DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

PROCEDURES FOR SELECTION, TRAINING, TESTING, QUALIFYING AND LICENSING OPERATORS OF CONSTRUCTION EQUIPMENT, MATERIEL HANDLING EQUIPMENT, AND ARMOR-VEHICLE-LAUNCHED BRIDGE (AVLB) MANAGED/ SUPPORTED BY US ARMY TANK-AUTOMOTIVE MATERIEL READINESS COMMAND

HEADQUARTERS, DEPARTMENT OF THE ARMY

28 JUNE 1979

TECHNICAL BULLETIN
NO. 600-2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *28 June 1979*

PROCEDURES FOR SELECTION, TRAINING, TESTING, QUALIFYING AND LICENSING OPERATORS OF CONSTRUCTION EQUIPMENT, MATERIEL HANDLING EQUIPMENT, AND ARMOR-VEHICLE-LAUNCHED BRIDGE (AVLB) MANAGED/SUPPORTED BY US ARMY TANK-AUTOMOTIVE MATERIEL READINESS COMMAND

REPORTING OF ERRORS

You can improve this bulletin by recommending improvements using DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in the back of this bulletin and mail the form direct to Commander, US Army Tank-Automotive Materiel Readiness Command, ATTN: DRSTA-MBA, Warren, MI 48090. A reply will be furnished direct to you.

CHAPTER 1
INTRODUCTION

1-1. Purpose. This bulletin outlines a system for selecting, training, testing, and qualifying operators of construction equipment and materiel handling equipment managed/supported by US Army Tank-Automotive Materiel Readiness Command (TARCOM).

1-2. Scope. This bulletin prescribes the steps necessary in selecting and training operator instructors and examiners and in selecting, training, examining, and supervising operators of TARCOM managed/supported construction equipment, materiel handling equipment and armor-vehicle-launched bridge (AVLB).

1-3. Applicability. This bulletin applies to the following equipment:

a. Mixing plants, rock crushers, and saw mills.

b. Graders, snow plows, and ditching machines.

c. Wheeled or track type tractors, front loaders, motorized scrapers, rollers and sweepers.

d. Crawler, truck, and wheel mounted cranes.

e. Forklift trucks, warehouse tractors, and straddle trucks.

f. Warehouse cranes.

g. AVLB

Every person operating any of this equipment must possess a valid Standard Form 46 (US Government Motor Vehicles Operator's Identification Card).

1-4. Objectives of Operator Training. *a.* The proper selection, training, qualification and supervision of operators is essential for efficient maintenance and operation and insuring materiel readiness.

b. A carefully planned/implemented operator training program is essential to assure that selected personnel are knowledgeable in every phase of operation concerning the specific equipment.

c. Only those of proven qualifications should be authorized to operate TARCOM managed/ supported equipment.

d. Faulty operation and lack of, or improper operator maintenance are recognized as sources of major equipment failures. Commanders, by eliminating these sources through an active/ efficient program of training and supervision, will materially reduce the logistical (maintenance and repair parts) problems, and will insure compliance with the provisions of AR 750-1, regarding command responsibility.

1-5. Operator Training Program. *a.* AR 750-1 states that prevention of equipment abuse is the commanding officer's responsibility. The best way for him to prevent equipment abuse is by proper selection, training, examination, and supervision of operators. To establish and maintain operator efficiency, certain definite and progressive steps, which are covered in this manual should be followed.

b. Standard Form 46 is issued only to persons who have passed examinations conducted by qualified examiners in accordance with AR 600-55.

c. To be effective, operator training must have the close cooperation and supervision of all commanders and instructor personnel. The commander must make certain that adequate time is allowed for training instructor personnel; the operator training program cannot succeed unless its instructors are proficient.

d. As a rule, training and examining of operators should not be decentralized below battalion level. Conducting training at this level, fullest use can be made of the best instructor personnel in the organization; a more stringent control/supervision can be applied, and more efficient and economical use can be made of required special equipment.

1-6. Test Administration and Supply. *a.* General testing conditions as outlined in AR 611-5 and AR 611-201 will apply for administration of operator selection test.

b. Materials and manuals will be requested through normal publication supply channels in accordance with DA Pam 310-8.

NOTE

Procedures contained in this Technical Bulletin may also be applied to bituminous and water distributors, dump, concrete and quarry trucks, compactors, tampers, drill machines, 250 ft 3/min and higher compressors, pile driving hammers, asphalt processing equipment, concrete saws, slipform pavers, hydraulic excavators, road planers, log skidders, aggregate storage and distribution bins, and asphalt repair equipment, and other related construction and materiel handling equipment requiring licensing.

CHAPTER 2
PREPARATION FOR CONDUCT OF OPERATOR TRAINING

2-1. Essential Features. Before the start of instructions, an estimate of the operator training capabilities must be made. Based upon this estimate, plans and schedules are developed, instructors and assistant instructors are selected and trained, and equipment and facilities are secured and placed in readiness.

2-2. Training Requirement Estimate. When the commander, or other person responsible for the preparation of the training program, has been assigned or detailed, he immediately makes an estimate of the operator training situation. Taken into consideration are such matter as:

a. Number of new operators to be trained.

b. Number of old operators to be retained or checked.

c. Number of drivers to be trained.

d. Caliber and general experience of personnel to be trained.

e. Time available.

f. Number of instructors and assistants available.

g. Special instructor training required.

h. Facilities available, including classrooms, visual aids, shops, equipment, operating ranges and availability of varied terrain.

i. Additional facilities needed and how they may be obtained.

j. Work necessary to place all equipment and facilities in readiness.

2-3. Planning and Organizing the Program. *a.* The information developed from the above estimate of training requirements is the basis on which the commander makes his decision and develops his plan for organizing and carrying out the training program. The following are considered:

(1) Number of operators to be trained.

(2) Program or schedule of instruction.

(3) Student organization.

(4) Number of instructors to be selected and trained, and a schedule covering their instruction.

(5) Assignment of duties and responsibilities to instructors.

(6) List of equipment and facilities to be obtained.

b. The plan should be based on appropriate Army subject schedules, listed in DA Pam 310-3, and adapted to local requirements and conditions.

2-4. Selection and Training of Instructors. *a.* The success of the program depends in a large measure upon the proper selection and training of instructors, examiners, and counselors. A good operator or specialist will not necessarily make a good instructor. The principles outlined in TC 21-5-7 for the selection and training of instructors should be followed.

(1) *Interviewing.* A technically proficient officer should carefully interview all prospective instructors and assistant instructors to select the best available personnel.

(2) *Selecting.* From the information gained during the interview, the officer groups the prospective instructors according to their potential ability. He selects the best qualified and most experienced individuals for further training.

b. Technical assistance, to assist commanders in the training of instructors, is available as outlined in AR 700-4 and AR 750-51.

2-5. Training Instructors and Examiners. *a. Instructors.* Before they start training operators, the selected instructors must be given a preliminary course of instruction. This course should include:

(1) The entire course to be given students.

(2) Application of principles prescribed by FM 21-6.

(3) Controlled observation (on-the-spot correction).

(4) Special training in conducting and scoring tests.

b. Examiners. The value of examination will depend largely on the competence of the examiners. They should have a thorough knowledge of test administration and equipment operating techniques, and should be periodically checked to insure consistency in their test evaluation. The operator counselors assist in overcoming and correcting physical deficiencies and poor operating habits through counseling and remedial training. To perform this function adequately, operator counselors should be selected from among those best qualified as operator instructors. They should, in addition, possess maturity, tact, and the ability to diagnose operator deficiencies and take effective corrective action.

CHAPTER 3
SELECTION AND CLASSIFICATION OF PROSPECTIVE OPERATORS

3-1. General. *a.* The objective of a selection program for potential operators is to choose the best individuals from the available resources. Not all personnel that meet the Army's physical standards are necessarily physically, temperamentally and mentally capable of becoming efficient operators. Unless those who do not qualify as good potential operators are eliminated before training starts, they will cause loss of time, damage equipment, and endanger the safety of instructor personnel and fellow trainees.

b. Individuals selected as potential operators should be moderate in habits, alert, dependable, and have good coordination and judgment. An accident-free equipment operation or driving record is desirable.

