer construction materials located within the airhead, including any enemy stocks which may be expected to fall into our hands, with special reference to items useful for the construction and repair of airstrips and for hasty fortifications.

(13) Water points for use during the capture and occupation of the airhead.

(14) Conditions as to observation and fields of fire, and covered approaches, along the perimeter of the airhead.

(15) Enemy engineer troops within or adjacent to the airhead, and their capabilities.

(16) Special data needed in connection with the possible employment of nuclear weapons.

c. DEFENSIVE POSITION. If the commander plans an advance into enemy-held territory, followed by the organization of a defensive position therein, the following data will be expected from the engineers in connection with organizing the position:

(1) Weather to be expected over the period of the organization and occupation of the position, with special attention to extremes of heat, cold, drought and precipitation. (Weather information supplied by engineers is based upon historic compilations; short-range meteorological data is not the responsibility of the engineers.)

(2) Topography and landforms, and any bodies of water both within and on the enemy side of the proposed position. Data on observation and fields of fire, covered approaches, and natural barriers and obstructions that may be adapted to defensive purposes. If time permits, a terrain model may be called for.

(3) Location and trafficability of roads within and on the enemy side of the position; extent to which roads within the position are or could be shielded from enemy ground observation.

(4) Roads, railroads, and other forms of communication leading to the position from the friendly side.

(5) Trafficability of soil within and on the enemy side of the position under the weather conditions that may be expected.

(6) Nature of soil from the viewpoint of installing both hasty and deliberate field fortifications.

(7) Natural cover and concealment within and on the enemy side of the position; variations of natural concealment that may be expected with the seasons.

PANEL 1-7. Applications of Engineer Intelligence - (Cont.)

(8) Enemy military or civilian installations within the area that may have a bearing in the establishment and occupation of the position.

(9) Sites for the various defensive elements of the position.

(10) Sites for engineer dumps, parks, and other facilities, both during and after the construction of the defensive works.

(11) Location, nature, and amounts of engineer construction materials within the area.

(12) Water point for use during the establishment and occupation of the position.

(13) Any special data needed in connection with the possible employment of nuclear weapons.

PANEL 1-7. Applications of Engineer Intelligence - (Cont.)

SELF-TEST

LESSON 1

Exercise: **For solution, see**

1. The difference between information and intelligence is — Frame 1-5

a. accuracy **b.** processing **c.** scope

2. What are the two basic categories into which intelligence is generally divided? — Frame 1-6

a. confirmed or unconfirmed

b. military and civilian

c. strategic and combat

3. What is the procedure called for obtaining intelligence? — Frame 1-12

____

4. List the four steps of the intelligence cycle. — Frame 1-13

____

____

____

5. Which of the following would **not** be included as engineer intelligence? — Frame 1-21, 1-22

a. bridge reconnaissance report

b. terrain study of an area

c. political climate in a specified country

d. soil composition

6. Who is responsible for planning the collection effort for engineer intelligence? — Frame 1-26

____

7. What are essential elements of information? Frame 1-29

____

____

____

8. The first step of the intelligence cycle, the collection plan, is based on____________________. Frame 1-35

9. Name the three ways in which engineer information is collected. Frame 1-45

____

____

10. What three procedures comprise the processing step of the intelligence cycle?____ Frame 1-55

____

11. As information is collected, it is recorded in various ways. On what record are items of possible intelligence interest listed in order of their occurrence?____ Frame 1-58 Panel 1-3

12. How are items recorded on the worksheet? Frame 1-60 Panel 1-4

____

13. Information is graphically recorded on _______________________ Frame 1-63 Panel 1-5

____

14. Information must be evaluated as to its pertinence and its accuracy. What other factor must be evaluated?______________________________ Frame 1-71

15. The evaluation of information is indicated by a letter-number combination. The letter represents reliability of source. What does the number indicate?____ Frame 1-80 Panel 1-6

____

16. The final step in processing is the ____________________________ of the recorded and evaluated information. Frame 1-85

17. What are the three procedures usually employed to form a critical judgment or an interpretation of evaluated material?_________________________ Frame 1-85

____

____

____

18. Isolating significant elements of evaluated information is the purpose of____ Frame 1-87

19. A hypothesis is formed when the elements of information and other known facts are combined or______________________________________ Frame 1-88

20. The final step in the interpretation process is the ________________ of meaning from the processed data. Frame 1-89

21. Which of the following is most important in the dissemination of intelligence? Frame 1-97

a. completeness

b. timeliness

LESSON 2

ENGINEER RECONNAISSANCE

CREDIT HOURS...2

TEXT ASSIGNMENT ....Attached programmed text.

LESSON OBJECTIVES .... Upon completion of this lesson, you will be able to:

1. Define engineer reconnaissance, and explain the scope of general and special engineer reconnaissance.

2. Describe the three methods of conducting an engineer reconnaissance, and the advantages and disadvantages of each.

3. Describe the procedures followed in conducting an engineer reconnaissance.

4. Record the observations made during a general engineer reconnaissance on DA Form 1711-R.

5. Perform computations necessary for water reconnaissance.

(verified) (2-48)

FRAME 2-49.

Under ideal conditions, ground reconnaissance is preceded by ____________________________________ and ________________________________ reconnaissance. It is used to _______________________ the preliminary data obtained from map study and aerial observers.

(heading; 1711-R; commander; number) (2-72)

FRAME 2-73.

The **body** of the form contains the specific details about the observed data: where it is (grid coordinates); what it is (complete description, incuding sketch when necessary); and when observed.

Details about reported information are included in the _____________________________ of DA Form 1711-R.

Set 2-1. ENGINEER RECONNAISSANCE

FRAME 2-1.

Engineer reconnaissance is the directed effort to observe and report information on anything that will affect an engineer operation.

Observation and reporting of engineer information is called ____________________ ____________________ .

(go on to next frame) (2-24)

FRAME 2-25.

For preliminary study of an area, photos have many of the same uses as maps. For example, they provide a means of studying inaccessible terrain. But the most important advantage of photos over maps is **currency**.

Photos are often used for preliminary study of an area, because of their great advantage of ____________________________ .

(map; aerial; verify) (2-49)

FRAME 2-50.

Areas **hidden** from aerial observers by heavy foliage, camouflage, or defilade can be inspected by ground parties.

Ground parties can make detailed observations of areas ______________________________ from aerial view.

(body) (2-73)

FRAME 2-74. INFORMATION FRAME.

Reportable information includes the following:

a. Obstacles to movement. Includes demolitions, mines, boobytraps.

b. Engineer materials. Includes road material, bridge timber, lumber, steel, fill, gravel, explosives.

c. Engineer equipment. Rock crushers, saw mills, garages, machine shops, abandoned enemy equipment, etc.

d. Bivouac areas. Access roads, soil, drainage, size, cover, concealment, fields of fire.

e. Utilities. Water, sewage, electricity, natural gas, pipelines.

f. Water points. Recommended locations.

g. Map errors.

h. Work estimates for construction, repair or removal of any reported item (shown on reverse side of DA Form 1711-R).

(engineer reconnaissance) (2-1)

FRAME 2-2.

Engineer reconnaissance is part of the collection effort of the intelligence cycle. It is the directed effort to ___________________________ and ________________________ information of engineer interest.

(currency) (2-25)

FRAME 2-26.

Photos can be used to **up-date** obsolete maps because they can be flown, processed, and distributed in a few days, compared to the many months required for new mapping.

Photos are a valuable supplement to older maps because they can be used to ______________________________ map information.

(hidden) (2-50)

FRAME 2-51.

Some characteristics of an area of interest to engineers, such as the composition of the soil, must be determined by **on-site inspection**. Ground reconnaissance is the only one of the three methods that can provide this information.

Ground reconnaissance is necessary to obtain information that an only be determined by ________________________ ______________________.

(go on to next fame) (2-74)

FRAME 2-75.

Refer again to Panel 2-2. Notice that the first column labeled "Key," contains numbers. These **Key** numbers are plotted on the situation **map**, **sketch**, or **overlay** which accompanies the report in their proper locations.

The identification of each observed item is shown by a ___________________________________ number, listed on the form and plotted in its correct position on a ___________________________, ___________________________ or _________________________.

(observe; report) (2-2)

FRAME 2-3

Engineer reconnaissance missions are of two types, **general** and **special**, with objectives as follows:

a. General: Local availability of engineer materials, equipment and water, climate conditions; terrain data; enemy engineer resources; any other environmental characteristics within a particular area.

b. Special: Detailed to support a specific task or task.

The two types of engineer reconnaissance are ______________________ and ________________________.

(update) (2-26)

FRAME 2-27

In a rapidly fluctuating combat situation, or during floods or other natural disaster, photos of the same area can be flown on successive days or weeks for purposes of **comparison**. Changes can thus be quickly detected.

A series of photos the same area taken on succeeding days my be used for purposes of ____________________________.

(on-site inspection) (2-51)

FRAME 2-52.

The exact dimensions of features can be **measured** and reported by ground parties. These include such items as stream widths, tunnel clearances, etc.

Ground parties can ___________________________ the exact dimensions of feats.

(key; map; sketch; overlay) (2-75)

FRAME 2-76. INFORMATION FRAME.

The object, shown in the next column, is either symbolized or briefly described. The symbols used are standard and are taken from FM 5-34, Engineer Field Data. Refer to Appendix 1 at the end of this booklet. This is an enlarged reproduction of the Engineer Reconnaissance Card. On pages 5 and 7 of this Appendix, you will find the symbols used in the sample report in Panel 2-2.

(general; special) (2-3)

FRAME 2-4.

General reconnaissance is a **broad, continuous**, operation, initiated as soon as the organization enters the area in which it is to conduct operations. Special reconnaissance seeks **specific information** for a specific purpose. However, the same reconnaissance party may perform both kinds of reconnaissance.

General reconnaissance is a ____________________________, ________________________ operation. Special reconnaissance seeks __________________________ _________________________.

(comparison) (2-27)

FRAME 2-28.

Photos are most useful for reconnaissance when they are used to **supplement** maps, unless they are specially-printed "orthophotos," which are the only aerial photos which are as accurate as maps in scale and positions.

Photos should be used to ________________________________ maps in preliminary reconnaissance studies.

(measure) (2-52)

FRAME 2-53.

Because they perform onsite inspection and make actual measurements, ground parties can **estimate** very closely the time, equipment, men and materials needed for any necessary engineer operations in the area.

Ground parties are a reliable source of work ________________________________ for engineer operations in the area.

(go on to next frame) (2-76)

FRAME 2-77.

Is the obstacle shown as Key No. 1 in Panel 2-2 proposed, prepared but passable, or completed? ____

(broad; continuous; specific information) (2-4)

FRAME 2-5.

The directed effort t observe and report engineer information is called ____________________________. There are two types, _____________________ and _____________________.

(supplement) (2-28)

FRAME 2-29.

Another advantage of aerial photos is **comprehensive** detail. Photos provide a wealth of information because the camera is unselective.

The detail shown on aerial photographs is _______________________________.

(estimates) (2-53)

FRAME 2-54.

Ground parties can obtain data ____________________________________ from aerial view, or that can only be obtained by _________________________. This includes measured ___________________________________ of features, and reliable work _______________________________ for future engineer operations.

(completed) (2-77)

FRAME 2-78.

The next two columns note the time of each observation and whether or not a work estimate related to the observed object has been prepared. How many of the observed objects required an estimate of work required? ____

Set 2-2. METHODS OF RECONNAISSANCE

(engineer reconnaissance; general; special) (2-5)

FRAME 2-6.

Three methods of reconnaissance are available to engineers: **map, aerial**, and **ground**. Studies can be performed indirectly, without physically entering or observing the area, on maps, aerial photographs, photomosaics, and similar material. The other two methods involve direct observation: from the air, by aerial observers, and on the ground, by reconnaissance parties.

The methods engineers employ for reconnaissance are ______________________, ____________________ and _____________________.

(comprehensive) (2-29)

FRAME 2-30.

In preliminary reconnaissance, aerial photos are used to _________________________________ maps because they are more _____________________ and contain __________________________ detail.

(hidden; on-site inspection; dimensions; estimates) (2-54)

FRAME 2-55.

Although ground reconnaissance is the most thorough and accurate means of obtaining engineer information, it is very **time-consuming**. When time is a critical factor, the party leader must adjust the schedule to obtain only the most-needed items. Incomplete, but timely, information is **useful**, whereas a complete report received too late to be acted upon is **worthless**.

Ground reconnaissance is __________________________ - ___________________________ and may have to be adjusted to a limited schedule. An incomplete but timely report is ___________________________________ but a report to late to be acted upon is _______________________________.

(one) (2-78)

FRAME 2-79.

In the "additional remarks and sketch" column, the object is **identified** and the **map location** is reported by grid coordinates, followed by explanatory remarks, calculations, and a sketch if appropriate.

In the final column of the body of the report, the details about the object always include its __________________________ and map _______________________.

(map; aerial; ground) (2-6)

FRAME 2-7.

Under ideal conditions, all three methods are employed, **supplementing** each other, and rounding out the available information.

The three methods of engineer reconnaissance, __________________________, ________________________, and ________________________, ____________________________ each other in obtaining information about an area.

(up-date; current; comprehensive) (2-30)

FRAME 2-31.

Aerial photography has certain disadvantages which make it impractical to rely on photos alone for an area study. Although the camera picks up everything within its range, critical detail can be **obscured** by clouds, dense foliage, heavy snow, or deep shadows. Bad weather can ground aircraft, making it sometimes impossible to obtain new photos when they are most needed.

Conditions can cause critical detail to be _________________________________ on aerial photos, or aircraft to be __________________________.

(time-consuming; useful; worthless) (2-55)

FRAME 2-56.

Another limitation on the effectiveness of ground reconnaissance parties is possible **inaccessibility** of the areas of interest. Many factors can operate to limit access, including rugged terrain, impenetrable swamps, etc, or control by **hostile forces**.

Ground reconnaissance may be limited or prevented by the ________________________________ of the area or control by ________________________ ____________________________.

(identification; location) (2-79)

FRAME 2-80. INFORMATION FRAME.

The location and identification of the object are always reported in the final column of the body of DA Form 1711-R. When applicable, the following information is also reported.

size	**soil**
quality	**access**
quantity	**bypass**
cover	**turn around**
concealment	**booby trap**
contamination	**calculations**
drainage	

(map; aerial; ground; supplement) (2-7)

FRAME 2-8.

Before physically examining the area, a preliminary study is made of the best available **maps** and **aerial photographs**, to pan operations and routes of ground parties, to determine areas which need inspection from the air, and to anticipate conditions which may be encountered by personnel operating in the area.

The best available ______________________________ and __________________ __________________ are used for a preliminary study of the area.

(obscured; grounded) (2-31)

FRAME 2-32.

On single photographs, terrain **relief** is not discernible. If overlapping stereo pairs have been flown, **relief** can be perceived and measured, but the stereoplotting equipment and trained personnel needed are generally only available to topo units.

Stereophotography and stereo plotters are needed in order to perceive and measure ______________________.

(inaccessibility; hostile forces) (2-56)

FRAME 2-57.

A ground party whose mission is to obtain engineer information must often work in the open, risking **exposure to the enemy**. Such exposure an seriously curtail the reconnaissance activities of the party.

One of the disadvantages of ground reconnaissance in combat areas is ______________________________________ ____________ _______________________________.

(go on to next frame) (2-80)

FRAME 2-81.

The specific details of the observed data are shown in the ___________________________________ of the form. As a minimum, the object is ____ both by symbol and description, and is ________________________________ by key number and grid coordinates.

(map aerial photographs) (2-8)

FRAME 2-9.

The tentative findings of the map and aerial photo reconnaissance are verified first by ______________________ observers, then by ______________________________ parties who actually enter the area to obtain such data as slope measurements, radii of curves, soil samples, bridge and tunnel data, etc. The three methods thus ____________________ provide maximum information.

(relief) (2-32)

FRAME 2-33.

Ordinary aerial photos contain inherent scale and image **distortions**, making distance and azimuth **measurements** unreliable. Special grids must be constructed for point location.

Aerial photos cannot replace maps for ____________________________________ purposes, because they have inherent ___________________________ in scale and image.

(exposure to the enemy) (2-57)

FRAME 2-58.

Ground reconnaissance has certain disadvantages that sometimes make map and ________________________ reconnaissance necessary supplements. Among these are the ____________________________________ required to complete a ground survey, possible ________________________________ of some or all of the area of interest, and the dangers of _______________________ to the enemy.

(body; identified; located) (2-81)

FRAME 2-82.

The authentication block contains the signature of the of the **commander** of the unit which performed the mission. His title is also entered in the heading in the block labeled "FROM". The party leader does not sign the form.

The report is authenticated by the signature of the performing unit's ________________________________.

(aerial; ground; supplement) (2-9)

FRAME 2-10.

Engineer reconnaissance can be performed by ______________________ and ________________________, by ______________________________ observers, or by ______________________ parties, either independently, or in planned sequence.

(measurement; distortions) (2-33)

FRAME 2-34.

Aerial photography, while a valuable ______________________________________ to map study, should not be relied upon exclusively for reconnaissance because detail may be _________________________________ or aircraft grounded. Because of scale and image distortions, ______________________________________ may be unreliable.

Set 2-6. PROCEDURES

(aerial; time; inaccessibility; exposure) (2-58)

FRAME 2-59.

Each reconnaissance mission is usually part of a larger collection plan (see panel 1-2 in lesson 1). The reconnaissance plan is therefore closely **coordinated** with the supported unit which has area responsibility.

The plan for a reconnaissance mission is carefully ________________________________ with the overall plan of the supported unit.

(commander) (2-82)

FRAME 2-83.

The front of DA Form 1711-R contains three parts: the ______________________________________, which provides information about the mission; the ___________________________________, in which observed data is described and located; and the _____________________________ ______________________, which contains the signature of the commander of the performing unit.

(maps, photos; aerial; ground) (2-10)

FRAME 2-11.

Circumstances sometimes make one or more of the reconnaissance methods **impractical**, or even impossible. Large-scale maps may not be available; bad weather may ground aircraft; rugged terrain or enemy control may make large areas inaccessible to ground parties. Whatever the conditions, the best combination of available methods is used to provide maximum usable information in the time available.

Although ideally, the three reconnaissance methods are used to supplement each other, circumstances may make one or two of the methods __________________________________.

Set 2-4. AERIAL RECONNAISSANCE

(supplement; obscured; measurements) (2-34)

FRAME 2-35.

In aerial reconnaissance, the terrain is viewed **directly** by an observer from aircraft. Aerial reconnaissance is normally conducted as a **follow-up** to map reconnaissance, but it may be the only means of obtaining information in a given area.

In aerial reconnaissance, the terrain is viewed ____________________________________ from aircraft. Map reconnaissance is normally ________________________________ by aerial reconnaissance.

(coordinated) (2-59)

FRAME 2-60.

The officer ordering the reconnaissance prepares **orders** setting forth the **mission** of the party. Refer to Panel 2-1. These are typical orders for a reconnaissance party. The items specified will include the location of the area, the desired data, amount of detail, priority of items (if any), and where, when, and to whom to send the report.

The detailed instructions for a reconnaissance party are contained in ________________________ describing the ________________________ of the party.

(heading; body; authentication block) (2-83)

FRAME 2-84.

Refer again to Panel 2-3. This is the reverse side of DA Form 1711-R, containing detailed **work estimate**s for items reported in the body of the form, and noted in the work estimate column on the front of the form. The work estimate indicates the amount and type of engineer effort required for construction, repair, or removal of the reported item.

The reverse side of DA Form 1711-R contains detailed ______________________ ______________________.

Set 2-3. MAP AND PHOTO STUDY

(impractical) (2-11)

FRAME 2-12.

There are many advantages to performing a preliminary reconnaissance on maps. In most parts of the world, standard military topographic maps are easily obtained through **regular distribution channels**. The same maps are thus available to all the elements interested in an area, permitting **simultaneous** study and improving the coordination of activities.

Maps are readily available through ____________________ ______________________ ___________________, and can be studied ______________________________________ by various elements operating in an area, improving coordination of activities.

(directly, followed) (2-35)

FRAME 2-36.

When it follows map reconnaissance, aerial reconnaissance is used to **verify** the information obtained from the maps and to **observe** and record items that are new, or **not** normally **shown** on maps.

Aerial reconnaissance after map reconnaissance is used to ______________________________ map information and ____________________________ items that are new or normally ______________________________ on maps.

(orders; mission) (2-60)

FRAME 2-61.

The **party leader** selects the general route to be followed, prepares a time schedule, and chooses the equipment and personnel necessary to perform the mission.

The actual reconnaissance mission is organized and scheduled by the____________________________.

(work estimates) (2-84)

FRAME 2-85.

Each work estimate is keyed by its critical point number to the appropriate item with the same number on the front of the form. Which item was reported on the front of the sample Engineer Reconnaissance Report as needing a work estimate? ____

(regular distribution channels; simultaneously) (2-12)

FRAME 2-13.

Military maps are an accurate means of **point** location, **distance** and **elevation** measurements, and **direction** plotting.

Maps are important tools in reconnaissance because you can accurately locate ___________________________, measure _______________________ and _________________________, and plot ____________________________.

(verify; observe; not shown) (2-36)

FRAME 2-37.

Aerial reconnaissance is especially valuable when **speed** is essential, because a relatively large area can be observed in a minimum of time.

One of the great advantages of aerial reconnaissance is the __________________________________ with which a large area can be observed.

(party leader) (2-61)

FRAME 2-62.

Good planning is essential to the success o a reconnaissance mission. It must be carefully ________________ with the overall plan, described in detail in ____________________________, and organized and _______________________________ by the party leader.

(item No. 1, log obstacle) (2-85)

FRAME 2-86.

What was the nature of the work for which the estimate was prepared?

____

(point, distance; elevations directions) (2-13)

FRAME 2 14.

Maps are readily available through regular ____________________________ ______________________ and provide an accurate means of point _____________________, distance and elevation ______________________, and direction _______________________.

(speed) (2-37)

FRAME 2-38.

As with map and photo reconnaissance, aerial reconnaissance can provide information on areas **inaccessible** to ground parties. Since the observer views the area directly, the information he obtains is up-to-date.

Aerial reconnaissance provides up-to-date information on __________________________________ areas.

(coordinated; orders; scheduled) (2-62)

FRAME 2-63.

In performing a reconnaissance, certain principles govern procedures regardless of the purpose or scope of the mission. Among these is **attention to detail**. Counting, measuring, and estimating should be done with great care because the accuracy and completeness of such numerical data can seriously affect the success of subsequent engineer operations.

In any observation, the accuracy and completeness of numerical data depend upon ______________________ to _____________________.

(Removal of obstacle by demolition) (2-86)

FRAME 2-87.

How much time did the party leader estimate would be needed for one squad to perform the necessary work? ____

(distribution channels; location; measurements; plotting) (2-14)

FRAME 2-15.

Maps also provide the user with **terrain** and **cultural** (manmade) data necessary for engineer operations. Such data include the steepness of slopes, location of ridges and valleys, etc. (terrain) and existing road network, settlements, etc. (culture).

You may also use your map to determine the ________________________ and _________________________ data necessary for engineer operations.

(inaccessible) (2-38)

FRAME 2-39.

Besides the visual observers, aerial reconnaissance missions may also employ **electronic** sensors, such as infrared and radar detectors, to aid in penetrating heavy foliage or camouflage concealment, or for use at night. An aerial camera can be used, with the appropriate kind of **film**, to provide a permanent record of the observations for later study.

Aircraft used for aerial reconnaissance missions may be equipped with ________________________________ sensors, to detect objects or activity not visible to the naked eye. All observations, whether visual or electronic, can be recorded on the appropriate kind of __________________________________.

(attention to detail) (2-63)

FRAME 2-64.

The schedule for any reconnaissance party is based upon the time available to perform the mission and the amount and kind of data desired. **Adherence to the schedule** is essential, to avoid either omitting important information or missing the deadline.

Moving too fast, and missing important data or moving too slowly, and missing the deadline, can be avoided by careful ____________________ ____ _______ ____________________.

(2 hours) (2-87)

FRAME 2-88.

The amount and type of engineer effort, in man-hours, equipment, and materials, required for construction, repair, or removal, as needed, of reported items is indicated in the ______________________________ on the reverse side of DA Form ___________________.

(terrain; cultural) (2-15)

FRAME 2-16.

Reliable time and equipment **estimates** can be based on the **terrain** and **cultural** data obtained from map study.

The _________________________ and ____________________________ data on your maps provide a basis for _________________________ time and equipment _____________________________.

(electronic; film) (2-39)

FRAME 2-40.

Because aerial reconnaissance provides a direct view of relatively large areas, it is valuable when __________________ is essential. It is used to _____________________ map or intelligence data, and provides information on areas __________________________________ to ground parties. Visual observation can be augmented with _________________ sensors.

(adherence to the schedule) (2-64)

FRAME 2-65.

The mission of a reconnaissance party is to obtain needed information. Therefore, the party does not engage in combat unless it must fight to accomplish that mission, or in self-defense. Under most conditions, the party must take special precautions to **avoid combat**.

To insure that it accomplishes its mission, a reconnaissance party avoids ______________ unless absolutely necessary.

(work estimate; 1711-R) (2-88)

FRAME 2-89. INFORMATION FRAME.

You will recall that in Frame 2-76 we referred to the Engineer Reconnaissance Card, which is enlarged and reproduced as Appendix I in the back of this booklet. The card itself is pocket-sized. The scales shown along the bottom of each page of the Appendix are not accurate because of the enlargement.

Much of the data included in the card is related specifically to route reconnaissance, but on pages 1, 5, and 7, there is information important to a general engineer reconnaissance.

Study the engineer resource symbols shown on page 7 of the Appendix. They provide a quick and uniform method of reporting the existence of any of these resources. The symbol is shown in column 2 of the body of the report.

(terrain; cultural; reliable; estimates) (2-16)

FRAME 2-17.

Your map is an accurate means of locating points, ______________________________ distances and elevations, and plotting directions. It also provides both _____________________ and _________________________ data, on which to base necessary time and equipment ______________________________.

(speed; verify; inaccessible; electronic) (2-40)

FRAME 2-41.

Aerial reconnaissance has certain disadvantages which must be considered when the collection plan is drawn up. Severe **weather** conditions can ground aircraft for extended periods. Unfavorable atmospheric conditions, such as clouds or fog, can obscure the sought-after information.

Aerial reconnaissance an be limited or prevented by unfavorable _______________________________.

(combat) (2-65)

FRAME 2-66.

In order to accomplish its mission with maximum effectiveness, a reconnaissance party must observe certain procedures. These include careful attention to __________________________, adherence to the established time ______________________, and avoiding _____________________________ if possible.

(go on to next frame) (2-89)

FRAME 2-90.

If the party leader wants to report the existence of a stockpile of brick, what symbol would be used? Draw the symbol below.

(measuring, terrain, cultural, estimates) (2-17)

FRAME 2-18.

Another advantage of map reconnaissance is that it is possible to obtain data **without physically entering** the area. **Map study** avoids exposure to the enemy, provides information on territory otherwise inaccessible, and is independent of weather conditions.

Information can be obtained despite enemy fire, inaccessible territory, or severe weather conditions through ______________________ ________________, because it can be performed ______________________________ ________________________________ an area.

(weather) (2-41)

FRAME 2-42.

The amount of information obtained by aerial reconnaissance is also dependent on the visual **perception** and **skills** of the observer. Even an experienced observer, however, can only **estimate** distances, elevations, and other measurements from the air.

Aerial reconnaissance relies heavily upon the visual ______________________ and _____________________ of the observer. Measurements can only be roughly _______________________________.

Set 2-7. RECORDING

(detail; schedule; combat) (2-66)

FRAME 2-67.

All reportable data observed should be recorded at once on prepared DA Forms and, if necessary, accompanying sketch maps or overlays. The form used for recording engineer reconnaissance data other than route classification is DA Form **1711-R**, Engineer Reconnaissance Report.

Reportable engineer information is shown on a sketch or overlay, and recorded on DA Form ________________________.

Set 2-8. WATER RECONNAISSANCE

 **(2-90)**

FRAME 2-91. INFORMATION FRAME.

One of the most important resources sought by an engineer party is a water point. Notice that there are two symbols for indicating existing water supplies, one for civilian facilities, the other for military. These would have a good water source, purification equipment, and good access routes. If there are no existing facilities, then a potential supply must be located. Estimates must be computed of the time, labor, and material necessary to improve the site.

(map study; without entering) (2-18)

FRAME 2-19. Review Frame.

Map reconnaissance has many advantages. Maps are readily available through regular distribution ________________________ and can be used by several elements for _________________________ study. They are an _________________________________ means of point location, distance measurement, and direction plotting. They provide detailed __________________________________ and cultural data without the necessity for entering an area.

(perception; skills (or experience); estimated) (2-42)

FRAME 2-43.

Heavy **foliage** can conceal objects or activity from an aerial observer as it does from an aerial camera. **Defilade** caused by rugged relief also affects the amount of information observed from a low-flying aircraft.

In forested areas, information can be hidden from an aerial observer by heavy ____________________________ or, in rugged areas, by _______________________.

(1711-R) (2-67)

FRAME 2-68.

Refer to panels 2-2 and 2-3. These illustrate a sample of a completed **Form 1711-R**, both front and back. The R in the number means that it may be locally reproduced, but it should follow the format shown to insure that all necessary data are included. There are four parts to Form 1711-R: the heading, the body, the authentication block, and, on the reverse side, the work estimate.

Observed data is most useful for intelligence purposes when it is recorded completely, accurately, and uniformly on DA Form __________________________.

(go on to next frame) (2-91)

FRAME 2-92.

