SUBCOURSE TR0660 | EDITION 6

MILITARY RAILWAY EQUIPMENT

AIPD

READINESS/ PROFESSIONALISM THRU GROWTH

THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT

ARMY CORRESPONDENCE COURSE PROGRAM

CORRESPONDENCE COURSE OF THE
U. S. ARMY
TRANSPORTATION SCHOOL

MILITARY RAILWAY EQUIPMENT

LESSON BOOKLET
TRANS SUBCOURSE 660

March 1976

Supersedes Trans 660, Military Railway Equipment, April 1972.
TO BE USED WITH REFERENCE TEXT 660, APRIL 1972.

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

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TRANS SUBCOURSE 660

MILITARY RAILWAY EQUIPMENT

INTRODUCTION

Operating a military railroad in a theater of operations requires the combined efforts of many people with various skills. Men are needed to run trains and repair railway equipment; others must maintain the right-of-way and the communications system. Before the railroad begins to operate, however, there is the tremendous task of planning the entire rail operation.

One of the many things a planner must know about is what equipment is available to move military tonnages and who will maintain it to keep supplies and ammunition rolling to the front. That is the purpose of this subcourse; to introduce you to the kinds of equipment found in a military railroad and the characteristics of the knockdown fleet belonging to the Army.

This is a one-lesson subcourse, including lesson exercises, lesson solutions, and an examination. One credit hour is allowed for the entire subcourse. The exercises are to be completed under the concept of self-paced instruction. You will grade them yourself, using the lesson solutions attached to the examination. Because of this, you have received only one examination response sheet for use in submitting your examination solutions.

Follow these steps in completing the subcourse.

(1) Study the text material assigned for the lesson.

(2) After thorough study, answer each question by marking or circling your solutions in the lesson book.

(3) Check your answers against the School solutions on the solution sheet. If you have answered any question incorrectly, look up the text reference given on the solution sheet. Study the reference and evaluate all possible exercise solutions, making sure you understand why the School solution is the best.

(4) When you have finished the lesson to your satisfaction, complete the examination as directed there and mail your solutions to AIPD for grading.

Text and materials furnished: Reference Text 660, Military Railway Equipment, April 1972; two Portapunch cards for answering the examination questions. Before you begin the subcourse, make sure that your Social Security number (SSN) or student number and the subcourse number are printed at the top of each Portapunch card. If either is incorrect, return the cards to the School, calling attention to the error. You will receive corrected cards. Include your SSN or student number on all correspondence.

On completion of this subcourse, keep the reference text, the lesson book, the blue solution sheet, and the examination; do not return them with your Portapunch card.

TEXT ASSIGNMENT	Reference Text 660, Military Railway Equipment, April 1972.
LESSON OBJECTIVE	To enable you to identify military railway equipment, the characteristics of the knockdown fleet, and those who have the responsibility for maintenance.
SUGGESTIONS	None.

EXERCISES

Weight — True-False

(Mark T for true or F for false.)

5 1. The kitchen facilities of an ambulance train are suitable for preparing snacks but not complete meals.

5 2. The Army's three hospital cars are designed to operate independently of each other.

5 3. Changing the gage of truck wheels is a responsibility of general support maintenance personnel.

5 4. A gondola is classified as a house car.

5 5. The load capacities of flatcars range from 50 to 250 tons.

5 6. The large flatcar in the Army's oversea fleet is designed to operate on standard- to broad-gage railroads.

Weight

5 7. The depressed center flatcar affords greater tonnage capability than the large flatcar in the foreign service fleet.

5 8. An ice-cooled refrigerator car is loaded with ice through its side doors.

Matching

(In questions 9 through 16, match a type of rolling stock from column II to each descriptive phrase in column I by writing the proper letter beside the question. Each item in column II may be used once, more than once, or not at all.)

Weight		Column I	Column II
5	9.	Has openings in bottom for unloading.	A. Hopper.
5	10.	May have a depressed center.	B. Tank car.
5	11.	Carries gasoline, milk, and fruit juices.	C. Flatcar.
5	12.	Is good for transporting engineer equipment.	D. House car.
5	13.	Carries lettuce, apples, and peaches.	
5	14.	Has running board on roof.	
5	15.	Has only five general components.	
5	16.	May be covered or open top.	

Column II lists the levels of maintenance; column I lists typical descriptions of those levels. Match a level of maintenance from column II to each descriptive phrase in column I by writing the proper letter beside the question. Each item in column II may be used once, more than once, or not at all.

Weight

Weight		Column I		Column II
5	17.	Repairing the undercarriage of a locomotive.	A.	Organizational.
5	18.	Replacing unserviceable parts.	B.	Direct support.
5	19.	Overhauling and rebuilding equipment.	C.	General support.
5	20.	Servicing equipment before, during, and after operation.	D.	Depot.

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SOLUTIONS

TRANS SUBCOURSE 660................Military Railway Equipment.

(All references are to Reference Text 660.)

Weight	Exercise		
5	1.	F.	(par. 2.20c)
5	2.	F.	(par. 2.20)
5	3.	T.	(par. 2.6)
5	4.	F.	(par. 2.2b)
5	5.	T.	(par. 2.2c)
5	6.	T.	(par. 2.17)
5	7.	F.	(pars. 2.17, 2.18)
5	8.	F.	(par. 2.19)
5	9.	A.	(par. 2.2b)
5	10.	C.	(pars. 2.2c, 2.18)
5	11.	B.	(pars. 2.2d, 2.14)
5	12.	C.	(par. 2.18)
5	13.	D.	(pars. 2.2a, 2.19)
5	14.	D.	(par. 2.2a)
5	15.	C.	(par. 2.2)
5	16.	A.	(par. 2.2b)
5	17.	C.	(par. 3.5)
5	18.	B.	(par. 3.4)
5	19.	D.	(par. 3.2d)
5	20.	A.	(par. 3.3)

MARCH 1976

Supersedes Trans 660, Military Railway Equipment April 1972.
TO BE USED WITH REFERENCE TEXT 660, APRIL 1972.

NOTICE TO STUDENT

Trans Subcourse 660

16 March 1976

CORRESPONDENCE COURSE
OF
THE U. S. ARMY TRANSPORTATION SCHOOL

IMPORTANT

Supplement No. 1 to Reference Text 660, Military Railway Equipment, April 1972, is published to make you aware of the field army reorganization that is taking place. DO NOT base your answers to the questions in the lesson exercises or examination on the information in the supplement. Answer all questions based on the material in the reference text.

REFERENCE TEXT
660

SUPPLEMENT NO. 1

16 March 1976

U. S. ARMY TRANSPORTATION SCHOOL

Supplement to REFERENCE TEXT 660, MILITARY RAILWAY EQUIPMENT, April 1972

The theater Army organization is being revised under the Echelons Above Division (EAD) study. The EAD eliminates the field army support command (FASCOM) and its subordinate support brigades and replaces them with a newly formed corps support command (COSCOM). The study concentrates on merging the theater army support command (TASCOM) headquarters with the theater army (TA) headquarters; eliminating the materiel command (MATCOM), with its field depots and COMMZ depot distribution system; establishing the COSCOM in the combat zone and the theater army area command (TAACOM) in the COMMZ as the highest organizational levels of supply and maintenance support in the theater; and incorporating supply concepts relying more heavily on CONUS theater oriented depots for direct supply as close to the using unit as possible.

Department of the Army doctrine covering the new concept has not been published. When the doctrine is published this text will be revised to reflect the new concept.

REFERENCE TEXT 660

MILITARY RAILWAY EQUIPMENT

The information contained herein is provided for instructional purposes only. It reflects the current thought of this school and conforms to printed Department of the Army doctrine as closely as possible. Development and progress render such doctrine continuously subject to change.

U. S. ARMY TRANSPORTATION SCHOOL

April 1972

Supersedes Reference Text 660, Military Railway Equipment, November 1968.

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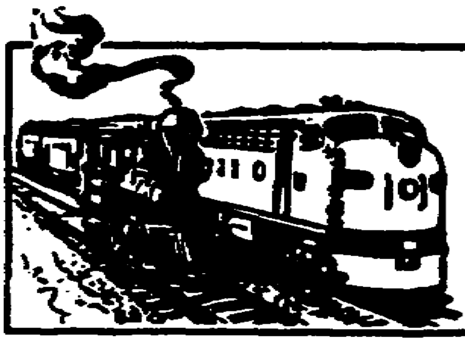


INTRODUCTION

Many old-time railroaders sigh with nostalgia when a steam locomotive is mentioned. But the hissing of steam has long since given way to the efficient whir of the diesel electric. The first American diesel locomotive was introduced in 1925 when a 300-horsepower one was used, rather inconspicuously, as a switch engine in a freight yard.

On class I railroads, steam locomotion still dominated 20 years later--39,000 steamers compared to just 3,800 diesels. Within another 7 years, the diesels outnumbered the steam locomotives 30,500 to 16,000. By 1960, steam locomotives were no longer being used on the main line--their number had dropped to 261 while the diesel fleet had grown to 28,278.

Who knows what the future will bring? A sigh of nostalgia for the diesel-electric locomotive? Perhaps. The diesel-electric as well as its only surviving competitor, the all-electric, may be made obsolete by the turbine engine or the linear induction engine--or maybe some power system yet to be created.