3-2. Screening Prospective Operators. The first step in the selection program must be comprehensive screening of eligible personnel's records. DA Form 2302 (Personnel Qualification Record) or DA Form 348 (Equipment Operator's Qualification Record, except Aircraft) will show the standard score obtained on the driver selection battery I tests. This score should be the basis upon which selection of operator candidates is made. However, to eliminate any change of error, the results of these tests should be verified by personal interview and observation.

3-3. Interviewing Prospective Operators. Useful information concerning each individual under consideration may be obtained through a carefully conducted interview. The person being interviewed must understand that the purpose of the interview is to help place him in the work for which he is best qualified. The importance of truthful answers should be emphasized. During the interview any evidence of extreme nervousness, poor hearing, or other abnormal characteristics should be noted.

a. The interview may be opened with introductory remarks such as "You're going to be asked a number of questions about yourself and your operator and driver experience. Answer every question as accurately as you can. Your answers will be used to help place you in work for which you are best qualified." Information obtained during the interview is recorded on DA Form 348. The following questions (if applicable) are suggested for use in the interview.

(1) How much experience have you had in driving a passenger car?

(2) Approximately how many miles did you drive a passenger car during the past 12 months?

(3) Have you operated any special equipment such as road construction equipment or bridge launchers? For how long?

(4) Have you ever driven a truck/tractor trailer combination?

(5) How much experience have you had driving a truck of 21/2-ton capacity or greater.

(6) How much experience have you had driving a vehicle with front wheel drive?

(7) Have you any objections to becoming an equipment operator? (If so, explain).

(8) How much mechanical experience have you had on gasoline and diesel engine powered equipment?

(9) How much operator and/or maintenance training have your received?

(10) Identify equipment on which operator and/or maintenance training has been received.

(11) Have you had trouble hearing clearly?

(12) Do you know of any physical defects that might affect you as an equipment operator on land?

(13) Do you know of any physical defects that might affect you as an equipment operator or water?

b. If possible, at least 25 percent more personnel than needed should be interviewed to allow eliminations due to failure to pass the written or physical requirements or inability to grasp the fundamentals of operating equipment.

c. When the number of personnel qualified to receive the training exceeds the number required, the data obtained during interviews may be used to select personnel.

3-4. Driver Selection Battery II Tests. *a.* Battery II tests are a series of written and manual tests to determine driver judgment, visual judgment, and eye-hand coordination. Battery II tests will be administered to selected operator candidates, if the individual's battery I test score is below 85, or in cases where the selected candidate has not taken the battery I test. DA Pam 310-8 provides current form numbers of test booklets, answer sheets and scoring keys.

b. DA Form 6122 (Army Emergency Judgment Test) determines individual reaction to emergency situations. The test consists of pictures of situations that may happen while driving on highways and streets. For each of these pictures, the student is asked a question about what he would do if he were one of the drivers.

c. DA Form 6123 (Army Visual Judgment Test) determines how well the student can pick out

words that have the same meaning. Each question is made up of one underlined word on the left followed by five more words. The student looks at the five words on the right and chooses the one that is exactly like the underlined word on the left. Also, the size of the type becomes progressively smaller in the tests.

d. DA-Form 6124 (Two-Hand Coordination Test) is designed to determine accuracy and speed of hand movement in conjunction with eyesight. On the test paper are three double paths of irregularly spaced circles. The circles represent touchdown points for the stylus. The examinee holds a stylus in each hand and at the proper signal walks the stylus from one circle to the next starting with the left hand and alternating left, right, left, etc.

3-5. Physical Evaluation Measures. Physical evaluation tests are intended for diagnostic guidance, and counseling purposes. In addition, they will insure that all operators possess at least minimum physical requirements for safe operation.

3-6. Classification of Prospective Operators. The information obtained from the interview, battery tests, and physical evaluation tests is recorded on DA Form 348. This information provides a basis for classification of potential operating ability. Three distinct categories of students are as follows.

a. Considerable previous experience in driving vehicles and operating equipment This group may be the most readily trained in the shortest time; however, they may have formed bad driving and/or operating habits that are difficult to overcome.

b. Limited previous driving and/or operating experience This group requires more time to train and also may have formed some bad driving/operating habits.

c. No previous driving and/or operating experience Personnel from this group will often make good operators if they are selected carefully and allocated sufficient training time to compensate for lack of experience.

CHAPTER 4
OPERATOR TRAINING

4-1. General. This phase of instruction teaches the student administrative procedures that must be performed by the operator how the equipment is constructed, how to keep the equipment operating properly, and how operating faults are detected and corrected. For students previously qualified to operate equipment, this part of their training may be shortened to include only subjects peculiar to the specific item on which training is being conducted.

a. It is essential for the student operator to become familiar with the major components of the equipment and functions they perform; services for which the operator and other crew members are responsible; emergency repair; field expedients; how to start and warm up the engine; and safety precautions.

b. The instructions/training must be designed to permit student operators to gain sufficient experience, to enable them to demonstrate through performance a general knowledge of and familiarity with proper operation, maintenance and safety procedures. Thorough operator and maintenance training will enable the operator to obtain maximum trouble free operation with minimum mechanical difficulty.

c. The instructor and assistant instructor must assure that correct operating techniques are demonstrated on each new exercise before the student operator attempts the exercise.

4-2. The Army Maintenance System (TAMMS). The student operator is taught the Army equipment record procedures as outlined in TM 38-750, including the categories of maintenance prescribed in AR 750-1. He is taught how the system operates in carrying out maintenance functions that vary from the simple preventive procedures performed by the operator himself to the complex repair and rebuild techniques employed at depot maintenance shops. He is also taught that the work that can and should be done at each level is flexible; and depends upon the presence of skilled mechanics and supervisors, the distribution of tools and equipment, the availability of repair parts, time available to complete the task, and the tactical situation. The importance of the operator's position is emphasized, and he is shown where he fits into the maintenance system.

4-3. Maintenance Publications, Forms, and Reports. The student operator is introduced to the publications required for the maintenance and operation of his equipment, with emphasis on technical manuals, technical bulletins, and lubrication orders. These publications are listed in DA Pam 310-4. The forms pertaining to his equipment are covered in detail, and the reports by which he records daily operations, services are thoroughly explained in TM 38-750. Accident(s) will be reported and recorded as set forth in AR 385-40. Required forms are listed in DA Pam 310-2. Publications and forms are available through DA Publication supply channels as outlined in AR 310-1 and DA Pam 310-10.

4-4. Principles of Driving Units. Preliminary mechanical instruction of the student operators should include familiarization with the characteristics and construction of driving units, e.g., internal combustion engines, turbine engines, electrical motors, batteries and fuel cells to include the principles of operation and component systems. Basic information may be found in TM 9-8000 and pertinent technical manuals.

4-5. Power Trains. Instructions to student operators should cover the purpose, components, and functions of power trains. The different types of clutches, transmissions, transfer cases, propeller shafts, universal joints, final drives and differentials should be explained. The theory of operation and general data regarding these units can be found in TM 9-8000. Specific details for the equipment on which the student is being trained are best obtained from the pertinent equipment technical manuals listed in DA Pam 310-4.

4-6. Instruments and Manipulation of Controls. *a.* The prospective operator should be familiar with the various types of instruments, how they work and what each signifies. Specific instructions should be given on the instrument panel of the equipment to which the prospective operator will be assigned.

b. The proper use of controls and correct operating cycle should be fully covered.

4-7. Electrical System. The major components of the electrical system and theory should be taught as contained in TM 9-8000 and FM 11-60. Specific application of the theory to the equipment being covered should be from the technical manual for that equipment. Subjects that should be included in the instruction are the batteries, generating system, magnetos, starting system, ignition system, and lighting system. Troubleshooting should be emphasized when explaining electrical components.