When a water point, either existing or potential, is reported on DA Form 1711-R, the quantity of water available is computed and noted. The **water point formula**, given on page 5 of Appendix I, is used to compute the quantity of water in gallons per minute. The formula multiplies the velocity of the water in feet per minute (V) by the cross-sectional area of the water source in square feet (A), and multiplies the result by a constant, 6.4. The formula is expressed as Q = (A) (V) (6.4).

The quantity of water in gallons per minute is computed by using the ______________________________ ____________________________.

(channels; simultaneous; accurate; terrain) (2-19)

FRAME 2-20.

As valuable as maps are for preliminary study of an area, they have certain disadvantages. The chief disadvantage is the rapid **obsolescence** of certain map data. The depiction of man-made features on older maps may be unreliable. And since it takes so long to make a map, some of the information on it could become obsolete before the map is printed.

One disadvantage of map reconnaissance is that the maps may be ________________________________.

(foliage; defilade) (2-43)

FRAME 2-44.

In combat zones, the low-flying, slower aircraft usually used for visual reconnaissance are vulnerable to enemy **fire**. Under such conditions, it may be preferable to depend upon high-altitude photographic surveillance, if available.

Aircraft or visual reconnaissance missions under combat conditions are vulnerable to enemy ________________________.

(1711-R) (2-68)

FRAME 2-69.

The **heading** of the report includes the officer who ordered the reconnaissance; the commander of the unit which performed it the name, rank and organization of the party leader; when and where the reconnaissance was conducted; maps used; address to which the report should be delivered, and date/time due.

Details about the mission and those who ordered and conducted it are listed in the ___________________________ of Form 1711-R.

(water point formula) (2-92)

FRAME 2-93.

On page 5 of Appendix I formulas are included for obtaining both A and V. The formula for obtaining the velocity of water, in feet per minute is

$$V = \frac{(60)\ (\text{distance in feet})}{\text{time in seconds}}$$

If you note that the stream at a possible water point is flowing at a rate of 3 feet in 12 seconds, what is the velocity in feet per minute?

(obsolete) (2-20)

FRAME 2-21.

Map users should also remember that the amount of detail shown on a map is dependent on its scale. The smaller the scale the fewer the features that can be symbolized. Even on large-scale military maps, only selected detail is shown and certain features may have been omitted because of **lack of space**.

Another disadvantage of map reconnaissance is that __________________ ______ ____________________ may have caused some features to be omitted.

(fire) (2-44)

FRAME 2-45.

Some of the disadvantages of aerial reconnaissance include: bad weather, heavy foliage, or defilade, which can _______________________________________ objects or activity; the need for _______________________ on the part of the observer; and the dangers from _____________________________.

(heading) (2-69)

FRAME 2-70.

Notice that the form is always from a **commander** to a **commander**, usually from a company commander to a battalion commander. The party leader's name appears only in the heading, in the Party Leader Block.

Form 1711-R is always addressed by a ____________________________ to a ____________________________.

(15 ft/min. $V = \frac{(60)(3)}{12} = 15$) (2-93)

FRAME 2-94.

To determine A, the area of the cross-section of the water source, you must measure the width of the top (a) of the cross-section, the bottom (b) of the cross-section, and its height (h).

The formula for A is: $A = \frac{h(a + b)}{2}$

If you find that the top of the stream is 10' wide, the bottom, 4' wide, and its depth, 2', what is the value of A?

(lack of space) (2-21)

FRAME 2-22.

Finally, certain types of information needed for engineer operations cannot be obtained from maps because they are **not symbolized**. These include such data as soil composition, engineer construction materials, type of rock, and kinds of timber.

Map reconnaissance should be followed by ground reconnaissance whenever possible because some information needed for engineer operations is not ________________________________ on maps.

Set 2-5. GROUND RECONNAISSANCE

(conceal (or obscure); skills; enemy fire) (2-45)

FRAME 2-46. INFORMATION FRAME.

In this and the following sets of Lesson 2, we will discuss general engineer reconnaissance as reported on DA Form 1711-R. Route reconnaissance and its related DA forms will be treated in Lessons 3 and 4.

(commander; commander) (2-70)

FRAME 2-71.

Because the form will become part of the intelligence collection effort of the organization, it is always delivered to the **S2**. **Maps** used are identified by name, scale, and sheet number.

The findings of a reconnaissance mission are always delivered to the ________________________ who can then relate them to the overall intelligence picture. The name, scale, and sheet number of the ________________________ used aid in locating the information.

(14 sq. ft. $\frac{2\ (10 + 4)}{2} = 14$**) (2-94)**

FRAME 2-95.

Now that you have determined V (15) and A (14), what is the quantity of water in gal. per min.? Remember that the water point formula is

$$Q = (A)\ (V)\ (6.4)$$

(symbolized (or shown)) (2-22)

FRAME 2-23.

The disadvantages of map reconnaissance stem from the possibility that older maps may be ___________________________; that certain features may be omitted because of ___________________________ ______________________________; and from the fact that many items important to an engineer operation are not __________________________ on maps.

(go on to next frame) (2-46)

FRAME 2-47.

In round reconnaissance, a survey party physically occupies an area and examines it directly for items of general engineer interest, for information related to a specific task.

An actual physical examination of an area by an occupying party is called _______________________________ reconnaissance.

(S2; maps) (2-71)

FRAME 2-72.

Information which identifies the engineer reconnaissance mission and the personnel involved in it is included in the ______________________ of DA Form _________________________. The form is usually from a commander to a _________________________________ and be delivered to the S2. Maps are identified by name, scale, and sheet _______________________________.

TURN BACK TO BOTTOM OF PAGE 2-2 FOR FRAME 2-73.

(1344 gal/min. Q = (14 sq. ft.) (15 ft/min) (6.4) = 1344) (2-95)

FRAME 2-96.

Among the essential data concerning a water point is an estimate of the amount of water available. This information is determined by using the ________________ ________________ formula. To use the formula, you must determine the _______________________________ of the water in ft per minute, and the ____________________________ of a cross section of the water source, in square feet.

(obsolete; lack of space; symbolized (or shown)) (2-23)

FRAME 2-24. INFORMATION FRAME.

Preliminary study of an area can also be made by using existing **aerial photos**. These can be in the form of a series of overlapping vertical photos, paired and viewed through a stereoscope to allow the perception of depth. They may be low or high oblique photos, taken from an aircraft with the camera at an angle to the ground. Area studies can also be made on photo maps or photomosaics, made by paneling together a series of adjacent photos to form a composite picture of a larger area.

TURN TO BOTTOM OF PAGE 23 FOR FRAME 2-25.

(ground) (2-47)

FRAME 2-48.

Ground reconnaissance is preceded by map and aerial reconnaissance whenever conditions permit. The ground party can then verify or modify the preliminary data through close-range inspection.

Information obtained by preliminary map or aerial reconnaissance is ________________________ by ground reconnaissance parties.

TURN BACK TO TOP OF PAGE 2-2 FOR FRAME 2-49.

(water point; velocity: area) (2-96)

END OF FRAMES

RECONNAISSANCE INSTRUCTIONS

1ST ENGR BN
(Organization)

NO. 3

TO: CO, Co B 1ST E

Effective Ø7Ø8ØØ OCT 72
(Hour and Date)

MAPS L-751 KOREA, 6528 IV 1:50,000

Complete report to S 3 1ST ENGR BN at NOLTARI AT 848399 Ø814ØØ OCT 72
(Organization) (Place, Time and Date)

Reconnoiter and report information as indicated below by items checked. Report also any other information of technical importance incidentally secured.

1. ROADS: Classify using symbols.
2. BRIDGES, FORDS AND FERRIES: classify using symbols. Possible by-pass for existing crossings.
3. Obstacles to our movement: natural and artificial: include demolitions mines, booby traps.
4. TERRAIN: general nature, ridge system, drainage system including fordability, forests, swamps, areas suitable for mechanized operations.
5. ENGR MATERIALS: particularly road material, bridge timbers, lumber, steel, explosives.
6. ENGR EQUIPMENT: rock crushers, saw mills, garages, machine shops, blacksmith shops, etc.
7. ERRORS AND OMISSIONS ON MAPS USED.
8. BARRIERS to enemy movement: natural, artificial and sites for construction of improvement. (work estimates)
9. WATER POINTS: recommended locations.
10. STREAMS: general description, width, depth, banks, approaches, character of bottom and means to be used at possible crossing sites. Navigability?
11. DEFENSIVE POSITIONS.
12. BIVOUAC AREAS: entrances, soil, drainage, sanitation, concealment.
13. PETROLEUM STORAGE AND EQUIPMENT.
14. UTILITIES: water, sewage, electricity, gas.
15. PORTS: wharves, sunken obstacles, cargo handling facilities, storage facilities, transportation routes.
16. CONSTRUCTION SITES: Drainage, water supply, power source, earthwork, access, acreage soil.

DETAILED INSTRUCTIONS
Areas, special features or structures special reports and work estimates required.

a. Conduct recon in Co B's area of responsibility.
b. Select sites for brigade WP's; coordinate with brigade S 4.
c. Prepare report on items checked using engr recon report and work estimate form.

FOR THE COMMANDER:

PANEL 2-1. Reconnaissance Instructions.

ENGINEER RECONNAISSANCE REPORT — PAGE 1 OF 1 PAGES

TO: CO, 21ST ENGR BN, ATT: S2 — FROM: Co 'A', 21ST ENGR BN

FILE NO.

REPORT NO. 1

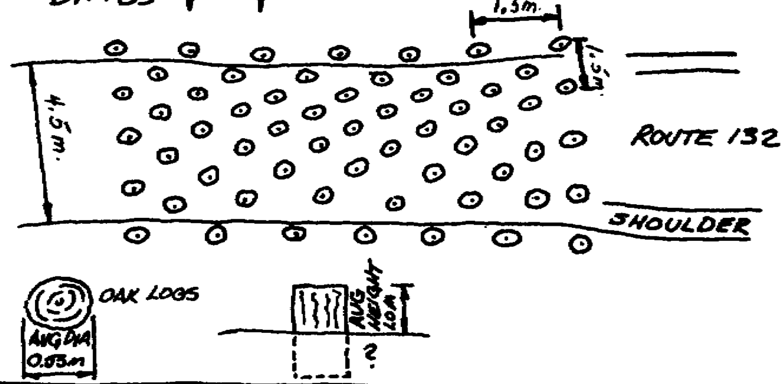
PARTY LEADER (NAME, GRADE, ORGANIZATION): W.C. STEVENS, M/SGT, E8, Co A, 21ST ENG BN

PLACE - HOUR - DATE: UT586708 131030 MAR 73

MAPS: QUANTICO, VIRGINIA 1:50,000 SHEET 5561 III

DELIVER TO (Organization, Place, Hour and Date): S-2, 21ST ENGR BN UT556461 131200 MAR 73

KEY	OBJECT	TIME OBSERVED	WORK ESTIMATE?	ADDITIONAL REMARKS AND SKETCH
1	X	0900	Yes	UT 586841 LOG POST OBSTACLE BLOCKING ROUTE 132 (59) LOGS @ 1.5 M C-C ON ALL SIDES OBSTACLE NOT DEFENDED BOOBY TRAP CHECK REVEALED NO BOOBY TRAPS. BYPASS
2		0940	No	UT598741 - ABANDONED ENEMY EQPT. QUANTITY & TYPE: (2) 'ZIPLO' MODEL 200 CRAWLER CRANES. (OPERATIONAL) CHECKED FOR BOOBY TRAPS - NONE
3		1000	No	UT561432 - EXISTING WATER PURIFICATION PLANT SUPPLYING WATER TO THE CITY OF YUCU OUTPUT: 50,000 GAL PER DAY



ENGINEER WORK ESTIMATES ON OTHER SIDE

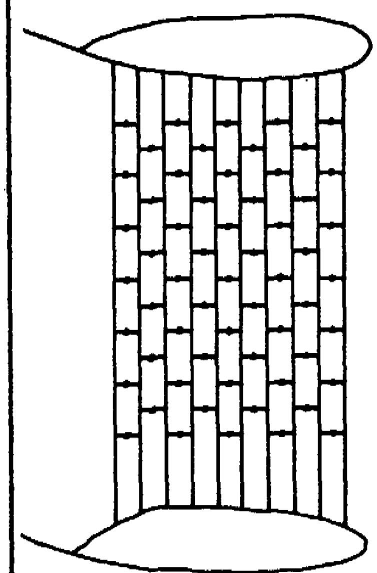
TYPED NAME, GRADE AND ORGANIZATION: W.D. ATKINSON, 2/LT, C.E., CoA, 21ST ENGR BN

SIGNATURES: William D. Atkinson 2/LT. C.E.

DA Form 1711-R, 1 Jun 61

PANEL 2-2. Engineer Reconnaissance Report - DA Form 1711R: front.

ENGINEER WORK ESTIMATE

LOCATION KEY	DESCRIPTION OF WORK	UNIT REQ'D	HOURS	EQUIPMENT TYPE	EQUIPMENT NO.	EQUIPMENT HOURS	MATERIALS TYPE	MATERIALS UNIT	MATERIALS QUANTITY
1 $D = (0.53)(39.37)$ $= 20.8$ INCHES $P = \frac{D^2}{40} = \frac{(20.8)^2}{40}$ $= 10.8$ LBS 11#/LOG = 649#	REMOVE LOG POST FROM ROUTE 132 BY DEMO 	1 SQD	2	DEMO SET #1	1	2	TNT	lbs	649
				D-7 DOZER	1	2	D-CORD	FT	1100
							NON ELECT CAP	EA	2
							TIME FUSE	FT	3
							M-2 FUSE LIGHTER	EA	2

RECONNAISSANCE REPORT ON OTHER SIDE

PANEL 2-3. Work Estimate - DA Form 1711-R: reverse.

SELF-TEST

LESSON 2

(solutions and text references follow)

Exercises:

1. There are two basic types of engineer reconnaissance, ____________________________________and ___________________________.

2. What are the methods used by engineers to perform reconnaissance missions? ____________________________, ____________________________, ____________________________.

Situation:

You are making a preliminary study of an area on maps and aerial photographs before a ground party enters the area. The maps are four years old; the photos were flown two weeks before the study. Would the maps or the photos be preferred to provide the necessary data for each of the following requirements?

3. Point locations for several specified items of engineer interest to be investigated by the ground party.

map ________________ photo __________________

4. Checking an intelligence report which lists a section of road as washed out during the previous rainy season.

map ________________ photo __________________

5. Key elevations along the tops of two ridges in the area, and the relative heights of the ridges above the surrounding terrain.

map ________________ photo __________________

6. Relative density of tee canopy in four wooded areas.

map ________________ photo __________________

7. An actual physical examination of an area by an occupying party is called

a. terrain study

b. engineer intelligence

c. ground reconnaissance

8. Certain data, such as soil composition or the clearance of a tunnel or underpass, can only be determined by ____________________________ reconnaissance.

9. Which is most important with regard to conducting a ground reconnaissance, **a**. providing the most complete data possible, or **b.** meeting the specified due date and time?

____

10. An engineer reconnaissance to check the capacity and condition of several bridges in an area is being planned. Who prepares the time schedule for arriving at the various points along the reconnaissance route?

____

11. Every reconnaissance party, regardless of its objective, observes certain principles. Which of the following is not a valid procedure for ground reconnaissance parties?

a. giving careful attention to obtaining accurate and complete measurements

b. adhering as closely as possible to a predetermined schedule

c. engaging the enemy in combat whenever possible.

Refer to Panel 2-1 in the Programmed Text for exercises 12 and 13.

12. How many types of information were specified in the instructions as requiring investigation by Co B?

____

13. Which of the following items was included among those requiring a report?

a. construction sites

b. map errors

c. water points

14. On which DA Form is a general engineer reconnaissance recorded?

____

15. Where on DA Form 1711-R will you find the identification of the reconnaissance mission and the personnel who ordered and conducted it? ____

16. What information do you expect to find in the body of DA Form 1711-R?

____

17. The authentication block contains the signature of

a. reconnaissance party leader

b. performing unit's commander

18. What is entered on the reverse side of DA Form 1711-R?

___

19. Engineer Resource Symbols are shown on page 7 of Appendix I. How are they used in a reconnaissance report? ___

a. They are drawn on a sketch map or overlay in the correct location.

b. They are entered in Column 2 of Form 1711-R, next to their Keying numbers.

20. One of the tasks which you, as a party leader, must report on is the quantity of water available at a potential water point noted during the preliminary map reconnaissance. You determine the velocity of water to be 10 ft per min, and the area of a cross-section of the stream to be 12 square feet. What is the available quantity of water, in gallons per minute, at this water point? ___

SOLUTIONS TO SELF-TEST

LESSON 2

	Solution	Text Reference
1.	general, special	Frame 2-3
2.	map, aerial, ground	Frame 2-6
3.	map	Frame 2-13
4.	photo	Frame 2-26
5.	map	Frame 2-13
6.	photo	Frame 2-29
7.	**c**	Frame 2-47
8.	ground	Frame 2-51
9.	**b**	Frame 2-55
10.	party leader	Frame 2-61
11.	**c**	Frames 2-63 - 65
12.	five	Panel 2-1
13.	**c**	Panel 2-1
14.	DA Form 1711-R	Frame 2-67
15.	Heading	Frame 2-69
16.	Specific details about observed data	Frame 2-73
17.	**b**	Frame 2-75
18.	work estimates	Frame 2-84
19.	**b**	Frame 2-89
20.	768 gal/min Q = (12) (10) (6.4) = 768	Frames 2-92 - 2-95 Pg. 5, App I

LESSON 3

ROUTE RECONNAISSANCE

CREDIT HOURS..3

TEXT ASSIGNMENT..Attached programmed text.

LESSON OBJECTIVES...Upon completion of this lesson, you will be able to:

1. Prepare route reconnaissance overlays, using standard symbolization for obstructions (curves, grades, width constrictions, etc.) to permit evaluation of conditions affecting traffic flow and deployment of personnel and materiel on a route.

2. Interpret route reconnaissance overlays to assess route conditions and determine feasibility of route for deployment of forces.

3. Express route classification in terms of formula, enabling ready evaluation of a route or alternate routes.

TURN TO PAGE 3-3 FOR FRAME 3-1.

(4-1m - overhead clearance is less than 4.3m; 7m - traveled way width is less than 8m) (3-60)

FRAME 3-61.

Note that the military load classification is never underlined regardless of the value or expected traffic. (Later we will-discuss the fact that the lowest bridge military load classification number determines the military load classification of the route.)

However, if either the overhead clearance or traveled way width noted on a bridge symbol represent an obstruction, they are__________________________ .

(vehicular; 40; 70 tons; 16 min) (3-90)

FRAME 3-91.

Draw below the ferry symbol for a ferry which has the following characteristics:

a. Left bank approach is difficult

b. Serial #12A

c. vehicular

d. Class 80

e. Dead weight capacity, unknown

f. Turn around time, 21 minutes

Set 3-1. ROUTE RECONNAISSANCE

FRAME 3-1

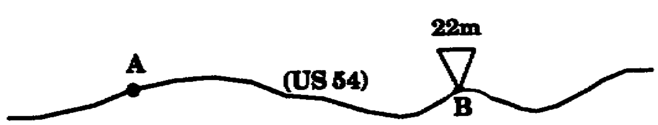
One of the most frequent types of reconnaissance that engineers are called upon to perform is **route reconnaissance**. Route reconnaissance provides information to aid in route selection for movement of troops, equipment, and supplies

Route selection for tactical operations is based whenever possible on information obtained by ______________________________ .

(triangle; radius) (3-30)

FRAME 3-31

The symbol below represents a curve at point A with a radius ______________________ (greater than, equal to, less than) 25 meters and a ______________________________ curve at point B with a radius of ______________ .



(underlined) 3- 61)

FRAME 3-62

Draw a symbol for a bridge on a route expected to have two way tracked and wheeled vehicle traffic with the following characteristics:

a. Bridge number 62.

b. Tracked vehicle class.

1. One way 60.
2. Two way 30.

c. Wheeled vehicle class.

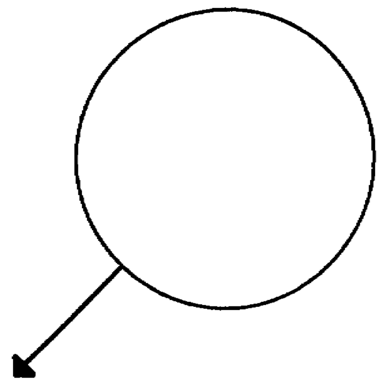
1. One way 65.
2. Two way 30.

d. Traveled way width: 7.5m

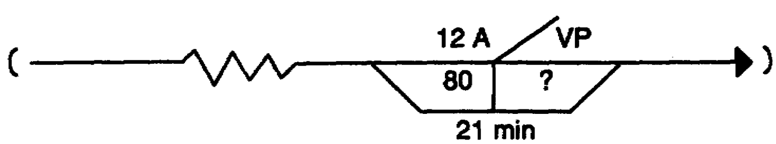
e. Overall length 95m.

f. Overhead clearance 9.9m

g. Bypass easy.



Set 3-10. UNDERPASSES AND TUNNELS



(3-91)

FRAME 3-92

Two structures found along a route which will often cause overhead clearance to be restricted are underpasses and tunnels The underpass symbol is drawn across the route symbol on the overlay in its correct **location**. The **location** of the tunnel is indicated by an arrow. Both symbols indicate the general **shape** of the opening, such as arched or rectangular.

Symbols for under passes and tunnels show both the ____________________________________ and general ______________________ of the feature.

(route reconnaissance) (3-1)

FRAME 3-2 INFORMATION FRAME

A route is acomposite of **terrain factors**. Information about these factors is the object of route reconnaissance. They include:

a. Physical characteristics of routes such as widths, curves, surface types, gradients, etc.

b. Bridges, fords, ferries.

c. Tunnels and underpasses.

d. Artificial obstacles (roadblocks, craters, minefields, etc.)

e. Rockfalls and slide areas.

f. Drainage clearance 9.9m

g. Other natural and man-made features, such as wooded or built-up areas, which may affect movement.

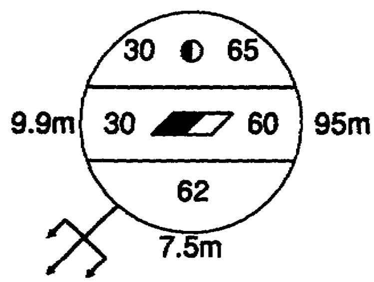
(greater than; sharp; 22m) (3-31)

FRAME 3-32

Sharp curves are considered to be **obstructions**.

Therefore, curves with radii of 25 meters or less are considered to be ____________________, and must be __________________________ on the route reconnaissance overlay.

Set 3-6. BYPASS SYMBOLS



(3-62)

FRAME 3-63

When the symbol for a bridge, tunnel, or other possible obstruction is shown, a bypass symbol may placed on the **shaft of the arrow** showing whether bypass is easy, difficult, or impossible.

The bypass symbol is placed on the ______________________ ______________________________ ___________________ of the bridge or tunnel symbol.

NOTE: Track one way or two way can **<u>never</u>** be higher than wheel.

(location; shape) (3-92)

FRAME 3-93

Before proceeding, refer back to Frame 3-57 and briefly review obstructions. For tunnels and overpasses, we are concerned with reduction in traveled way widths, and less than minimum overhead clearances.

The minimum overhead clearance is ______________________________. The minimum road way width for two way tracked vehicle traffic is ____________________________ ; for two way wheeled vehicle traffic it is _____________________ ; for one way tracked vehicle traffic it is ____________________ ; for one way wheeled vehicle traffic it is _____________________ .

(go on to next frame) (3-2)

FRAME 3-3.

There are two methods of conducting route reconnaissance, **hasty** and **deliberate**. They differ only in the completeness of reported information.

Route reconnaissance may be either ____________________________ or _______________________________ depending on the _____________________________ or reported information.

(obstructions; symbolized (or shown or recorded)) (3-32)

FRAME 3-33.

Another obstruction along a route which must be reported is a steep slope or grade. Any slop of **7%** or greater is considered an obstruction, but all slopes **5%** or greater must be reported on the overlay.

To be considered an obstruction, a slope must be _________________ % or more, although all slopes which measure ______________________ % or more must be recorded.

(shaft of the arrow) (3-63)

FRAME 3-64.

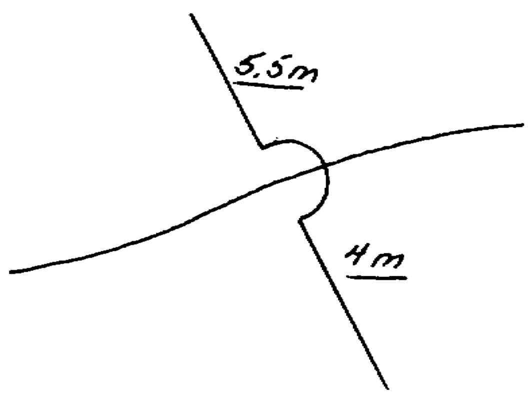
Bypasses are classified as EASY, DIFFICULT, or IMPOSSIBLE. Each type of bypass is symbolized on the shaft of the arrow indicating the feature's map location.

There are three kinds of bypasses which are symbolized on route reconnaissance overlays: ________________________ , _________________________ and ____________________________ .

(4.3m; 8m; 7m; 6m; 5.5m) (3-93)

FRAME 3-94.

On the underpass symbol, overhead clearance is shown to the **right** of the basic symbol and **width** is shown to the **left**. As with bridges, we underline the values of overhead clearance and width if they constitute an obstruction, as explained on pages 3, 11 and 12 of Appendix I.



This symbol represents an ____________________ shaped underpass with _________________________ overhead clearance and ________________________ traveled way width. For one way tracked vehicle traffic, we would ________________________ the value for width.

(hasty; deliberate; completeness) (3-3)

FRAME 3-4.

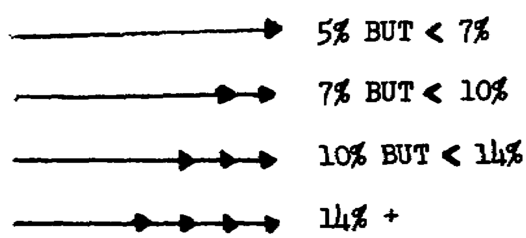
Hasty route reconnaissance determines the immediate military trafficability of a specified route, and limited to critical **terrain** data necessary for route classification and the intelligence requirements of the situation.

Critical ____________________________ data regarding the immediate military trafficability of a route is the object of _________________________________ route reconnaissance.

(7; 5) (3-33)

FRAME 3-34.

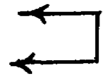
The slope symbol is an **arrow** pointing **uphill** with the exact grade next to it. The number of arrowheads indicates the steepness. These are the symbol, as shown on page 3 of Appendix I.



A steep slope is shown by an ___________________________ pointing ________________________ with the exact grade beside it.

(easy; difficult; impossible (3-64)

FRAME 3-65.

The symbol for a **bypass easy** is  ,and it means that the obstacle can be crossed within the immediate vicinity by a US 2 1/2 ton truck without work to improve the bypass.

A bypass which can be crossed by most military vehicles without expenditure of engineer effort is shown as a ________________________ __________________________ .

(arch; 4m; 5.5m; underline) (3-94)

FRAME 3-95.

This underpass is ____________________________ shaped and has _____________________________ meters overhead clearance.

(terrain; hasty) (3-4)

FRAME 3-5.

Deliberate route reconnaissance is made when enough **time** and qualified **personnel** are available to provide data for a **thorough** analysis and classification of significant terrain features along a route, including, when required, recommended repair or demolition procedures.

Adequate ________________________ and qualified ________________________ are necessary for the performance of a ________________________ reconnaissance which is a more ________________________ analysis of route terrain features.

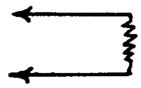
(arrow; uphill) (3-34)

FRAME 3-35.

The symbol shown below represents a grade of ________________________ %, going downhill from ________________________ to ________________________ (direction).

(bypass easy) (3-65)

FRAME 3-66.

The symbol for a bypass difficult is  . A bypass difficult means that the obstacle can be crossed within the **immediate vicinity**, but some **work** will be necessary to improve the bypass.

Both the bypass easy and bypass difficult indicate that the obstacle can be crossed within the __________________ ______________________ but the bypass difficult requires some ________________to improve the bypass.

(rectangular; 7) (3-95)

FRAME 3-96.

A tunnel or overpass represents an obstruction to travel when either overhead ______________________ or traveled way _____________________________ is below the minimum. In that case, the figures are ___________________________ .

(time; personnel; deliberate ; thorough) (3-5)

FRAME 3-6.

Route reconnaissance obtains necessary data about the ________________ ____________________ which make up a route. It may be hasty or ______________________ , depending on the ____________________ of the reported information.

(22; east; west (remember, the arrow points uphill)) (3-35)

FRAME 3-36.

When the grade symbol is used, the **length** of the **arrow** represents the length of the grade if the map scale permits.

If the route is plotted to scale, the length of the grade is indicated by the ______________________________ of the ______________________ .

(immediate vicinity; work or effort) (3-66)

FRAME 3-67

The Symbol for a bypass impossible is . This situation means that the obstacle can only be crossed by one of the following methods:

1. Repair of item; e.g. bridge.

2. New construction.

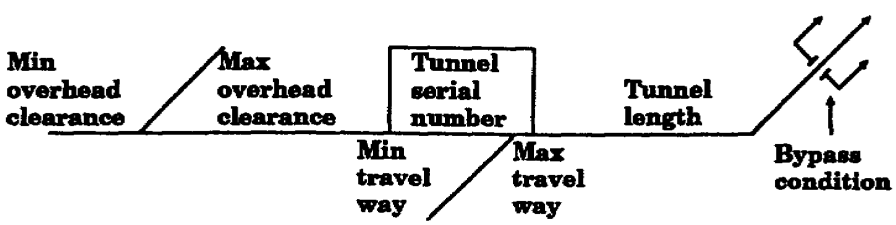
3. Detour using alternate route which crosses the obstacle some distance away.