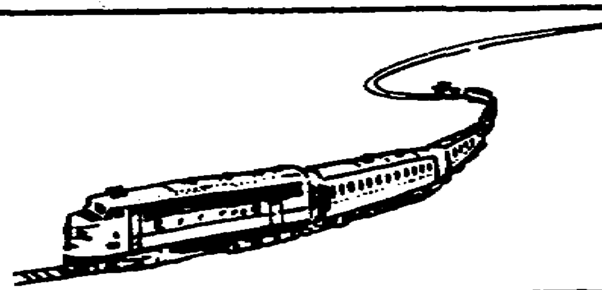
Over the years, commercial rolling stock has changed; it's bigger, better, and, in some instances, highly specialized. But the basic house cars, gondolas, and flats are still in use and will long continue. The bigger cars have increased the fleet's capacity while the total number of cars has decreased. The many different kinds of specialized cars are designed to meet the particular needs of certain shippers, military and civilian.

The Army also owns, operates, and maintains diesel-electric locomotives and various types of rolling stock. Suppose you received an assignment to plan a rail operation for providing logistical support to combat troops in a theater of operations. You would need to know what rail equipment you had to move troops and supplies to the frontlines, and who would maintain it. This text, consisting of three chapters, introduces you to some of the rail equipment the

Army has to provide rail support for a tactical mission, the type best suited for specific jobs, and the men who maintain it. Chapter 1 describes the Army's diesel-electric locomotives and how they are classified. Chapter 2, divided into two sections, discusses railway rolling stock with emphasis in section I on the fleet specially designed and built for use in any theater of operations. Section II discusses some other types of rolling stock including piggyback and container equipment. Finally, chapter 3 outlines briefly the Army maintenance system and explains who is responsible for maintaining military railway equipment.

Chapter 1

MOTIVE POWER



1.1. GENERAL

Fast, powerful, reliable, and economical, the modern, highly developed diesel-electric locomotive has undoubtedly found a permanent niche for itself as a prime mover. It requires a minimum of maintenance, low-cost fuel oil, a small supply of water, and a short warmup period. The diesel engine of the locomotive can produce more heat units of work more efficiently than any other engine and is used as a source of motive power for locomotives throughout the world. The efficiency of diesel engines from 100 to 2400 indicated horsepower, as the source of energy to turn electrical generators, has been adequately proven.

The U.S. Army owns diesel-electric locomotives for training transportation railway service personnel in their operation, for use in utility railroad service, and for combat logistical support. This chapter describes the Army's locomotives and explains the system used to classify them.

1.2. DIESEL-ELECTRIC LOCOMOTIVES

A diesel-electric locomotive is an efficient, self-contained unit with all parts properly coordinated for providing motive power for railway equipment. The major parts are the diesel engine to furnish primary power, a generator, electrical equipment to transmit power from the generator to wheels, trucks to keep driving wheels on rails, and an under frame and a cab to hold the trucks in line and to support the diesel engine, generator, control equipment, air compressor, and other necessary equipment.

The diesel engine in the locomotive is an internal combustion engine similar to that used in the automobile. The diesel engine uses compression ignition, a process whereby air is compressed to extremely high pressure resulting in high temperature within the cylinder. Then fuel oil, injected into the cylinder, is ignited by the high temperature of the compressed air. On the other hand, an automobile engine uses a mixture of gasoline and air which is ignited by a spark from a spark plug. The mechanical energy output of the diesel engine is converted by a generator into electrical energy which powers the traction motors that drive the axles and turn the locomotive's wheels.

Three representative diesel-electric locomotives that the Army owns and operates are described briefly in subparagraphs a through c. The classification 0-6-6-0, etc., is explained in paragraph 1.3.

a. The 0-6-6-0, 120-ton road switcher locomotive, shown in figure 1.1, is designed for use in heavy-duty road and yard service. It may be used in single or multiple units on standard and broad gage railways, This 120-ton, 1600-horsepower locomotive is highly versatile, suitable for operation under extremes of climate, and adaptable for both foreign and domestic coupling arrangements. This locomotive is often referred to as MRS-l--the MRS stands for military road switcher.

Figure 1.1. Diesel-Electric Locomotive, Road Switcher, 0-6-6-0.

b. The 0-4-4-0, 100-ton, SW-8 locomotive, shown in figure 1.2, is designed for heavy-duty road and switching service on standard-gage railroads both in the continental United States and foreign countries. It has an 800-horsepower engine and has multiple-unit capability.

c. The 0-4-4-0, 60-ton locomotive, shown in figure 1.3, can be used for both road and switching service. It may be used in single or multiple units on broad gage railroads. This locomotive has a 500-horsepower diesel engine and can be used on both

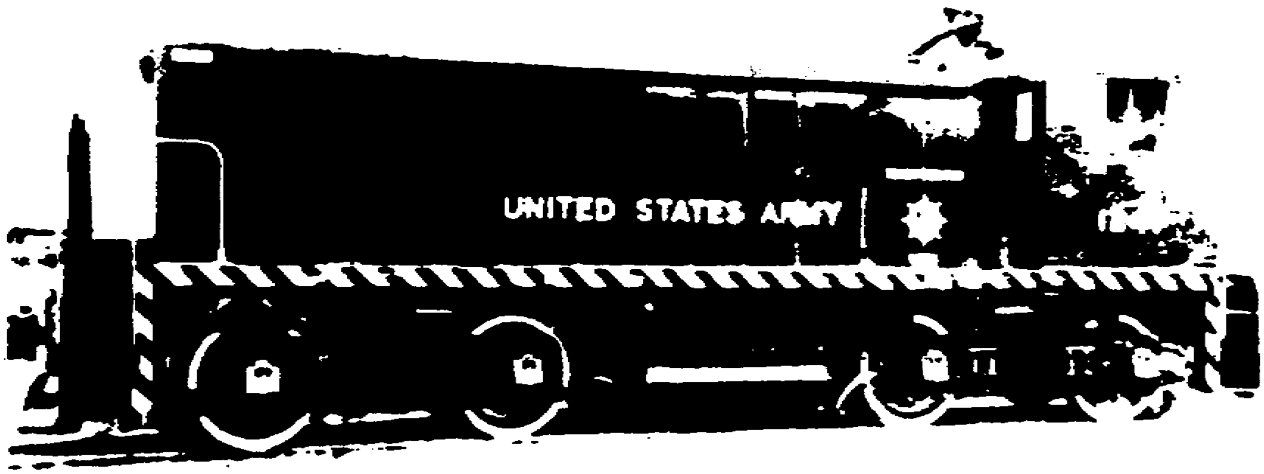


Figure 1.2. Diesel-Electric Locomotive, Road and Switching, 0-4-4-0, 100-Ton.

continental United States and foreign railroads. Its drawhook and buffer kit converts it for use on European railroads.

Figure 1.3. Diesel-Electric Locomotive, Road and Switching, 0-4-4-0, 60-Ton.

1.3. CLASSIFICATION

Locomotives have been classified in various ways--by size, by horsepower, and by tractive effort. However, none of these is completely descriptive or adequate for all purposes. The most widely used and accepted system of classification is the Whyte Classification System. It was developed about 1900 by F. M. Whyte, a mechanical engineer on the New York Central and Hudson Railroad. The system is generally accepted in Great Britain and the British Commonwealth and in North and South America.

The Whyte classification is based on the number of locomotive wheels on the axles of each type of truck. Wheels or trucks are of three types--leading (front), driving, and trailing (rear). Truck is the term used to designate a wheeled assembly that supports a locomotive or a car body. The Whyte system uses a series of digits or numerals separated by hyphens to specify the number of wheels in each type of locomotive truck. The first numeral denotes the number of wheels in the leading truck, the next one or two represent the number in the driving group, and the last specifies the number in the trailing truck. The numerals always refer to the wheels from front to rear. Digits are never omitted; if there are no leading or trailing wheels, a zero is used.

All wheels on Army diesel-electric locomotives are drivers; there are no leading or trailing wheels. The diesels have either two sets of six-wheel trucks or two sets of four-wheel trucks. Therefore, the digits 0-6-6-0 denote no leading or trailing wheels and 2 sets of 3 driving axles with 2 wheels on each, or a total of 12 driving wheels. Likewise, an 0-4-4-0 locomotive would have no leading or trailing wheels and two sets of two driving axles each, or a total of eight driving wheels. Figure 1.4 illustrates the Whyte system of classifying diesel-electric locomotives.

Another system, commonly used in Europe and other parts of the world, uses letters and figures to identify a diesel or electric locomotive by its axles. Letters are used for driving axles and numbers for nondriving axles. In this system, "A" stands for one driving axle, "B" for two, "C" for three, and "D" for four. A small "o" placed after the initial letter shows that each axle is individually powered. Thus, a single unit locomotive with two individually powered two-axle trucks would be classified as a Bo-Bo. One with three axle trucks in which the center axle is an idler would be designated as an A1A-AlA.