4-8. Fuel System. The basic principles and functions of the fuel system components should be taught to the student operator. In addition to the basic principles of carburetion and injection, the operator should be familiar with the function, design, and operation of each of the components from fuel tank to exhaust. Particular emphasis should be placed on the operator's maintenance responsibilities and specific repair limitations in regard to the fuel pump, fuel and air filters, and the carburetor or injectors. Handling of fuels will be in accordance with FM 10-69.

4-9. Auxiliary Equipment. The student operator should be made familiar with auxiliary equipment and its operation. Items to be included in the training, as a minimum, are the power control units, starting engines, compressors, and attachments. The operator's technical manuals for the equipment contain the information necessary for the operator.

4-10. Stowage of On-Vehicle Equipment. The student operator must know that each major item of equipment is issued with the necessary tools, publications, and equipment for its operation and operator maintenance. A place for stowing them is provided on or within the equipment.

4-11. Operator Maintenance. *a.* The operator must have the technical manual for his item of equipment. He must know it thoroughly and he must know the equipment itself intimately to enable him to perform the required operator maintenance services properly. Frequent inspections of the equipment and its logbook will enable supervisors to determine the effectiveness of the services. The purpose and methods of conducting a supervisor's inspections should be explained and the student operator impressed with the importance of his presence during these inspections.

b. The student operator must be taught that all tools, publications, and equipment intended to be carried on a major item of equipment are needed, and must be accounted for, stowed, and maintained in a serviceable condition. Instructing the student operator in the proper use of tools may prevent future injury to himself and damage to the equipment or its components.

4-12. Starting, Warmup, and Stopping Procedures. The student will satisfactorily demonstrate a basic knowledge of procedures involved in putting his equipment in operation and stopping it. The following outline will guide instructors:

a. Starting. The student will demonstrate his familiarity with proper starting procedures under normal conditions. Instructors should point out procedures to be used in various climatic conditions.

b. Warmup. The student operator should demonstrate knowledge that an engine must be properly warmed up prior to applying a load. Equipment technical manuals prescribe proper warmup procedures. In general, a fast idle is satisfactory. Students should be aware that rapid acceleration or deceleration is harmful to a piston type engine, and should use the hand throttle to hold the engine at a constant speed until engine is warm and the engine oil pressure is normal. Warmups permit the metals to expand uniformly and engine lubricants to circulate thoroughly.

c. Stopping Procedures. After operation, the student should idle the engine for a short period before stopping it to prevent uneven cooling and distortion of metals.

4-13. Washing and Cleaning. The student is taught that equipment is cleaned after each days operation and, during normal operations, should be washed once a week. In this area of instructions the following points should be brought out: Mud, sticks, small stones, and wire often become lodged in and around suspension systems and must be removed in order that the operator may make a thorough inspection of his equipment. Spilled oil, grease or fuel must be promptly wiped up with rags and cleaning solvent to prevent fire hazards. During washing, no cold water should be allowed to strike hot metals. Water should not be used inside the equipment except in small quantities and from a container.

4-14. Field Expedients and Repair. Properly instructed operators, with thorough knowledge of their equipment, can often make temporary repairs to a disabled item of equipment that will enable them to evacuate that equipment to a maintenance facility. Care must be exercised in teaching expedient repair, since some expedient repairs might be extremely harmful to the equipment and should be resorted to only in case of extreme emergency.

4-15. Safety. AR 385-10 prescribes the Army's safety program and assigns safety as a command responsibility. Student operators must receive adequate instructions on safety practices when operating equipment. Refer to TB 385-5, TB 385-6, TB 385-7, TB 385-8, TB 385-9, TB 385-10 and TB 385-101. Examples of safety precautions that should be emphasized to the student operator are as follows:

a. Insure proper exhaust systems or adequate ventilation when operating equipment indoors.

b. Inspect chains or slings when hoisting loads.

c. Do not stand close to open moving cables.

d. Always lower tractor dozer blade and drawn attachments when equipment is standing.

e. Keep moldboards of graders angled well under the machine when not in use.

f. Do not raise crane boom too high as it may snap back over the cab should the load be suddenly released.

g. Always shut engine OFF before filling fuel tank.

h. Do not permit persons to ride trailers of tractor trailer trains.

i. Always lower forks and set parking brake on forklift trucks when left unattended. Report accidents in accordance with AR 385-40.

4-16. Fire Prevention and Firefighting. All prospective operators must be made aware of fire on or within the equipment to be operated. Rags, spilled oil, gasoline, diesel fuel and cleaning fluids in open containers must be removed from the equipment prior to working on electrical components, or starting the engine. Emphasis must be placed on fire prevention and proper use of fire extinguishers.

4-17. Visual Signals. Signals, when applicable, must be taught thoroughly to insure adequate control, understanding of orders, and cooperative action. They provide flexibility of maneuver in tactical situations, allow for fine adjustments of positions in congested areas, and permit commanders to control a group of motor vehicular equipments without resorting to less secure communication measures. FM 21-60 illustrates and explains these signals.

a. Hand and arm signals can be used to prescribe direction, speed, caution, formation desired, and action expected. These signals may be augmented as need arises; however, care must be taken to avoid confusion and to keep everyone concerned informed on the meaning and use of additional signals.

b. Flag signals are limited by the colors and numbers of flags available. Green, orange and red flags are available through normal supply channels. Green normally means everything is operational and equipment and crew are ready for orders. Red means danger and warrants investigation. Orange usually indicates equipment out of action but no help needed. By prearrangement, combinations of two or all three colors can be used to indicate action expected or serve as a warning of gas or chemical attack.

c. Light signals indicating action expected or direction of movement are used in night exercises to control the column and move individual equipment.

d. The use of signals is taught best by illustrations, demonstration, and application. Signal drills must be repeated until all students are thoroughly familiar with all signals and can recognize them instantly, demonstrate them properly, and comply with them promptly. Signals (when applicable), should be used throughout the course of instruction.

4-18. Operation of the Equipment. This phase of instruction is designed to give the student operator sufficient operating experience to enable him to habitually follow the proper procedures and techniques in performing operator maintenance services, starting the equipment, manipulating the controls, and moving the equipment, if applicable. During this phase of instructions, the student learns to apply the knowledge gained during his preliminary training. TARCOM construction equipment and materiel handling equipment includes a wide variety of vehicles; no single operating course is outlined to make qualified personnel proficient in all phases of operation. As a general rule, the training areas where this phase of instruction is given should be simple, on level terrain, away from congested areas, and free from obstructions and distractions.

a. The student operator must complete with each phase satisfactorily before going to the next phase. Supervision must be rigid to prevent any trial and-error-type operation. To attain maximum progress, the assignment of one instructor or assistant to each five students is desirable.

b. On each new exercise and before the student attempts the problem, the assistant instructor demonstrates the correct operating technique for the equipment.

c. During all phases of student operation, each student maintains separate logbooks for his equipment, which is handed to the senior instructor after each day of operation. These logbooks can serve as a valuable aid in determining the effectiveness of the inspections and services the equipment received.

d. Emphasis on proper instruction and supervision will prevent much equipment abuse during all phases of equipment training.

CHAPTER 5
QUALIFICATION AND LICENSING

Section I. QUALIFICATION

5-1. General. Qualification should be based largely upon operating ability but inspections, services, and procedures must not be neglected nor their importance overlooked.

5-2. Mechanical Knowledge. *a.* As a minimum, operators selected for licensing will demonstrate satisfactorily a mechanical knowledge of the specific equipment for which a Standard Form 46 is sought. Each potential operator will be examined on:

(1) Ability to identify all major components of the equipment and their basic functions;

(2) Familiarity with the pertinent operator's manual and lubrication order;

(3) Ability to demonstrate satisfactorily the preventive maintenance service the operator must perform. During this demonstration, the potential operator should be authorized to use the pertinent operator's manual, lubrication order, and DA Form 2404, (Equipment Inspection and Maintenance Work Sheet).

b. Standards for this type of test must be high. Procedures must be impartial and thorough to insure desired results. Each potential operator should be tested individually.

c. The appendixes contain suggested questions for a written test on selected items of equipment. They may be used to evaluate the potential operator's technical knowledge. At the commander's discretion, similar tests may be prepared using data from pertinent operator's manual, applicable to equipment on which instruction/ training is conducted.