When an obstacle requires extensive repair or construction or a long detour, it is classed as a bypass___________.

(clearance; width; underlined) (3-96)

FRAME 3-97

The tunnel symbol, like the underpass symbol, shows the basic shape of the restriction, overhead clearance and width. However, the tunnel symbol also shows the length of the tunnel, serial number, bypass conditions, and is drawn with an arrow extending to the map location.



This tunnel symbol represents a ________________________ shaped tunnel with a bypass __________________________ .

Set 3-2. REPORTING METHODS: OVERLAYS

(terrain factors; deliberate; completeness) (3-6)

FRAME 3-7

Route reconnaissance information is **reported** in three ways: on an **overlay**; by a coded route classification **formula**; and on special DA Reconnaissance Report Forms as applicable.

Three ways: ________________________ , classification ______________________ , and DA Reconnaissance Report Forms, are used by reconnaissance parties to ___________________________ observed information.

(length; arrow) (3-36)

FRAME 3-37.

The symbol shown below represents a grade of _________________ %, ____________________ meters long, going uphill from ___________________________ to _______________________________ (direction).

(impossible) (3-67)

FRAME 3-68.

Draw the symbols for:

a. Bypass easy.

b. Bypass difficult.

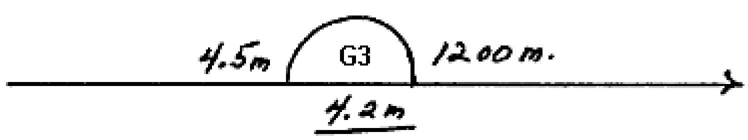
c. Bypass impossible.

a **b.** **c.**

(rectangular ; impossible) (3-97)

FRAME 3-98.

The tunnel serial number is inside the tunnel symbol, overhead clearance on the left side of the figure, length on the right side of the symbol, and width below the figure. As with bridges and underpasses, dimensions are in meters and we underline the values of overhead clearance and width if they represent an obstruction.



This tunnel symbol represents an arch-shaped tunnel, number ________________,which is ___________ high, ______________________ long, and ______________________ wide.

(overlays; formulas; report) (3-7)

FRAME 3-8.

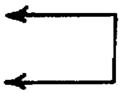
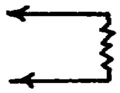
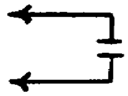
Route reconnaissance information is reported on ____________________, by classification ___________________ ,and by DA Reconnaissance Report _______________________________ .

(11; 2000; east; west) (3-37)

FRAME 3-38.

Refer to the Route Reconnaissance Overlay on page 2 of Appendix I. In the upper right corner of the overlay, Route N452 makes a sharp curve as it climbs a steep hill, both symbolized as obstructions on the overlay. What is the radius of the curve, and the per cent slope of the hill?

---

a.  b.  c.  **(3-68)**

FRAME 3-69.

When an obstacle can be bypassed with no work necessary to improve it, it is symbolized as a bypass ________________________. If some work, but no long detour is required, the symbol used is for a bypass ________________. Major repair or construction or a long detour means that the bypass for the obstacle will be shown as____________________ .

(G3; 4.5m; 1200m; 4.2m) (3-98)

FRAME 3-99.

Draw below the symbol for a tunnel with a road way width of 6 meters an arch shape, and which has 5 meters overhead clearance for all of is 127 meter length. Bypass of this tunnel is impossible.

(overlays; formulas; forms) (3-8)

FRAME 3-9.

The **preferred method** for reporting route reconnaissance is on an **overlay**, or if existing maps are not available, on a simplified map sketch.

A sketch or ________________ is the _____________ __________________ for reporting route reconnaissance information.

(27m; 8%) (3-38)

FRAME 3-39.

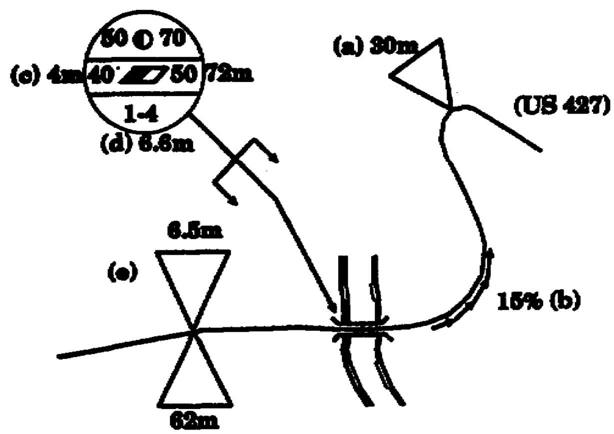
Sharp ______________________________ with radii of __________________________ m. or less, and steep ___________________ with slopes greater than ____________________ % are considered obstructions and must be reported on the overlay.

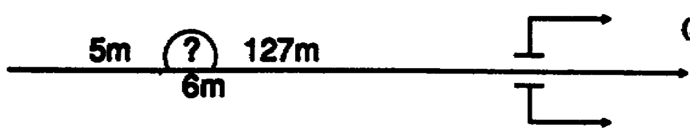
Set 3-7. REVIEW OF OBSTRUCTIONS

(easy, difficult; impossible) (3-69)

FRAME 3-70

The sample route symbolized below will be used for two-way class 40 military vehicles. How many obstacles have been symbolized along the route?





(3-99)

FRAME 3-100.

A tunnel or underpass represents an obstruction to travel when either overhead __________ or traveled way __________________ is below the minimum. In either case, the figures are __________________________ .

(overlay, preferred method) (3-9)

FRAME 3-10

There are five items that must be entered on an overlay. These are:

1. Title block.

2. Two grids intersections.

3. Grid North Arrow.

4. Route drawn to scale, with reconnaissance symbols shown as necessary.

5. Rout classification formula.

This information **identifies**, **locates**, and **orients** the route reconnaissance.

The five required items on an overlay serve to __________, ___________, and __________________ the reconnaissance.

(curves, 25, hills; 7) (3-39)

FRAME 3-40

Constrictions, reductions in traveled way **widths** which are below the standard minimum widths prescribed for the expected type of traffic flow, are considered to be obstructions.

Another type of obstruction which must be reported is a _____________ , or reduction in the traveled way _______________________ .

(four) (3-70)

FRAME 3-71.

List the four obstacles shown on the overly:

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

(clearance; width; underlined) (3-100)

FRAME 3-101.

Let us review those minimum dimensions below which a tunnel or overpass becomes an obstruction. The minimum overhead clearance is ______________________. The minimum road way widths are as follows:

two way tracked vehicles: ______________________________

two way wheeled vehicles: ______________________________

one way tracked vehicles: ______________________________

one way wheeled vehicles: ______________________________

(identify, locate, and orient) (3-10)

FRAME 3-11.

The title block usually appears in the lower right corner of the overlay. It tells **when** and **by whom** it was prepared, its scale, and the **map** to which it is keyed.

NAME AND RANK
ORGANIZATION
DATE/TIME
MAP REFERENCE
SCALE

The title block tells ____________________________ and by ______________________________ the overlay was prepared, and the ________________________________ to which it is keyed.

(constriction; width) (3-40)

FRAME 3-41.

To determine whether or not a constriction is an obstruction, you must know the traffic flow requirements, such as whether it will be one way or **two way**, and whether the route will be used by wheeled or **tracked** vehicles.

Traffic flow considerations include whether it will be one way or ____________________________ ______________________________ , and will accommodate wheeled or ___________________ vehicles.

(a. sharp curve (25 radius); b. 15% grade; c. 4m overhead clearance; d. 6.6m traveled way width (note that this is an obstruction to two way traffic for both wheeled and tracked vehicles); e. 6.5m traveled way width constriction) (3-71)

FRAME 3-72.

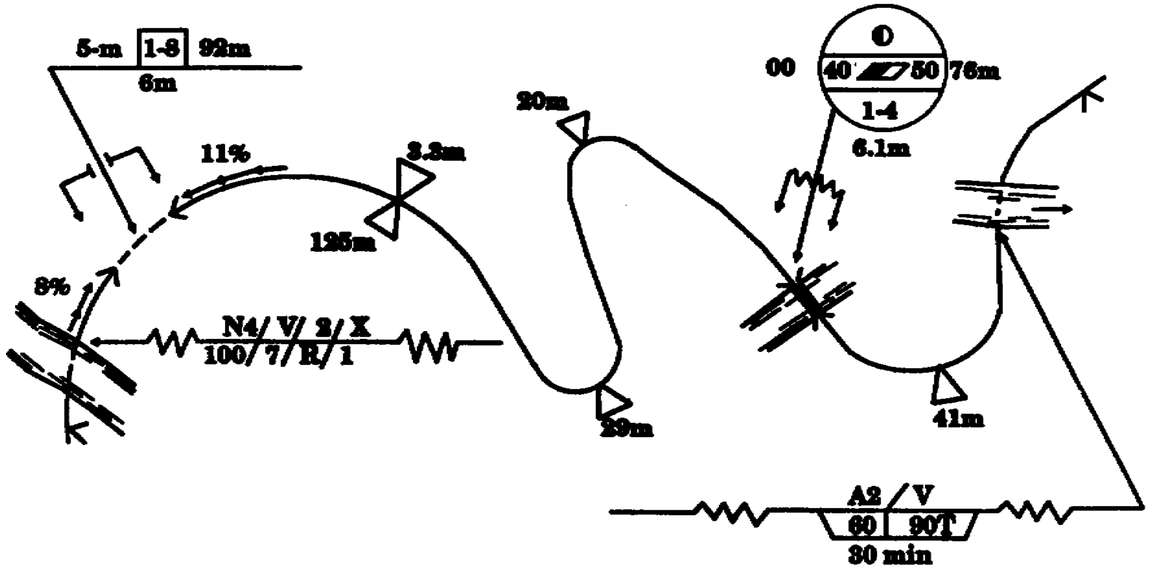
The bridge symbol indicates obstacles both in overhead clearance and width of traveled way. What does it tell us about bypassing it?

Set 3-11. REVIEW OF OVERLAY SYMBOLS

(4.3m; 8m; 7m; 6m; 5.5m) (3-101)

FRAME 3-102.

Study the sample route symbolized below. The military traffic expected for this route will be one-way tracked vehicles. How many obstructions are there for this type of traffic? ______________________________



(When Whom; Map) (3-11)

FRAME 3-12

The next two required items, the **grid** intersections and the **north arrow**, serve to orient the overlay correctly with reference both to the map and to ground direction.

The overlay is properly oriented by means of the ______________ intersections and the __________________ _________________ .

(two way; tracked) (3-41)

FRAME 3-42

The minimum roadway widths are as follows:

TRAFFIC FLOW	WIDTHS FOR WHEELED VEH.	WIDTHS FOR TRACKED VEH.
SINGLE	5.5m to 7.3m	6m to 8m
DOUBLE	7.3m+ + over	8m + over

A roadway with a width of 7.3m will handle two way ________ vehicle traffic but will handle only one way ________________ vehicle traffic without causing an obstruction. This area would be recorded on a route reconnaissance overlay as an obstruction only when considering the route for ____________ vehicles.

Set 3-8. FORDS

(bypass easy) (3-72)

FRAME 3-73

In an area of operations, fords are often on routes used by military traffic. All fords are considered to be obstructions and as such must always be ___________ on the route reconnaissance overlay.

---

(6) (3-102)

FRAME 3-103

The route crosses three streams, using a ford, a ferry, and a bridge, and tunnels through a hilltop. Which of these constitutes obstructions for one-way tracked vehicles?

(grid north arrow) (3-12)

FRAME 3-13

Two grid intersections, usually in opposite corners, are needed for proper orientation. The north arrow indicates **grid north**, or compass direction.

For proper orientation, ____________ grid intersections are needed. The north arrow indicates ____________________ north.

(wheeled; tracked; tracked) (3-42)

FRAME 3-43

Before proceeding, be sure you can complete the table shown below:

TRAFFIC FLOW	WIDTHS FOR WHEELED VEH.	WIDTHS FOR TRACKED VEH.
→		
← →		

(recorded or symbolized) (3-72)

FRAME 3-74.

See the ford reconnaissance symbol shown on page 4 of Appendix I. This symbol provides limited information about the ford by **figures** above and below the main line of the ford symbol. **Approach conditions** are shown by a straight or sawtooth line on the left or right of the figures. An arrow at one end o this line indicates the **location** of the ford.

The ford symbol consists of ____________________ above and below a line symbol, with a straight or sawtooth line on either side to indicate _________________________ __________________________, and an arrow to indicate __________________________.

(ford; ferry) (3-103)

FRAME 3-104.

Remember that fords and ferries are always considered obstructions, regardless of their size or capacity. The tunnel and the bridge shown on the overlay, however, would not be obstructions to the expected traffic, since both their widths and overhead clearances equal or exceed the minimum for one-way tracked vehicles. How many of the curves shown constitute obstructions?

(two; grid) (3-13)

FRAME 3-14

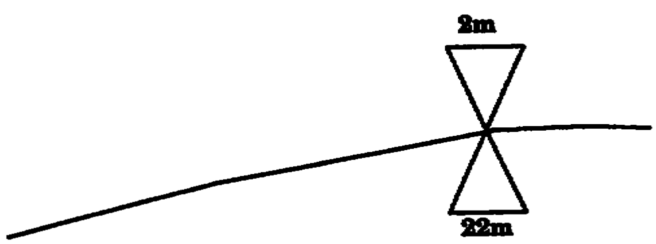
The overlay and the one who prepares it are identified by means of the __________ _________. The _____________ intersections and the north ______________ are used to orient the overlay.

	WHEELED VEH.	TRACKED VEH.
SINGLE	5.5m to 7.3m	6m to 8m
DOUBLE	7.3m + over	8 + over

(3-43)

FRAME 3-44

The symbol for a width constriction looks like this



The width is expressed in meters of usable roadway and is written outside of the triangle on the **left**, and the total constricted length, in meters, is written on the **right**.

Width constriction symbols indicate the width of the traveled way on the _______________ and the length of the constricted area on the ___________________ .

(figures; approach conditions; location) (3-74)

FRAME 3-75

At this point, it is helpful to pay attention to Note #3 on page A-11 of Appendix I, which gives the rule for proper orientation of the right and left banks of a stream. These are always determined by the observer looking **downstream**.

To determine the right and left banks of a stream, the observer must be looking __________________________ ________________ .

(one) (3-104)

FRAME 3-105

There are curves which have a radii 25 meters or less and therefore constitute obstruction. The other curves with a radius of 41 meters has been reported, but would not be a obstruction for normal military traffic. What other obstructions are shown along this route?

Set 3-3. ROUTE RECONNAISSANCE SYMBOLS

(title block; grid; arrow) (3-14)

FRAME 3-15.

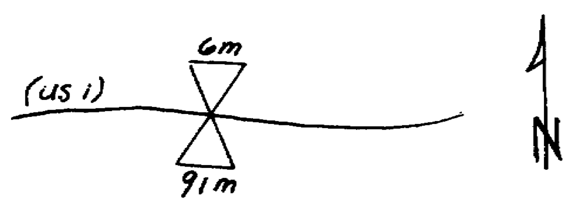
The route (the fourth required item on the overlay) is shown by a **single line** which follows the axis of the road symbol on the map. If the road symbol is not shown on the map, the line is plotted on the overlay as closely as possible to the true location of the road. The route number, either military or civilian, is shown in parentheses next to the symbol.

The route symbol on the overly is a ____________________ ____________________ which follows the map symbol.

(left; right) (3-44)

FRAME 3-45.

The symbol shown below represent a ________________ _________________,.with a usable roadway width of _________________________ meters, and a total constricted length of _______________________ meters.



(downstream) (3-75)

FRAME 3-76

A sawtooth line indicates a **difficult** approach. A straight line indicates an easy approach. The side symbol where the straight or sawtooth line appears corresponds to the right or left bank of the stream.

A sawtooth line on the right of the ford symbol indicates a ______________________ approach on the ________________ bank.

(two steep slopes; on width constrictions) (3-105)

FRAME 3-106

Both slopes are greater than 7% and the width constriction is less than the 6m minimum width required for one-way tracked vehicles. The six obstructions, then, the consist of the ford, the ferry, two steep slopes, a width constriction, and one sharp curve.

(single line) (3-15)

FRAME 3-16.

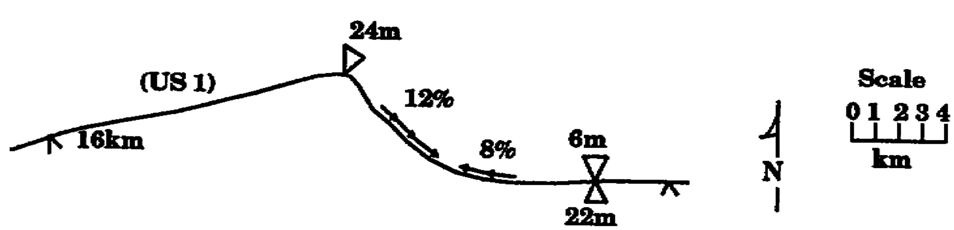
The line of the route symbol indicates the true alinement of the road, scale permitting. When the route symbol (line) **curves**, it denotes a **curve** on the ground.

Therefore, the symbol for a curve on the ground is a ________________________ in the route symbol on the overlay.

(width constriction; 6m; 91m) (3-45)

FRAME 3-46. REVIEW FRAME.

Let's review the symbols for obstructions we have learned so far. This example of a route recon overlay was prepared for potential two-way tracked vehicle traffic.

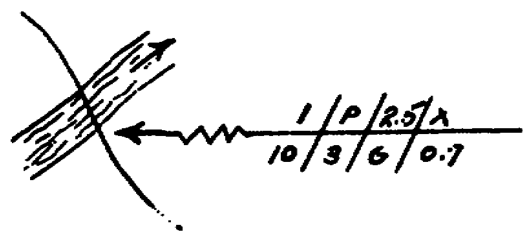


Proceeding from west to east, the first obstruction we encounter is a ____________________ ____________________ with a radius of ______________________ . The route turns south and begins a ______________ km uphill grade of ___________%. Upon topping the ill and turning eat on a curve with a radius ______________ than 25m, we proceed downhill on a ____________ km grade of ________%. The fourth and last obstruction is a ____________ ______________ having a usable width of _________m and extending for ___________ meters.

(difficult; right) (3-76)

FRAME 3-77.

The figure below has a difficult approach on the ___________________ bank and an easy approach on the ______________________ bank.



Set 3-12. ROUTE CLASSIFICATION FORMULA

(go to next frame) (3-106)

FRAME 3-107.

If you refer back to frame 3-10, you will recall that there are five required items for a route reconnaissance overlay. We have discussed the title block, grid intersections, north arrow, and route symbols. What is the fifth item required on an overlay

---

(curve) (3-16)

FRAME 3-17.

Besides the line indicating the location and alinement of the route, there are various route **reconnaissance symbols**, shown along the route , which portray other data.

To show additional needed date, __________________ ___________________ ____________________ shown along the route.

(sharp curve; 24m; 2.0; 12; greater; 2.2; 8; width construction 6; 22) 3-46)

FRAME 3-47.

Another obstruction, which is usually indicated as part of the symbol for another feature, is an overhead clearance of less than 4.3 meters. Tunnels, underpasses, overhead wires, and overhanging buildings whose overhead clearance is less than ______________ are considered to be ______________________ .

(left; right) (3-77)

FRAME 3-78.

All fords are considered ________________ , and must be recorded. The symbol consists of a main line with ___________________ above and below the line indicating the characteristics of the ford. Straight or sawtooth extensions of this line indicate _______________________________ __________________________ .

(route classification formula) (3-107)

FRAME 3-108. INFORMATION FRAME.

The route classification formula summarizes the factors of military significance which characterize a route. Page 8 of Appendix I describes the components of the formula, and explains several examples. The components follow a standardized sequence of **minimum traveled way width, route type, lowest military load classification, obstruction(s)**, if present, and **special conditions**, if present.

(left; right) (3-17)

FRAME 3-18.

Route reconnaissance symbols, like map symbols and other graphic portrayals, provide a "shorthand" for concisely recording terrain data pertaining to any particular route.

Terrain data pertaining to any particular route can be concisely recorded by the use of ______________________ ______________________ _____________________ .

(4.3;m obstructions) 3-47)

FRAME 3-48.

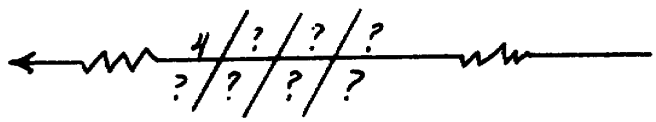
As we discuss the symbol for some of the other features shown on a route reconnaissance overlay, you will learn the ways of indicating overhead **clearance** that is an obstruction.

For now, you should remember to include among obstructions which must be indicated any feature whose overhead _________________ is less than _______________________ .

(obstructions; figures; approach conditions) (3-78)

FRAME 3-79.

The figures in the ford symbol are separated by slashes (/) and each figure has a specific location in the symbol. If the information is not known, a question mark (?) is used in place of the standard figure. The first figure above the line in the ford symbol is the ford serial number.



This symbol represents a ford with serial number ________________________. The approaches on both banks are ______________________ .

(go on to next frame) (3-108)

FRAME 3-109.

In determining the first item in the formula, the minimum width, consider all factors which might limit the traveled way width, such as underpasses, bridges, fords, etc. What would be the minimum width of traveled way for the route symbolized in Frame 3-102? ____

(route reconnaissance symbol) (3-18)

FRAME 3-19.

The route itself is shown on the overlay by a single __________________ which follows the map symbol and shows the ________________ on the ground. Terrain data along the route are shown by _________________ __________________ ____________________ .

(clearance; 4.3m) (3-48

FRAME 3-49.

The four types of obstructions which we have learned so far are:

a.

b.

c.

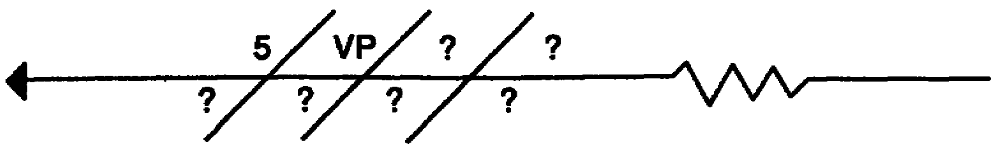
d.

(4; difficult) (3-79)

FRAME 3-80.

The second figure above the line represents the **type** of ford. Two letters are used to show the basic types of ford:

V -- Vehicular ford
P -- Pedestrian ford



To properly determine whether a ford is vehicular (V), Pedestrian (P), or both (VP), it must meet the following criteria:

TRAFFICABILITY OF FUNDS

	Maximum Depth	Minimum Width
Pedestrian	1 meter	1 meter
Vehicular	1.05 meters	4.2 meters

* Approaches over 35% are considered difficult for both V or P traffic.

This ford symbol represents a ford with serial number ________________ which is both a __________ _______ and a ___________________ ford and has a ___________________ approach on the right bank.

(3.3m) (3-109)

FRAME 3-110.

The next item, the route type, is determined by the trafficability of the route in adverse weather. There are three types; **X,** all weather, **Y**, all weather (limited); and **Z**, fair weather.

The three types of routes are ______________________ , all weather; ______________________ , all weather (limited); and _____________________________ , fair weather.

(line; curves; route reconnaissance symbols) (3-19)

FRAME 3-20. INFORMATION FRAME.

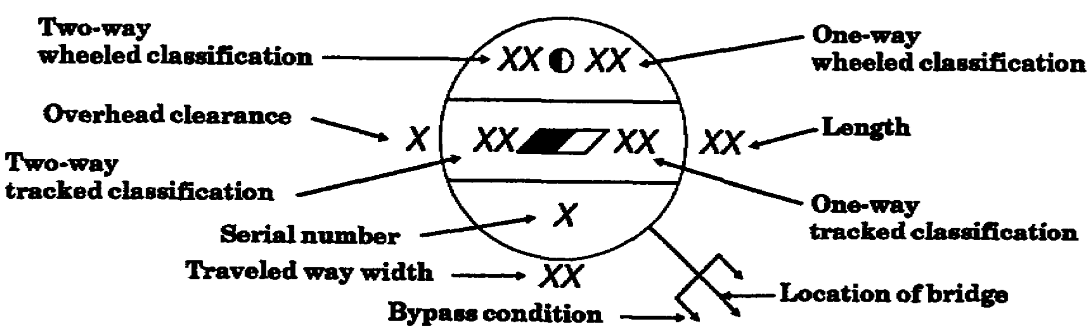
Refer again to Appendix I. You will recall from the last lesson that this is an enlarged reproduction of the pocket-sized Engineer Reconnaissance Card, GTA5-25-5. On page A-2 of the Appendix there is an example of a route reconnaissance overlay. Pages 3, 4, and 5 contain explanations of symbols to be used on overlays for reportable items. Bridge information, methods for measuring curve, slopes, and stream widths, and other reconnaissance data, are found elsewhere in the Appendix. Become familiar with the material found in this Appendix. It will aid you both in preparing and in interpreting route reconnaissance overlays.

Set 3-5. BRIDGE SYMBOLS

(a. sharp curves (curves with radii equal to or less than 30m); b. gradients (slopes) of 7% or greater; c. reductions in traveled way widths which are below minimum standard for the type of vehicle flow; d. overhead clearances less than 4.3m) (3-49)

FRAME 3-50.

Perhaps the most frequently used symbol in route reconnaissance is the full NATO bridge symbol. The bridge symbol consists of the following information:



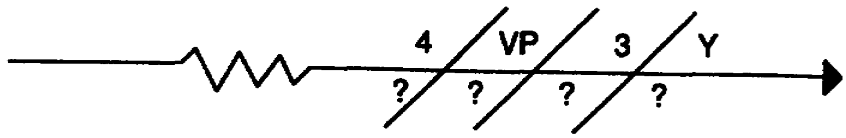
The bridge symbol has an arrow extending from the circle to the ____ ________________ of the bridge.

(5; pedestrian; vehicular; difficult) (3-80)

FRAME 3-81.

The third figure above the line represents stream **velocity** in meter per second and the final figure above the line represents **seasonal limiting factors**. An **X** is used to indicate no seasonal limitations except short duration flooding and a **Y** is used to indicate significant seasonal limitations

NOTE: If the **Y** symbol is used, the **route** type in the classification formula automatically becomes type **Z**.



This symbol represents a (type) ____________________ford, number 4, with a __________________ m/sec velocity, __________________ seasonal limitations, and an _____________________ approach on the right bank.

(X; Y; Z) (3-110)

frame 3-111

Just as the narrowest portion of the traveled way determines the minimum width of the route, so does the worst section of the route determine the mute type in the formula.

The route type is determined by the

a. longest

b. best

c. worst section of the route

(go on to next frame) (3-20)

FRAME 3-21.

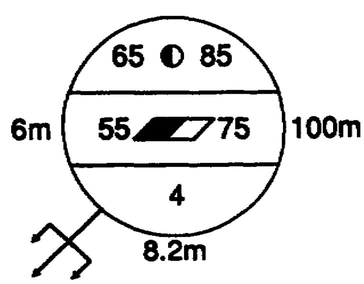
On page 4 of Appendix I, you will note the **limits of sector** symbol. It consists of two V-shaped arrowheads with their points on the route symbol.

V-shaped symbols with their points touching the mute symbol indicate the ______________________________ __________________ _________________ .

(map location) (3-50)

FRAME 3-51.

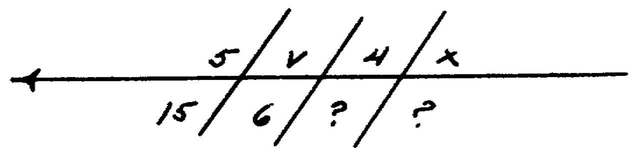
The circle in the bridge symbol is divided into three parts, the top halves showing the military load classification and the bottom half showing an arbitrarily assigned serial number for the bridge. The bridge indicated by this symbol is bridge number _______________, and the one-way wheel classification is____________________.



(vehicular; 3; significant; easy) (3-81)

FRAME 3-82.

The first two figures below the line are the **length** and **width** of the ford in meters.



This symbol represents a vehicular ford, number 5, with a ___________________ meter length and _________ meter width. The stream velocity for this ford is _________________ and there are _____________ seasonal limitations.

(c. worst) (3-111)

FRAME 3-112.

The first two items in the route classification formula indicate

a. the ________________________ of the narrowest portion of the traveled way, in meters or feet.

b. the route ____________________ , as determined by the effects of the weather on the ________________________ section of the route.

(limits of sector) (3-21)

FRAME 3-22.

The limits of sector symbol indicates the extent of each portion of the route which has a given route classification.

The limits of each portion of the route which has a separate classification are shown by the _______________ _______________ _______________ symbol.

(4; 85) (3-51)

FRAME 3-52.

The full NATO bridge symbol indicates the bridge classification for both track and wheel traffic. Information within the symbol will indicate one-way wheel or track on the right side of the symbol and two-way wheel or track on the left side.

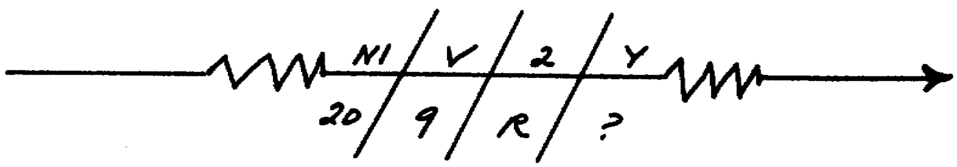
The one-way wheel or track information is shown on the ________________ side and the two-way wheel or track information on the _________________ side of the symbol.

(15; 6; 4m/sec; no) (3-82)

FRAME 3-83.