1.4. SUMMARY

Diesel-electric locomotives have internal combustion engines to furnish primary power and electrical equipment to transmit the power from the engines to the driving wheels. In the engine's

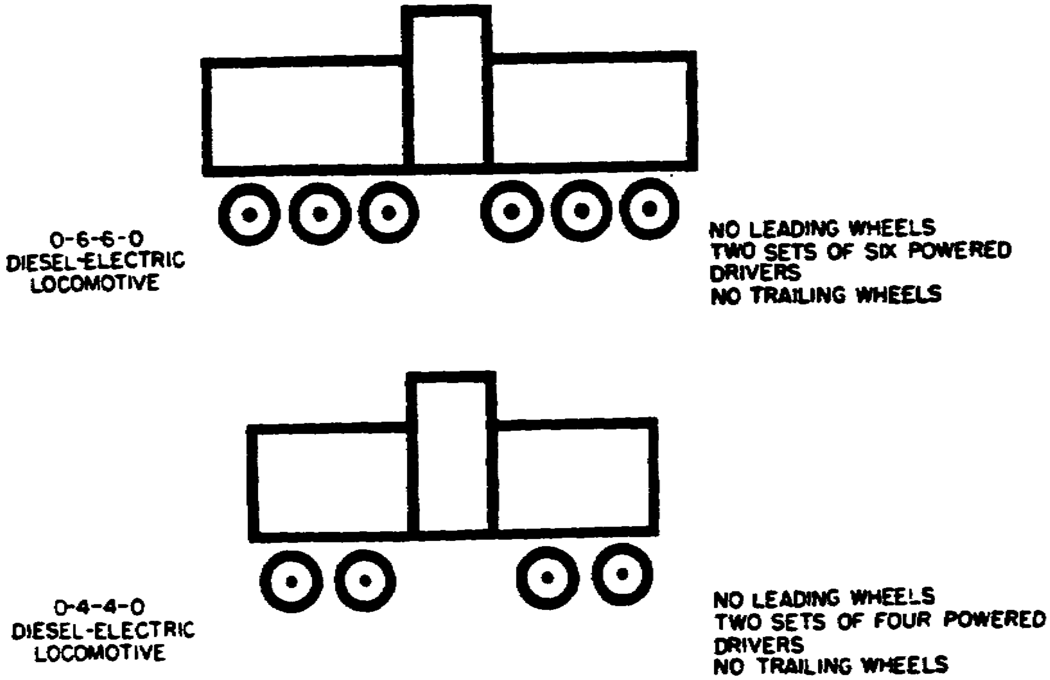


Figure 1.4. Whyte Classification of Diesel-Electric Locomotives.

cylinder, highly compressed air reaches a high temperature and provides the spark that ignites the fuel oil as it is injected into the cylinder.

Army locomotives are classified under the Whyte Classification System, according to their wheel arrangement from front to rear. A series of digits separated by hyphens specify the total number of wheels on the axles of each type of truck beginning with the leading truck, next the driving wheels, and then the trailing truck. Army diesel-electric locomotives have neither leading nor trailing trucks; all wheels are drivers. These locomotives generally have two sets of either four-wheel or six-wheel trucks.

Chapter 2

ROLLING STOCK

2.1. GENERAL

The first railway cars were merely horse-drawn wagons. They were introduced in England in 1602 to transport loads of coal from English mines to navigable streams where the coal was transferred to vessels. The wagons were equipped with handbrakes to reduce their speed when they started rolling faster than the gait of the horses that pulled them. They had wooden wheels and rolled on wooden wagon ways or rails, called tramways. Experience soon proved that the wooden wheels and rails wore out quickly and had to be replaced frequently. This led to the use of metal wheels and rails. But, as time passed and industries grew, the limited capabilities of the horses and wagons could not meet the demands of transporting the ever-increasing tonnages. Some method of transportation was needed that could both carry heavier loads and withstand long use.

When the steam locomotive was built to replace the horses of the wagon roadways, iron rails and later steel ones were developed. Railway cars were designed and built to replace the horse-drawn wagons. The original railway cars were constructed to handle minimum loads as were locomotives, roadbeds, and track structures. Through the years, roads and structures have been improved and the equipment made more efficient, larger, heavier, stronger, and safer. Railroads and private-car owners, including the Army, now own and operate a vast heavy-duty railway fleet.

Today's piggyback and Flexi-Van cars provide a high degree of flexibility which minimizes empty-car movements on return trips. Containerization is expanding continually and is being used increasingly. With containers, the flatcar becomes an all-purpose car with the advantage of fast loading and unloading. Freight-handling labor is reduced, and damage to the lading is decreased.

This chapter describes some of the railway equipment the Army owns. Emphasis is placed on the foreign service or knockdown fleet that can be used in a theater of operations anywhere in the world. The chapter also discusses other freight cars, passenger and special equipment, and a recently developed rail car which may prove to be very desirable in the transportation of nuclear weapons.

2.2. TYPES OF ROLLING STOCK

Railway rolling stock is classified into four general types: house cars, open-top cars, flatcars, and tank cars. All railway cars except flatcars have six general components: trucks, brake gear, draft gear, couplers, underframe, and superstructure. Since flatcars have no superstructure, they have only five general components. The following subparagraphs discuss each of the four types of cars in the order mentioned.

a. House cars have an enclosed superstructure with sides, ends, and roof and usually doors, vents, ladders, and rooftop running boards. Boxcars, refrigerator cars, and cabooses are examples. Since boxcars and refrigerator cars are discussed in paragraphs 2.13 and 2.19, only the caboose is described here. A caboose is a car attached to the rear of a freight train. It accommodates the conductor and flagman and serves as their office and quarters while in transit. The caboose also carries supplies, tools, and car parts that might be required en route.

b. Open-top cars, such as gondolas, ballast cars, and hoppers, normally have sides and ends. However, both types of hopper cars, covered and open-top, are included in the open-top car category. The following subparagraphs describe the two types of hoppers and the ballast car. The gondola car is discussed in paragraph 2.12.

(1) Covered hoppers are permanently enclosed, weather-tight cars with fixed sides, ends, and roofs. Openings with weather-tight covers or doors are provided in the roof or sides through which the cars are loaded. For unloading, the cars may have openings in the bottom with tight-fitting covers, doors, ports, or valves, or roof and side openings through which freight may be discharged. Covered hoppers may be partitioned into compartments.

(2) Open-top hoppers are similar to gondolas except that they have higher sides and ends, and generally interiors with self-clearing features. For example, a sloping construction of the car bottom and compartments that end at openings equipped with doors provide for discharge of the car's contents. Open-top hopper cars are of many types that vary according to the size and class of commodities they carry. Some have twin hopper pockets while others have quadruple ones; each has a door for discharging lading.

(3) Ballast cars are similar to low-side gondolas except that the load may be discharged from the sides. Sometimes referred to as side-dumping gondolas, these cars are used for hauling ballast, sand, gravel, or small loads of coal.

c. Flatcars have no housing or body; they simply have a floor laid over the underframe sills. The load capacities of flatcars range from 50 to 250 tons. Examples are the basic flatcar and the depressed-center one; they are described further in paragraphs 2.11 and 2.18.

d. Tank cars are those with tanks mounted on special underframes. They carry many kinds of liquid and semiliquid commodities ranging from milk to TNT. The Interstate Commerce Commission (ICC) issues regulations and specifications governing tank cars used in the United States. These specifications are combined with those of the Association of American Railroads (AAR) to make one set of specifications covering car construction that the ICC publishes. For oversea use, the specifications are modified because of emergency austerity demands.

2.3. FREIGHT EQUIPMENT FOR MILITARY USE

The first instance of rail cars being used for military purposes probably occurred during the Civil War when mortars were permanently mounted on railroad flatcars and moved into an area to support troops. In 1917, five naval railway batteries were built and shipped to France for use in World War I campaigns. Each battery consisted of a gun car carrying a 14-inch gun, and ammunition, workshop, kitchen, and berthing cars. The 14 cars of each battery were probably the first rail cars used entirely for military purposes.

Army railway motive power and rolling stock built for use in domestic service differ little in design from standard U.S. commercial rail equipment. In comparison to foreign equipment, however, it is generally larger and heavier. When World War II began, European rolling stock had a small carrying capacity and was scarce in all theaters of operations. Many cars were hurriedly designed and built in the United States and shipped overseas knocked down to save shipping space, and a few American cars were modified for use on European railroads. This experience led to the development of a railway fleet capable of operating on railroads of various gages which could be sent quickly to areas of conflict. Some of the equipment can be shipped knocked down to conserve shipping space. Section I describes the knockdown equipment.

Section I. Knockdown Fleet

2.4. GENERAL

Experience in World Wars I and II showed that foreign railway systems were incapable of sustaining combat operations because the capacity and the amount of foreign rail equipment were not enough for military purposes. The U.S. Army realized it had to be prepared to produce its own motive power and rolling stock should it again engage an enemy on foreign soil.

Soon after World War II, the Army began to develop a railway fleet suitable for use in any future theater of operations. The objective for railway cars was a modified American car design capable of operating in any foreign country in a train with local equipment. Starting with a basic flatcar that could be converted to a gondola or boxcar by addition of the proper superstructure, these cars were to be designed to work with the coupling and braking systems on equipment used on principal railroads of foreign countries, and to be capable of operating on railroads of various gages. Keeping in mind these requirements, American designers developed a basic flatcar.

In addition to the domestic service equipment, the Army inventory contains a knockdown fleet of 40-ton equipment designed and built primarily for emergency oversea service. Another one for use on narrow-gage track in foreign theaters was proposed but not procured; it was to consist of 76-ton diesel-electric locomotives, 30-ton gondolas, 30-ton flatcars, and 55-ton depressed center cars. The 40-ton fleet consists of more than 11,000 items of motive power and rolling stock in storage at various Army depots and installations. Paragraphs 2.5 through 2.10 discuss generally the construction and major components of the cars in the foreign service fleet and the basic procedure of assembling knockdown cars. The remainder of the section and accompanying figures describe cars of the fleet that can be assembled or partially assembled in a theater, and explain their assembly and conversion.

2.5. CONSTRUCTION

Because of the expected shorter life of emergency equipment used in a theater of operations as compared with standard equipment, the fleet is constructed as simply and economically as military standards permit. Designers of the equipment found that physical characteristics of foreign railroads would limit capacity and dimensions. For example, track and bridge load limits would determine the equipment's axleload while clearances would affect its dimensions.