5-3. Operating Proficiency. *a.* The operating proficiency test, the final examination of the potential operator, is designed to determine the individual's ability to perform every operation of which the equipment is capable. Examining personnel will rate the driver as satisfactory or unsatisfactory on the basis of a prepared checklist, DA Form 6125 (Checklist of Driver's Road Test).

b. The manner in which the individual operates the specific equipment should clearly indicate familiarity and self confidence.

c. In cases where equipment is manned by a crew, each crew member must demonstrate familiarity and self confidence at each operating station.

Section II. LICENSING

5-4. Licensing. *a.* Successful completion of the prescribed tests qualify an individual to be licensed for the equipment(s) on which the individual passed tests. Specific nomenclature of the equipment will be entered on the Standard Form 46.

b. The standard operator's permit (SF 46) will be issued to the individual. The permit will be completed and authenticated for type, model, or capacity of equipment or type of plant the holder is qualified to operate.

c. Permits will be authenticated by the commanding officer or the authorized supervisor. Facsimile signatures are authorized in accordance with AR 340-15, but do not relieve the officer whose signature is used from responsibility for the precautions (including numbering and recording the issue and permits) against misuse.

d. The battalion, or licensing agency, will maintain a ledger of all permits issued, including the name of the person to whom issued, date, type of permit, and authority or certification. Permits will be valid as indicated in AR 600-55 unless revoked or suspended earlier for cause. Renewal procedures will be followed whenever a licensed operator is to qualify on an additional item of equipment. Renewal procedure will consist of an examination of the operator's qualification record, physical evaluation, and operating performance.

APPENDIX A
REFERENCES

A-1. Publication Indexes. The following indexes should be consulted frequently for latest changes or revisions and for new publications relating to material covered in this technical bulletin.

DA Pam 310-2	Index of Blank Forms
DA Pam 310-3	Index of Doctrinal, Training, and Organizational Publications
DA Pam 310-4	Index of Technical Publications
DA Pam 310-8	Index of Army Personnel Tests and Measures
DA Pam 310-10	Guide for Publications Supply Personnel

A-2. Forms. Refer to TM 38-750, The Army Maintenance Management System (TAMMS) for instructions on the use of maintenance forms pertaining to the material.

DA Form 2302	Personnel Qualification Record
DA Form 348	Equipment Operator's Qualification Record
DA Form 2404	Equipment Inspection and Maintenance Work Sheet
DA Form 6122	Army Emergency Judgment Test
DA Form 6123	Army Visual Judgment Test
DA Form 6124	Two-hand Coordination Test
SF 46	US Government Motor Vehicle Operator's Identification Card

A-3. Miscellaneous Publications

FM 10-69	Petroleum Supply Point Equipment and Operations
FM 21-6	Techniques of Military Instruction
FM 21-60	Visual Signals
TC 21-5-7	Training Management in Battalions
T9-8000	Principles of Automotive Vehicles

APPENDIX B
QUALIFYING PROCEDURES FOR OPERATORS OF CONSTRUCTION EQUIPMENT

B-1. Purpose. The purpose of these tests is to determine if the personnel selected for licensing have sufficient knowledge to recognize malfunctions and proper maintenance procedures for this equipment.

B-2. Test Grades. These tests consist of true or false and multiple choice type questions. All questions have equal weight and the passing grade is 85. Personnel failing this test will not be permitted to proceed to the performance test. Such failure will disqualify the student until he has completed a retraining period on the technical aspects of the equipment.

Section I. SUGGESTED TEST QUESTIONS FOR MIXING PLANTS, ROCK CRUSHERS AND SAW MILLS

Answer these questions by "True" or "False".

1. Engine should be operated at full throttle during warm up period.
2. If oil pressure gauge shows zero shut down engine immediately.
3. Water pump grease is soluble in water.
4. Any member of the US Army is authorized to operate any equipment.
5. An operator may clean his engine and equipment with gasoline.
6. An operator is responsible for the spare parts and tools for his equipment.
7. Before shutting down his equipment, the operator will cool the engine by idling for a few minutes.
8. It is not necessary to fill the fuel tank daily unless a full day's running is anticipated.
9. Operators do not need to check gauges after engine is warmed up.
10. Always block towed equipment securely before starting to operate it as a stationary unit.
11. Maintain proper belt tension to prolong drive belt life.
12. Strict adherence to lubrication chart requirements is not necessary on this type equipment.
13. All guards will be in place during operation of this equipment.
14. Operators should service air cleaner on this type equipment at least twice as often as the lubrication chart states.
15. Air cleaners are critical items which can lengthen or shorten engine life, depending on frequency and quality of servicing operations.
16. At first notice of any unusual noise or vibrations, unit should be shut down and checked for cause of trouble.
17. Overheating does not harm the engine if temperature does not exceed normal by more than 30°.
18. An operator should be familiar with all control levers and valves before attempting to operate any pieces of equipment.
19. The operator is responsible for safety of other personnel working on his unit.
20. The operator should either inspect his unit himself or delegate an assistant to inspect it before and after each shift.

Section II. SUGGESTED TEST QUESTIONS FOR GRADERS, SNOW PLOWS AND DITCHING MACHINES

Answer these questions by "True" or "False".

1. Engine should be operated full throttle during warmup period.
2. Transmission should be in neutral position when engine is started.
3. If oil pressure gauge shows zero, it should be reported after reaching motor park.
4. Driver should always disengage clutch while descending grades.
5. Water pump grease is soluble in water.
6. Any member of the US Army is authorized to drive a military vehicle.

7. A driver may use gasoline to clean his vehicle engine.
8. A driver is responsible that his vehicle tools are always present, complete, and in serviceable condition.
9. A driver should always know his destination and route before leaving the motor park.
10. Before stopping, a vehicle engine should be cooled by idling.
11. Permitting vehicles to stand overnight with low fuel levels will allow condensation, resulting in water in the fuel.
12. Driver does not need to check instruments after engine is warmed up.
13. During freezing weather, vehicles should be parked on planks.
14. Brakes should be applied intermittently when used in descending a long grade.
15. Instructions on lubrication charts should be strictly adhered to when servicing a vehicle.
16. If a tire is cut, exposing the body plies, it should be removed and repaired before further damage occurs.
17. Scarifier teeth should be removed and placed in storage location when not in actual use.
18. If engine does not start after holding button in for 30 seconds, you can hold it for 30 seconds more immediately.
19. Air receiver tanks must be drained daily to prevent condensation from entering air brake system.
20. Always operate the unit in the highest gear possible and at full throttle.

Section III. SUGGESTED TEST QUESTIONS FOR WHEELED OR TRACK TYPE TRACTORS, FRONT LOADERS, MOTORIZED SCRAPERS, ROLLERS AND SWEEPERS

A. Answer these questions by "True" or "False".

1. Engine should be operated at full throttle during warmup period.
2. Transmission should be in "neutral" position when engine is started.
3. If oil pressure gauge shows zero, it should be reported after reaching motor park.
4. Driver should always disengage clutch while descending grades.
5. Water pump grease is osluble in water.
6. Any member of the US Army is authorized to drive a military vehicle.
7. A driver may use gasoline to clean his vehicle engine.
8. A driver is responsible that his vehicle tools are always present, complete, and in serviceable condition.
9. A driver should always know his destination and route before leaving the motor park.
10. Before stopping, a vehicle engine should be cooled by idling.
11. Permitting vehicles to stand overnight with low fuel levels, will allow condensation, resulting in water in the fuel.
12. Driver does not need to check instruments after engine is warmed up.
13. During freezing weather, vehicles should be parked on planks or dunnage.
14. Brakes should be applied intermittently when used in descending a long grade.
15. Instructions on lubrication charts should be strictly adhered to when servicing a vehicle.