The third figure below the line represents the **nature** of the **bottom** of the ford. Capital letters are used to designate the different types of bottom as shown below:

M — mud	**C — clay**	**S — sand**
G — gravel	**R — rock**	**P — artificial paving**



This symbol represents vehicular ford, number N1, with a ________________ bottom, a ______________-stream velocity, significant seasonal limitations, a __________________width, a ____________________ length and difficult approaches.

(width; type; worst) (3-112)

FRAME 3-113.

The third item in the formula, the **military load classification**, is a rating system which considers the load-bearing capacity and dimensions of routes, especially bridges, and the weight and size of the vehicles. Most military vehicles are marked with their classification numbers.

The rating system developed to indicate whether a route can accommodate a vehicle of a given weight and size if known as the __________________________ _____________________________ ______________________ .

(limits of sector) (3-22)

FRAME 3-23.

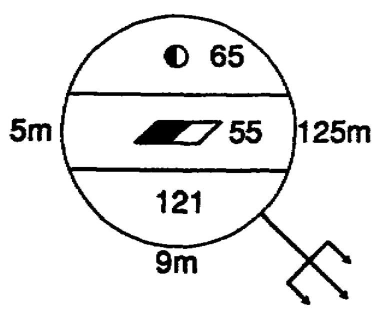
The **length** of the section of the route is shown, in kilometers or miles, along the route symbol between the two arrowheads.

The limits of sector symbol shows the ____________________of the section of road it indicates.

(right; left) (3-52)

FRAME 3.53.

The full NATO bridge symbol, which shows the military load classification for one-way wheel and track traffic only, looks like this.



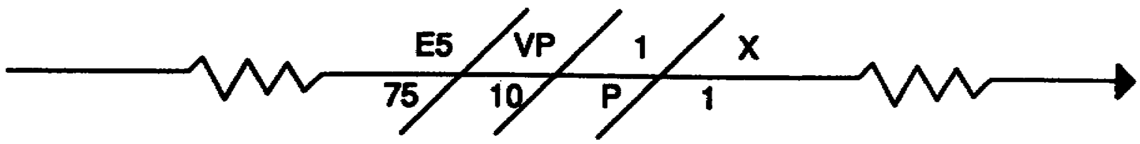
The military load classification of this bridge for one-way track is _________________________ .

(rock; 2m/sec; 9m; 20m) (3-83)

FRAME 3-84.

The final figure below the line represents the normal depth of water in meters at the deepest point.

In Ford #E5 represented by the symbol below, what is the length, width, bottom composition, and deepest point of the ford? ____



(military load classification) (3-133)

FRAME 3-144.

The **lowest** military load classification found along the route is used in the formula. Most of the time, this is the classification of a bridge.

The route classification formula always indicates the _______________ military load classification found along the route (length) (3-23)

FRAME 3-24.

How many kilometers of road have been reconnoitered in the sample shown below? ____________________

____

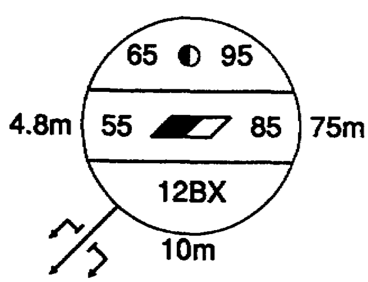
---

(55) (3-53

FRAME 3-54.

The full bridge symbol shows the military load classification for two-way traffic on the left, and one-way traffic on the right.

The bridge symbol below denotes bridge number _____________ , which has a one-way wheel classification of __________________ , and a two-way track classification of __________________________ .



(75m; 10m; artificial paving; 1m) (3-84)

FRAME 3-85. REVIEW FRAME.

How would you symbolize the following ford on a reconnaissance overlay?

It is the second ford to be symbolized, vehicular, and crosses a stream flowing at 2 meters per second, with no seasonal limiting factors. It is 15 meters long, 5 meters wide, has a gravel bottom, and .75 meter deep at its deepest point. The approach on the left bank is difficult; on the right bank it is easy. Draw the symbol below.

(lowest) (3-114)

FRAME 3-115.

The fourth item in the route classification formula is the lowest overhead clearance along the route. If clearance is unlimited, symbolize it by using 00 in the route classification formula

If any of the **obstructions** we have discussed in this lesson exist along a route, the letters (OB), in parentheses, are shown n the route formula. Obstructions may be in overhead clearance or width constructions, slopes, curves, ferries or fords.

The fourth item in the route classification formula is the lowest ________________________. The letters (OB) in the formula indicates one or more ____________________________ along the route.

(49) (3-24)

FRAME 3-25

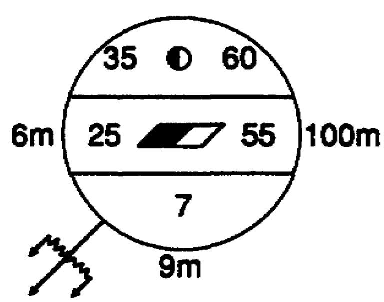
The limits of sector symbol indicates both the ________ and the ____________ in kilometers or miles of each section of the route which has the same _______________.

(12BX; 95; 55) (3-54)

FRAME 3-55.

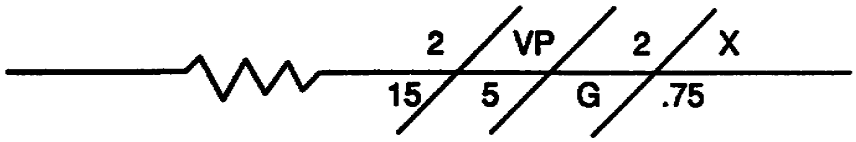
Some bridge symbols show the military load classification for two way traffic on the left and one-way traffic on the right of symbols.

The bridge indicated by the symbol shown below will carry class ____________________________ two-way tracked vehicle traffic and class ______________________ one-way wheeled vehicle traffic.



SET 3-9. FERRIES

Set 3-9. FERRIES



(3-85)

FRAME 3-86

A **ferry**, like a ford, is always considered to be an obstruction to traffic and therefore is always recorded on reconnaissance reports and overlays.

Beside some bridges and all fords, another river crossing method that is always considered an obstruction is a ______________________ .

(overhead clearance; obstructions) (3-115)

FRAME 3-116.

If the formula indicates that there are obstructions along a route, it is necessary to refer to the overlay to determine the **number** and **nature** of the obstructions.

The formula indicates the existence, but not the ___________ or ____________ of the obstructions.

Set 4. OBSTRUCTIONS

(limits; length classification) (3-25)

FRAME 3-26.

One of the most important functions of route reconnaissance symbols is to pin-point and describe the various obstructions along the route.

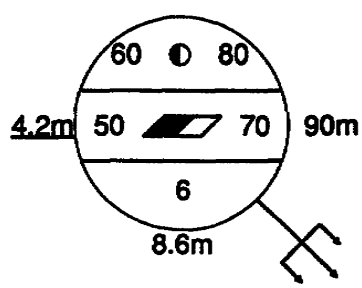
Route reconnaissance symbols are used to indicate ______________________ along the route.

(25; 60) (3-55)

FRAME 3-56.

Regardless of the scheme of graphically displaying the load classification, all bridge symbols have the bridge serial number in the lower half of the circle with the **two-way class** on the **left** and **one-way class** on the **right**. (If only one class is shown, it is the one-way class of the bridge.)

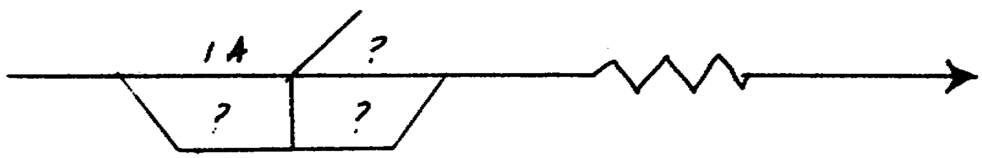
The bridge symbol shown below has a one-way wheel military load classification of __________ and a two-way wheel classification of ____________. Its serial number is _____________________ .



(ferry) (3-86)

FRAME 3-87.

The ferry symbol is similar to the ford symbol in that approach conditions are recorded in the same manner, and because the first notation above the line is the serial number.



Ferry number lA, represented by this symbol, has a ___________________________________ approach on the right bank.

(number; nature) (3-116)

FRAME 3-117.

Finally, the formula indicates **snow blockage** or **flooding**, when these conditions occur regularly along the route. The letter (T) enclosed in parentheses is used for **snow blockage**; the letter (W) indicates **flooding**.

Special conditions are indicated at the end of the formula by the letter T, for ____________________________ ______________________ , or the letter W, for _______________________ .

(obstructions) (3-26)

FRAME 3-27.

Obstructions are factors which restrict the type, amount, or speed of traffic flow. They are **always recorded** on route reconnaissance overlays.

Any factors which restrict traffic flow are considered _____________________ and are ___________________ _______________________ on the route reconnaissance overlays.

(80; 60; 6) (3-56)

FRAME 3-57. REVIEW FRAME.

Before further discussing the bridge symbol, let's briefly review obstructions; the factors which restrict the type and amount or speed of traffic flow and which are always recorded on the route reconnaissance overlays. So far, the following features have been classified as obstructions:

a. Curves whose radii of curvature are 25m or less.

b. Gradients (slopes) of 7% or greater.

c. Reduction in traveled way widths which are below minimum standards prescribed for the type traffic flow (single or double, wheeled or tracked.) Minimum widths were defined as:

TRAFFIC FLOW	WIDTHS FOR WHEELED VEH.	WIDTHS FOR TRACKED VEH.
	5.5m to 7.3m	6m to 8m
	7.3m or over	8m or over

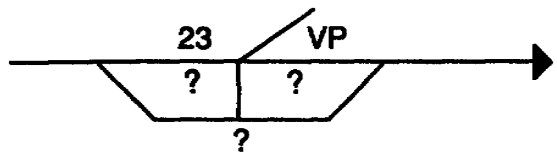
d. Overhead clearances which are less than 4.3m.

(difficult) (3-87)

FRAME 3-88.

The first figure above the line of the ferry symbol is the ferry serial number and the second figure represents the type of ferry. The two types of ferries are presented by letters as shown blow.

V -- vehicular ferry
P -- pedestrian ferry



NOTE: If a ferry is a vehicular type it will always be categorized as both V & P (VP). (Basically if it can transport vehicles, then it can transport pedestrians.) However, a pedestrian type ferry cannot be considered a vehicular type ferry.

This symbol represents a (type) _______________ ferry with ________________ approaches and serial number __________________ .

(snow blockage; flooding) (3-117)

FRAME 3-118.

The load bearing capacity and dimension on a route are used to determine the military load classification of the route formula. If the letters OB, T, or W appear at the end of the formula, it indicates that there are ____________ , _______________ , _______________ , or ________________ .

(obstructions; always recorded) (3-27)

FRAME 3-28.

As you learned in FRAME 3-16, when a route curves on the ground the line depicting it curves on the overlay. An additional symbol is needed if the curve is sharp; that is when it has a radius of 25 meters or less.

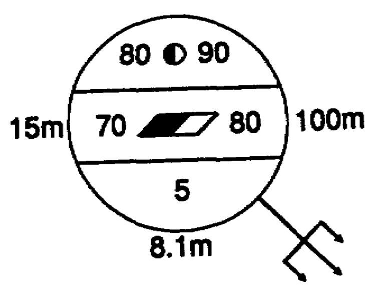
Curves which have a radius 25 meters or less are considered ____________________ curves, requiring an additional symbol.

(go on to next frame) (3-57)

FRAME 3-58.

The bridge symbol also has information to the left, right and below the basic symbol. Overhead clearance is to the left, overall length of the bridge to the right, and traveled way width is blow the basic symbol

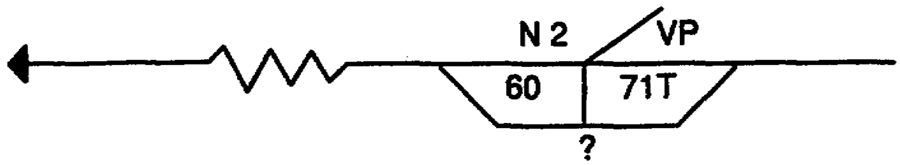
The bridge represented by this symbol has ____________________ overhead clearance, ___________________ overall length, and __________________ traveled way width. The classification of this bridge for two way wheeled vehicle traffic is _______________________ .



(vehicular; easy; 23) (3-88)

FRAME 3-89.

The figures inside the boxed ferry symbol represent the military load classification and dead weight capacity in tons.



This symbol represents a (type) __________________ ferry with serial number ________________ , a military classification of ________________ , and a _______________ dead weight weight capacity.

(lowest; obstructions; snow blockage; flooding) (3-118)

FRAME 3-119.

Write the route classification formula for an all weather route, class 30, 6 meter wide route with a minimum overhead clearance of 4.2 meters. There is a ferry that crosses the route.

(sharp) (3-28)

FRAME 3-29.

Sharp curves, i.e., curves which have a radius of 25 meters or less, are considered **obstructions** and are always symbolized on the overlay. Curves with radii between 25 and 45 meters are reported, although they are not obstructions.

Sharp curves are considered ____________________________ if they have a radius of 25 meters or less.

(154m; 100m; 8.1m; 80) (3-58)

FRAME 3-59.

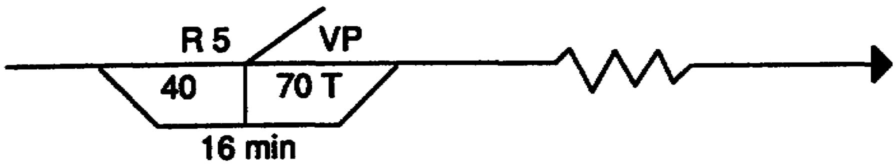
With obstructions in mind, lets take another look at the bridge symbol. When the overhead clearance or traveled way width on the symbol represents an **obstruction**, it is **underlined**

Overhead clearances or traveled way widths on a bridge symbol are _______________________ when they are ____________________ .

(vehicular; N2; 60; 71 Ton) (3-89)

FRAME 3-90.

Finally, the figures below the symbol show the turn around time, in minutes.



This symbol represents a (type) _______________ ferry, number 5, military load class ___________, a dead weight capacity of _______________, and a turn around time of _____________ .

TURN BACK TO BOTTOM OF PAGE 3-2 FOR FRAME 3-91.

(6/X30/4.2/(OB)) (3-119)

FRAME 3-120.

Describe the route classified by the following formula:

4.2/Y/5/4.1(OB)

____

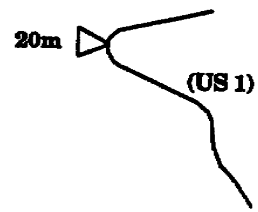
____

____

(obstructions) (3-29)

FRAME 3-30.

The symbol for a sharp curve is a **triangle** with the vertex on the route symbol at the curve, and the radius of the curve, in meters, written outside of the symbol. Here is the route reconnaissance symbol for a sharp curve with a radius of 20 meters:



The sharp curve symbol is a _______________ with its vertex on the route symbol at the curve, and its _______________ written outside the symbol.

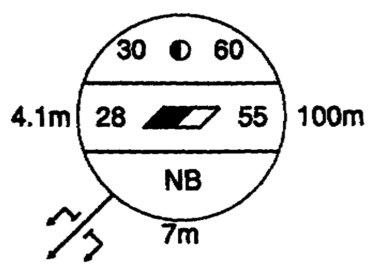
TURN BACK TO BOTTOM OF PAGE 3 FOR FRAME 3-31.

(underlined; obstructions) (3-59)

FRAME 3-60.

In the bridge symbol blow, with an overhead clearance of 4.1m, overall length, 100m, and traveled way width of 7m for expected two way tracked vehicle traffic, which values should be underlined?

____



TURN BACK TO TOP OF PAGE 3-2 FOR FRAME 3-61.

(minimum width is 4-2m, limited all weather, lowest military load classification, 52, with one or more obstructions along the route) (3-120)

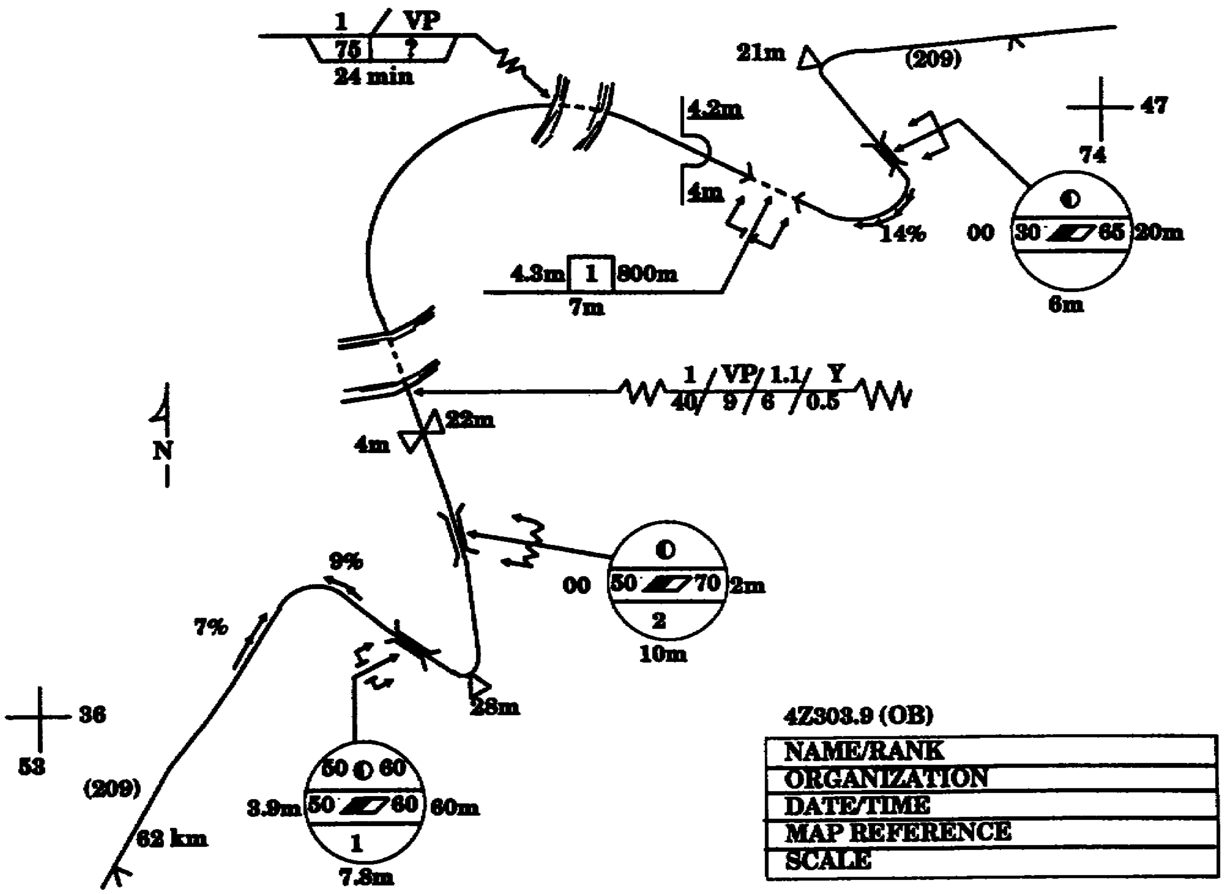
END OF FRAMES

SELF TEST

LESSON 3

(Solutions and references follow)

The leader of a route reconnaissance has prepared the overlay shown below to record the information gathered by the party. The expected military traffic will be two-way tracked vehicles. The exercises which follow are based on this overlay. Fill in the solutions in the spaces provided. To check your solutions, or to review the frames containing the teaching points, refer to the solution sheet which follows the self test.



Exercises:

1. What information on the overlay aids the user in locating and orienting the overlay?

2. What is the route designation?

3. How long is the section of the route that was reconnoitered?

4. The route symbol shown on the overlay indicates that there are five curves in the sector which was reconnoitered. How many are obstructions?

5. Is the symbol correct for the slope between tunnel #1 and bridge #3

6. The symbol northwest of bridge #2 represents a

a. sharp curve

b. detour

c. width constriction

d. underpass

7. What is the overhead clearance for tunnel #1?

8. Why is the overhead clearance figure underlined on the underpass symbol?

9. Is the underpass symbol correct for the expected two-way tracked vehicle traffic?

Why?

10. How many other symbols represent an obstruction to two-way tracked vehicles with regard to the width of traveled way?

---

11. If only one-way tracked vehicular traffic were permitted, how many obstructions, from the standpoint of width, would remain?

---

12. #1?

---

13. Are any of the bridges easy to bypass?

---

14. Which approach is difficult at the ferry site?

---

15. What is the stream velocity at ford #1 ?

---

16. The route classification formula for this route is shown in the northeast corner of the overlay. Is the type indicated for this route consistent with the ford symbol?

---

17. What change would you make in this route classification formula when considering this route for two-way tracked vehicular traffic?

SOLUTIONS TO SELF-TEST

LESSON 3

	Solutions	Test Reference
1.	map reference; grid intersections, north arrow	Frames 3-11 - 3-13
2.	209	Frame 3-15
3.	62km	Frames 3-21 - 3-25
4.	two	Frames 3-28 - 3-32
5.	no, 14% + grades are shown as: 	Frame 3-34
6.	c, width constriction	Frames 3-40 - 3-45
7.	4.3m	Frame 3-98
8.	it is less than 4.3m	Frame 3-96
9.	no. The width also must be underlined, because it is less than 8m.	Frame 3-42
10.	four: tunnel #1, bridges #1 and #3, width constriction on road	Frame 3-42
11.	two, the underpass and the width constriction, under 6m.	Frame 3-42
12.	bypass impossible	Frame 3-67
13.	yes, #3	Frame 3-65
14.	right bank	Frames 3-75, 3-76
15	1.1 m/sec	Frame 3-81
16.	yes, Z indicates a fair weather road; the Y in the ford symbol means significant seasonal variations which usually prevent all weather use of the route.	Frames 3-81, 3-110
17.	Change the military load classification from 50 to 30, the class of bridge #3. The lowest class is always used.	Frame 3-114

LESSON 4

RECONNAISSANCE REPORT FORMS

CREDIT HOURS.. 2

TEXT ASSIGNMENT.. Attached programmed text.

LESSON OBJECTIVES.. Upon completion of this lesson, you will be able to record the information gathered during a deliberate reconnaissance mission on the appropriate DA forms for roads, bridges, tunnels, fords, and ferries. As part of the road reconnaissance report, you will be able to summarize the classification of a road by means of a road classification formula.

TURN TO PAGE 4-3 FOR FRAME 4-1.

(sketches) (4-56)

FRAME 4-57.

The **side elevation** shows the general features of the bridge. These include the number of spans, piers, and abutments, their type and construction material. Critical dimensions, such as span length, height above streambed, water level, and panel length, are also noted.

The general features of the bridge are depicted in the ____ ________________________ .

(type; methods; instruments; compass) (4-84)

FRAME 4-85.

The Ford Reconnaissance Report DA Form ______________________________________ , provides information to _____________________________ and _____________________________ a ford. It also tabulates in detail the _________________________ of the crossing.

FRAME 4-1. INFORMATION FRAME.

In previous lessons of this subcourse, you learned about the various elements which make up a route, and the preparation of the Engineer Reconnaissance Report, DA Form 1711-R, and route reconnaissance overlays. You also learned that deliberate reconnaissance is performed when there are sufficient time and skilled personnel to examine thoroughly each element. It is during deliberate reconnaissance missions that special reconnaissance report forms, each dealing with one component of a route, are prepared. These forms are available for roads, bridges, tunnels, fords, and ferries. This lesson will familiarize you with the information reported on each of these forms.

(No, the prefix "A" is used) (4-28)

FRAME 4-29.

What do the two figures for width represent? ____
____

____

(side elevation) (4-57)

FRAME 4-58.

The **critical span** is the span with the least **load-carrying capacity**. It is sketched in cross section which shows details of construction.

A cross-section is drawn show construction details of the ______________________________ ______________________________ ,which is the span with the least ______________________________ __________________ ____________________ .

(1251; identify; locate; characteristics) (4-85)

FRAME 4-86.

In the next six items, the ford is **described** in detail. The description includes the composition of the bottom, nature and slope of the approaches, type of pavement (if any), the width of the ford, and any hazards that might exist.

Items 12 through 17 provide a __________________________ of the ford.

(go on to next frame) (4-1)

Set 4-1. ROAD RECONNAISSANCE REPORT

FRAME 4-2.

The purpose of road reconnaissance is to determine the classification of the road; that is, the **quantity** and **kinds** of loads that a road can accommodate in its present condition.

To determine the classification of a road by road reconnaissance, you must find out the ____________________ and ________________________________ of loads that a road can accommodate in its present condition.

(width of traveled way and combined width of traveled way and shoulders) (4-29)

FRAME 4-30.

Does this road have the same surface material throughout?

____

____

____

(critical span; load-carrying capacity) (4-58)

FRAME 4-59.

In the cross section of the **critical span**, construction details such as width of span, type and materials of construction, and structural design, are included. These provide a basis for computation of the military load classification, and for determining maintenance, reinforcement, and demolition requirements.

Construction details shown in the sketch of the __________________________ __________________________ help to determine military requirements with regard to the bridge.

(description) (4-86)

FRAME 4-87.

The remaining space on the front of Form **1251** is reserved for **remarks**. Here are entered any other pertinent data not recorded elsewhere on the report.

Other pertinent data about the ford are entered in the space for ______________________________________ on the front of DA Form ______________________ .

(quantity; kinds) (4-2)

FRAME 4-3.

Road classification is an important part of **route** selection. It also is used to **update** existing maps.

Two important uses for road classification information are ________________________________ selection and _________________________ existing maps.

(No - The first six miles are bitumen-penetrated macadam, the remaining ten miles are bituminous or asphaltic concrete) (4-30)

FRAME 4-31.

The road reconnaissance report, DA Form ____________________________________ ,is used to provide both ___________________________ and ________________________ information about a road and to summarize the roads characteristics and condition in a road classification ___________________________ .

(critical span) (4-59)

FRAME 4-60.

Also sketched in **cross-section** are critical members, which are shown in enough detail to provide a basis for strength calculations.

Critical members are also sketched in ________________________ ___________________________ .

(remarks; 1251) (4-87)

FRAME 4-88.

Other data recorded under **"Remarks"** may include, when pertinent, a description of approach road., guide markers, depth gages, availability of and distances to bypasses and alternate crossings, and a **other pertinent information.**

In the space reserved for remarks are entered __________________________ ____________________________ _________________________ about the ford.

(route; updating) (4-3)

FRAME 4-4.

The information obtained during a **road reconnaissance** mission is recorded on DA Form 1248, Road Reconnaissance Report.

The Road Reconnaissance Report, DA Form ____ , is used to record _________________________ _____________________________ information.

(1248; general; detailed; formula) (4-31)

Set 4-2. BRIDGE RECONNAISSANCE REPORT

FRAME 4-32.

The purpose of bridge reconnaissance is to collect **bridge data** necessary to support **operational** planning and movement. It may be part of a larger route reconnaissance mission, or it may be conducted solely for the purpose of obtaining the bridge information.

Bridge reconnaissance is performed to collect _________________________ ____________________________ in support of ___________________________ planning and movement.

(cross-section) (4-60)

FRAME 4-61.

The site plan sketch is a **graphic portrayal** of the location and alinement of the bridge with relation to the obstacle spanned. It also includes the location of unusual nearby features, direction of stream flow, characteristics of the approaches, and topographic data about the obstacle as needed.

The site plan is a ________________________ ____________________________ of the bridge and the obstacle it crosses.

(other pertinent information)(4-88)

FRAME 4-89.

On the front of DA Form 1251, Ford Reconnaissance Report, the ford is _______________________________ , _________________________ and described. Also recorded are the ___________________________________ of the crossing and other pertinent data.

(1248; read reconnaissance) (4-4)

FRAME 4-5.

The load bearing capacity of roads is determined by ______________________ ______________________ This information is needed in the selection of ____________________________ and to ______________________ existing maps. It is recorded on DA Form 1248.

(bridge data; operational) (4-32)

FRAME 4-33.

Hasty bridge reconnaissance is performed to acquire limited bridge information necessary for immediate tactical use.

Tactical needs are met by the limited bridge information obtained by __________________________________ bridge reconnaissance.

(graphic portrayal) (4-61)

FRAME 4-62.

The reverse side of DA Form 1249, bridge reconnaissance report, contains ______________________________ which depict side ________________________ __________________________ _______________________ of the critical span and members, and a _________________________________ plan.

(identified; located; characteristics) (4-89)

FRAME 4-90.

Sketches of a profile of the ford and a site plan are drawn on the reverse side of DA Form 1251, as shown in the example in Panel 4-8.

The reverse side of DA Form 1251 provides space for ___________________________________ of the ford.

(road reconnaissance; routes; update) (4-5)

FRAME 4-6.

Refer to Panel 4-1 and 4-2. These illustrate the front and reverse sides of a sample road reconnaissance report. Notice that there is a heading and four sections. How many sections deal primarily with road information?

____

(hasty) (4-33)

FRAME 4-34

The bridge **symbols** shown on the **route reconnaissance overlay** (see Lesson 3, Set 3-5) express the limited bridge data obtained by a hasty bridge reconnaissance.

When a hasty bridge reconnaissance is conducted, the information obtained is recorded by ______________________ on the ____________________ ______________________ ____________________ .

(sketches; elevation; cross-section; site) (4-26)

Set 4-3. TUNNEL RECONNAISSANCE REPORT

FRAME 4-63

Tunnel reconnaissance obtains essential information about underground galleries, or portions of roads or railroads that have manmade covers, such a snow-sheds.

Underground or covered portions of roads or railroads are the subject of ______________________________ ______________________ .

(sketches) (4-90)

FRAME 4-91.