The designers decided that a capacity of 40 tons was best for transporting military supplies and equipment on standard- to broad-gage railroads--56 1/2, 60, 63, and 66 inches. Design modifications were based on the equipment's shorter life expectancy and on regulations expected to govern rail operations in a theater. The emergency oversea equipment is designed and built to meet clearance limitations of foreign railroads. The major assemblies and components of the different types of knockdown cars are interchangeable. Paragraphs 2.6 through 2.9 discuss four of the basic components of railway cars of the knockdown fleet with the exception of tank. cars; paragraph 2.10 discusses their assembly.

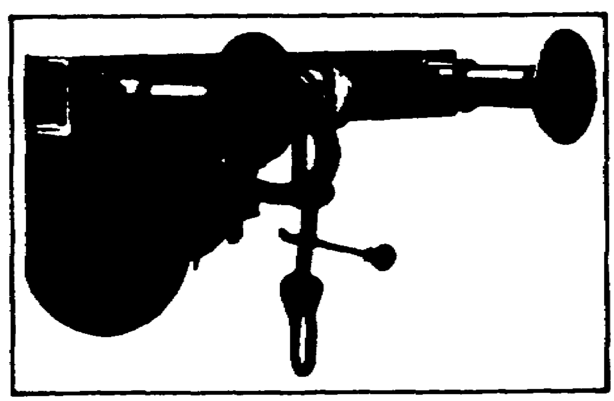
2.6. TRUCKS

Multigage trucks enable the knockdown fleet to operate on railroads of various widths--those with standard to broad gages. The trucks can be adapted to the different gages, or an entire truck may be removed and another substituted. Changing the gage of the wheels when once set on multigage trucks can be accomplished only by a general support maintenance unit. Wheels cannot be pushed in or out at will; a heavy-duty wheel press is required.

The multigage trucks can be applied to locomotives, wrecker and locomotive cranes, snowplows, and other rail equipment. Trucks and wheels used on equipment of the fleet conform to the standards of the Association of American Railroads and are completely interchangeable among cars of the same capacity. Only the major assemblies, however, are interchangeable among the trucks themselves. A diagram of a typical railway truck is shown in figure 2.1.

2.7. COUPLERS

Because the fleet is designed primarily for service in an oversea area, it is equipped with the hook and link coupler used predominantly in Europe, Russia, and other parts of Asia. The inserted sketch shows the hook and link of the coupler as well as the bumpers for absorbing jolts. Figure 2.2 is a model of a car equipped with a hook



and link coupler and end bumpers. The equipment of the fleet is designed so that it can also use the standard automatic U.S. coupler.

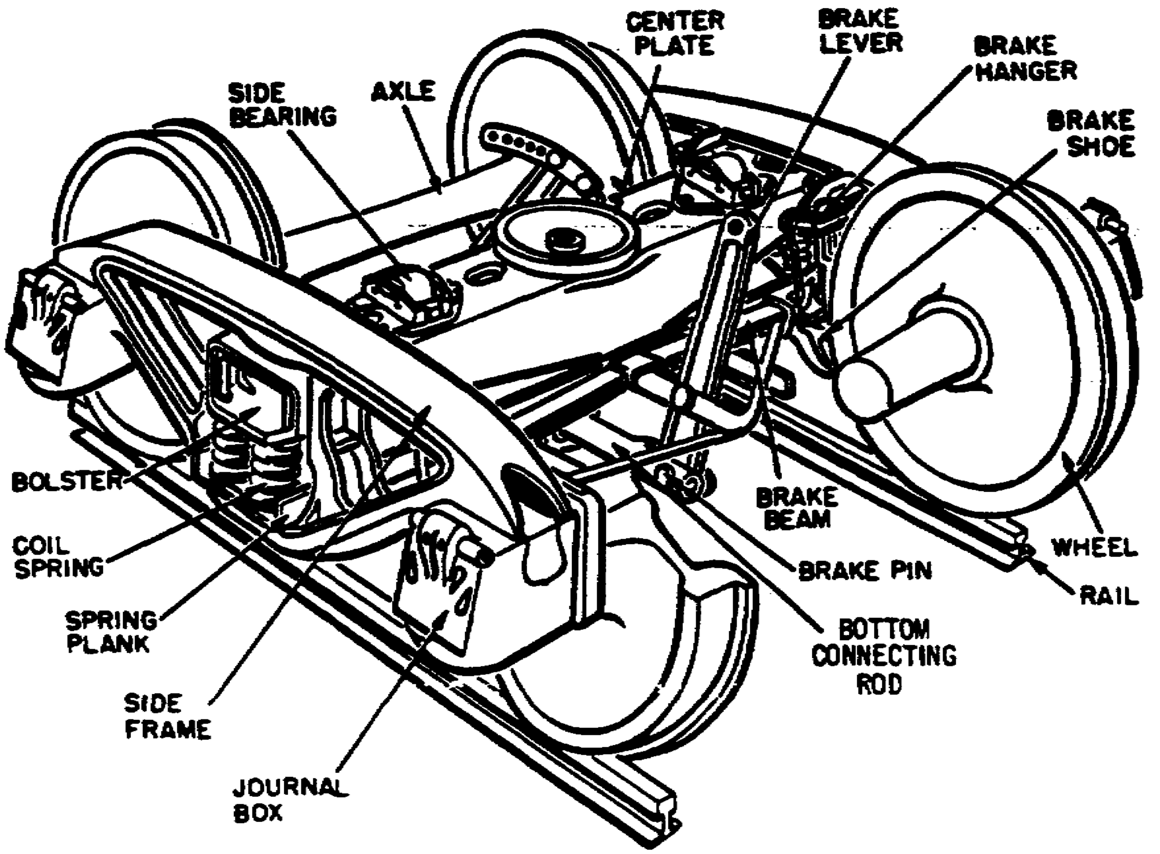


Figure 2.1. Typical Railway Truck.

2.8. UNDERFRAMES

Equipment of the fleet uses steel underframes completely fabricated and drilled at carbuilders' shops in the United States. All underframes for flatcars, gondolas, and boxcars are assembled in the same way. Wooden plank flooring is laid over the underframe.

2.9. SUPERSTRUCTURE

Made generally of wood with metal reinforcement bars, the superstructure units provide only rigidity. They are not designed to support any appreciable amount of the weight of the lading. The superstructure units are prefabricated, punched, and drilled for rapid assembly.

Figure 2.2. Railway Car With Hook and Link Coupler.

2.10. ASSEMBLY

The general method of assembling a car of the knockdown fleet, with the exception of tank cars, follows. First, assemble the trucks and the underframe. Then, install miscellaneous items to underframe, including airbrake equipment, and apply to the underframe's end sill such parts as coupling, draft gear, buffers, and blocks. Next, mount the underframe assembly to the trucks. Lastly, attach body side bearings, shims, and wear plate to body bolster. When required, add the proper superstructure. The components of unassembled cars are packaged in quantities that permit issue of cars in multiples of 10; components common to all cars are packaged separately from those peculiar to one type of car.

2.11. FLATCAR

Known as the workhorse of rail service, a flatcar is used to transport very large and very heavy items. The basic unit of the knockdown fleet is the flatcar. It is simply a floor laid over the underframe sills and placed on trucks; it has no housing or body. Figure 2.3 shows the major components of the flatcar, and figure

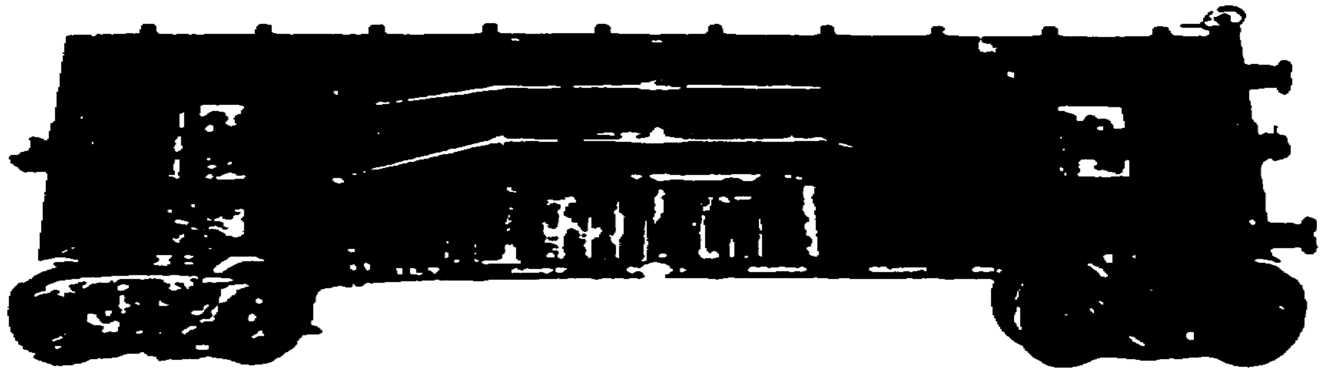


Figure 2.3. Components for Assembling Flatcar.

2.4 shows the car after assembly. Flatcars of the knockdown fleet are structurally designed with load capacities of 40 tons. In addition to serving as regular flatcars, the 40-ton cars also provide the foundation to which superstructure units can be added to convert them to gondolas and boxcars.

Figure 2.4. Assembled Flatcar.

Underframes for flatcars of the 40-ton fleet are shipped with the wooden floor already laid. Flatcar underframes are completely interchangeable with any other car of the fleet. The side and end sills of the flatcar are prefabricated, punched, and drilled.