B. The following questions are multiple choice type.

16. When loading earth moving scoops or bowls:
    a. Make a thin long cut.
    b. Make a deep cut till engine lugs, then taper off on cut.
17. When traveling empty from dump to fill locations:
    a. Use highest gear position without overloading the prime mover engine.
    b. Use lower gear positions and carry bowl high.
18. If possible, arrange the work so a scraper can be loaded:
    a. Down hill and in direction of fill.
    b. Down hill and away from direction of fill.
19. When there is a choice of routes traveling from cut to fill:
    a. Always take long route to save time by utilizing higher speed.
    b. Take short, steeper route using low gear to save maintenance cost on trucks, rollers, bearings, etc.
20. If a tire is cut, exposing the cords of the body plies: a. Disregard it and continue operating unit if tire does not go flat.

b. It should be removed and repaired before further damage occurs.

21. The yoke support jacks on a 18-yard scraper are used to:
    a. Raise the draft yoke only while attaching scraper to prime mover.
    b. Raise entire scraper while attaching unit to a prime mover.
22. If unit is operated for a short time with tires overinflated:
    a. Tires will not be damaged if deflated as soon as job is completed.
    b. Tires will be damaged no matter how short the time they are operated this way.
23. Cables should be cleaned and lubricated.
    a. Once each week whenever possible.
    b. Once each month if conditions permit.
24. When traveling with a loaded scraper:
    a. Carry bowl resting on bowl locks.
    b. Carry bowl 1 to 2 inches above bowl locks.
25. When returning to the cut at high speeds:
    a. Always close apron and retract the ejector.
    b. Leave apron partially open and keep the ejector forward.

Section IV. SUGGESTED TEST QUESTIONS FOR CRAWLER, TRUCK, AND WHEEL MOUNTED CRANES

A. Answer these questions by "True" or "False".

1. A crane operator must be alert and know all the hand signals authorized for use by the US Army.
2. When handling heavy loads, stability and strength shall be checked by hoisting the load a short distance and holding it with the hoist brake.
3. No warning signal is sounded before swinging a load over workmen.
4. When using a magnet, the weight of the magnet should be figured as part of the load.
5. The magnet can be used to break up heavy pieces of scrap.
6. If, when operating, the battery ammeter shows discharge, the battery is fully charged.
7. When the crane is shut down for the night, all brakes must be set.
8. If the engine does not start after holding the start button in for 30 seconds, you can hold the button in for 30 seconds more, immediately.
9. Before hoisting a heavy load after the crane has been idle for several days, it is advisable to hoist the hook block to the boom point several times with the brakes applied lightly to remove moisture from brake linings.
10. The operator must avoid rough or jerky stops and starts at all times.
11. If cables are not spooled smoothly on the host drums they might break.
12. In case of fire, the following action should be taken: Close emergency fuel shutoff and use fire extinguisher with discharge directed at base of the fire.
13. Each crane has a lubrication chart, listing points to be lubricated, proper lubricants, and intervals. It is not necessary to use this chart when crane has been operating for 30 days or more.
14. A tagline is a device used to hold a load stationary when the house is rotated.
15. The operator may allow a man to ride a suspended load if he is wearing safety shoes.
16. Only authorized persons are allowed in the cab when the crane is in operation.
17. No part of the rotating upper works should come nearer than 10 feet to any power line.
18. The operator shall make sure, by personal observation and signals from ground man that the load is well secured and balanced before raising it more than a few inches.
19. Drivers of truck mounted cranes may move the crane only on signal from the crane operator when moving a load suspended.
20. In emergencies, it is permissible to make a side pull with a crane.
21. It doesn't make any difference where the boom is in relation to the load.
22. Spare gasoline for the starting engine may be carried on a crane in a gallon jug.
23. The operator must not leave the controls while a load is still suspended.
24. Engines must be shut down before refueling any crane or crane carrier.
25. The crane operator is responsible for unsafe practices pertaining to his rig and his chainers.

B. The following questions are multiple choice type.

26. The preoperation inspection of all cranes should be performed by:

a. Operator.
b. Shop maintenance personnel.
c. Oiler.

27. Cranes used by Department of the Army are powered by the following method:
a. Gasoline engine.
b. Gasoline or steam engine.
c. Gasoline, diesel or steam engine.

28. Care must be taken not to overload the crane. The capacity data plates furnish rated capacities for each unit and are located:
a. In the supply room.
b. In the OVM tool box.
c. Riveted or bolted to cab adjacent to operator's seat.

29. The following listed steps must be taken before starting and running the engine. One step does not apply to this list.
a. Inspect engine and cab floor for loose bolts, nuts, tools, or other material lying around loose.
b. Place the ignition switch in ON position.
c. Place throttle in idle position d. Place all operating levers in neutral position.
e. Set outriggers.
f. all brakes.
g. Press starter button. (Do not operate starter more than 30 seconds to prevent damage to starter).
h. Run engine at part throttle to warm up engine.
i. Immediately after starting engine, observe oil pressure gage, the pressure is indicating shut engine down.

30. The oil pan, lines, and filters should be inspected for leaks:
a. Daily or oftener.
b. When engine is shut down.
c. Once a week.

31. Most cranes are quipped with an emergency fuel shut-off valve. This valve is for quickly cutting the flow of fuel:
a. To the air compressor.
b. To the engine in case of emergency
c. To the engine crankcase.

32. The air receiver tank must be drained to prevent moisture from entering the brakes and control valves.
a. Daily or change of crew.
b. Weekly.
c. Every 100 hours.

33. Periodic cleaning and lubrication of wire ropes and cables will materially lengthen their life and insure free movement over pulleys and drums. Cleaning interval is governed by amount and type of work performed, and good judgment of the operator. How often should the above be performed on the average?
a. When new cables are installed.
b. Every 6 months.
c. Weekly.

34. The house lock should be set when the crane is:
a. To be left standing a week.
b. To be left standing for repairs.
c. Whenever the engine is shut down.

35. What is the normal engine coolant temperature?
a. 100° to 120°.
b. 120° to 140°.
c. 140° to 185°.

36. When a near capacity load is to be handled, what must be done?
a. Position the outriggers.
b. Clear the cab deck.
c. Attach clam shell bucket.

37. When operating the crane, all movements must be:
    a. Fast and jerky.
    b. Slow and smooth.
    c. Makes no difference.
38. When operating the crane at night with floodlights, the lights suddenly fade and dim, what would you do?
    a. Finish the job.
    b. Set all brakes immediately.
    c. Call for assistance.
39. The crane operator should take signals when working from:
    a. Anyone.
    b. The ground man or head chainer.
    c. Call for assistance.
40. The following rules apply to the use of chains and slings. One does not apply; indicate which one.
    a. Take up slack and lift load slowly.
    b. Keep slings free from kinks, knots and twists.
    c. Knots can be used to shorten chains and slings.
    d. Lift from center of hooks, never from the point.
    e. Distribute the load evenly on all legs of the sling.
    f. Inspect slings regularly.
    g. Do not overload chains or slings.
41. The tools and on-board spares are listed in the following manner.
    a. List fastened to cab wall.
    b. No list.
    c. Operator's manual issued with the crane.
42. You go out to your crane and it has a deadline tag on it. Do you:
    a. Remove the tag and start the engine.
    b. Return to the maintenance shop to see why it is deadlined.
    c. Fill the fuel tank.
43. The crane is to be moved from one location to another several miles distant. You should:
    a. Call the maintenance shop.
    b. Secure anti-rotation devices before starting to new location.
    c. Raise boom and secure house lock.
44. When moving a crawler type crane, the track drive sprockets should be:
    a. Forward.
    b. To rear under counterweight.
    c. Makes no difference.
45. Loose nuts and bolts and tools lying on crane deck would indicate:
    a. Previous operator was sloppy.
    b. Someone is working on the crane.
    c. Someone has been in your parts supply.