The profile sketch indicates the water level, and an elevation o the stream bottom and approaches.

The water level. stream bottom and approaches are sketched in the ________________________________ .

(four) (4-6)

FRAME 4-7.

Sections I through IV are principally devoted to specific information about the road itself. The **heading**, which appears at the top of the front of the form, gives the names of the reconnaissance party leader, the destination of the report, map reference, and date/time of the information.

Information which identifies the road classification mission and the personnel who ordered and accomplished It is contained in the ____ at the top of Form 1248.

(symbols; route reconnaissance overlay) (4-34)

FRAME 4-35.

Deliberate bridge reconnaissance procedures, which provide data in sufficient detail for structural analysis, are undertaken when the military load classification of a bridge must be calculated, or the bridge must be repaired or demolished.

When bridge data is needed in sufficient detail for structural analysis, a ______________________ bridge reconnaissance is performed.

(tunnel reconnaissance) (4-63)

FRAME 4-64. INFORMATION FRAME.

In Lesson 3 we discussed the tunnel symbol used on the route reconnaissance overlay (see Frames 3-92 to 3-101). This symbol contains the essential tunnel information which must be reported, including the serial number, location, overhead clearance, width, length, and bypass conditions. When more detailed information is needed, a deliberate reconnaissance is performed and the information obtained is recorded on the Tunnel Reconnaissance Report, DA Form 1250.

(profile) (4-91)

FRAME 4-92.

The **site plan** gives the alinement of the ford and its approaches with respect to the stream. Any critical terrain features near the banks are shown if they will affect the use of the ford. The north arrow and the direction of flow of the stream are always indicated.

The alinement of the ford and its approaches are sketched in the ____ ______________________ .

(heading) (4-7)

FRAME 4-8.

As you can see, **Section I** presents the general information abut the road which was reconnoitered.

General road information obtained in a road reconnaissance mission is reported in ________________________ ________________________ of DA Form ____________________ .

(deliberate) (4-35)

FRAME 4-36.

The **bridge reconnaissance report**, DA Form **1249**, is the means by which the detailed bridge data obtained by reconnaissance is recorded.

Detailed bridge data is recorded on DA Form ______________________ , ___________________________ ______________________ report.

(go to next frame) (4-64)

FRAME 4-65.

Refer to Panels 4-5 and 4-6. These illustrate the front and reverse sides of a sample tunnel reconnaissance report, DA Form **1250**. This form is used to report detailed tunnel information, during either a route reconnaissance mission, or a mission intended only to investigate the tunnel.

Detailed tunnel information is reported on DA Form ____________________________ .

(site plan) (4-92)

FRAME 4-93.

Additional space for remarks is provided below the sketches. Photographs are taken if possible, and attached here.

What observation about the ford was made in Panel 4-8 by the reconnaissance officer?

(Section I; 1248) (4-8)

FRAME 4-9.

The general information recorded Section I includes the UTM grid coordinates of the limit of the reconnaissance, the route designation, length in either kilometer a miles, and the upper and lower limits of the traveled way width. What is the width o roadway shown on the sample report? ______________________________

(1249, bridge reconnaissance) (4-36)

FRAME 4-37.

It is not always necessary, even in a deliberate reconnaissance, to investigate every element related to bridges. The **nature** of the **mission** dictates the elements to be reported. For example load class and overhead clearance are not needed for demolition.

The amount and extent of bridge data reported depends upon the _____________________________________ of the ________________________________ for which the reconnaissance is performed.

(1250) (4-65)

FRAME 4-66.

The **heading** of the tunnel reconnaissance report is brief, serving only to record the destination of the report, the name, rank, and unit the reconnaissance officer, and the date.

In the tunnel reconnaissance report, the date, destination and originator of the report are found in the ______________________________________ .

(To carry loads over 10 tons, stream bottom must be repaired) (4-93)

FRAME 4-94.

The reverse side of DA Form 1251 contains space for _______________________ of a ___________________ and a ____________________________ ____________________________ . Space is also provided for additional _______________________ .

(6.7 - 9.3 meters) (4-9)

FRAME 4-10.

Since the road width varies, the widest and narrowest limits are shown, and the points of change must be indicated on the reverse side of the form. Note also that the weather is described, especially the time of the last rainfall. This can influence the evaluation of drainage and other road characteristics.

The grid coordinates, length, width, weather conditions and other ______________________ information is found in Section I.

(nature; mission) (4-37)

FRAME 4-38.

To meet immediate tactical needs, a ______________________ bridge reconnaissance is performed. Data is recorded on the route reconnaissance ______________________ . Detailed bridge data, needed for structural analysis, is obtained by ______________________ bridge reconnaissance, and reported on DA Form ______________ .

(heading) (4-66)

FRAME 4-67.

The remaining blocks on both the front and reverse of the form are numbered, and grouped to provide specific detailed information about the tunnel. The first group, items **1 through 11**, identify and locate the **tunnel**.

The tunnel is ____________________________ and located in the first group of ___________________ blocks.

(sketches; profile; site plan; remarks) (4-94)

Set 4-5. FERRY RECONNAISSANCE REPORT

FRAME 4-95.

The Ferry Reconnaissance Report, DA Form 1252, is used to record detailed information concerning a ferry or ferry site.

When detailed information about a ferry is required, the Ferry Reconnaissance Report, DA Form _________________ , is used.

(general) (4-10)

FRAME 4-11.

The road reconnaissance mission and personnel involved in it are identified in the _______________ of DA Form _______________ . Section I provides ____________________________ information abut the road.

(hasty; overlay; deliberate; 1249) (4-38)

FRAME 4-39. INFORMATION FRAME.

Refer to panels 4-3 and 4-4. These are samples of the front and reverse sides of the Bridge Reconnaissance Report, DA Form 1249. On Panel 4-3, note that the heading is similar to that on the road reconnaissance report, providing information about the mission and mission personnel. The body of the form is divided into eight columns of Essential Bridge Information, which is required. Space is available for additional bridge information, the items of which are added as needed. In the sample, columns have been added for military load classification, overall length, roadway width, vertical clearance, and bypass possibilities.

(identified; 11) (4-67)

FRAME 4-68.

Positive identification of the tunnel, and its general and specific location, are established by reporting the route number and location, the map reference, the grid coordinates and serial number of the tunnel, its location with reference to the nearest town, its type, and geographic reference name.

In the hypothetical tunnel reconnaissance report in Panel 4-5, how far is tunnel T-1 from the nearest town? ____

(1252) (4-95)

FRAME 4-96.

The ferry **symbol**, shown on the route reconnaissance overlay (see Frames 3-86 to 3-91) provides the minimum essential information about a ferry, such as is obtained during a hasty reconnaissance.

The minimum essential information about a ferry is shown on the route reconnaissance overlay by the ferry ____________________ .

(heading; 1248 general) (4-11)

FRAME 4-12.

Detailed information about the alinement, surface, drainage and foundation of the road is recorded in Section II.

Section II of DA Form 1248 records the ______________________________ information about the road.

(go to next frame) (4-39)

FRAME 4-40.

The bridge is **identified** in Column **1** by the serial number used on the route reconnaissance overlay. Bridge location is reported in Column 2 by **UTM grid coordinates**.

The serial number, shown in Column _________________ serves to _____________________________ the bridge. In Column 2 the bridge location is indicated by ______________________ ______________________ ______________________ .

(10.0 km from Ft Belvoir) (4-68)

FRAME 4-69.

The tunnel reconnaissance report, DA Form ______________________________ , provides detailed information about tunnels. The first group of entries serves to positively ____ and _____________________________ the tunnel.

(symbol) (4-96)

FRAME 4-97.

The **detailed** information obtained during a deliberate reconnaissance is shown on DA Form **1252**, Ferry Reconnaissance Report.

The Ferry Reconnaissance Report, DA Form __________________________ ,provides ____________________ information about ferries.

(detailed) (4-12)

FRAME 4-13.

Notice that in each of the five categories in this section, there is a choice of several descriptions of road conditions. The party leader selects the one that applies to the road being reconnoitered. What was reported about the alinement of the road?

(1; identify; UTM grid coordinates) (4-40)

FRAME 4-41.

In Column **3**, the horizontal clearance is indicated. To determine **horizontal clearance**, you measure the distance between the inside edges of the bridge 30 centimeters (12 inches) above the surface of the traveled way.

Measuring the horizontal distance between the inside edges of the bridge gives you the ____________________ ____________________ , which is reported in Column ____________________ .

(1250; identify; locate) (4-69)

FRAME 4-70.

The overall **dimensions** and **alinement** of the tunnel are recorded in the next group of blocks, items 12 through 17. These include length, roadway width (or number of tracks), horizontal and vertical clearances, % grade, if any, and, if the tunnel is curved, the radius of the curve.

In items 12 through 17, the overall ______________________________ and ___________________________ of the tunnel are reported.

(1252; detailed) (4-97)

FRAME 4-98. INFORMATION FRAME.

Refer to Panel 4-9 and 4-10. These represent the front and reverse sides of a sample DA Form 1252, Ferry Reconnaissance Report. The form is similar in format to the other reconnaissance report forms, and is designed to provide a complete description of both the ferry and its terminals and approaches on the front side, and necessary sketches on the reverse.

(steep gradients and sharp curves) (4-13)

FRAME 4-14.

In each case, the choices cover any possible road condition that would affect the movement of military traffic from the standpoint of **alinement, drainage, foundation**, and **surface**. By checking the appropriate item in each category, the party leader provides complete, uniform, and detailed information about the road.

The detailed road information in Section II describes the ____________________ ______________________ ______________________ , and ____________________ of the road.

(horizontal clearance; 3) (4-41)

FRAME 4-42.

Any horizontal clearance less than the minimum width listed in Table 2, p. 12 of Appendix I, is **underlined**. Unlimited horizontal clearance is indicated by the symbol for infinity (∞).

Horizontal clearance is considered an obstruction and is therefore ______________________________________ when it is less than the minimum width specified for the bridge class and traffic flow.

(dimensions; alinement) (4-70)

FRAME 4-71.

Construction characteristics, such as the type of lining and portal material, ventilation, and drainage are entered in the next four boxes.

What types of materials were used in the construction of the tunnel described by Panel 4-5?

(go to next fame) (4-98)

FRAME 4-99.

Study the front of the sample form, Panel 4-9. Notice that there is a brief **heading**, which indicates the destination of the repot, the reconnaissance officer, and the-date.

The Ferry Reconnaissance Report is dated and addressed in the ______________________________________ .

(alinement, drainage, foundation, surface) (4-14)

FRAME 4-15.

In Section III, **obstructions** are listed and described. The five types of obstructions we learned about in Lesson 3 are reported here when they occur, located by grid coordinates, with reference to additional reports when necessary.

Section III of the Road Reconnaissance Report contains a list of ______________________________ .

(underlined) (4-42)

FRAME 4-43.

Underbridge clearance, shown in Column 4, is the minimum clear distance between the underside of the bridge and the surface of the ground or water at mean level. Mean water level can be determined from gaging-station records, observation of high and low water marks, or information gained from local inhabitants.

The distance between the underside of the bridge and the surface of the ground or water below, called the ______________________ ____________________ , is entered in Column ____________________ .

(stone portals; concrete lining) (4-71)

FRAME 4-72.

The remaining blocks on the front of DA Form 120 are used to record special information about the tunnel which can influence military use of it. The items include demolition chambering, age and condition of tunnel, bypass possibilities, approaches, restrictions, and other data pertinent to maintenance, improvement, or safety.

How old was the tunnel at the time the report illustrated by Panel -5 was made?
____________________ .

(heading) (4-99)

FRAME 4-100.

The first 11 items of the report provide information which positively **identifies** and **locates** the specific ferry which is being reported. They specify the route, map reference, grid coordinates, ferry number, military load classification, nearest town, and the name of the water barrier it crosses.

In the first 11 items of the report, the ferry is positively ____ and ________________________ .

(obstructions) (4-15)

FRAME 4-16

We note in the sample list of obstructions in Panel 4-1 that the party leader reported an obstruction that was in addition to the five types which we discussed in Lesson 3. What was this unusual obstruction? ______________________________

(underbridge clearance; 4) (4-43)

FRAME 4-44.

The first four columns of the body of the bridge reconnaissance report ______________________________ the bridge by serial number, ______________________________ it by grid coordinates, and list both the ______________________________ and ______________________________ clearances.

(65 years old) (4-72)

FRAME 4-73.

Items recorded in the remaining blocks of the front of DA Form 1250 provide detailed information about the length, width and other ____ , construction ________________________ , and ____________________ ____________________ needed by military users.

(identified; located) (4-100)

FRAME 4-101.

The Ferry Reconnaissance Report is similar to the other reconnaissance reports in that it has a brief ________________________________ which lists the origin and destination of the report, and a group of items (1 through 11) which serve to ____________________________ and _______________________ the ferry which is the subject of the report.

(road crater) (4-16)

FRAME 4-17.

The road crater is further described in the Reconnaissance Report #1, as noted in the remarks column of Section II. The Reconnaissance Report is made on DA Form 1711-R, which we learned about in Lesson 2. What important feature of Form 1711-R led to its use in reporting the crater? (hint: refer to Panel 2-2)

(identity; locate; horizontal; underbridge) (4-44)

FRAME 4-45.

The remaining 4 columns provide data on the bridge **spans**, including number of identical spans, type of construction and material, length, condition, and if the span is over water (W).

Columns 5 through 8 provide information on the bridge ______________________________________ .

(dimensions; characteristics; special information) (4-73)

FRAME 4-74.

Refer to Panel 4-6. This is the reverse side of DA Form 1250, Tunnel Reconnaissance Report, and contains **sketches** relating to the tunnel. The spaces provided are "cross-hatched" with evenly spaced lines to facilitate sketching.

The revere side of DA Form 1250 is used for ____ of the tunnel.

(heading; identify; locate) (4-101)

FRAME 4-102.

In item 12, any limiting features are entered which might affect ferry operations. These include such factors a the condition of vessels or terminals, floods, low water, freezing, tides, and similar data. What limiting feature was reported about Ferry No. 1 in the sample report show in Panel 4-9? ____

(work estimate) (4-17)

FRAME 4-18.

To repair or bypass a road crater of this size, it is logical to assume the need for engineer effort, and therefore, a work estimate. The reverse side of Form 1711-R provides for work estimates when necessary. What other documents were prepared in connection with this reconnaissance?

____

____

____

(spans) (4-45)

FRAME 4-46.

When there is more than one span to be described, they are listed in sequence starting from the **west**. If the bridge runs due north and south, the spans are listed from the north and the letter N precedes the number of spans.

If the bridge has more than one span, they are listed in sequence starting from the ____________________ .

(sketches) (4-74)

FRAME 4-75.

A **plan** and **profile** are sketched in the first of the spaces provided. The plan includes the position of the tunnel, approaches, alinement, and any nearby terrain features of importance. The profile shows the gradients of the approaches, and of the tunnel itself.

The first sketch on the reverse side of DA Form ______________________ is a ____________________ and ____________________ .

(capacity of landing at Little Reno) (4-102)

FRAME 4-103.

The **crossing** is **described** in items 13 through 15, including the water levels, crossing time and length of the course.

Items 13 through 15 provide a _________________________ of the __________________________ .

(overlay, bridge report, ford report) (4-18)

FRAME 4-19.

Section II of DA Form 1248 contains the ______________________________ information about the rod, such as alinement, drainage, foundation, and ______________________________ . Section III contains a list of ________________________ .

(west) (4-46)

FRAME 4-47.

Refer to page 6 of Appendix I. Note that in the illustration of typical bridge spans, a number is used to identify each type of bridge span **construction**. The appropriate number is shown in Column 6 of the report.

A coded number is used identify the type of span ____ .

(1250; plan; profile) (4-75)

FRAME 4-76.

The **portal** view shows the mouth of the tunnel, and the material of which it is constructed. It may also show a limited section of the approach route.

The mouth of the tunnel is sketched in the ____ view.

(description; crossing) (4-103)

FRAME 4-104.

The pertinent design features of the **vessel(s)** are recorded in item 16. This information includes the number and construction type of units, the method and power propulsion, length, beam, draft, gross and net tonnage, and capacity.

The next item records in detail the pertinent design features of the ______________________________ .

(detailed; surface; obstruction) (4-19)

FRAME 4-20.

Refer to Panel 4-2. This is the reverse side of DA Form 1248, and contains Section IV, the **mileage** chart, which is a schematic portrayal of the road in which the relative positions of items not shown elsewhere are located along the route, and the road classification formula or formulas are indicated.

Section IV, on the reverse side of DA Form 1248, contains the ______________________________ chart.

(construction) (4-47)

FRAME 4-48.

Beneath the illustration of typical bridge spans, there is a list of span **construction material**, with a lower case letter code for each type. The appropriate letter is shown in Column 7 of the report.

A lower case letter or letters is shown in Column 7 to indicate the ________________________________ ____________________________ of the span.

(portal) (4-76)

FRAME 4-77.

The **cross section** of the tunnel bore shows in detail the allowable traffic width, the shape of the bore, and possible man-made or natural obstructions.

Details about the shape of the bore itself e shown in the ______________________________ .

(vessel) (4-104)

FRAME 4-105.

The group of blocks which make up item 17 are devoted to a description of the **terminals** and the **approaches**. The geographic directions of the banks are circled. Other entries record the names of the terminals, the dimensions and capacities of the slips, and a description of the docking facilities. Highway approaches are described to surface, lanes, and military load classification. If the ferry is for railroads, the number of backs and sidings are entered.

Item 17 provides a detailed description of the __________________ and ________________ .

(mileage) (4-20)

FRAME 4-21.

The mileage chart provides for measurements in miles, on one side of the chart, and kilometers on the other, reading from the bottom up. Which unit of measurement was used in the hypothetical mission repotted on the sample chart in panel 4-2? ____________________

(construction material) (4-48)

FRAME 4-49.

In Column 8, the span length is recorded, together with special information about bridge conditions. If the span is not usable, the letter X is placed after the span length. If the span is over water, the letter W follows the span length.

Column 8 records the span ____________ and special ____________ , if any.

(cross section) (4-77)

FRAME 4-78.

The reverse side of DA Form 1250 contains ______________________________ which include a plan, ____________________ ,a ____________________ view, and a ______________ ______________ of the bore.

(terminals; approaches) (4-105)

FRAME 4-106.

The remaining space on the front of DA Form 1252 has been reserved for remark. They may include obstructions, navigational aids, possible alternate crossings, and **other pertinent data** not recorded elsewhere.

The remarks space is used for ______________ ______________ ______________ not recorded elsewhere.

(kilometers) (4-21)

FRAME 4-22.

The road classification is indicated by a **formula**, placed on the side of the chart with the selected unit of measurement. The other side may be used for **notations** of critical features or conditions along the road, such as the road intersections, turnoff, and built-up area shown on the sample.

Section IV, the mileage chart, contains both the road classification ________________________________ and ____________________ of critical features along the road.

(length; condition) (4-49)

FRAME 4-50

Columns 5 through 8 of the bridge reconnaissance report list information about the bridge spans, including construction ________________________________ and _________________________________ , span _____________________ and special _______________________ .

(sketches; profile; portal; cross section) (4-78)

Set 4-4. FORD RECONNAISSANCE REPORT

FRAME 4-79. INFORMATION FRAME

The ford reconnaissance symbol, which you learned about in frames 3-73 through 3-85, is shown on the route reconnaissance overlay to provide minimum essential information about fords. When more detailed information is needed concerning a specific ford, especially during a deliberate reconnaissance, DA Form 1251, Ford Reconnaissance Report, is used.

(other pertinent data) (4-106)

FRAME 4-107.

The detailed ferry information reported on DA Form 1252 includes ______________________________ ______________________________ which may effect ferry operations, and complete descriptions of the ______________________ ,the ______________________ , and the ______________________ and approaches

(formulas, notations) (4-22)

FRAME 4-23.

The road classification formula for each section of the road is placed in its appropriate position along the chart, with the extent of the section indicated by limiting lines. In Panel 4-2, how many road classification formulas were needed to describe the conditions along the entire route?

a. one

b. three

c. six

(type; materials; length; conditions) (4-50)

FRAME 4-51.

The right side of the body of the bridge reconnaissance report has been left blank, providing space for the **addition** of columns, as needed to provide more information on the bridge itself, its approaches, or the obstacle it crosses.

Additional bridge information, where required, is reported by ______________________________ column in the blank space provided.

(go to next frame) (4-79)

FRAME 4-80.

Refer to Panels 4-7 and 4-8. These illustrate the front and reverse of a sample DA Form 1251, in which a hypothetical ford was reported. Notice that this form is similar to the tunnel reconnaissance report in that it has a brief heading, to address the report, and a series of numbered items which provide the necessary information about the **ford**.

DA Form 1251 provides detailed information about ____ .

(limiting features; crossing; vessel; terminals) (4-107)

FRAME 4-108.

On the reverse side of DA Form 1252 (see Panel 4-10), space is provided for **sketches** of the route alinement and the two terminals.

A route alinement plan and views of the two ferry terminals are shown by ______________________________ on the reverse side of DA Form ______________ .

(b. three) (4-23)

FRAME 4-24.

Section IV, the ______________________ chart, contains the road classification ____________________ and ________________________ of critical features along the road.

(adding) (4-51)

FRAME 4-52.

In the sample report shown in Panel 4-3, the information usually shown by bridge symbols on the reconnaissance overlay has been added to the bridge reconnaissance report. This includes military load class, overall length, width of traveled way, overhead clearance, and bypass possibilities.

Does the overhead clearance on any of the bridges represent an obstruction? __________________________

(fords) (4-80)

FRAME 4-81.

The data recorded in items one through ten are designed to provide positive **identification** of the ford, and its exact **location**.

The first ten items of the Ford Reconnaissance Report, DA Form 1251, indicate the ____________________ and _____________________ of the ford.

(sketches; 1252) (4-108)

FRAME 4-109.

The **route alinement plan** shows the geographic position of the ferry course and the positions of the approaches to the sips. A north arrow and the direction of flow (if the water barrier is a stream) are shown, together with any obstructions or navigational aids.

The geographic position of the ferry course and its approaches are sketched in the _________________________ ___________________ ___________________________ .

(mileage; formula; notations) (4-24)

FRAME 4-25.

The road classification formula is similar to the route classification formula shown on the overlay in that it is expressed as a **standardized sequence** of coded components which describes the road conditions.

The road classification formula is expressed in a ____ of coded components.

(yesm bridge #2 is less than 4.5m) (4-52)

FRAME 4-53.

Bypass of bridge #2 is reported as possible, but difficult. What other information has been reported about bridge #2, besides the low overhead clearance, that makes bypass possibilities of critical importance.

(identification; location) (4-81)

FRAME 4-82.

The ford is specifically **identified** by its serial number and further identified by **locating** it with respect to the route on which it occurs, the map sheet on which it falls, its grid coordinates, the nearest town, and the stream it crosses.

Information listed in items 1 through 10 of DA Form ____________________________ , Ford Reconnaissance Report both ____________________________ and __________________________________ the ford.

(route alinement plan) (4-109)

FRAME 4-110.

A separate sketch is made of each **terminal**, including the banks, and details of the slips, ramps, and bumper piles.

Two separate sketches provide detailed views of the two ____ .

(standardized sequence) (4-25)

FRAME 4-26. INFORMATION FRAME.

Refer to pages 8 and 9 of Appendix I. Here are listed the seven components of the road classification formula, the coded symbols used for some of them, the characteristics they represent, and the correct sequence for showing the components. The road classification formula tells the user whether or not there are limiting characteristics, and if so what they are; width of both roadway alone and roadway with shoulders; road surface material; length, when deemed appropriate; the existence of obstructions; and special conditions when they occur. When conditions along the road change, a separate formula for this section of road is composed, with its limits indicated on the mileage chart.

(one span not usable) (4-53)

FRAME 4-54.

The "X" shown after the span length of one of the concrete slab spans indicates that damage has rendered this span not usable. Unless it can be repaired, bypass will be necessary to movement of military traffic.

What is meant by the infinity symbol ∞ shown in the overhead clearance column for bridges 1 and 3?

____

(1251; identifies; locates) (4-82)

FRAME 4-83.

The next item, 11, tabulates the characteristics of the crossing. These characteristics include the **width** and **depth** of the crossing, and the velocity the steam at the present water level and at low, mean, and high level. The date and season for each of these is also given.

The characteristics of the crossing include ____________________________ and ________________________ of the crossing, and the _____________________________ of the stream.

(terminals) (4-110)

FRAME 4-111.

The detailed information reported on the Ferry Reconnaissance Report is completed by the _____________________ included on the reverse side. These portray the ______________________________ _____________________ _____________________, and a separate view of each ________________________ .

(go to next frame) (4-26)

FRAME 4-27.

In Panel 4-2, refer to the road classification formula for the first six kilometers of the road (remember to read from the bottom-up). The prefix tells us that there are limiting characteristics. What are the limiting characteristics for this section of road?

____

____

____

(overhead clearance unlimited) (4-54)

FRAME 4-55.

Space has been provided on the right side of the bridge reconnaissance report for ____________________ ____________________ ____________________ when required.

(width; depth; velocity) (4-83)

FRAME 4-84

Stream widths can be determined by actual measurements using a **tape** or rope, or by surveying **methods** and **instruments**. An expedient method of determining approximate stream width, requiring only a **compass**, is illustrated on page A-14 of Appendix I.

Stream widths can be measured with a ______________________ , by surveying ____________________ and ______________________ , or by using a ____________________ to construct a 45° right triangle.

TURN BACK TO BOTTOM OF PAGE 4-2 FOR FRAME 4-85

(sketches; route alinement plan; terminal) (4-111)

FRAME 4-112.

We have now discussed all of the five special purpose reconnaissance report forms available to engineers performing a deliberate route reconnaissance. Can you match the correct DA Form numbers with the reports listed below?

Report Name		**DA Form**
Ford Reconnaissance	______________________	1248
Road Reconnaissance	______________________	1249
Ferry Reconnaissance	______________________	1250
Tunnel Reconnaissance	______________________	1251
Bridge Reconnaissance	______________________	1252

(sharp curves, steep gradients, poor drainage, rough surface. Foundation material is unknown) (4-27)

FRAME 4-28.

Are there any limiting characteristics in the second stretch of road? ______________________________________

TURN BACK TO BOTTOM OF PAGE 4-3 FOR FRAME 4-29

(additional bridge information) (4-55)

FRAME 4-56.

Sketches are drawn in the graphed area on the back of DA Form 1249 (Panel 4-4), to depict a side elevation, cross section of the critical span and members, and a site plan.

The reverse side of DA Form 1249 provides space for various ______________________________ of the bridge and its site.