In a theater, the flatcar is generally used for very early rail operations. When theater activities stabilize and requirements increase for transportation of supplies that need protection from weather or pilferage, the flatcar can be converted to a closed car. After conversion, the weight of the lading is still carried by the car bed. The superstructure provides rigidity, not support. Because of its versatility, the flatcar is the backbone of the fleet.

2.12. GONDOLA

By the addition of the sides and ends, the basic flatcar becomes a gondola. Either high-side, 48-inch, or low-side, 18-inch, gondolas may be assembled depending on the height desired; the only difference in the two cars is the height of the superstructure. Figure 2.5 shows a flatcar being converted to a high-side gondola, and figure 2.6 shows it after assembly. The sides and ends of gondolas in the knockdown fleet, made of 1 1/2-inch tongue-and-groove wood sheathing with metal reinforcement bars, may be used on the 40-ton flatcar underframes with minor adjustments to the corner bands and ends.

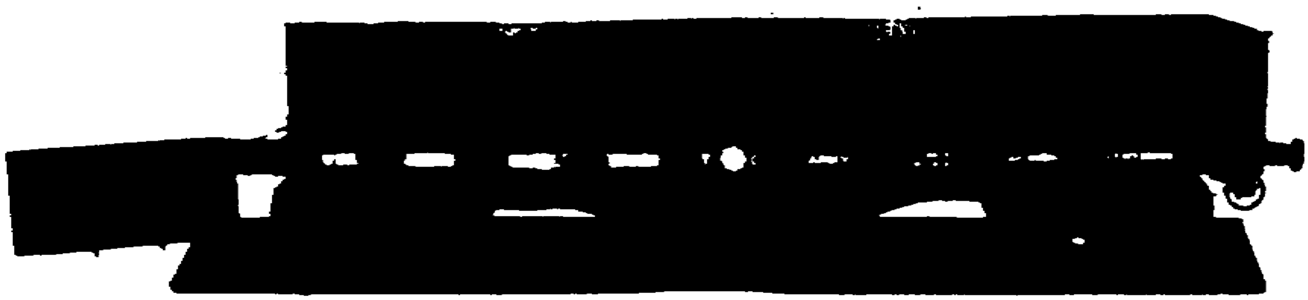


Figure 2.5. High-Side Gondola Before Assembly.

Figure 2.6. High-Side Gondola After Assembly.

Conversion of the flatcar to a gondola consists generally of positioning sides to underframe side sills and securing them in place, fastening handholds, and positioning end assemblies and securing to corner posts on all corners of the car. Gondolas can transport a variety of heavy and bulky items. They are used primarily for carrying such materials as coal, ore, stone, lumber, iron and steel products, and machinery. If necessary, they can be used to transport troops.

2.13. BOXCAR

Enclosed with sides and ends and having a roof, the boxcar is designed to carry commodities that must be protected against breakage, pilferage, or weather damage. Like the gondola, the boxcar of the knockdown fleet can be assembled by adding the proper superstructure to the flatcar underframe.

Made of a light frame with plywood lining, the superstructure consists mainly of sides, ends, doors, and a roof. The sides are constructed in four separate sections, two for each side; the ends are single units; and the roof is one unit. The door assembly consists of a door track, threshold plate, and door. Figure 2.7 shows the flatcar underframe with boxcar superstructure unassembled, and figure 2.8 shows the assembled boxcar with the door open.

Figure 2.7. Underframe With Boxcar Superstructure Units.

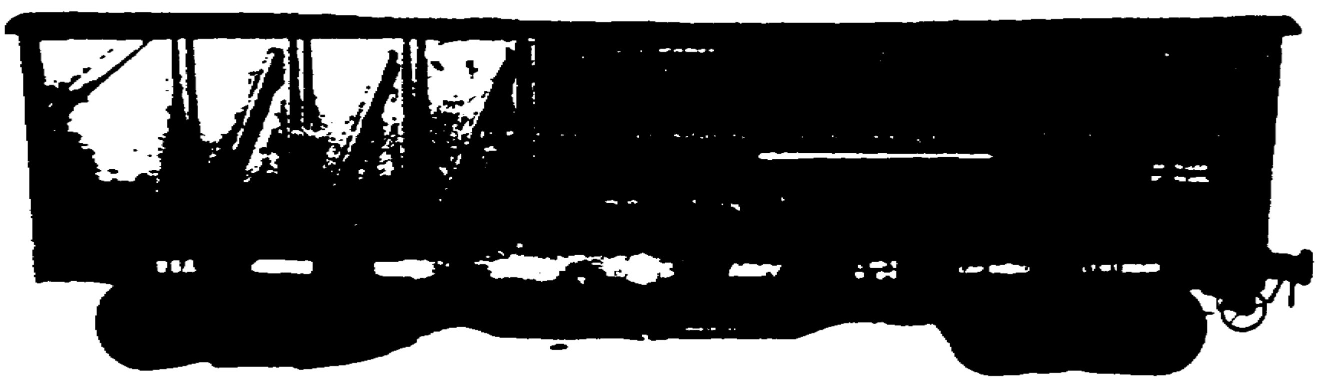


Figure 2.8. Assembled Boxcar With Door Open.

To assemble the car, the underframe is assembled the same as for the flatcar with the exception of camber adjustment, corner connection angles, sill steps, and handholds. The two side sections adjacent to one end of the car are first attached to the underframe; then the end unit connecting those two side sections is attached to them and the end sill of the underframe. The same procedure is followed for the other end of the car. When the side sections and end units are erected and the door tracks and doors are in their proper place, the roof is positioned and secured to the corners and sides.

2.14. TANK CAR

A tank car consists of a tank, usually made of steel, mounted on a car with a special underframe. Except for its superstructure and a modified underframe, the tank car has components similar to other cars. The underframe is floored and steel running boards are built on each side at a height even with the flooring. Made of a corrosion-resistant material, tank shells may have either a single compartment or multiple ones. The ordinary tank car has a single compartment equipped with dome safety valves and bottom outlets.

To prevent corrosion, linings are required in steel tanks when acids are shipped in them. Some may be insulated to provide the even temperature required by certain commodities. In addition, some cars may have steam coils installed inside the tank shell to provide heat for lading. Tank cars are used for transporting liquid and semiliquid commodities such as oils, gasoline, alcohols, acids, coal-tar products, compressed gases, fruit juices, and milk. Tank capacities usually range from 5,000 to 10,000 gallons. A typical U.S. Army tank car is shown in figure 2.9.

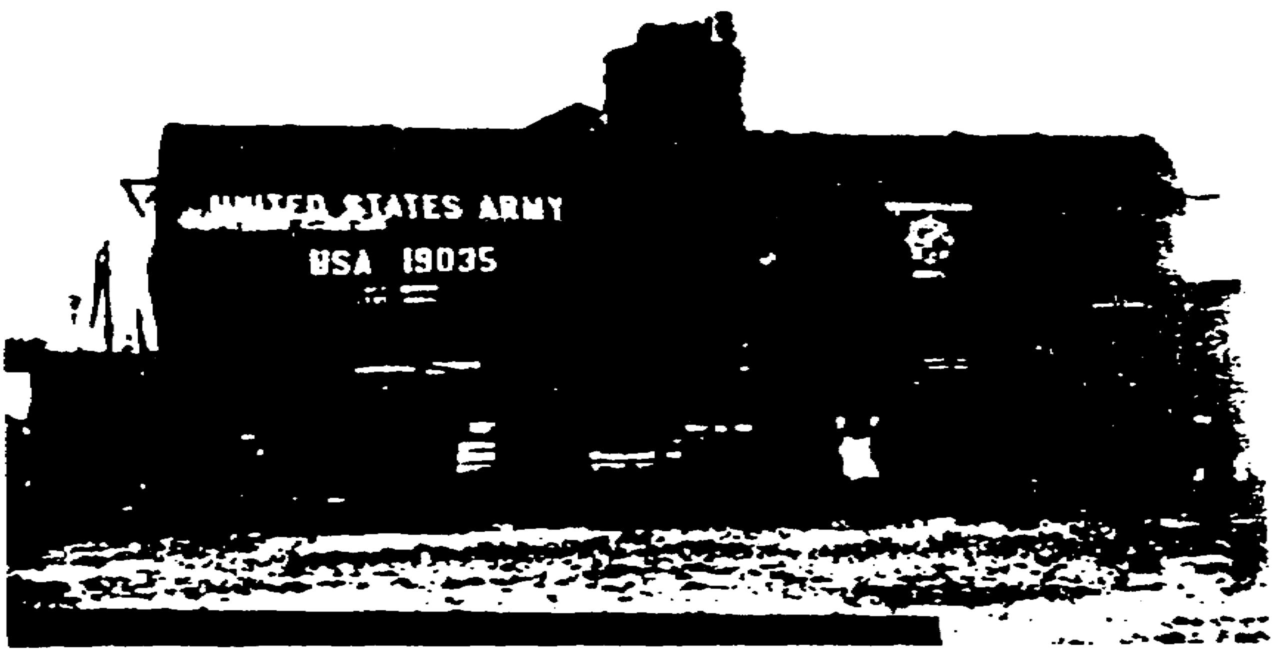


Figure 2.9. Typical U.S. Army Tank Car.