Section V. TEST SOLUTIONS FOR APPENDIX B

SECTION I

1. False	8. False	15. True
2. True	9. False	16. True
3. True	10. True	17. False
4. False	11. True	18. True
5. False	12. False	19. True
6. True	13. True	20. True
7. True	14. True	

SECTION II

1. False
2. True
3. False
4. False
5. True
6. False
7. False
8. True
9. True
10. True
11. True
12. False
13. True
14. True
15. True
16. True
17. True
18. False
19. True
20. False

SECTION III

1. False
2. True
3. False
4. False
5. True
6. False
7. False
8. True
9. True
10. True
11. True
12. False
13. True
14. True
15. True
16. *a*
17. *a*
18. *a*
19. *b*
20. *b*
21. *a*
22. *b*
23. *a*
24. *b*
25. *b*

SECTION IV

1. True
2. True
3. False
4. True
5. False
6. False
7. True
8. False
9. True
10. True
11. True
12. True
13. False
14. True
15. False
16. True
17. True
18. True
19. True
20. False
21. False
22. False
23. True
24. True
25. True
26. *a*
27. *c*
28. *c*
29. *e*
30. *a*
31. *b*
32. *a*
33. *c*
34. *c*
35. *c*
36. *a*
37. *b*
38. *b*
39. *b*
40. *c*
41. *c*
42. *b*
43. *b*
44. *a*
45. *b*

APPENDIX C
QUALIFYING PROCEDURES FOR OPERATORS OF MATERIEL HANDLING EQUIPMENT

C-1. Personnel Selection. Personnel selected for testing should possess sufficient mental aptitude and mechanical ability to enable them to absorb and retain instructions and become expert in materiel handling operations.

C-2. Purpose and Test Grades. The purpose of this test is to determine if the personnel selected for licensing have adequate knowledge in the proper operation of materiel handling equipment. This test consists of 50 questions; each question has a weight of 2 points. A passing grade is 70 percent. Personnel failing this test should not be permitted to proceed to a performance test. Such failure shall disqualify the student for licensing until he has completed a retaining period.

C-3. Test Options. Questions that do not pertain to the equipment for which the operator is being licensed may be deleted.

C-4. Test Responsibility. Operating proficiency tests should be set up by the commander.

Section I. SUGGESTED TEST QUESTIONS FOR FORKLIFT TRUCKS, WAREHOUSE TRACTORS AND STRADDLE TRUCKS

A. Answer these questions by "True" or "False".

1. Operators will check gas, oil, and water at the beginning of each shift.
2. Operators, while driving, must watch for pedestrians and workers.
3. You may park on railroad tracks when no cars are spotted in the area.
4. Power trucks can be left unattended with engine running.
5. Stunt driving is a good way to show that you are a good operator.
6. Operators must fix immediately any mechanical deficiency.
7. It is unsafe to fill the gas tank of your vehicle inside a warehouse.
8. Operators will use reverse to stop their machine rather than the brake.
9. You may have people stand or add weight to the back of the fork truck in order to life more weight with the forks.
10. The forks or the guard may be used to bump a loaded pallet into position.
11. When going up or down a ramp with a loaded fork truck, the load should be on the low end of the truck.
12. It is good safe practice to permit people to ride trailers of tractor-trailer trains.
13. An operator must face in the direction in which his machine is traveling.
14. It is permissible for an operator to let his foot ride the clutch pedal.
15. Operators are permitted to race engines and spin wheels of their vehicles.
16. Trucks should be operated at full speed at all times.
17. After filling a tank with gasoline, it is unsafe to start the engine immediately.
18. Trucks straddle carry operated on public streets or highways will be equipped with all safety devices required by state law.
19. It is permissible to start, turn, or stop a truck abruptly.
20. The operator is required to perform the daily preventive maintenance services as listed in applicable Technical Manual.
21. The operator will be held responsible for the equipment.
22. Equipment shall be operated only by the person to whom it is assigned.
23. Never pick up a load with one fork.
24. When making sharp turns, keep close to the inside corner. Avoid starting your turn from the middle of an aisle.
25. Electric powered fork trucks, spark enclosed, will be used for the handling of flammable material such as paint, oil, gasoline and flammable gas.
26. Always carry load tilted forward.
27. When freight car is higher than the deck, go backward up into car and forward down out of the car.
28. Make sure that the plate between the deck and the freight car is secure, strong enough, wide enough, and cannot slip.
29. Check freight car floor for obstacles and weak or broken flooring.

30. Check door width and height with the clearance of the machine you are using.

B. The following questions are multiple choice type.

31. What is the approximate cost of a 6000-lb capacity forklift truck?
    a. $2,000.
    b. $3,000.
    c. More than $4.000.
32. If an operator cannot start his truck immediately, he should:
    a. Fix it himself.
    b. Call the mechanic.
    c. Report the trouble to his supervisor.
33. If mechanical deficiency develops, he should:
    a. Fix it himself.
    b. Keep on driving the truck.
    c. Report the trouble to his supervisor.
34. Forks on empty parked trucks must always be:
    a. Two inches from the floor.
    b. Four inches from the floor.
    c. On the floor.
35. Forks on a moving empty or loaded truck must always be raised:
    a. To the height that the load will be stacked.
    b. Just high enough to miss any floor obstruction.
36. Anyone may ride the pallet load of a truck in any manner:
    a. If absolutely necessary.
    b. Never in any case.
37. Fork trucks may be driven with the forks at top elevation:
    a. If considered necessary.
    b. Never in any case.
38. Operators will drive their trucks or tractors:
    a. Two truck or tractor lengths behind other vehicles.
    b. Three truck or tractor lengths behind other vehicles.
39. Following are some safety precautions that should be followed; one of the following does not apply. Indicate which one.
    a. Raising a load into position for stacking while the truck is in motion is forbidden.
    b. When servicing battery, do not smoke or use flame in the vicinity.
    c. Do not fill fuel tank while engine is running.
    d. Do not remove radiator cap from an overheated radiator.
    e. The operator will stop the engine and set the brake before getting off the machine.
    f. Never travel with the mast tilted back.
    g. If truck is parked on incline, block at least two wheels in the event of handbrake failure.
40. On a tractor-trailer train passengers may:
    a. Ride the first trailer.
    b. Ride the last trailer.
    c. Not ride at all.
    d. Ride the tractor when a permanent passenger seat is provided.
41. Explain what procedure you would follow if you were to leave your forklift truck.
42. Explain what you will do when coming to a cross aisle or blind corner.
43. Forklift trucks may be used to elevate personnel provided these steps are followed; one does not apply. Indicate which one.
    a. Authorized by the supervisor.
    b. A safety pallet equipped with guard rails placed on the forks.
    c. The truck will not be moved.
    d. The person being lifted will face away from the mast and remain clear of the hoisting mechanism.
    e. No more than two persons may occupy the safety pallet to be lifted.
44. After filling a tank with gasoline, it is unsafe to start the engine immediately. Explain steps to be taken before starting the engine.

45. The following listed steps must be taken when loads are to be moved. One does not apply; indicate which one.

a. Inspect all loads to be moved.

b. Be sure the load is well balanced.

c. Do not overload.

d. Do not underload.

e. Do not move a questionable load.

f. carrying loose material.

g. Refuse to move unsafe loads.

46. Each operator must know the load capacity of his truck. If you are operating a 6000-lb forklift truck which of the following capacities would you be permitted to lift?

a. 4000 lb.

b. 5000 lb.

c. 6000 lb.

d. 6500 lb.

e. 7000 lb.

47. Upon completion of work assignment, equipment will be parked in designated areas. One of the following does not apply; indicate which one.

a. Do not obstruct traffic.

b. Lower forks to floor.

c. Tilt mast rearward.

d. Check shift lever for neutral position.

e. Turn off ignition.

f. off lights.

g. Set emergency brake.

48. The following rules apply to electric powered equipment. One does not apply; indicate which one.

a. The deadman control is a safety device to bring the truck to a quick stop.

b. Check tires for correct air pressure.

c. Never dismount from your truck until it has come to a complete stop.

d. Never let people work or walk under the forks.

e. Do not attempt to operate your truck with a weak battery.

f. Enclosed trucks will be used when handling flammable material.