TURN BACK TO TOP OF PAGE 4-2 FOR FRAME 4-57

(1251; 1248; 1252; 1250; 1249) (4-112)

END OF FRAMES

ROAD RECONNAISSANCE REPORT (FM 5-36)

DATE: 1 JUNE 73

TO: (Headquarters ordering reconnaissance) COMMANDING OFFICER, ATTN: S2; 21ST ENGR BN (21ST INF DIV)

FROM: (Name, grade and unit of officer or NCO making reconnaissance) John H. Doe — JOHN H. DOE 1/LT CO A 21ST ENGR BN

1. MAPS	a. COUNTRY	b. SCALE	c. SHEET NUMBER OF MAPS	2. DATE/TIME GROUP (Of signature)
	QUANTICO	1:50,000	5561-III	01 1800 JUN 73

SECTION I - GENERAL ROAD INFORMATION

3. ROAD GRID REFERENCE FROM	TO	4. ROAD MARKING (Civilian or Military number of road)	5. LENGTH OF ROAD (Miles or kilometers, specify)
UT 122864	UT 097899	VIRGINIA 617	16.0 Km

6. WIDTH OF ROADWAY (Feet or meters, specify): 6.7 - 9.3 METERS

7. RECONNAISSANCE — DATE: 1 JUN 73 — TIME: 1000 HRS

8. WEATHER DURING RECONNAISSANCE (Include last rainfall, if known): CLEAR - TEMP. 84° LAST RAINFALL - APPROX. 28 MAY 73

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)	✓	(2) INADEQUATE DITCHES, CROWN/CAMBER OR CULVERTS. ITS CULVERTS OR DITCHES ARE BLOCKED OR OTHERWISE IN POOR CONDITION
	(3) SHARP CURVES (Radius less than 100 ft (30m))		
✓	(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) WATERBOUND MACADAM
✓	(2) BITUMINOUS (Specify type where known): CHECK CHART		(7) GRAVEL
			(8) LIGHTLY METALLED
			(9) NATURAL OR STABILIZED SOIL, SAND CLAY, SHELL, CINDERS, DISINTEGRATED GRANITE, OR OTHER SELECTED MATERIAL
	(3) BRICK (Pave)		(10) OTHER (Describe):
	(4) STONE (Pave)		
	(5) CRUSHED ROCK OR CORAL		

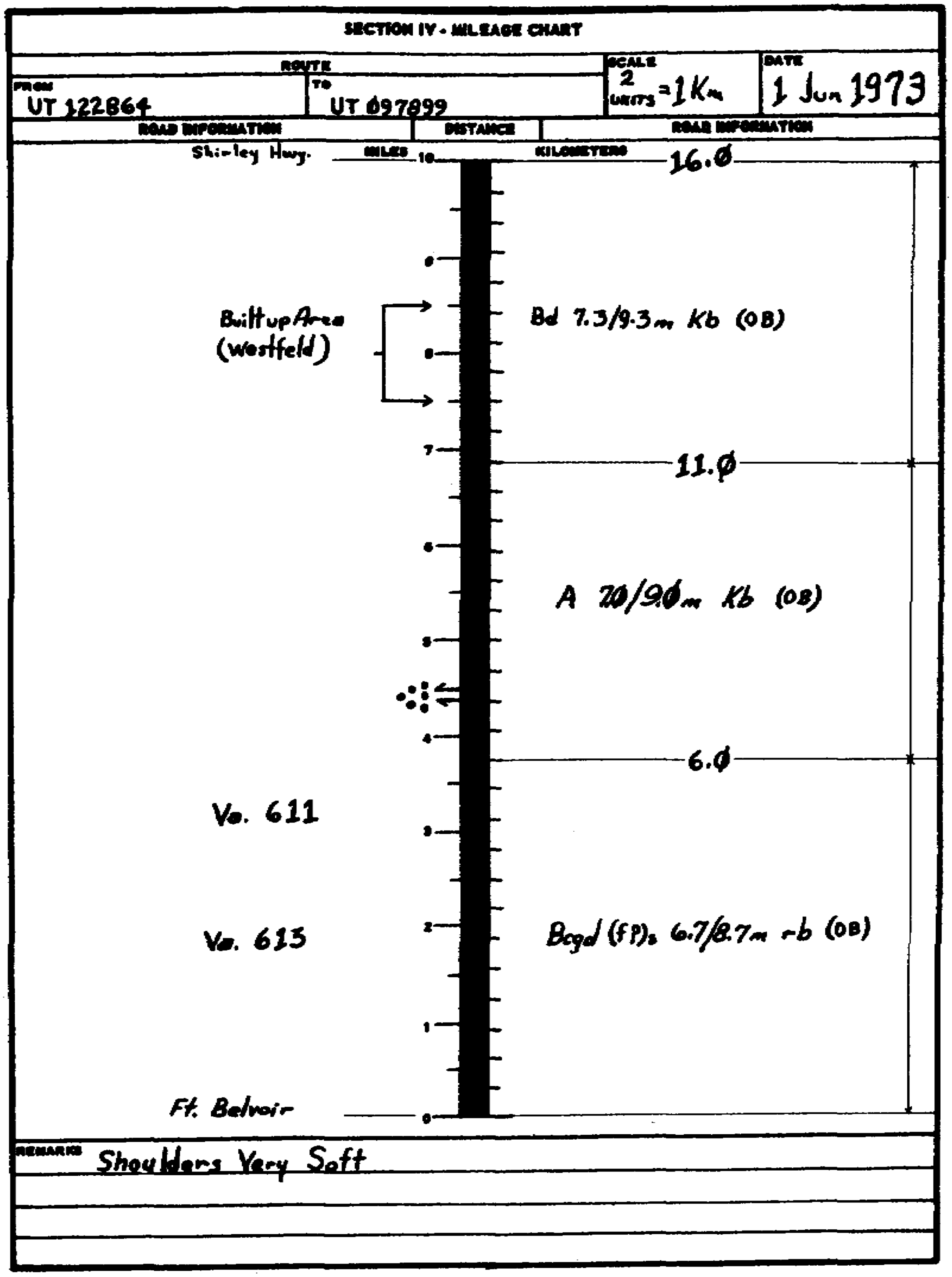
SECTION III - OBSTRUCTIONS *(List in the columns below particulars of the following obstructions which affect the traffic capacity of a road. If information of any factor cannot be ascertained, insert "NOT KNOWN")*

(a) Overhead obstructions, less than 14 feet or 4.25 meters, such as tunnels, bridges, overhead wires and overhanging buildings.
(b) Reductions in road widths which limit the traffic capacity, such as craters, 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	SHARP CURVE - RADIUS 27.5m	UT 122869	SEE OVERLAY
2	STEEP GRADE - 8% - UPHILL EAST	UT 115875	LENGTH 300 m
3	NARROW BRIDGE - TRAVELED WAY 5.0m	UT 169879	SEE BRIDGE RPT. #1
4	UNDERPASS - V.C. 4.05m	UT 202883	SEE OVERLAY
5	ROAD CRATER - LGT. 7.5m	UT 202884	SEE RECON RPT #1
6	FORD - LGT. 7.3m - WIDTH 8.2m	UT 100886	SEE FORD RPT #1
	BOTTOM GRAVEL - DEPTH 0.5m		

DA FORM 1 JUL 60 1248 PREVIOUS EDITION OF THIS FORM IS OBSOLETE.

PANEL 4-1. Road Reconnaissance Report - DA Form 1248 front.



PANEL 4-2. Mileage Chart - DA Form 1248: Reverse.

BRIDGE RECONNAISSANCE REPORT
(FM 5-36)

DATE: 1 JUN 1973

SIGNATURE: John H. Doe

TO: (Headquarters ordering reconnaissance) COMMANDING OFFICER, ATTN: S2 21ST ENGR BN (21ST INF DIV)

FROM: (Name, grade, and unit of officer or NCO making reconnaissance) John H. Doe 1st Lt. Co A 21st ENGR BN

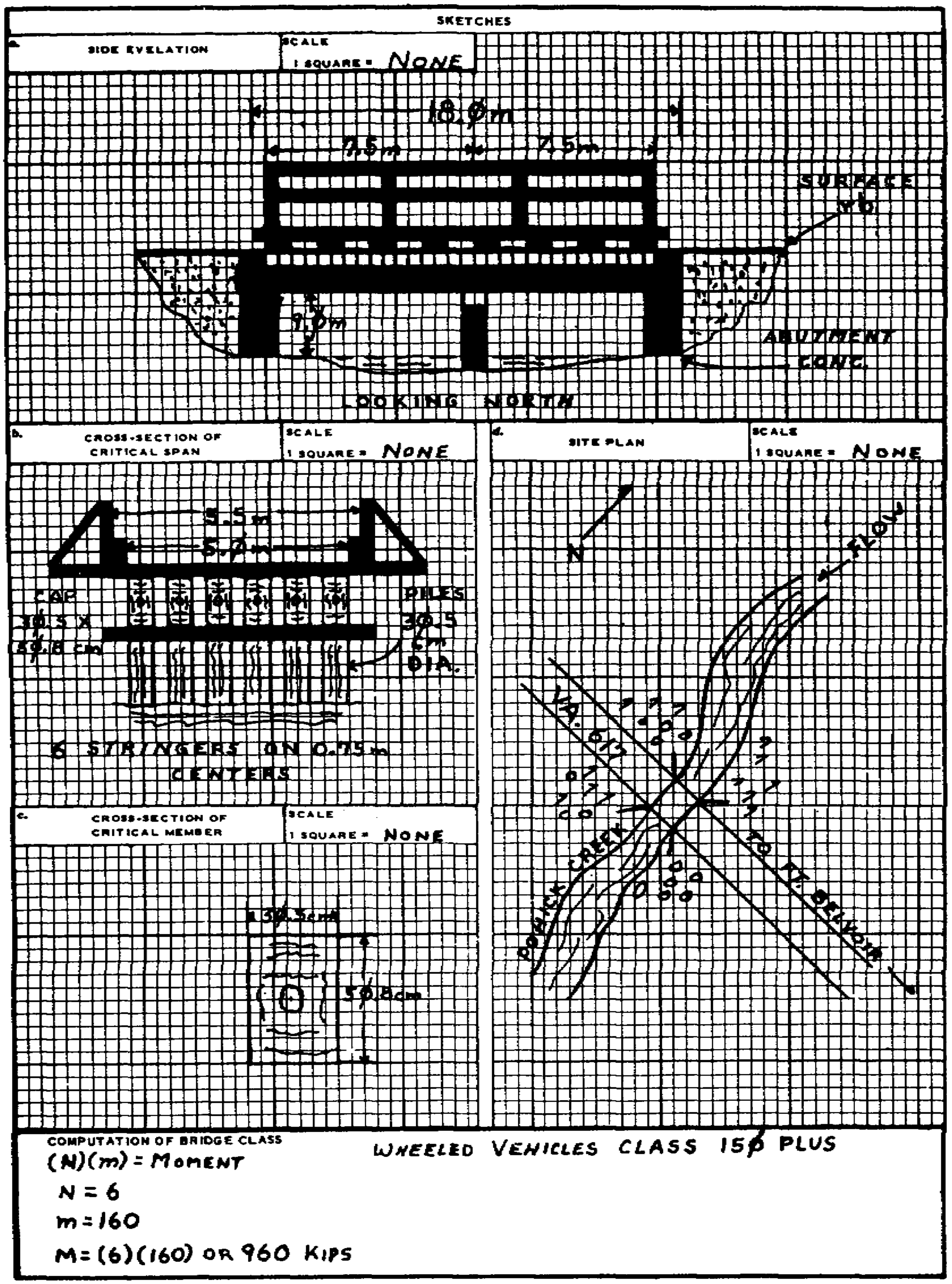
MAPS (Country, scale and sheet number or name): Virginia, Anandale, 1:25000; Sheet 5561

DATE/TIME GROUP (Of signature): Ø1196ØZ

ESSENTIAL BRIDGE INFORMATION								ADDITIONAL BRIDGE INFORMATION (Add columns as needed) (Military load class, overall length, roadway width, vertical clearance, bridge by-pass)					
		CLEARANCE		SPANS									
SERIAL NO. 1	LOCATION 2	HORIZONTAL 3	UNDER-BRIDGE 4	NUMBER 5	TYPE OF CONSTRUCTION 6	TYPE OF CONSTRUCTION MATERIAL 7	LENGTH AND CONDITION 8	Military Load Classification 9	OVERALL LENGTH 10	Traveled width 11	Overhead Clearance 12	By-pass Possibilities 13	Remarks 14
1	LA Ø72687	∞	2	1	3	h	4.8 w	3Ø	4.9	3.5	∞	Easy	NONE
2	LA 118759	9.5	6.5		4	K	4	4Ø 5Ø	25	7.5	4	Difficult.	NONE
					1	a	16 w						
					4	K	4 wX						
3	LA 16565Ø	∞	23	5	3	ak	25	80 6Ø	126	8.5	∞	Impossible	NONE
4	LA 156643	10.5	8.5	3	6	K	1Ø	8Ø 1ØØ 6Ø 8Ø	1ØØ	1Ø	10.5	Impossible	NONE
				2	2	a	2Ø w						
				3	6	K	1Ø						

DA FORM 1249 JUL 66 — PREVIOUS EDITION OF THIS FORM IS OBSOLETE. GPO 937914

PANEL 4-3. Bridge Reconnaissance Report - DA Form 1249: front.


SKETCHES

a. SIDE EVELATION — SCALE 1 SQUARE = NONE

18.Øm
7.5m
7.5m
SURFACE
WD.
7.Øm
ABUTMENT
CONC.
LOOKING NORTH

b. CROSS-SECTION OF CRITICAL SPAN — SCALE 1 SQUARE = NONE

5.5m
5.Øm
CAP
30.5 X
50.8 cm
PILES
30.5
cm
DIA.
6 STRINGERS ON 0.75m
CENTERS

c. CROSS-SECTION OF CRITICAL MEMBER — SCALE 1 SQUARE = NONE

30.5cm
50.8cm

d. SITE PLAN — SCALE 1 SQUARE = NONE

N
FLOW
VA. 613
POHICK CREEK
TO FT. BELVOIR

COMPUTATION OF BRIDGE CLASS

(N)(m) = MOMENT
N = 6
m = 160
M = (6)(160) OR 960 KIPS

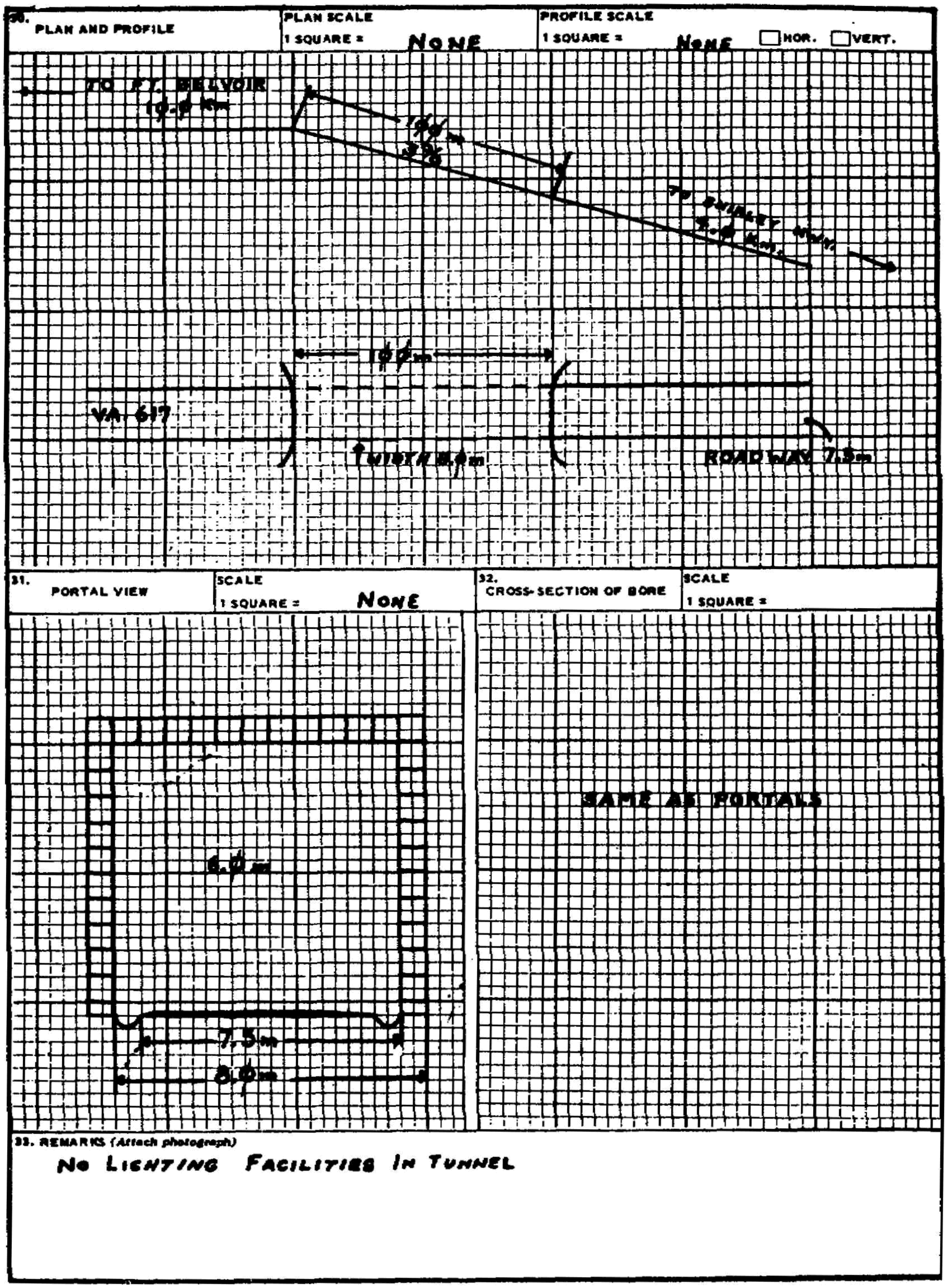
WHEELED VEHICLES CLASS 15Ø PLUS

PANEL 4-4. Bridge Reconnaissance Sketches - DA Form 1249 reverse.

TUNNEL RECONNAISSANCE REPORT (FM 5-36)				DATE 14 JUNE 1979	
TO: (Headquarters ordering reconnaissance) ATT. S2 CO: 21ST. EBC (21ST. INF. DIV.)			FROM: (Name, grade and unit of reconnaissance officer) John H. Doe JOHN H. DOE 1/LT. CO. A 21ST EBC		
1. ROUTE OR LINE — HIGHWAY VIRGINIA 617	RAILROAD N/A	2. FROM (Initial Point) UT 122864	3. TO (Terminal Point) UT 097899		4. DATE/TIME (Of signature) 14 1800 JUN.73
5. MAP SERIES NR V734	6. SHEET NUMBER 5561-III	7. GRID REFERENCE — TYPE UTM 1:50,000	COORDINATES UT 098888	8. TUNNEL NUMBER T-1	
9. LOCATION FROM NEAREST TOWN — DISTANCE 10.0 Km.	DIRECTION NORTHWEST	NAME OF NEAREST TOWN FT. BELVOIR, VIRGINIA		10. TYPE (Subaqueous, Rock, Soil) ROCK	
11. NAME (Mountain or Water feature) ACCOTINK MTS.			12. LENGTH 100 m.	13. NUMBER OF TRACKS N/A	14. ROADWAY WIDTH 7.5 m.
15. CLEARANCE — VERTICAL 6.0 m	HORIZONTAL 8.0 m	16. GRADE (Percent) 3%	17. ALINEMENT (Straight or radius of curve) STRAIGHT		
18. LINING (Material) CONC.	19. PORTALS (Material) STONE	20. VENTILATION (Type) NATURAL			
21. DRAINAGE EXCELLENT					
22. CHAMBERED FOR DEMOLITION ☐ YES ☑ NO		23. COMPLETED (Year) 1908	24. CONDITION (Check appropriate box) ☐ EXCELLENT ☑ GOOD ☐ FAIR ☐ POOR		
25. BYPASSABILITY EASY					
26. ALTERNATE CROSSING BACKLICK ROAD TO SHIRLEY HWY.					
27. APPROACHES FAIR (4%)					
28. IN-TUNNEL RESTRICTIONS NONE					
29. GEOLOGIC DATA LIMESTONE					

DA FORM 1 JAN 58 1250

PANEL 4-5. Tunnel Reconnaissance Report - DA Form 1250: front.



PANEL 4-6. Tunnel Reconnaissance Sketches - DA Form 1250: reverse.

FORD RECONNAISSANCE REPORT (FM 5-36)						DATE 14 JUNE 1973
TO: (Headquarters ordering reconnaissance) COMMANDING OFFICER, ATTN: S2 21ST ENGR BN (21ST INF DIV)			FROM: (Name, grade and unit of reconnaissance officer) John H. Doe JOHN H. DOE 1/LT CO A 21ST ENGR BN			
1. ROUTE NUMBER VIRGINIA 617	2. FROM (Initial Point) UT 122864		3. TO (Terminal Point) UT 097899			4. DATE/TIME (Of signature) 14 1800 JUN 73
5. MAP SERIES NUMBER V734	6. SHEET NUMBER 5561-III	7. GRID REFERENCE TYPE UTM 1:50,000	COORDINATES UT 100886			8. FORD NUMBER 1
9. LOCATION FROM NEAREST TOWN				10. CROSSING (Name of stream or other body of water)		
DISTANCE 11.0 Km	DIRECTION SOUTHEAST	NAME OF NEAREST TOWN FT. BELVOIR, VIRGINIA		ACCOTINK CREEK		

11. CHARACTERISTICS OF CROSSING

WATER LEVELS	WIDTH	DEPTH	VELOCITY	DATE	SEASON OR MONTH(S)
TODAY	7.3 m	0.5 m	1.5 mps	14 JUN 73	SPRING
LOW	6.1 m	0.3 m	1.1 mps	07 AUG 72	SUMMER
MEAN	7.3 m	0.5 m	2 mps		
HIGH	8.4 m	1.8 m	2.2 mps	6 MAR 72	WINTER

12. BOTTOM	13. APPROACHES	14. SLOPE RATIO
☐ SAND ☑ GRAVEL ☐ STONE ☐ OTHER (Specify):	☐ FIRM ☐ SOFT ☑ PAVED	10%

15. TYPE OF PAVEMENT	16. USABLE WIDTH	17. HAZARDS (Flash floods, quicksand, etc.)
BITUMINOUS	8.2 m	UNKNOWN

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

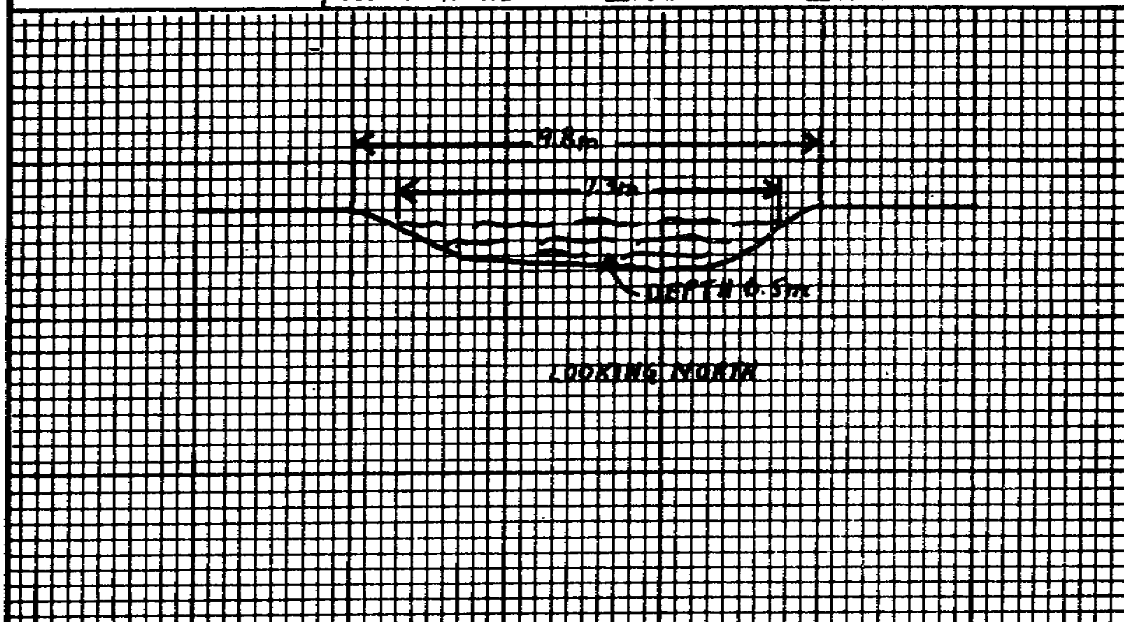
NO DEPTH GAGE

DA FORM 1 JAN 58 1251

PANEL 4-7. Ford Reconnaissance Report - DA Form 1251: front.

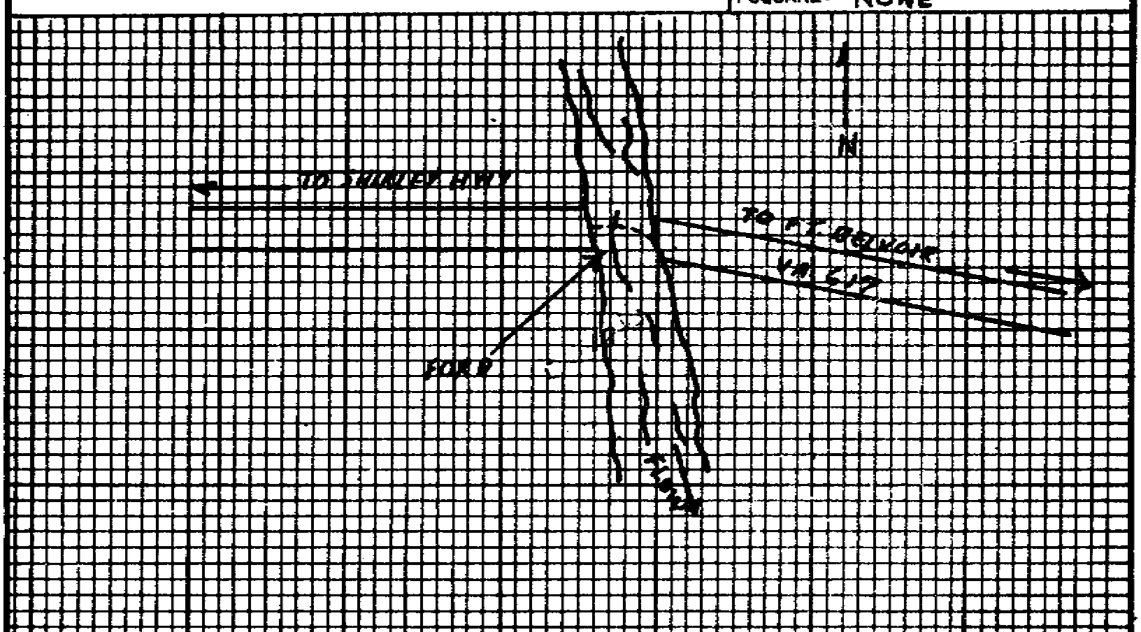
19. PROFILE

SCALE
1 SQUARE = NONE ☐ HOR. ☐ VERT.



20. SITE PLAN (INDICATE NORTH ARROW & DIRECTION OF FLOW)

SCALE
1 SQUARE = NONE



21. REMARKS (ATTACH PHOTOGRAPH)

TO CARRY LOADS OVER 10 TON — STREAM BOTTOM MUST BE REPAIRED.

PANEL 4-8. Ford Reconnaissance Sketches - DA Form 1251: reverse.

FERRY RECONNAISSANCE REPORT
(FM 5-36)

DATE: 14 JUN 1973

TO: (Headquarters ordering reconnaissance)
COMMANDING OFFICER, ATTN:
S2; 21ST ENGR BN (21ST INF DIV)

FROM: (Name, grade and unit of reconnaissance officer)
John H. Doe
JOHN H. DOE 1/LT CO A 21ST ENGR BN

1. ROUTE OR LINE — HIGHWAY	RAILROAD	2. FROM (Initial Point)	3. TO (Terminal Point)	4. DATE/TIME (Of Signature)
VA 617	N/A	LORTON, VA	HOBY, MD	14 1800 JUN 73

5. MAP SERIES NR	6. SHEET NUMBER	7. GRID REFERENCE — TYPE	COORDINATES	8. FERRY NR	9. CLASS
V734	5561-III	UTM 1:50,000	UT134830	1	40

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

12. LIMITING FEATURE (Condition of vessels, terminals, floods, low water, freezing, tides etc.) (Seasons and Dates)
CAPACITY OF LANDING - LITTLE RENO

13. WATER LEVELS (Depths) — LOW	MEAN	HIGH	14. CROSSING TIME	15. LENGTH
3.2 m	4.7 m	7.6 m	11 MINUTES	1.0 Km

16. VESSEL FEATURES (Attach photographs)

UNITS	CONSTRUCTION TYPE	PROPULSION METHOD			LENGTH	BEAM	DRAFT	TONNAGE*		CAPACITY		
		TYPE	UNITS	HP				GROSS	NET	PASS	VEHICLE	R.R. CARS
2	OPEN	DIESEL	2	210	22.5m	7.6m	1.6m	85	85	200	8 MAX	N/A

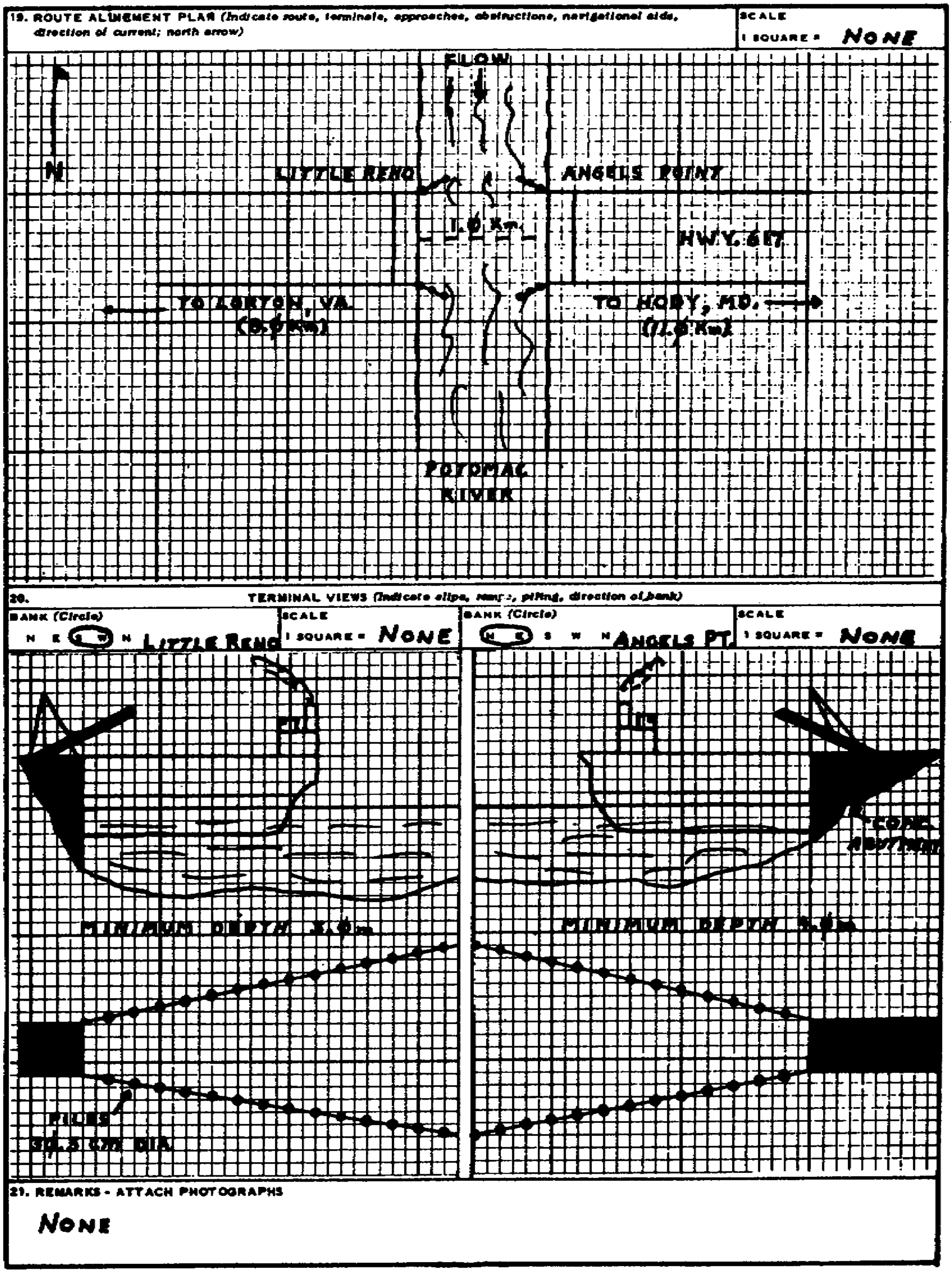
17. TERMINAL FEATURES

DIRECTION OF BANK	NAME	SLIP			DOCKING FACILITIES	APPROACHES				
						HIGHWAY			RAILROAD	
		WIDTH	DEPTH	CAPACITY		SURF	LANES	CLASS	TRACKS	SIDING
N E S W (S circled)	LITTLE RENO	13.2m	3.0m	1 BOAT	GOOD	ASPH	2	45	N/A	N/A
N E S W (E circled)	ANGELS PT	14.0m	4.0m	1 BOAT	GOOD	CONC	2	55	N/A	N/A

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

DA FORM 1 JAN 55 1252

PANEL 4-9. Ferry Reconnaissance Report - DA Form 1252: front.