Tank cars in the foreign service fleet have single compartments and would normally carry petroleum products. The 5,000-

gallon car operates on narrow-gage railroads, while the 10,000-gallon one runs on standard- to broad-gage tracks. The car manufacturer assembles the tank unit to the car underframe along with the outlet and safety valve assemblies and dome cover. The remaining work can be done in the field. It consists of assembling and applying the following: subcenter sill and center plate to the tank and underframe assembly; tank and underframe assembly to the trucks; miscellaneous items such as brake equipment supports to underframe; parts to end sill; airbrake to underframe; body side bearings, shims, and wear plate to body bolster; and such miscellaneous items as tank ladder and braces to tank car body and tank.

2.15. SUMMARY

Experience in World War II proved that the Army must be prepared to supply its own locomotives and rail cars in a theater of operations since many foreign countries have just enough rail equipment to support their own needs. Military tonnage requirements placed on these rail systems would not only exceed the capabilities of their equipment and facilities but also create near chaos in their operations. Therefore, to meet emergencies, the U.S. Army inventory contains a fleet of railway equipment specially designed and built for use in theaters of operations where standard- to broad-gage railroads are operated.

In developing the foreign service equipment, designers found that physical characteristics of foreign railroads would influence size and capacity. They decided that a capacity of 30 tons was best for equipment that would operate on narrow-gage railroads and 40 tons for equipment operating on standard to broad gages; however, only the 40-ton fleet was procured. The cars were fabricated, punched, and drilled at carbuilders' shops to provide for easy assembly in a theater. They can be shipped knocked down to conserve shipping space. Major components and assemblies are interchangeable. With minimum modification to the coupling arrangement and by substituting trucks or altering trucks to fit different gages, the 40-ton equipment can operate on from standard- to broad-gage track ranging from 56 1/2 to 66 inches.

The flatcar is the basic unit of the knockdown fleet. It can serve as a regular flatcar during early theater operations. When theater activities stabilize and other types of cars are needed, the flatcar can be converted in the field to a gondola or boxcar. Gondolas can be assembled by adding sides and ends to the flatcar. Depending on the height desired, either the high- or low-side gondola may be erected. When cars are needed to carry commodities requiring protection from the weather or pilferers, the flatcar can be converted to a boxcar by the addition of sides, ends, doors, and roof. After the flatcar has been converted to either a gondola or a boxcar, the weight of the lading is still carried by the bed of the car. Superstructure units provide rigidity but do not support any appreciable amount of weight.

Tank cars of the fleet are partially assembled by the car manufacturer who attaches the tank unit to the car underframe along with the outlet and safety valve assemblies and dome cover. The remaining assembly can be done in the field.

Section II. Other Equipment

2.16. GENERAL

In addition to the knockdown cars described in paragraphs 2.11 through 2.14, some heavier freight cars, some passenger cars, and some equipment built for special purposes are included in the foreign service fleet. This section discusses this rolling stock and, in addition, some of today's newer developments in rail equipment.

2.17. EIGHTY-TON FLATCAR

Some 80-ton flatcars are included in the oversea fleet for carrying ordnance and engineer equipment weighing more than 40 tons. An example is seen in figure 2.10. Similar to the 40-ton flatcars, only larger, these cars are designed to meet most railway operating restrictions in a theater. They are shipped knocked down and are packed for easy assembly; however, converting them to a gondola or a boxcar is not planned for at present. Because of their greater load capacity, each car is mounted on two 6-wheel trucks, three axles per truck, to avoid exceeding the low axleload limit on foreign railway track, bridges, and other rail structures which are designed to support a certain amount of weight per axle. With the 6-wheel truck, weight is distributed evenly over a greater area than with a 4-wheel truck, and more weight can be supported. The 80-ton flatcar is designed to operate on standard- to broad-gage railroads.

Figure 2.10. 80-Ton Flatcar.

2.18. DEPRESSED-CENTER FLATCAR

Flatcars with lowered or depressed centers have been designed and built for transporting ordnance and engineer material and equipment that would exceed permissible heights if loaded on regular flatcars. Their usefulness is measured mainly by the added headroom they afford for clearances. The 70-ton depressed-center flatcar designed for foreign service has two 6-wheel trucks, as shown in figure 2.11, and operates on from standard- to broad-gage track, 56 1/2 to 66 inches.

Figure 2.11. Depressed-Center Flatcar.

2.19. REFRIGERATOR CAR

Refrigeration is important in moving perishable items, and controlling the temperature is essential to protect such foods as fresh fruits and vegetables from freezing in transit. Refrigerator cars can be used for both purposes: to keep commodities cool and to protect them from too much cold. A car can be cooled with ice or by mechanical means. Standard refrigerator cars resemble boxcars in general outward appearance. The framework, sheathing, ends, and roof are similar to that used in standard boxcar construction except that insulation has been added and, in ice-cooled refrigerator cars, the roof has hatch openings through which ice is loaded. Figure 2.12 shows a refrigerator car with hatches visible.

Refrigerator cars developed for the foreign service fleet are 40-ton, eight-wheel, ice-cooled cars. They have the same type of underframe, trucks, and brake and coupler arrangement as the other cars in the foreign service fleet. The superstructure's outside sheathing is plywood. Two ice bunkers are installed, one at each end of the car, to receive ice from the hatch openings, and hinged metal racks are placed over the floor. The sides, ends, roof, and floor are insulated with fiberglass.

Figure 2.12. Ice-Cooled Refrigerator Car.

2.20. PASSENGER EQUIPMENT

Ambulance train cars are the only passenger equipment included in the foreign service fleet. Because of the experience of the Army Medical Service during the Korean and Vietnam wars, the rapid development of air transportation, and the quick evacuation of wounded from combat, the requirement for rail hospital cars in a theater is not as great as years ago. However, ambulance trains provide temporary facilities to care for sick and wounded patients while transporting them to central points where they can be evacuated by air to base hospitals.

After World War II, the Surgeon General requested that an ambulance train consisting of three types of cars, a ward, a medical personnel, and a kitchen-dining-storage car, be designed and developed for use on foreign railroads with standard to broad gages. The cars were to have a common underframe and superstructure design with interior arrangements and fixtures appropriate to each type. The 3-car prototype train was designed and constructed and has been placed in storage.

The cars of the ambulance train are constructed of steel and have interchangeable underframe and superstructure components; they are built to resist great impact forces and provide maximum safety and comfort. They have multigage four-wheel, passenger-type trucks, and the coupler arrangement is designed to permit rapid conversion to another coupling arrangement of the standard- to broad-gage trains. Each car is insulated, ventilated, and equipped with its own heating and power-generating plants and water supply system; only the ward car is air-conditioned. Car windows are designed for complete blackout. The three cars of the train are designed to operate as a unit to furnish complete railway ambulance facilities. Each type of car is discussed in the following subparagraphs.

a. Ward car. Located midway on both sides of the center aisle of the ward car are tier-type bunks to accommodate 30 litter patients or 12 litter and 24 ambulatory patients. Six bunks are stationary; 24 can be converted to seats. Other facilities necessary for the patients' comfort and care are included: sterilizing equipment, a lavatory, and an air-conditioning system. A receiving room is located at the platform, and sliding side doors provide for receiving patients into the car.

b. Medical personnel car. Personnel of the Army Medical Service are provided with sleeping quarters, dressing rooms, and toilet facilities in the medical personnel car. It is equipped with two air-circulating blower units, and it contains staterooms for 4 officers, 2 nurses, and 15 enlisted men.

c. Kitchen-dining-storage car. Space for storing medical and food supplies and for preparing and serving food is contained in the kitchen-dining-storage car. The car is divided into three sections: a kitchen with such cooking facilities as stove, refrigerator, steamtables, and bins to prepare complete meals; a dining area with tables to seat 24; and a cleaning area containing a service sink and storage space for medical, food, and cleaning supplies. This car also has an emergency water supply.

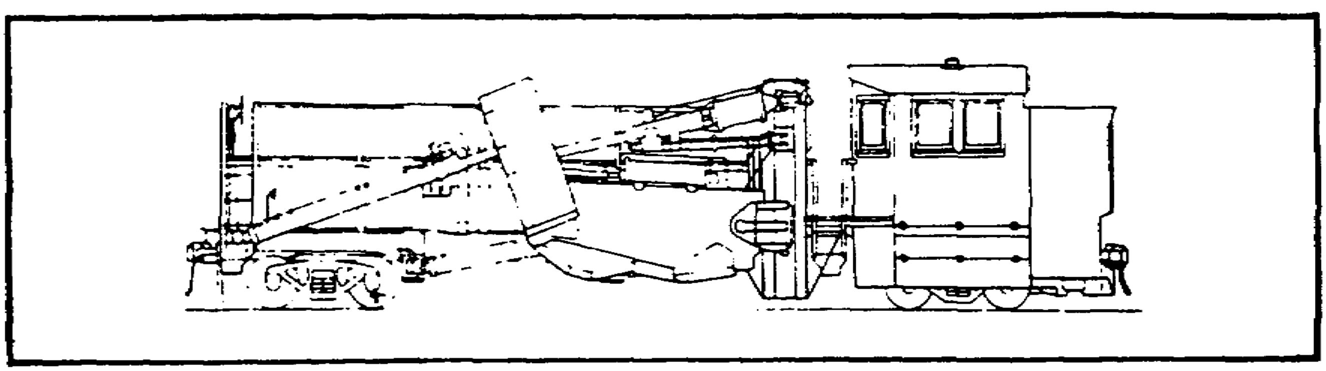
2.21. SPECIAL EQUIPMENT

To reduce the time required for various types of rail operations and to speed up repairs, laborsaving machinery and tools are provided. Special equipment designed for specific purposes has been built for use in railway operations. Two types of such equipment included in the foreign service fleet are cranes and snowplows.

a. Cranes. In loading and unloading cars and moving supplies and materiel, cranes help to speed up many railway operations. Clearing rail lines when traffic has been interrupted by washouts, landslides, wrecks, or other causes is one of the many tasks for which cranes can be used. The cranes in the foreign service fleet can be especially useful in handling heavy truck assemblies and bulky superstructure units in erecting cars of the knockdown fleet. Figure 2.13 shows a crane in use.