49. The following operating rules are applicable to warehouse tractors. One does not apply; indicate which one.

a. Weaving the train is dangerous and shall not be permitted.

b. When negotiating a turn into a road or aisle, allow sufficient time to get into position to make the turn and allow for proper clearance of the last trailer.

c. Operators and supervisors should limit the height of the load on the first trailer behind the tractor. The height shall not obstruct the rear view of the operator, nor create a hazard to the operator in the event material accidentally shifts or falls.

d. When going down a grade with a load, back down.

e. No person shall be permitted to ride on the trailer to hold the load in place.

50. The following operating rules are applicable to trucks, straddle carry; one does not apply. Indicate which one.

a. Carry the hoist shoes up to avoid striking any obstruction when the truck is not loaded.

b. Drive only on solid ground.

c. Drive cautiously at all times because of limited visibility directly in front of and to the right of the truck.

d. Avoid sudden stops, especially when truck is loaded.

e. Carrying a load which extends ahead or behind the truck is not authorized.

Section II. TEST SOLUTIONS FOR FORKLIFT TRUCKS, WAREHOUSE TRACTORS, AND STRADDLE TRUCKS

1. True
2. True
3. False
4. False
5. False
6. False
7. True
8. False
9. False
10. False
11. False
12. False
13. False
14. False
15. False
16. False
17. True
18. True
19. False
20. True
21. True
22. True
23. True
24. True
26. True
26. False
27. False
28. True
29. True
30. True
31. *c.*
32. *c.*
33. *c.*
34. *c.*
35. *b.*
36. *b.*
37. *b.*
38. *b.*
39. *J*
40. *d.*
41. Lower forks to floor
    Check shift lever for neutral position
    Turn off ignition
    Turn off lights
    Set emergency brake
42. Slow down
    Sound horn
43. *e.*
44. Replace fuel tank cap
    and clean up any spillage.
45. *d.*
46. *a. b. c.*
47. *c.*
48. *b.*
49. *d.*
50. *e.*

Section III. SUGGESTED TEST QUESTIONS FOR WAREHOUSE CRANES

1. Personnel selected for warehouse crane operators are first required to obtain a license for operating forklift trucks.

2. The purpose of this test is to determine if the personnel selected for licensing have adequate knowledge in the proper operation of warehouse cranes.

3. This test consists of 25 questions, each question has a weight of 4 points. A passing grade is 70 percent. Personnel failing this test should not be permitted to proceed to a performance test.

4. Performance tests should be set up by the commander.

Answer these questions by "True" or "False".

1. Loads should not be picked up without a signal from the rigger.
2. Slings are attached and removed from loads by the rigger; he also determines when loads are balanced properly.
3. Never overload crane or pick up load until satisfied that it may be carried safely.
4. Back crane down an incline when there is a substantial load on the block.
5. Do not allow a person to ride the hook or load.
6. The hook must not be centered over the load.
7. The operator maneuvers the crane into position, using the sluing mechanism if necessary at the direction of the rigger.
8. In order to save wear on the boom and for stability, a load should be lifted with the boom in the highest position possible.
9. If the boom was raised before the hook, the load could be dragged along the ground or floor.
10. The block should not be raised so high that it becomes blocked or in contact with the boom head.
11. If the crane has a sluing boom, and if the load is to be moved only within the circumference of the slue, it is necessary to move the crane.
12. The crane should travel slowly and smoothly, avoiding sudden stops and turns.
13. When it is necessary to cross a shallow ditch, the crane should cross at a right angle to the ditch with' the boom held in the direction of travel.
14. While the crane is traveling, the operator must not allow the load to swing too far.
15. A swinging load does not cause severe strain on all parts of the crane.
16. When a crane travels loaded and there is danger of load swing, the rigger should attach a line to the load to be used to steer long loads and control the swing of the load.

17. Normally, the rigger should walk ahead of the loaded crane with a tag line and give any necessary instructions concerning travel.

18. To place the load, the operator maneuvers the crane into position, uses the slue and topping mechanism to center the load directly over the spot where it is to be placed, and lowers the load.

19. A load should be placed through use of the boom only.

20. Holding the load with the boom near the horizontal position does not put a severe strain on all parts of the crane.

21. The rigger and other helpers, if necessary, should guide the load into position as it is lowered.

22. The cable may damage the load by cutting, abrading, or causing undue strains leading to damage if the cable has not been carefully checked.

23. If the cable has not been carefully checked, it may become detached, allowing the load to fall.

24. A load chart showing the capacity of the crane under all circumstances, should be visible on the crane.

25. The operator must be aware of the factors which influence the capacity of the crane, and must understand that the crane will not lift the maximum capacity under all circumstances.

Section IV. TEST SOLUTIONS FOR WAREHOUSE CRANES

1. True
2. True
3. True
4. True
5. True
6. False
7. True
8. True
9. True
10. True
11. False
12. True
13. True
14. True
15. False
16. True
17. True
18. True
19. False
20. False
21. True
22. True
23. True
24. True
25. True

APPENDIX D
QUALIFYING PROCEDURES FOR OPERATORS OF AVLB

D-1. Personnel Selection. Personnel selected for testing should have normal color perception, good hearing ability, and a standard score of 100 or higher in aptitude area MM of the Army classification battery.

D-2. Purpose. The purpose of this (either M60A1 AVLB or M48A2 AVLB) is to determine if personnel selected for operating have sufficient technical knowledge of vehicle driving principles and practices. This test should be administered prior to the performance test.

D-3. Tracked Vehicle Operators. Operators of tracked vehicles will be familiar with the contents of TM 21-301, Driver Selection, Training and Supervision, Tracked Vehicles.

D-4. Test. This test consists of 25 true or false and multiple choice questions. Each question has a total weight of 4 points for each correct answer. Some questions, as noted, will have four answers; therefore, each correct answer is equal to 1 point, for a total of 4 points per question. Passing grade is 85 percent. Any student failing the test will be disqualified for licensing until he has completed a retraining period on the technical aspects of the equipment.

Section I. SUGGESTED QUALIFYING QUESTIONS FOR M60A1 AVLB

A. Answer these questions by "True" or "False".

1. The safety precautions are listed in section II of TM 5-5420-202-10.
2. The correct form for reporting errors, omissions and recommendations for improving the technical manual on the launcher is DA Form 2407 (Maintenance Request).
3. Daily preventive maintenance is to be performed as outlined in table 3-1 before, during, and after operation.
4. The M60A1 Launcher is powered by a 12-cylinder continental liquid cooled diesel engine.
5. The operator controls and instruments are located in the left forward compartment.
6. All panel instruments must be checked for normal operation prior to moving the launcher.
7. The hydraulic pump clutch is engaged during launching and retrieving of the bridge only.
8. The fuel fillers are located at the rear of the operator's and commander's hatches.
9. While starting the engine, the crew should be at their assigned stations (operator and commander), with hatches closed.
10. The M60A1 launcher is equipped with a valve bank with five control levers to control six hydraulic cylinder operations.
11. The launcher will be parked in a level area with the brakes set, or in the locked position when not in use.
12. The launcher speed in low range is 15 mph: high range 50 mph; reverse 9 mph.
13. Grade ascending and descending ability is 50 percent.
14. The launcher is a modified M60A1 tank.
15. Track adjustment is performed by DCU.
16. Six 12-V batteries are required to support the 24-V electrical system of the launcher and are located in the forward compartment.
17. An electrical slave receptacle is located to the right and forward of the commander's seat for the purpose of starting the engine from an outside source in case of low or dead batteries.

B. In the following multiple choice questions, only one answer is correct. Check the correct answer.

18. Before starting the engine:
    - *a.* Switches to all electrical should be in the OFF position.
    - *b.* The hatches closed.
    - *c.* Fuel shut-off handle should be in the OFF position.
19. If engine fails to start after several attempts:
    - *a.* Ignition system shorted out.
    - *b.* Fuel tank empty or shut-off valve closed.
    - *c.* Transmission low of oil.
20. Purge the fuel lines of air:
    - *a.* By depressing the accelerator to full displacement several times.

b. By bleeding the fuel lines.
c. By operating the purge pump simultaneously with the accelerator depressed 2/3 of displacement while cranking the engine.