19. ROUTE ALINEMENT PLAN (Indicate route, terminals, approaches, obstructions, navigational aids, direction of current; north arrow)

SCALE
1 SQUARE = NONE

20. TERMINAL VIEWS (Indicate slips, ramps, piling, direction of bank)

BANK (Circle)
N E S W N LITTLE RENO

SCALE
1 SQUARE = NONE

BANK (Circle)
N E S W N ANGELS PT.

SCALE
1 SQUARE = NONE

21. REMARKS - ATTACH PHOTOGRAPHS

NONE

PANEL 4-10. Ferry Reconnaissance Sketches - DA Form 1252: reverse.

SELF-TEST

LESSON 4

First requirement. From the information contained in the following situation, fill out both sides of DA Form 1248 (figs 4-1 and 4-2) as the reconnaissance officer would have done. Then, referring to the form and to the situation, answer exercises 1 through 6.

NOTE: The mileage chart on DA Form 1248 measures 16 kilometers in all. On a map of 1:50,000 scale, 1 centimeter equals 0.5 kilometers.

Situation. At 0745 hours, 24 October 1972, the CO of the 33d Engineer Combat Battalion ordered Company B to submit a road reconnaissance report prior to 1700 hours on State Route 210 between grid coordinates 293152 and 262218 (These points are referenced to the PEMBERTON map, 1:50,000, sheet 6063 1). The anticipated traffic is single flow for wheeled vehicles.

CO, Company B, assigned the mission to LT W. B. Duke, who started his reconnaissance at 1000 hours at grid coordinates 293152. He completed his report at 1530 hours. During his reconnaissance, LT Duke made the following observations:

a. A light steady rain fell throughout the trip.

b. Both the base and surface of the road were gravel. While the foundation seemed to be firm, considering the recent continuous rain, the surface was badly rutted, and the surfacing gravel of the crown had sloughed to the shoulders over most of the route. The "washboard" ruts made vehicle operation difficult.

c. The steepest grade observed had a 5.5 percent slope.

d. One culvert in a marshy area (283178) 3.0 kilometers from the starting point had been demolished by explosives placed inside it. The resultant crater was hindering suitable drainage and was bypassed with difficulty by the reconnaissance vehicle. Otherwise, the ditches and culverts were effective under inclement conditions.

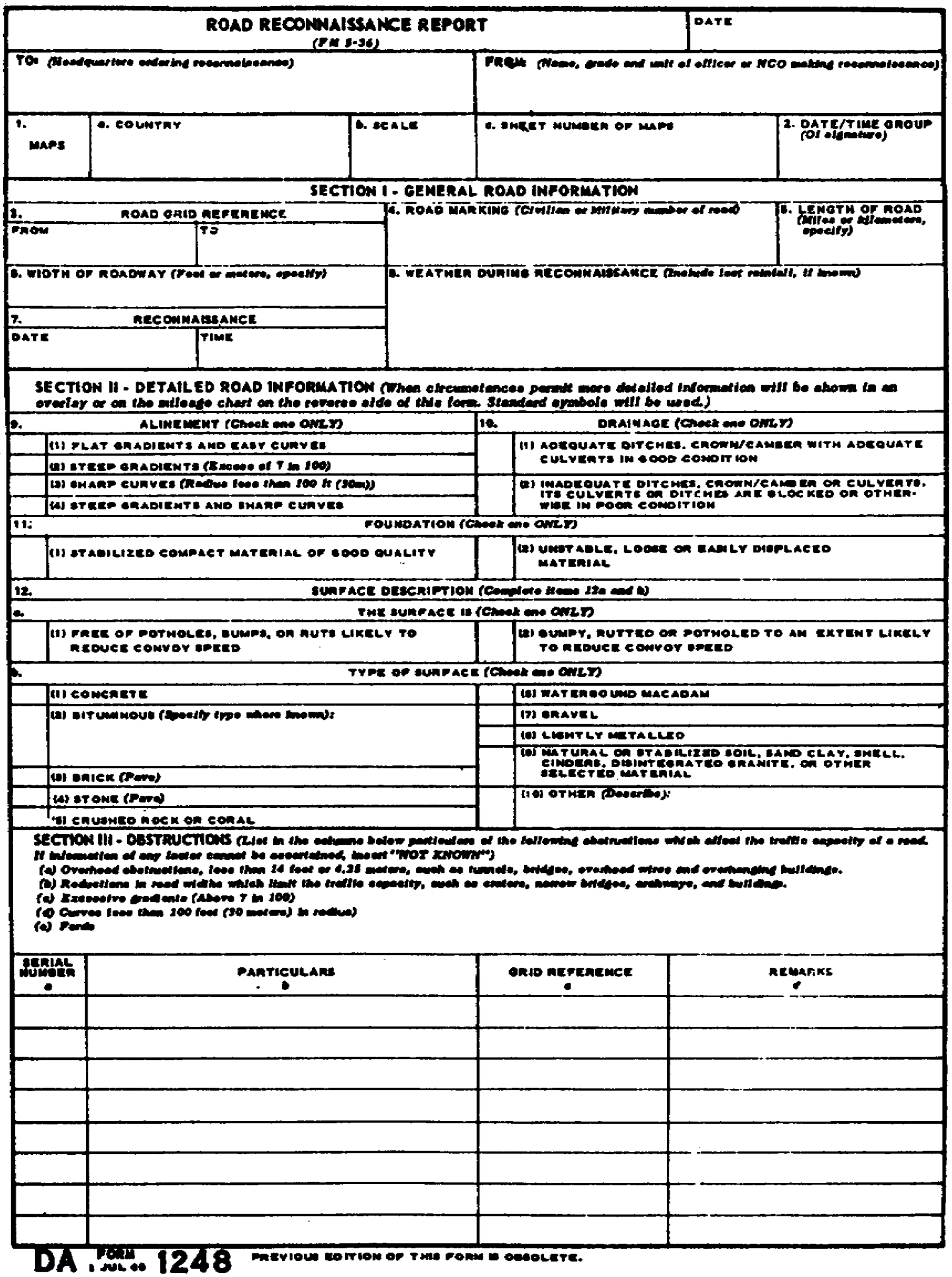
e. The traveled way was 5.5 meters with 1-meter shoulders over most of the route. From start to finish, the route reconnoitered was 8.0 kilometers long.

f. At coordinates 272184, which was 4.2 kilometers from the starting point, a concrete slab bridge was located. It was of reinforced construction, consisting of one 9-meter span, 3.8 meters over water. The horizontal clearance measured 6.8 meters; vertical clearance was unlimited. The military load classification was computed to be 60. Bypassing this bridge would be difficult.

g. At coordinates 266204, which was 66 kilometers from the starting point, there was an old timber-truss bridge. The military load classification was estimated to be 8. The bridge was 7.5 meters long; horizontal clearance was 2.5 meters; and vertical clearance was unlimited. This bridge could be bypassed easily.

h. Suitable turn-offs with concealment (scrub oak) were observed 1.3 kilometers and 5.5 kilometers from the starting point.

i. The measurements for determining the radius of the sharpest curve observed were as follows: chord length, 50 meters; perpendicular distance from the tape measuring the chord to the road center line, 2 meters.



ROAD RECONNAISSANCE REPORT
(FM 5-36)

DATE

TO: (Headquarters ordering reconnaissance)

FROM: (Name, grade and unit of officer or NCO making reconnaissance)

1. MAPS | a. COUNTRY | b. SCALE | c. SHEET NUMBER OF MAPS | 2. DATE/TIME GROUP (Of signature)

SECTION I - GENERAL ROAD INFORMATION

3. ROAD GRID REFERENCE — FROM | TO

4. ROAD MARKING (Civilian or Military number of road)

5. LENGTH OF ROAD (Miles or kilometers, specify)

6. WIDTH OF ROADWAY (Feet or meters, specify)

7. RECONNAISSANCE — DATE | TIME

8. WEATHER DURING RECONNAISSANCE (Include last rainfall, if known)

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)
- (1) FLAT GRADIENTS AND EASY CURVES
- (2) STEEP GRADIENTS (Excess of 7 in 100)
- (3) SHARP CURVES (Radius less than 100 ft (30m))
- (4) STEEP GRADIENTS AND SHARP CURVES

10. DRAINAGE (Check one ONLY)
- (1) ADEQUATE DITCHES, CROWN/CAMBER WITH ADEQUATE CULVERTS IN GOOD CONDITION
- (2) INADEQUATE DITCHES, CROWN/CAMBER OR CULVERTS. ITS CULVERTS OR DITCHES ARE BLOCKED OR OTHERWISE IN POOR CONDITION

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
- (2) BITUMINOUS (Specify type where known):
- (3) BRICK (Pave)
- (4) STONE (Pave)
- (5) CRUSHED ROCK OR CORAL
- (6) WATERBOUND MACADAM
- (7) GRAVEL
- (8) LIGHTLY METALLED
- (9) NATURAL OR STABILIZED SOIL, SAND CLAY, SHELL, CINDERS, DISINTEGRATED GRANITE, OR OTHER SELECTED MATERIAL
- (10) OTHER (Describe):

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) Reductions in road widths which limit the traffic capacity, such as craters, 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

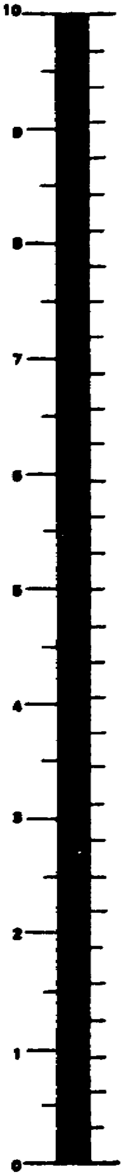
DA FORM 1 JUL 60 1248 PREVIOUS EDITION OF THIS FORM IS OBSOLETE.

Figure 4-1. DA Form 1248, for exercises 1 through 4.

SECTION IV - MILEAGE CHART

ROUTE		SCALE	DATE
FROM	TO		

ROAD INFORMATION	DISTANCE	ROAD INFORMATION
	MILES KILOMETERS	



REMARKS

Figure 4-2. DA Form 1248 (reverse) for exercises 5 and 6.

Exercises:

1. What is your entry in Block 2 of DA Form 1248? ____

____

2. Which number is checked in Block 9 on DA Form 1248? ______________________________________

3. Which number is checked in Block 12b DA Form 1248? ______________________________________

4. In Section III of DA Form 1248, how many obstructions are listed? ___________________________

____

5. The mileage chart on the reverse side of DA Form 1248 should repeat the same symbol at points 1.3 and 5.5 kilometers from the starting point. Which of the symbols in figure 4-3 would be the correct one?

a. A **c. C**

b. B **d. D**

6. Which of the following represents the correct road classification formula to enter on the mileage chart on the reverse side of DA Form 1248?

a. As 5.5/7.5 1 (8.0km) (OB) **c.** Bs 5.5/7.5 1 (8.0km) (OB)

b. Ags 5.5/7.5 (8.0km)(OB) **d.** Bs 5.6/7.5 (8.0km) (OB)

Second Requirement. Exercises 7 8, 9, 10 and 11 are concerned with the procedures and symbols used to report bridge reconnaissance.

Situation. From the situation described above, fill out a Bridge Reconnaissance report, DA Form 1249 (figure 4-4) to provide the detailed information needed on the two bridges along the route. The bridge described in par. f of the situation is designated Bridge No. 1; the bridge described in par. g is Bridge No. 2.

7. What entry would you make in column 6 of DA Form 1249 for Bridge No. 1?

____

8. What entry would you make in column 7 of DA Form 1249 for Bridge No. 1?

____

9. In the column provided for additional information on DA Form 1249, what entry could you make, if any, regarding the military load class of Bridge No. 1? ____

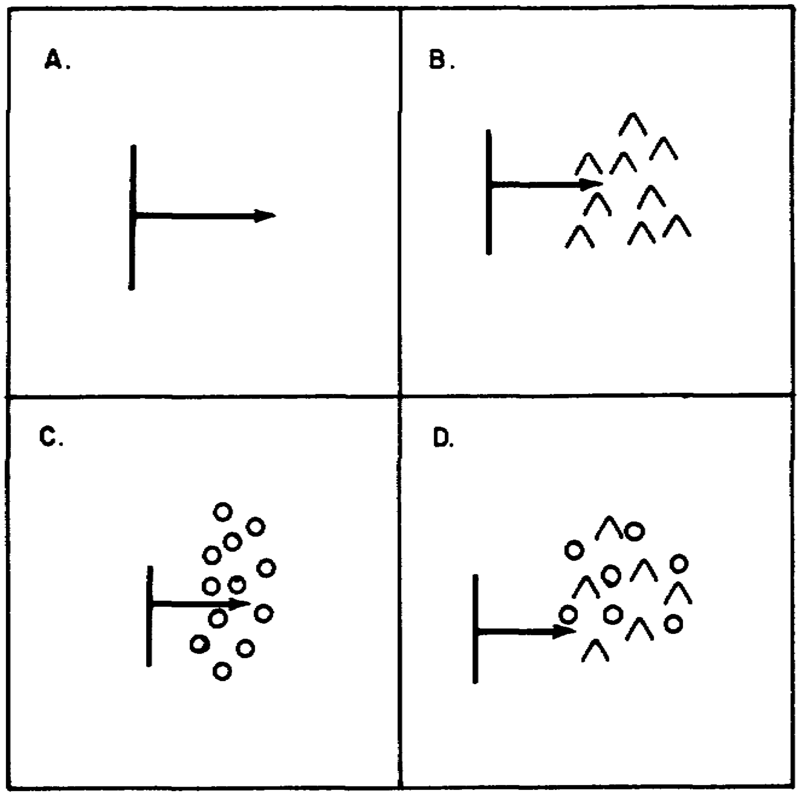


Figure 3. Symbols for Exercise 5.

10. In reporting on Bridge No. 2, what entry would you make in column 6?

---

11. Column 7 contains the code for type of material. What entry would you make for bridge No 2?

Third Requirement. Exercises 12-15 are concerned with the reporting of information on tunnels, fords and ferries.

12. The description of bridge No. 2 in the situation notes that the bridge could be bypassed

BRIDGE RECONNAISSANCE REPORT
(FM 5-36)

BRIDGE RECONNAISSANCE REPORT *(FM 5-36)*	DATE / SIGNATURE
TO: *(Headquarters ordering reconnaissance)*	FROM: *(Name, grade, and unit of officer or NCO making reconnaissance)*
MAPS *(Country, scale and sheet number or name)*	DATE/TIME GROUP *(Of signature)*

ESSENTIAL BRIDGE INFORMATION								ADDITIONAL BRIDGE INFORMATION *(Add comments as needed)* *(Military load class, overall length, roadway width, vertical clearance, bridge by-pass)*
		CLEARANCE		SPANS				
SERIAL NO. 1	LOCATION 2	HORIZONTAL 3	UNDER-BRIDGE 4	NUMBER 5	TYPE OF CONSTRUCTION 6	TYPE OF CONSTRUCTION MATERIAL 7	LENGTH AND CONDITION 8	

DA FORM 1 JUL 60 1249 PREVIOUS EDITION OF THIS FORM IS OBSOLETE.

Figure 4-4. DA Form 1249, for exercises 7 through 11.

easily. If the bypass consisted of a ford, what important information about the stream must the reconnaissance party obtain in order to fill out block 11 of the Ford Reconnaissance Report?

____

____

13. If a Ford Reconnaissance Report is added as a result of reporting on the bypass of Bridge No. 2, what change must be made to DA Form 1248? ____

____

14. Item 15 of the Tunnel Reconnaissance Report, DA Form 1250, is used to report the vertical and horizontal clearances in the tunnel. When measuring tunnel width for horizontal clearance, where is the measurement made?

a. at traveled way level

b. 30 inches or higher above traveled way

c. 4 feet or higher above traveled way

d. at widest height above traveled way

15. If you were preparing a classification formula for the route which included the ferry reported in Panel 4-9, what military load classification would you include in the formula?

____

SOLUTIONS TO SELF-TEST

LESSON 4

All references to Frames, Panels, and Appendix I are to the programmed text.

1. 24 1530 Oct 72. Block 2 requires the date/time group of the signature. LT Duke completed his reconnaissance at 1530 hours, 24 October 1972. (situation)

2. #1. Block requires information on road alinement. Number 1 is checked since there were no steep gradients or sharp curves. (situation)

3. f. Block 12b describes the type of road surface, which is indicated as gravel in par. b of the situation.

4. Two: the crater at grid coordinates 283178, and the bridge at grid coordinates 266204.

5. c. The situation states that there were two suitable turnoffs with concealment (scrub oak) at the two points in question. The symbol for a turnoff with deciduous tree concealment is given on page 5 of Appendix I.

6. c. Pages 8 and 9, Appendix I, and Frames 3-107 to 3-120 explain the composition of the road classification formula. The letter "B" indicates that there are limiting characteristics. The second letter "s" indicates that the limiting characteristic is route surface condition. The width of the traveled way and shoulders is expressed as W5/7.5. The letter "l" is used for roads that have a gravel surface. The length of the road is 8.0km, and the presence of obstructions Is indicated by (OB).

7. 4. Slab-type bridges are shown as number 4 on page 6 of Appendix I to the programmed text.

8. k. The coded letter for concrete bridges is the letter "k".

9. 60. The situation indicates that the military load class was computed to be 60.

10. 1. The truss type of construction is coded as 1 on page 6 of Appendix I.

11. n. The letter "n" represents wooden construction of any type.

12. The width, depth, and velocity of the stream at the present time, and during low, mean, and high water levels (Panel 4-7, programmed text).

13. The ford must be listed in Section III, since al fords are considered obstructions. (frames 4-15; 3-73 (Lesson 3))

14. c. Page 12 of Appendix I to the programmed text gives the specifications for measuring critical dimensions, including clearance for tunnels.

15. 40. Item 9 of Panel 4-9 lists 40 as the class of the ferry. Since it is lower than the class of either of the approaches listed in item 17, it would be used in the formula. (page 8, App I; Panel 4-9)

GTA 5–2–5 (1970) **APPENDIX I**

ENGINEER RECONNAISSANCE CARD

(FM -5-36, JAN 1970)

SUPERSEDES GTA 5-2-1, 1966

REPORTS MUST BE COMPLETED ON TIME. INCOMPLETE INFORMATION, ON TIME MAY BE OF SOME VALUE: COMPLETE INFORMATION, RECEIVED TOO LATE, MAY BE USELESS.

ENGINEER RECONNAISSANCE INFORMATION AS RECORDED ON DA FORM 1711-R

WHERE IS IT?
Give the LOCATION. (Grid coordinates)

WHAT IS IT?
Give a clear, complete and concise description of the item reported. (Use sketch, standard symbols, and abbreviations where applicable).

WHEN OBSERVED?
(Time)

1. **OBSTACLES:** To movement, natural and artificial, include demolitions, mines, booby traps.
2. **ENGINEER MATERIALS:** Particularly road material, bridge timber; lumber, steel, fill, gravel, explosives.
3. **ENGINEER EQUIPMENT:** Rock crushers, saw mills, garages, machine shops, abandoned enemy equipment, etc.
4. **BIVOUAC AREAS:** Access roads, soil, drainage, size, cover, concealment, fields of fire.
5. **UTILITIES:** Water, sewage, electricity, natural gas, pipe lines.
6. **WATER POINTS:** Recommended locations.
7. **MAP ERRORS.**
8. **WORK ESTIMATES** for construction, repair, or removal of any item encountered on a reconnaissance.

CONVERSION FACTORS

MULTIPLY	BY	TO OBTAIN
Inches	2.54	Centimeters
Feet	30.48	Centimeters
Feet	0.3048	Meters
Miles	1.609	Kilometers
Square Inches	6.452	Square Centimeters
Square Feet	929	Square Centimeters
Square Miles	2.59	Square Kilometers
Cubic Inches	16.39	Cubic Centimeters
Cubic Feet	0.02832	Cubic Meters
Cubic Yards	0.7646	Cubic Meters
Acres	4047	Square Meters
Meters	3.28	Feet
Meters	100	Centimeters
Kilometers	1000	Meters

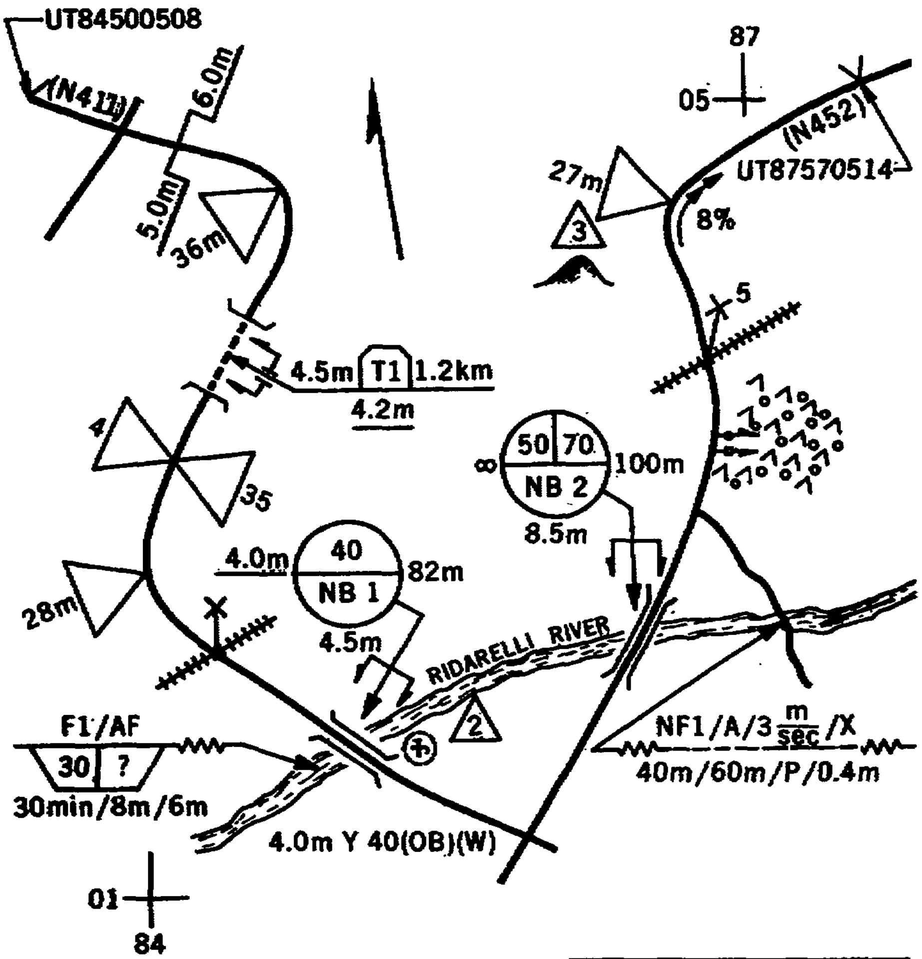
1

CENTIMETERS

ROUTE RECONNAISSANCE OVERLAY

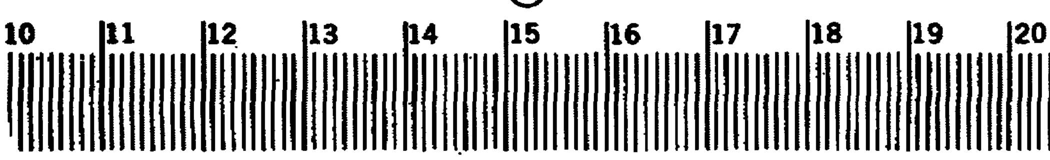
The route reconnaissance overlay is an accurate and concise report of conditions affecting traffic flow along a specified route, and is the preferred method of preparing a route reconnaissance report. If more detail is required to support the reconnaissance, then the overlay is supplemented with written reports describing the critical route characteristics in more detail.

Example of an overlay pertaining to a route from UT84500508 to UT87570514

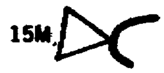
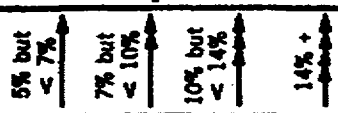
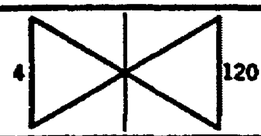
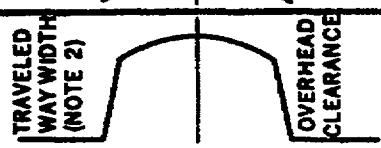
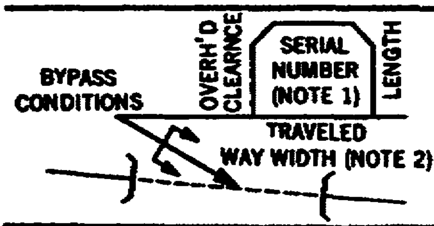
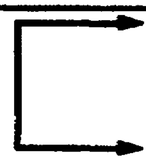
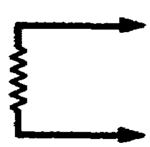
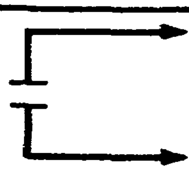


NAME & RANK
ORGANIZATION
DATE/TIME
MAP REFERENCE
SCALE

②



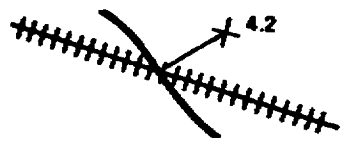
SYMBOLS FOR USE IN THE RECONNAISSANCE REPORT

SYMBOL	DESCRIPTION & CRITERIA
 	SHARP CURVE: (OB) Any radius less than or equal to 30 meters, however, any curve greater than 25 meters, but less than 45 meters is reportable.
 	SERIES OF SHARP CURVES: The figure to the left indicates the number of curves; that to the right, the minimum radius of curvature in meters.
 	STEEP GRADES: (OB) Any grade 7% or higher. Actual % of grade will be shown. Arrows always point uphill, and length of arrow represents length of grade if map scale permits.
 	CONSTRICTION: (OB) Any reduction in the traveled way below the standards of Table 3, Page 12. The figure to the left indicates the width of the constriction; that to the right, the total constricted length, both in meters.
 	UNDERPASSES: Show shape of structure (OB) when overhead clearance is less than 4.25 m or when the traveled way is below the standards of Table 3, Page 12. See Note 4, and Sketch 1, Page 12. Note nowhere, refer to page 11.
 	TUNNEL: (Includes manmade snowsheds). Show shape of structure (OB) when overhead clearance is less than 4.25 m or when the traveled way is below the standards of Table 3, Page 12. See Note 4.
 	BYPASSES: Are local alternate routes which enable traffic to avoid an obstruction. Bypasses are classified as EASY, DIFFICULT, or IMPOSSIBLE. Each type bypass is represented symbolically on the line extending from the symbol to the map location and defined as follows: BYPASS EASY: The obstacle can be crossed within the immediate vicinity by a US 2.5 ton truck (or NATO equivalent) without work to improve the bypass. BYPASS DIFFICULT: The obstacle can be crossed within the immediate vicinity, but some work will be necessary to prepare the bypass.
	BYPASS IMPOSSIBLE: The obstacle can only be crossed by one of the following methods: (1) Repair of item; i.e., bridge (2) New construction (3) Detour using an alternate route which crosses the obstacle some distance away.

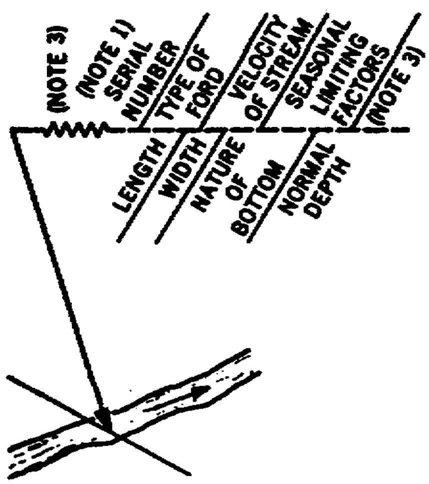
3

21 22 23 24 25 26 27 28 29 30

SYMBOL	DESCRIPTION & CRITERIA



RAILROAD (RR) LEVEL GRADE CROSSING: Passing trains will interrupt traffic flow. The figure indicates overhead clearance.



FORD: All fords are considered as obstructions (OB) to traffic. Trafficability conditions shown in Table 4, Page 12.

Type of Ford:

V—Vehicular P—Pedestrian

Seasonal Limiting Factors:

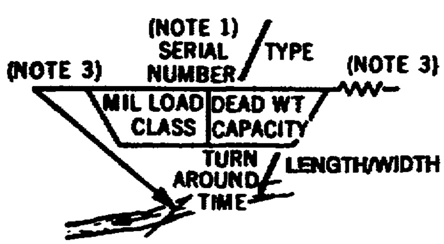
X—No seasonal limitation except for limited duration sudden flooding.
Y—Significant seasonal limitations.