Figure 2.13. Typical Railway Crane.

b. Snow-handling equipment. Clearing snow and ice from railway tracks is important in keeping railroads operational in severe weather. The snow-handling equipment in the foreign service fleet is a year-round, multipurpose track maintenance machine. In addition to clearing ice and snow from tracks during the winter, this snowplow, also called a spreader-ditcher car, can be used during other seasons of the year to do a variety of jobs. Some of these include: spreading and leveling ballast, ditching, forming slopes and banks, moving dirt and fill material, widening roadbeds and cuts, building up and reinforcing roadbeds, and removing foul ballast from the ends of ties. A sketch of the spreader-ditcher is inserted below.



2.22. SPECIAL RAIL CARS

Some of the Army's highly refined weapons systems, such as missiles, rockets, and nuclear warheads, pose special transportation problems because of their size and sensitivity. While in transit, these weapons may be damaged by handling, environment, and the conveyance itself; therefore, special care must be taken in moving and protecting them. One of the more recently developed railway cars, designed for both piggyback and container service, is equipped with a shock-absorbing mechanism that provides a high degree of protection for the equipment and lading. Shown in figure 2.14, it has three basic elements: a container, a trailer chassis, and the piggyback rail car itself. The following subparagraphs discuss this equipment.

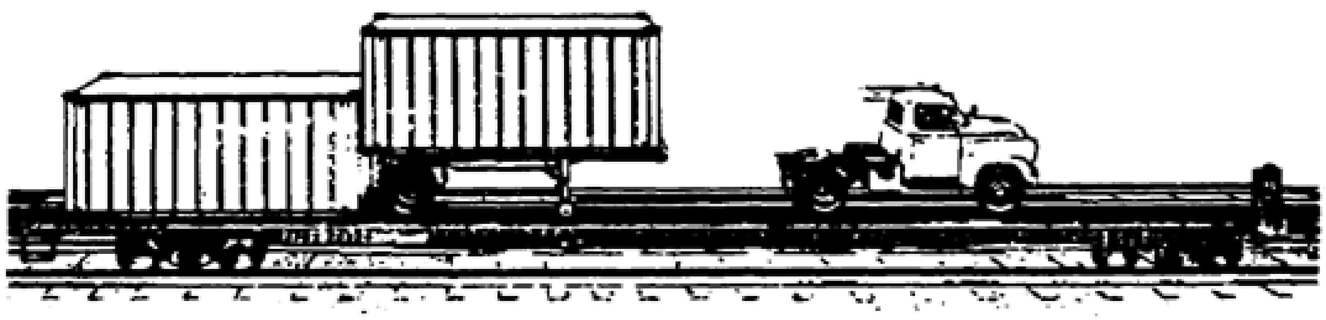


Figure 2.14. Piggyback Rail Service Equipment.

a. Container. Specifically designed and built to operate interchangeably between road, rail, and ship, the container is the key item in containerization transportation. It can be used in lift-on-lift-off or roll-on-roll-off service. The container is built with lifting eyes and stacking castings on all four corners and is engineered to withstand the stresses of lift-on-lift-off operations at ports, rail terminals, or loading docks. The corner post construction permits stacking of fully loaded containers. These features of design and construction are particularly desirable in ship operation where a crane is the one practical means of loading and unloading containers. Some containers have fork pockets that enable them to be loaded or unloaded by forklift trucks. Pulling a container on or off the rail car is done with a power-operated winch that provides the power to draw the container on or off the car. The container is locked to the rail car by the same kind of tiedown clamps used to secure ordinary truck trailers.

b. Trailer chassis. Designed and built to accommodate the container, the trailer chassis has devices that lock and unlock the container easily and quickly. The chassis is moved by a truck tractor that operates dependably on either rough country roads or smooth city streets. The chassis is equipped with piggyback adapter equipment so that it can be driven on or off the piggyback rail car. From front to rear, it is engineered and built for container service.

c. Piggyback rail car. Designed exclusively for container and piggyback service, the piggyback rail car is equipped with a shock absorber that absorbs 75 percent of the shock the car receives. A center guide automatically alines containers and trailers so that loading and unloading is a smooth, continuous, hands-off operation. An automatic tiedown hitch, operated from the truck tractor which is backed onto the rail car, secures trailers and containers to the shock-absorbing mechanism. Because the load is carried lower than on ordinary rail cars, this piggyback car provides railroad clearance for the largest trailers now normally in use. Provision is also made for possible future changes in the width of the trailers because there are no side rails to interfere.

Mixed loads of containers and conventional trailers can be hauled on the piggyback rail car. Without modification, it can transport containers, chassis--with or without containers, tank containers, tank trailers, semitrailers, furniture vans, and automobile carriers. The car is fully compatible with ordinary flatcars in both main-line and yard service. At present, the Military Traffic Management Command (MTMC) leases a limited quantity of this equipment when needed for use in domestic interchange. The equipment is not now a part of the Army's foreign service fleet.

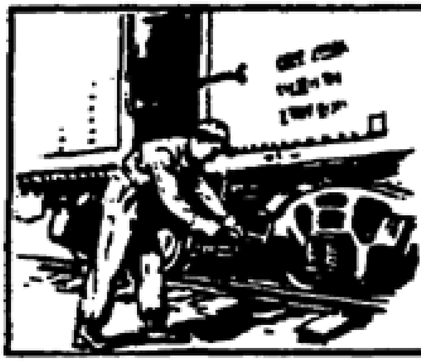
2.23. SUMMARY

The foreign service fleet contains special freight cars, such as the 80-ton and the depressed-center flatcars, for carrying very large and very heavy ordnance and engineer equipment. Included in the fleet are ice-cooled, fiberglass-insulated refrigerator cars to carry perishable items, and the cranes and snow-handling equipment to speed up various jobs and keep railroads operational.

The only passenger equipment included in the fleet is the foreign service ambulance train which consists of three types of cars: a ward, a medical personnel, and a kitchen-dining-storage car. A prototype of each of these three cars has been designed and built for standard- to broad-gage rails; they are now in storage. The ward car contains facilities for patient care and comfort including an air-conditioning system. Sleeping quarters, dressing rooms, and toilet facilities are included in the medical personnel car. The kitchen-dining-storage car contains a kitchen with facilities to prepare complete meals, a dining area where meals can be served, and a cleaning-storage area containing service sink and space for storing supplies.

Special equipment in the foreign service fleet are cranes and snowplows. Cranes help in handling heavy equipment, and the snow-handling equipment cleans ice and snow from tracks. In addition to its use during the winter months, this machine (also called a spreader-ditcher car) can be used during other seasons of the year for various track maintenance jobs.

Finally, MTMC leases a limited quantity of rail equipment designed for both container and piggyback service for use within the United States. Because of its great shock-absorbing capability, this equipment may be very effective for transporting highly sensitive weaponry. This equipment, however, is not presently a part of the foreign service fleet.



Chapter 3

MAINTENANCE OF EQUIPMENT

3.1. GENERAL

Maintenance is the work that every man in a unit must do to keep his equipment in first-class shape. In its simplest form, maintenance consists of cleaning, lubrication, repair, and preservation. It is important to safety; the failure of one small part in a locomotive or railway car may cause the loss of hundreds of lives because of an accident or the lack of delivery of material vital to combat forces.

Rail equipment used for the logistical support of combat forces must have proper maintenance. Having the best equipment money can buy is little better than having none if it is not taken care of. The foundation of any efficient rail operation is to have high standards of inspection and maintenance. In peacetime, high maintenance standards are the rule; in wartime in a theater of operations, however, some of these standards may have to be sacrificed to accomplish the main objective of the military railroads--getting troops and supplies to the front to support fighting armies.

This chapter discusses the Army maintenance system, how it relates to railway equipment, and the units responsible for maintaining this equipment.

3.2. CATEGORIES OF MAINTENANCE

The Army maintenance system, based on experience and practical operation, is divided into four categories: organizational, direct support, general support, and depot maintenance. The categories assign responsibility for specific maintenance tasks for specific items of materiel to specific levels of command. They are defined in the following subparagraphs. Paragraphs 3.3 through 3.5 explain how rail maintenance fits into these categories and who is responsible for each.

a. Organizational maintenance is normally authorized to, performed by, and the responsibility of a using organization on the equipment in its possession. This maintenance consists of functions and repairs within the capabilities of men, skills, tools, and test equipment authorized to a unit by a table of organization and equipment (TOE) or by a table of distribution (TD).

b. Direct support maintenance is normally authorized to and performed by a designated maintenance activity in direct support of a using organization on a return-to-user basis.

c. General support maintenance is authorized to and performed by designated TOE and TD organizations in support of the Army supply system. Repairs and overhauls bring materiel up to required maintenance standards and ready-to-issue condition based upon applicable supported Army area supply requirements.

d. Depot maintenance is performed by activities with a capability of overhauling, rebuilding, and repairing equipment beyond that of general support maintenance organizations. Depot maintenance augments the procurement program in satisfying overall Army requirements.