21. To make a pivot turn:
    a. Place the transmission shift lever in low range position.
    b. Place the transmission shift lever in reverse position.
    c. Place the transmission shift lever in neutral position.
22. To steer the launcher while in forward motion:
    a. A forward right turn is made by a counterclockwise turn of the steering control.
    b. By a clockwise turn of steering control.
    c. By applying the brake.
23. Launch the Bridge (check 2 correct answers):
    a. The bridge is launched with the launcher in forward motion.
    b. Launched with the shift lever in neutral position with brake depressed, until outrigger strikes the ground.
    c. The bridge is attached to the launcher tongue by two (2) hydraulically operated pins.
    d. The bridge may be launched and retrieved without exposure to crew members.
24. To acquire top performance of the hydraulic system during launching of the bridge:
    a. The accelerator should be set to maintain engine speed at 1800 revolutions per minute.
    b. The engine speed should be 900 revolutions per minute.
    c. The hydraulic pump clutch lever should be in the DOWN position.
25. The record and report forms applicable to the launcher:
    a. Shall be kept in engine compartment.
    b. Shall be attached to the bridge.
    c. Shall be kept in a canvas bag mounted on the launcher.

Section II. SUGGESTED QUALIFYING QUESTIONS FOR M48A2 AVLB

A. Answer these questions by "True" or "False".

1. The safety precautions are listed in section II of TM 5-5420-200-12.
2. The correct form for reporting errors, omissions, and recommendations for improving the technical manual on the launcher is DA Form 2407 (Maintenance Request).
3. Daily preventive maintenance is to be performed as outlined in table 3-1 before, during, and after operation.
4. The M48A2 launcher is powered by a 12-cylinder continental liquid cooled diesel engine.
5. The operator launching and retrieving controls, except for the clutch lever, are located directly in front of the driver's seat.
6. All panel instruments must be checked for normal operation prior to moving the launcher.
7. The hydraulic pump clutch is engaged during launching and retrieving of the bridge only.
8. The fuel fillies are located at the rear of the operator's and commander's hatches.
9. While starting the engine, the crew (operator and commander) should be at their assigned stations with the hatches closed.
10. The M48A2 launcher is equipped with a bank of six control levers to control five hydraulic cylinder operations.
11. The bridge cannot be launched or recovered unless the launcher is perfectly level.
12. For normal driving on hard surface roads, shift directly into the high (H) position before moving.
13. All warning lights should be off immediately after starting the main engine.
14. The launcher is a modified M48A2 tank.
15. Track adjustment can be performed by the operator.
16. Six 12-V batteries are required to support the launcher 24-V electrical system.
17. If batteries are weak, start the auxiliary generator and engine before attempting to start the main engine.

B. In the following multiple choice questions, only one answer is correct. Check the correct answer.

18. Before starting the engine:
    a. Switches to all electrical equipment should be in the OFF position.
    b. The hatches must be closed.
    c. The transmission shifting lever should be in the neutral (N) position.

19. If engine fails to start after several attempts it is probably because:
    a. The MASTER (battery) switch is in the ON position.
    b. Transmission oil level is low.
    c. There is air in the fuel line.
20. Purge the fuel lines of air by:
    a. Depressing the accelerator several times.
    b. Draining the fuel filter.
    c. Loosening the plug on top of the filter and bleeding.
21. To make a pivot turn:
    a. Place the transmission shift lever in low range position.
    b. Place the transmission shift lever in neutral position.
    c. Place the transmission shift lever in reverse position.
22. To steer the vehicle forward downhill in reverse range is forward right turn is made by:
    a. Turning the wheel left.
    b. Turning the wheel right.
    c. Neither a nor b.
23. To recover the bridge:
    a. An outside man is needed to direct backing the launcher up to the bridge.
    b. Extend the locking plugs by lowering the locking cylinder control valve and engage the bridge with the launcher tongue.
    c. All debris should be removed from the bridge before moving the launcher into position.
24. Holddown chains are automatically released by:
    a. Raising the scissor cylinder control lever.
    b. Raising the overhead cylinder control lever.
    c. Lowering the tongue cylinder control lever.
25. The operator's manual, TM 5-5420-200-12, should be kept in the:
    a. Right front fender box.
    b. Left rear fender box.
    c. Crew compartment.

Section III. TEST SOLUTIONS FOR M60A1 AVLB

1. False
2. False
3. True
4. False
5. True
6. True
7. True
8. True
9. False
10. True
11. True
12. False
13. False
14. True
15. False
16. True
17. True
18. a
19. *b*
20. *c*
21. *c*
22. *b*
23. *b* and *c*
24. *a*
25. *c*

Section IV. TEST SOLUTIONS FOR M48A2 AVLB

1. False
2. False
3. True
4. False
5. True
6. True
7. True
8. True
9. False
10. False
11. False
12. True
13. False
14. True
15. True
16. False
17. True
18. a
19. *c*
20. *c*
21. *b*
22. *a*
23. *c*
24. *b*
25. *c*

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25A, operator maintenance requirements for truck, fork lift, rough terrain, and warehouse equipment; DA Form 12-25B, operator maintenance requirements for construction equipment (lines B-1 through B-39); and DA Form 12-25D, operator maintenance requirements for bridge and launcher equipment.

*U S Government Printing Office: 1999 - 454-114/10496

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM, CUT IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)

Your complete address

DATE Date you fill out form

PUBLICATION NUMBER	DATE	
TB 600-2	Date of TB	Procedures for Licensing Operators of Construction Equipment and Materiel Handling Equipment

BE EXACT...PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO
75		183	
105	3-12		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Change illustration. Reason: Tube end shown assembled on wrong side of lever cam.

This paragraph says to refer to chapter 6 for repair of auxiliary engine but procedures are not in chapter 6. Please add procedures or give correct reference.

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

John Smith, SP4 798-XXXX

SIGN HERE

John Smith

DA FORM 1 AUG 74 2028-2

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

CUT ALONG DOTTED LINE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM, CUT IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)

DATE

PUBLICATION NUMBER	DATE	
TB 600-2	28 JUN 79	Procedures for Licensing Operators of Construction Equipment and Materiel Handling Equipment

BE EXACT...PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO	TABLE NO

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

TYPED NAME, GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

CUT ALONG DOTTED LINE

DA FORM 1 AUG 74 2028-2

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

Commander
US Army Tank-Automotive Materiel
Readiness Command
ATTN: DRSTA-MBA
Warren, MI 48090

CUT ALONG DOTTED LINE

FOLD BACK

REVERSE OF DA FORM 2028-2

THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

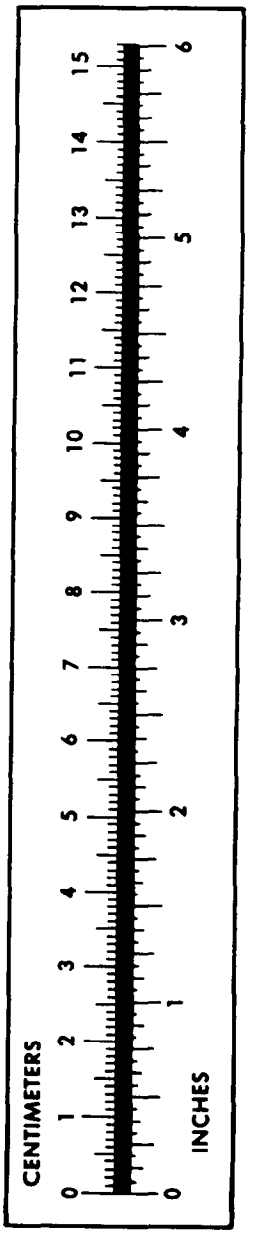
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



PIN: 042181-000