Approach Conditions

-ᴧᴧᴧ-	—
Difficult	Easy

Nature of bottom:

M—Mud	C—Clay	S—Sand
G—Gravel	R—Rock	P—Artificial Paving



Ferry: All ferries are considered as obstructions (OB) to traffic.

Approach Conditions

-ᴧᴧᴧ-	—
Difficult	Easy

Type of Ferry:

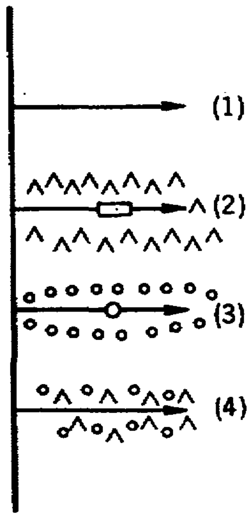
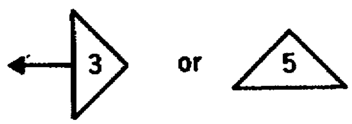
V—Vehicular Ferry
P—Pedestrian Ferry

LIMITS OF SECTOR: Limits of reconnoitered sector or of route having the same road classification formula.

(495)

ROUTE DESIGNATION: Civil or Military Route Designation. Written in parentheses along route.

4

SYMBOL	DESCRIPTION & CRITERIA
	**OFF-ROUTE MOVEMENT (,TURN OFFS) & CONCEALMENT** (arrows point to left or right of road where turn off exists): (1) Possible turn off (2) Tracked vehicle turn off with coniferous concealment (3) Wheeled vehicle turn off with deciduous concealment (4) Possible turn off in mixed concealment.
	**[illegible]AL POINTS:** are used as numbered keys to describe in detail on attached reconnaissance forms or docu[illegible] those features that cannot be adequately [illegible]d by oth[illegible]reconnaissance symbols on the overlay.
 (1) (2) (3)	**OBSTACLES** (road blocks, craters, blown bridges, landslides, etc.): 1. Proposed obstacle 2. Prepared but passable obstacle 3. Completed obstacle
?	**UNKNOWN OR DOUBTFUL INFORMATION:** Used in all symbols where information is not known, or doubtful.

WATER POINT FORMULA

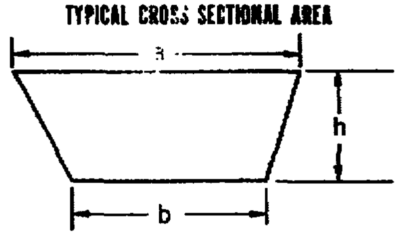
$$Q = (A)\ (V)\ (6.4)$$

Q = Quantity of water in gal./min.
A = Cross sectional area of water source
V = Velocity of water in ft./min.
6.4 = Constant

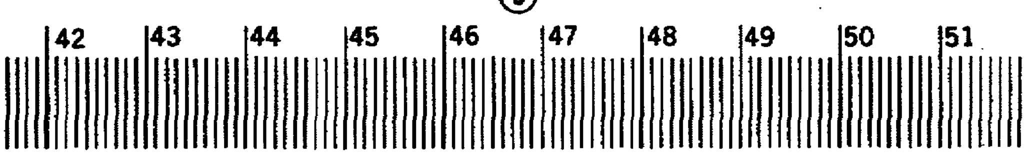
$$A = \frac{h\ (a+b)}{2}$$

$$V = \frac{(60)\ (\text{distance in feet})}{(\text{time in seconds})}$$

TYPICAL CROSS SECTIONAL AREA



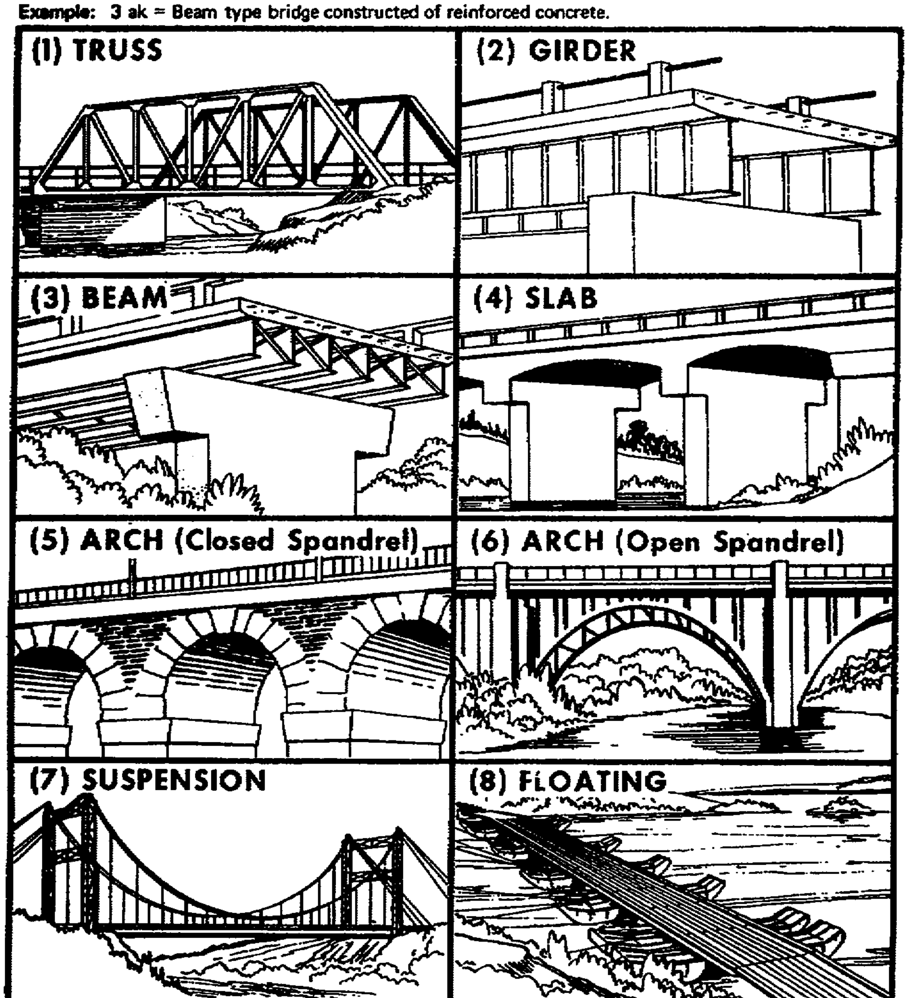
5



TYPICAL BRIDGE SPANS

Symbolized on Bridge Reconnaissance Report (DA Form 1249) by Number (Type of Construction) and Letter (Material of Construction)..

Example: 3 ak = Beam type bridge constructed of reinforced concrete.



(9) Use 9 for all other type span construction (i.e., swing, lift, cantilever, bascule). Specify on reconnaisance report by name.

Material Used in Span Construction

Steel or other metal	a
Concrete	k
Reinforced Concrete	ak
Pre-stressed Concrete	kk
Stone or Brick	p
Wood	n

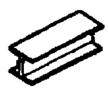
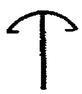
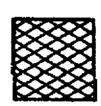
(1) Spans which are not useable because of damage are symbolized by "x" placed after the dimension of span length.

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

6

52 53 54 55 56 57 58 59 60 61 62

ENGINEER RESOURCE SYMBOLS

	Sawmill		Electrical Supply Equipment
	Lumber Yard		Water Point (Military)
	Aggregate (Including gravel, slag) etc.		Forestry Equipment
	Sand		Paint
	Iron & Steel Stock		Gypsum & Lime Products
	Wire Stock		Cement Concrete Products
	Mobile Heavy Construction Equipment		Brick & Other Clay Products
	Quarrying Equipment		Factories
	Powered Hand Tools		Asphalt & Bituminous Stock
	Water Purification Equipment (Civilian)		Cordage, Nets & Yarn

7

63 64 65 66 67 68 69 70 71 72

ROUTE CLASSIFICATION FORMULA

The Route Classification Formula is expressed in a STANDARDIZED SEQUENCE of Minimum Traveled Way Width, Route Type, Lowest Military Load Classification, Obstructions If Present, and Special Conditions If Present.

1. WIDTH: Narrowest width of the route expressed in meters or feet.

2. ROUTE TYPE: X, Y, or Z determined by the worst section of the route.

   TYPE X: ALL WEATHER ROUTE is any route which with reasonable maintenance is passable throughout the year to traffic never appreciably less than maximum capacity. The roads which form this type of route normally have waterproof surfaces and are only slightly affected by precipitation or temperature fluctuations. At no time is the route closed to traffic by weather effects other than temporary snow or flood blockage.

   TYPE Y: ALL WEATHER ROUTE (LIMITED TRAFFIC DUE TO WEATHER) is any route which with reasonable maintenance can be kept open in all weather but sometimes only to traffic considerably less than maximum capacity. The roads which form this type of route usually do not have waterproof surfaces and are considerably affected by precipitation or temperature fluctuations. Traffic may be completely halted for short periods. Heavy unrestricted use during adverse weather may cause complete collapse of the surface.

   TYPE Z: FAIR WEATHER ROUTE is any route which quickly becomes impassable in adverse weather and cannot be kept open by maintenance short of major construction. This category of route is so seriously affected by weather that traffic may be brought to a halt for long periods.

3. MILITARY ROUTE (LOAD) CLASSIFICATION: Normally, the lowest bridge military load classification number on the route determines the military load classification of the route. If no bridges occur then the worst section of the road governs the route load classification.

4. OBSTRUCTIONS (OB): Factors which restrict the type, amount, or speed of traffic flow, e.g., overhead clearances less than 4.3 m, reduction in the traveled way widths below the standards of Table 3, Page 12, gradients of 7% or greater, curves with radii less than or equal to 25 m ferries, and fords.

5. SPECIAL CONDITIONS: Snow blockage (T) and flooding (W) are used when the condition is regular, recurrent, or serious.

EXAMPLES

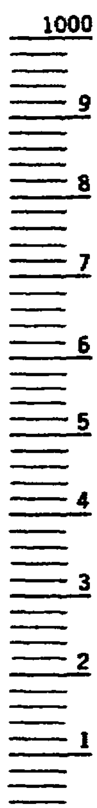
6.7 m Y 30 Route is 6.7 m wide, limited all weather route with load carrying capacity of class 30 with no obstructions.

21 ft Z 10 (OB) (W) Route is 21 ft wide, fair weather route with load carrying capacity of class 10 and obstructions do exist. Route is subject to flooding.

10.5 m X 120 (OB) Route is 10.5 m wide, an all weather route with load carrying capacity of 120. Obstructions do exist.

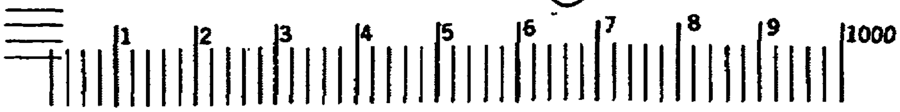
ROAD CLASSIFICATION FORMULA

The Road Classification Formula is expressed in a STANDARDIZED SEQUENCE of a Prefix, Limiting Characteristics If Present, Width of the Traveled Way/Combined Width of the Traveled Way and the Shoulders, Road Surface Material, Length If Desired, Obstructions If Present, and Special Conditions If Present.



1 : 12,500 METERS

8



1. **PREFIX:** The formula is prefixed by the letter "A" if there are NO LIMITING CHARACTERISTICS. The letter "B" is the prefix if there are ANY LIMITING CHARACTERISTICS.

2. **LIMITING CHARACTERISTICS** **SYMBOL**

LIMITING CHARACTERISTICS	SYMBOL
Curves (Radius 25 m or less)	c
Gradients (7% or more)	g
Drainage (inadequate)	d
Foundation (unstable)	f
Surface Condition (rough)	s
Camber or superelevation (excessive)	j

An unknown or undetermined characteristic is represented by a question mark following the symbol of the feature to which it refers, e.g., (d?).

3. **WIDTH:** Width of the traveled way expressed in meters or feet followed by a slash and the combined width of the traveled way and the shoulders, e.g., 14/16 m).

4. **ROAD SURFACE MATERIAL:** Road surface material is expressed by a letter symbol as follows:

SYMBOL	MATERIAL
k	Concrete
kb	Bituminous or asphaltic concrete (bitmuinous plant mix)
p	Paving brick or stone
rb	Bitumen-penetrated macadam water-bound macadam with superficial asphalt or tar cover.
r	Waterbound macadam, crushed rock, or coral.
l	Gravel or lightly metaled surface.
nb	Bituminous surface treatment on natural earth, stabilized soil, sand-clay or other select material.
b	Used when type of bituminous construction cannot be determined.
n	Natural earth, stabilized soil, sand-clay, shell cinders, disintegrated granite, or other select material.
v	Various other types not mentioned above (indicate length when this symbol is used).

5. **LENGTH:** Length of road in km or miles may or may not be shown. If shown place in parentheses, e.g., (7.2 km).

6. **OBSTRUCTIONS:** Expressed as (OB) when existing on road, e.g., overhead clearances less than 4.3 m, reduction in the traveled way widths below the standards of Table 3, Page 12, gradients of 7% or greater, and curves with radii less than or equal to 30 m (100 ft).

7. **SPECIAL CONDITIONS:** Snow blockage (T) and flooding (W) are used when the condition is regular, recurrent, and serious.

EXAMPLES

A 5.4/6.2 m k: Road has no limiting characteristics with 5.4 m traveled way, combined width of 6.2 m traveled way and shoulder, and a concrete surface.

Bcgs 14/16 ft 1 (2.4 km) (OB): Road has limiting characteristics of sharp curves, steep grades, and a rough surface condition; 14 ft of clear traveled way, 16 ft combined with shoulders; a graveled or lightly metaled surface; 2.4 km length; obstructions are present.

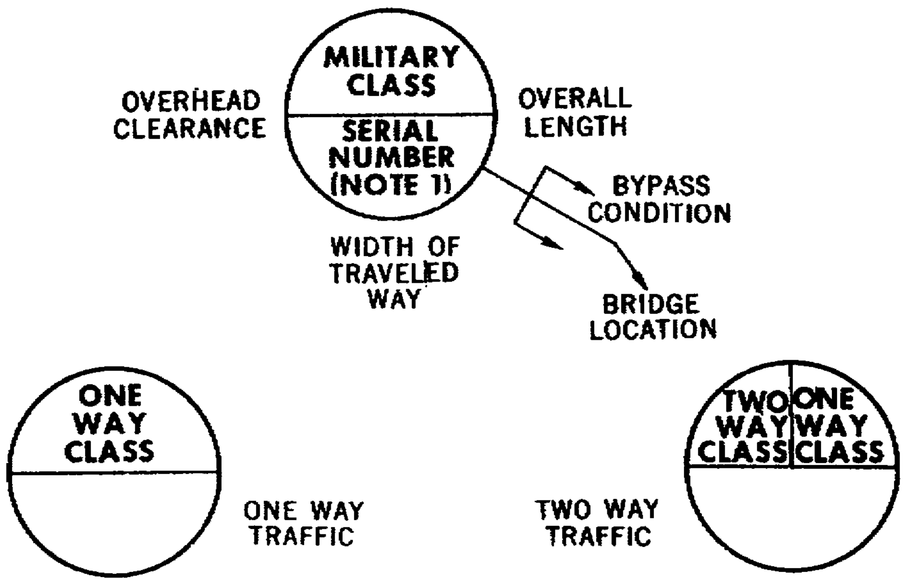
Bcgd (f?)s 3.2/4.8 m nb (4.3 km) (OB) (T): Road has limiting characteristics of sharp curves, steep grades, bad drainage, unknown foundation condition, and rough surface; 3.2 m wide traveled way, 4.8 m wide with shoulder; a bituminous surface treatment; 4.3 km long, and it contains obstructions. The road is subject to snow blockage.

INCHES 0 1 2 3

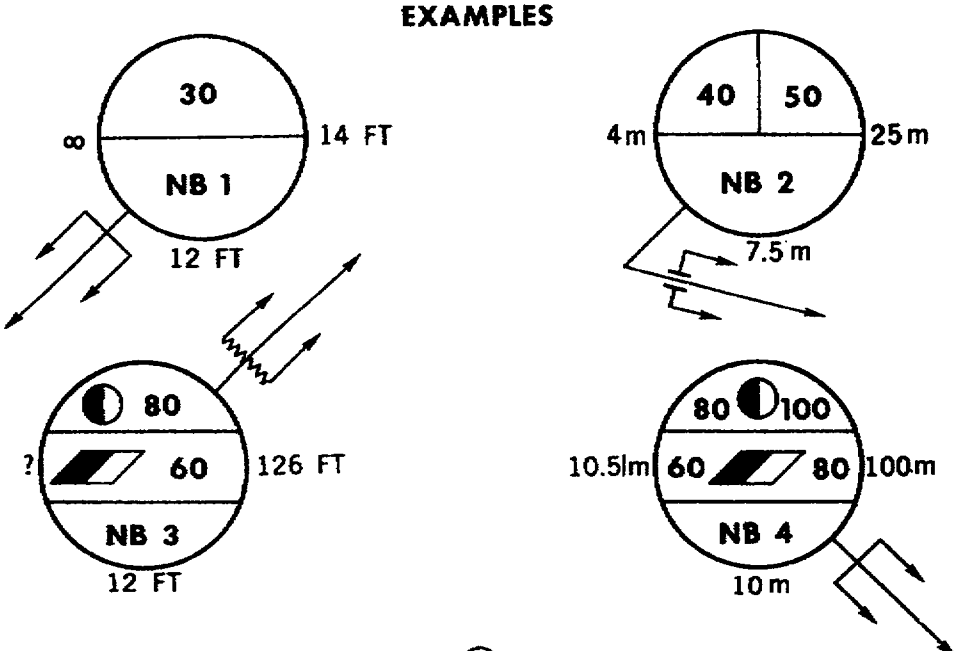
BRIDGE RECONNAISSANCE SYMBOLS

FULL BRIDGE SYMBOLS

(NOTE 4)



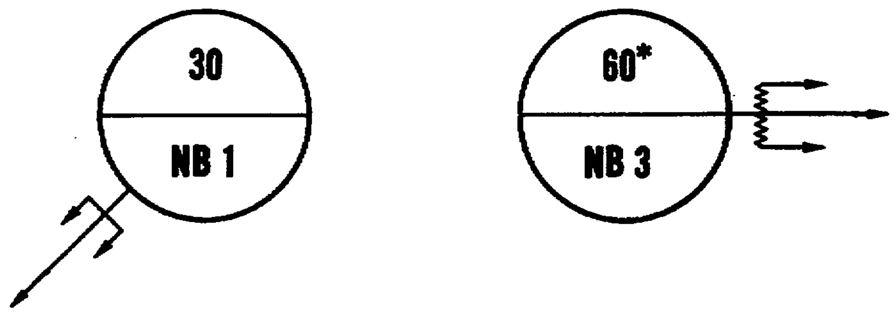
EXAMPLES



(10)

ABBREVIATED BRIDGE SYMBOLS

(When used, overlay must be accompanied with DA Form 1249 or detailed report.)



Only the single flow traffic is represented in abbreviated bridge symbols. For bridges with seperate tracked and wheeled vehicle classification, only the lower classification is shown. If a bridge has more than one classification, number shown is asterisked (*), and full classification is shown in the accompanying report.

NOTE 1: (Serial Numbers)

A SERIAL NUMBER IS ASSIGNED TO EACH BRIDGE, TUNNEL, FORD AND FERRY. SERIAL NUMBERS MUST NOT BE DUPLICATED ON ANY ONE MAP SHEET, OVERLAY OR DOCUMENT.

NOTE 2: (Traveled Way Width)

IF SIDEWALKS EXIST AND WILL PERMIT THE PASSAGE OF WIDER VEHICLES, SYMBOLIZE THE SIDEWALKS AND RECORD THE WIDTH AS THE TRAVELED WAY/TOTAL WIDTH, I.E., (5.0/5.9M).

NOTE 3: (Bank Orientation)

THE LEFT AND RIGHT BANK OF A STREAM ARE DETERMINED BY LOOKING IN THE DIRECTION OF THE CURRENT DOWNSTREAM. SPECIAL ATTENTION MUST BE PAID WHEN RECORDING APPROACH CONDITIONS ON THE SYMBOL, FOR PROPER ORIENTATION OF DESIGNATING THE LEFT AND RIGHT BANK.

NOTE 4: (Critical Dimensions)

ANY OVERHEAD CLEARANCE OF A BRIDGE LESS THAN THE STANDARDS OF TABLE 1, PAGE 12 IS UNDERLINED. ANY WIDTH OF A ONE LANE BRIDGE WHICH IS LESS THAN THE STANDARDS OF TABLE 2, PAGE 12 IS UNDERLINED. THE TWO WAY CLASS OF ANY TWO LANE BRIDGE IS DOWNGRADED IF THE WIDTH OF THE BRIDGE IS LESS THAN THE STANDARDS OF TABLE 2, PAGE 12 THE WIDTH OF THE TRAVELED WAY OF TUNNELS OR UNDERPASSES WHICH IS LESS THAN THAT OF THE OUTSIDE ROUTE IS UNDERLINED.

8 9 10 11 1

CRITICAL DIMENSIONS

TABLE 1 — MINIMUM OVERHEAD CLEARANCE FOR BRIDGES

Bridge classification	Minimum overhead clearance
All classes	4.5m

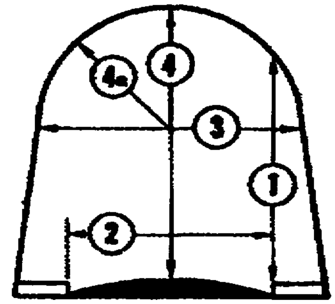
TABLE 2 — MINIMUM LANE WIDTHS FOR BRIDGES

Bridge	Minimum width between curbs	
	One lane (meters)	Two lane (meters)
4-12	2.75 (9'-0")	5.50 (18'-0")
13-30	3.35 (11'-0")	5.50 (18'-0")
31-60	4.00 (13'-2")	7.30 (24'-0")
61-100	4.50 (14'-9")	8.20 (27'-0")

TABLE 3 — ROUTE WIDTHS

Traffic flow possibilities	Widths for wheeled vehicles	Widths for tracked vehicles
Single flow	5.50 meters to 7 meters (18 ft to 23ft)	6 meters to 8 meters (19½ ft to 26 ft)
Double flow	Over 7 meters (23 ft)	Over 8 meters (26 ft)

Measuring width of roadway and horizontal and vertical clearances for tunnels, underpasses, and through truss bridges:

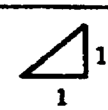
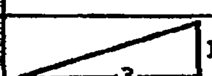
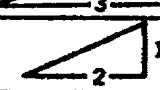


SKETCH 1

1. Minimum overhead clearance measured vertically from edge of traveled way.
2. Effective width of the traveled way, curb-to-curb.
3. Horizontal clearance, is the minimum width measured at least four feet above the traveled way.
4. Maximum overhead clearance, is the minimum distance between the top of the traveled way and the lower edge of the overhead, or any obstruction below the overhead, such as trolley wires or electric light wires.

4a. Rise or arch (radius or curved portion).

TABLE 4 — TRAFFICABILITY OF FORDS

Type of traffic	Shallow fordable depth (meters)	Minimum width (meters)	Maximum desirable slope for approaches[1]	Symbol
Foot	1 (39")	1 (39") (single file) 2 (79") (column of 3's)	1:1	
Trucks and truck-drawn artillery	0.75 (30")	3.6 (12')	3:1	
Light tank	1 (39")	4.2 (14')	2:1	
Medium tanks[*]	1.05 (42")	4.2 (14')	2:1	

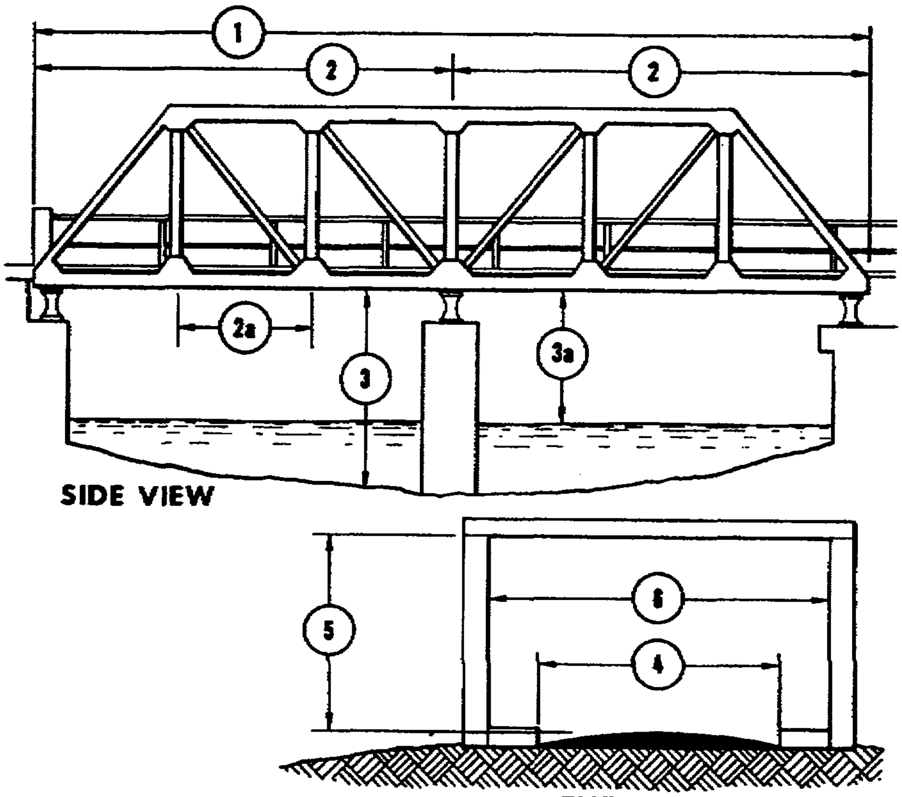
[1] Based on hard, dry surface

[*] Depths up to 4.3 meters can be negotiated with deep water fording kit

GENERAL DIMENSION DATA FOR EACH OF THE SEVEN BASIC TYPES OF BRIDGES

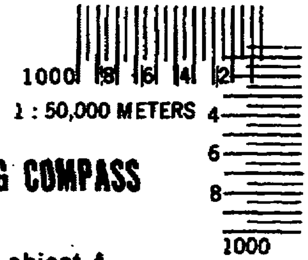
Number on figure	Dimension data	Basic type of bridge						
		Simple stringer	Slab	T-beam	Truss	Girder	Arch	Suspension
1	Overall length	X	X	X	X	X	X	X
2	Number of spans	X	X	X	X	X	X	X
2	Length of spans	X	X	X	X	X	X	X
2a	Panel length	---	---	---	X	---	---	X
3	Height above streambed	X	X	X	X	X	X	X
3a	Height above estimated normal water level	X	X	X	X	X	X	X
4	Traveled way width	X	X	X	X	X	X	X
5	Overhead clearance	∞	∞	∞	X	∞	∞	X
6	Horizontal clearance	X	X	X	X	X	X	X

Note: The letter "X" indicates the dimension is required

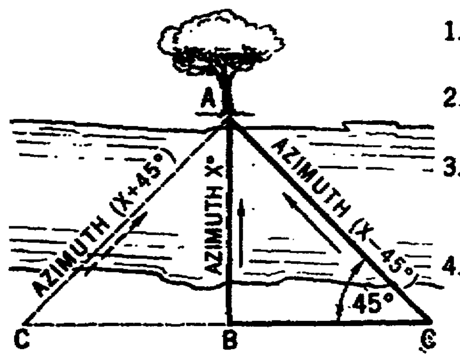


13

17 18 19 20

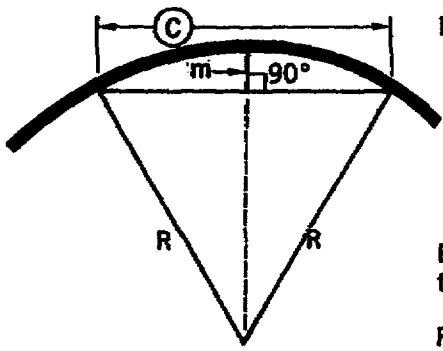


MEASURING APPROXIMATE STREAM WIDTH USING COMPASS



1. Select prominent object A (i.e., tree) on far bank.
2. Stand at point B, opposite A, and read azimuth X°.
3. Move up or down stream to a point C so that azimuth to A equals X+45° or X–45°.
4. Distance BC then equals gap AB.

MEASURING THE RADIUS OF A CURVE



$$R = \frac{c^2}{8m} + \frac{m}{2}$$

c = length of chord (tape)

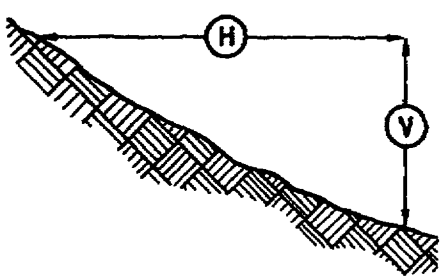
m = perpendicular distance from the center of tape to the ℄ of road

R = radius of circle

By fixing m always at 2 meters, then the formula becomes –

$$R = \frac{c^2}{16} + 1$$

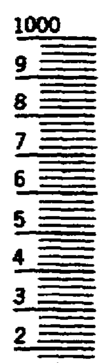
DETERMINING PERCENT (%) OF SLOPE



When using any distance for (H), use the formula

$$\% \text{ Slope} = \frac{V}{H} \times 100$$

By always setting the horizontal (H) at 50, and measuring the vertical distance (V), the formula becomes % slope = 2 × V.



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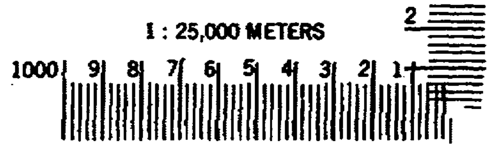

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