In the continental United States, depot maintenance of railway equipment is a responsibility of the Army Materiel Command. The maintenance is performed in selected commercial rail repair shops under contract. In a theater of operations, depot maintenance is not normally performed. If it were, for example in a large sophisticated theater, it would be a responsibility of the supply and maintenance command, theater army support command (TASCOM).

3.3. ORGANIZATIONAL MAINTENANCE

Men in the operating units of the transportation railway service perform organizational maintenance on equipment they use. Engineers, running the locomotives, and car inspectors check and service equipment each time it is used. On locomotives, the maintenance includes inspecting, cleaning, lubricating, adjusting, and replacing such minor parts as fuel injectors and subassemblies. On rolling stock, it includes inspection of airbrakes, running gear, and other parts, and examination and lubrication of journal boxes.

Organizational maintenance may be separated into three parts: before-, during-, and after-operation service.

_a_. _Before-operation service_ is performed by the equipment operators and users to find out if the locomotive and rail cars are ready for use and if there have been any changes since the last after-operation service. This may include no more than an inspection to insure that the equipment is ready to do its job; however, it should never be neglected.

_b_. _During-operation service_ consists of noting any unusual or unsatisfactory performance of equipment or components during their use. If any deficiencies are detected in a locomotive, they should be investigated, corrected if authorized, and then reported to the proper mechanics upon return from the road.

_c_. _After-operation service_ prepares the equipment to do its next job without unnecessary delay. Most of this service consists of inspecting a locomotive and rail cars to detect deficiencies that may be corrected before they develop into more serious problems.

3.4. DIRECT SUPPORT MAINTENANCE

The transportation railway equipment maintenance company of the transportation battalion has two platoons that are responsible for the direct support maintenance of locomotives and cars. _The car repair platoon_ is responsible for maintenance, repair, and inspection of cars. It performs light car repairs and inspects cars passing over the division for defects. On rolling stock, direct support maintenance includes replacing brakeshoes, installing airhose, repairing trucks, and changing defective wheels. _The diesel-electric locomotive repair platoon_ is responsible for maintenance and running repairs to locomotives, cranes, and similar equipment. Such maintenance includes repairing end items and replacing unserviceable parts, subassemblies, and assemblies--wheels and journals, for example.

Four railway service teams may be attached to the battalion to perform direct support maintenance on locomotives and rolling stock. They are the ambulance train maintenance detachment, the diesel-electric locomotive maintenance crew, the railway car repair crew, and the railway workshop mobile detachment. _The ambulance train maintenance detachment_ augments the railway car repair crew when required to perform direct support maintenance on ambulance trains. This team provides refrigeration and supply specialists necessary for this support. _The diesel-electric locomotive maintenance crew_ may be assigned to a railway battalion to perform direct support maintenance on locomotives and cars at a small terminal or to augment the battalion's capabilities. The railway car repair crew may be assigned to a railway battalion to inspect and perform direct support maintenance on railway cars at points distant from fixed facilities. As mentioned earlier, this team works with the ambulance train maintenance detachment in maintaining ambulance trains. The railway workshop mobile detachment provides direct support maintenance on diesel-electric locomotives and rolling stock in areas where static facilities are inadequate or nonexistent. The team's mobile shop can be mounted on rail cars.

3.5. GENERAL SUPPORT MAINTENANCE

In a theater of operations, general support maintenance is the responsibility of the diesel-electric locomotive repair company and the transportation railway car repair company. Both companies are normally assigned to the maintenance battalion of a supply and maintenance command field depot. They may be attached to a transportation railway group of TASCOM's transportation command since no one else but the railway service requires their support.

For locomotives, some examples of general support maintenance are repairing undercarriages, removing and installing traction motors, rewinding armatures, repairing electrical control equipment, and assembling and testing new diesel-electric locomotive units. All heavy repairs on railway cars, such as stripping and erecting, are made by the railway car repair company. It also assembles and inspects knocked-down equipment brought into the theater.

3.6. SUMMARY

The four categories of Army maintenance are organizational, direct support, general support, and depot. The four categories as they relate to railway maintenance are the responsibility of various units. For example, organizational maintenance is done by equipment users in the operating units. Direct support maintenance is provided by two platoons of the transportation railway equipment maintenance company. Four railway service teams may be attached to the battalion: the ambulance train maintenance detachment, the diesel-electric locomotive maintenance crew, the railway car repair crew, and the railway workshop mobile detachment. General support maintenance is performed by the diesel-electric locomotive repair company and the railway car repair company. In a theater, there is normally no depot maintenance capability.

Appendix I

REFERENCES

Army Regulations

AR 310-25	Dictionary of United States Army Terms
AR 310-50	Military Terms, Abbreviations, and Symbols
AR 750-1	Army Materiel Maintenance Concepts and Policies

Field Manuals

FM 54-7	Theater Army Support Command
FM 55-15	Transportation Reference Data
FM 55-20	Army Rail Transport Operations

Technical Manuals

TM 55-202	Operation and Maintenance of Diesel-Electric Locomotives
TM 55-203	Maintenance of Railway Cars
TM 55-206	Railway Train Operations
TM 55-208	Railway Equipment Characteristics and Data
TM 55-2220-201-35	Assembly Instructions for 40-Ton Railway Freight Car Fleet (Flat, Box, Tank, High- and Low-Side Gondola) (Foreign Service)

Appendix II

GLOSSARY

Airbrakes--braking system employing air under pressure to operate and force the brakeshoes against the wheels.

Axle--cylindrical shaft of wrought iron or steel on which wheels are mounted; holds the wheels to gage and transmits the load from journal boxes to wheels.

Body (of car)--main or principal part in or on which the car's load is placed.

Body bolster--transverse member of the underframe over the trucks through which the weight carried by the longitudinal sills is transmitted to the trucks. Resting on the truck bolster, the body bolster carries and transmits its load through the mated body and truck center plates.

Body center plate--plate made of cast or malleable iron or pressed or cast steel attached to the underside of the body bolster, or in cast steel bolsters an integral part of the casting. With the truck center plate, it supports a car body on the trucks.

Body post (freight car bodies)--upright piece fastened to the side sill and plate of a freight car. Body posts and corner posts form the vertical members of the side frame of a car body.

Body side bearing--upper one of the two side bearings; is attached to the body bolster.

Center sill--central longitudinal member of the underframe of a car; forms the backbone of the underframe.

Classification, locomotive--See Whyte Classification System.

Compression ignition--ignition of a fuel charge by heat generated when air is compressed in the cylinder.

Coupler--device that connects cars to cars, or locomotives to cars.

Cylinder--cylindrical part of an engine in which the piston moves.

Direct current--electric power system in which the electric current flows continuously in the same direction.

Dome--See Tank dome.

Dome cover--closure for the top of a tank car dome.

Driving axle--axle on which two coupled driving wheels are mounted.

Driving Wheels--all wheels under a diesel-electric locomotive that transmit power from the traction motor driven axle to the rail.

End sill--transverse member of a car's underframe that extends across the ends of all the longitudinal sills.

Gage of track--distance between the two parallel rails. Standard gage, the most commonly used gage in the United States, is 56 1/2 inches. Broad gages include measurements of 60, 63, and 66 inches; and narrow gages include 36, 39 3/8, and 42 inches.

Generator--apparatus that transforms mechanical energy into electrical energy.

Ice bunker--receptacle or compartment in refrigerator car in which ice is placed.

Load limit (in car)--weight of load in a car which when added to the light weight of the car gives the maximum AAR axle loading.

Load limit (on rail)--the combined light weight of a car and the load weight which give the maximum AAR axle loading.

Locomotive--self-propelled vehicle that runs on rails and generates energy and converts it into force or effort for the purpose of hauling cars.

Locomotive classification--See Whyte Classification System.

Piston--metal disk with packing that works back and forth in a cylinder and transmits the force exerted upon its crown (top of the piston) to the connecting rod and working parts of an engine.

Roof handhold--iron bar bent to a required shape and fastened to the roof to be grasped when ascending the ladder at the end of a boxcar or a refrigerator car.

Running board--plane surface, made of boards or a special metal structure on which trainmen may walk, located on the roof of a caboose; stock, refrigerator, and covered hopper cars; and boxcars; and at the sides of tank cars.

Safety valve--valve attached to the dome of a tank car to prevent excess pressure from vapors arising from volatile liquids.

Sheathing--covering around the sides and ends of a house car.

Side bearings--bearings attached to the bolsters of a car body or truck on each side of the center plate to steady the car and prevent excessive rocking.

Side frame--frame that forms the side of a car body or a truck.

Side sills--outside longitudinal members of the underframe.

Superstructure--that part of a car above the underframe and floor; commonly divided into sides, ends, and roof.

Tank dome--vertical cylinder attached to the top of a tank car that permits the tank proper to be filled to full cubic capacity which would be impossible without a dome.

Traction motor--electric motor that drives an individual axle of a diesel-electric locomotive.

Tractive effort--horizontal force at the rails that the locomotive driving wheels can exert provided they do not slip.

Truck--assembly of parts that support a locomotive or a car body at each end and provide for the attachment of wheels and axles.

Truck bolster--crossmember in the center of a truck on which a car body rests that is connected to a body bolster by a center pin that passes through both bolsters.

Truck center plate--plate made of cast or malleable iron or pressed or cast steel attached to the top side of, or cast integral with, the truck bolster. With the body center plate, it serves to support a car body on the trucks.

Underframe--framework that receives buffing and pulling stresses and carries the weight of the floor and body of a vehicle.

Whyte Classification System--system in which locomotives are classified according to wheel arrangement; developed by F. M. Whyte and used extensively throughout the United States to classify locomotives.

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