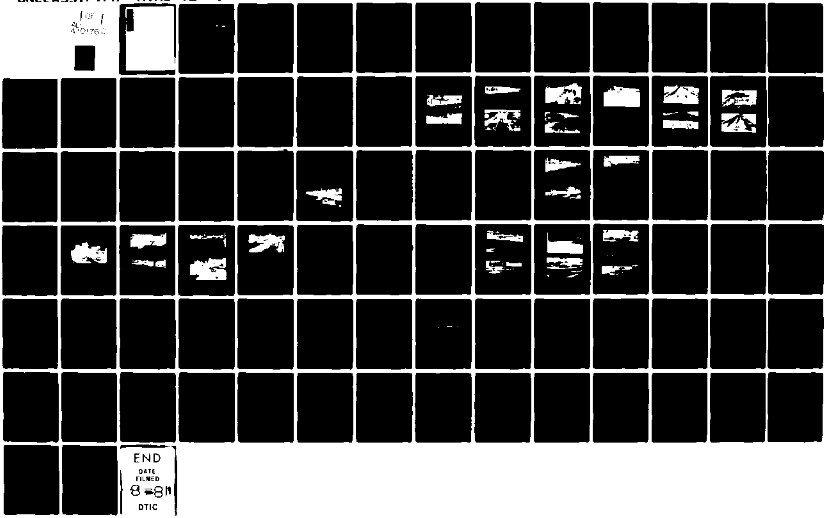
AD-A101 762 MILITARY TRAFFIC MANAGEMENT COMMAND TRANSPORTATION EN--ETC F/G 13/6
RAIL AND MOTOR OUTLOADING CAPABILITY STUDY, FORT CHAFFEE, ARKAN--ETC(U)
NOV 78 T J LEFEBVRE
UNCLASSIFIED MTMC-TE-78-48 SBIE-AD-E750 090 NL

1 OF 1
AD
A101762



END
DATE
FILMED
8-81
DTIC

MTMC REPORT TE 78-48

RAIL AND MOTOR OUTLOADING CAPABILITY STUDY

FORT CHAFFEE, ARKANSAS

November 1978

Project Engineer

Thomas J. Lefebvre
Traffic Engineering Division

MILITARY TRAFFIC MANAGEMENT COMMAND

TRANSPORTATION ENGINEERING AGENCY

Newport News, Virginia 23606

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

TABLE OF CONTENTS

TABLE OF CONTENTS - cont

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS - cont

LIST OF TABLES

EXECUTIVE SUMMARY

1. SCOPE

The Military Traffic Management Command (MTMC) conducted a survey of the rail and motor facilities at Fort Chaffee, Arkansas, from 1 through 5 May 1978, to determine the installation's outloading capability. Commercial rail facilities within the Fort Smith and Van Buren areas were included in the survey.

2. FINDINGS

Fort Chaffee has the potential capability to support relatively large-scale rail outloading operations.

To transport the equipment of the National Guard units, approximately 770 railcars would be required, with an estimated composition of 713 flatcars and 57 boxcars.[1] Of the 713 flatcars, 673 would contain roadable and 40 nonroadable equipment. Since the installation's outloading plans were incomplete and no time frame had been established for unit outloading, the analyses in this report are based on a 4-day outloading operation.

The Missouri Pacific (MP) Railroad provides all railroad operating and switching service at Fort Chaffee. The MP railroad also provides periodical track inspection at no cost to the Government.

The Fort Chaffee rail system consists of about 9.8 miles of trackage, of which only about 7.4 miles are presently in service. This trackage, with a few exceptions where maintenance would be required, is in generally good condition, meeting the Federal Railway Administration's (FRA) Track Safety Standards for Class 2.[2]

---

[1] Since most flatcars are 57 feet long (coupler to coupler), that length is used in this report; to convert to any other length, simply multiply the number of cars by 57 and divide by the desired length.

[2] AR 420-72, 24 March 1976, Surfaced Areas, Railroads, and Associated Structures, para 3-15a, states that track on military installations will be maintained to the minimum track safety standards required for Class 2 track, as outlined in the current Department of Transportation Federal Railway Administration Track Safety Standards (Appendix A).

Potential capability of the Fort Chaffee rail system is greater than current capability. Current limitations are due primarily to shortages of handtools, bridgeplates, blocking and bracing materials, and trained personnel. Blocking and bracing materials are on hand for about 25 carloads; and some, but not enough, handtools and bridgeplates are available. If these deficiencies were corrected, the existing physical rail system at Fort Chaffee could outload approximately 200 railcars per day. This outloading rate would meet the requirement to outload the National Guard units within 4 days. The recommended plan, Plan 4, has a yield of 198 railcar loads per 24-hour period. Other options, producing 40, 118, and 158 railcar loads, are presented in this study.

Commercial rail facilities are available to support Fort Chaffee's outloading in the Fort Smith and Van Buren areas, about 10 miles from Fort Chaffee.

A survey of end-loading ramps and other equipment suitable for loading flatbed semitrailers revealed that, although the actual availability of semitrailers cannot be predetermined, the motor outloading capability of Fort Chaffee exceeds the probable supply of available commercial flatbed trailers. Adequate van semitrailer loading platforms do not exist at Fort Chaffee. However, vans currently back up directly to the warehouse doors for cargo transfer. Seventeen van outloading positions could be utilized for van semitrailer loading. Table 1 shows current and potential rail and motor outloading capabilities of Fort Chaffee.

3. CONCLUSIONS

a. The Fort Chaffee railroad tracks are basically in good condition. The primary constraint limiting its rail outloading capability is the shortage of blocking and bracing materials, small handtools, bridgeplates, and trained blocking and bracing crews.

b. After the deficiencies noted above are corrected and on receipt of a sufficient number of railcars to permit full-scale outloading, Fort Chaffee could achieve an outloading rate of 198 railcars per 24-hour day. At this rate, the National Guard units' equipment could be outloaded in 4 days.

c. With a few exceptions where minor maintenance would be required, no costs for track repairs were indicated since selected tracks are in generally good condition and meet federal track safety

TABLE 1
RAIL AND MOTOR OUTLOADING CAPABILITY

RAIL				
Rate	Number and Type of Railcars (57-ft bed coupler to coupler)			Current Constraints
	Flatcars	Boxcars	Total Outloading	
Daily Current	25	12	37	
Daily Mobilize	183	15	198[a]	Shortage of blocking and bracing materials, small handtools, bridgeplates, and trained blocking and bracing crews, and lack of outloading plans.
Plan 4	183	15	198	Same

MOTOR				
Rate	Number of Trailers at Available Facilities			Current Constraints
	Flats	Vans	Total Outloading	
Daily Current:				
Concurrent (with rail operation)	12	12	24	
Separate (without rail operation)	12	12	24	
Daily Mobilize:				
Concurrent (with rail operation)	80[b]	68	148	The probability of obtaining these numbers of flatbed and van semitrailers on a daily basis is remote.
Separate (without rail operation)	140[c]	68	208	

[a] Current supply of blocking and bracing materials adequate for only 25 railcars.

[b] With existing usable end-loading ramps and equipment suitable for end-loading semitrailers.

[c] Using all of b above plus all existing usable rail end-loading ramps and 15,000-pound capacity forklift.

standards, Class 2. Costs for needed handtools, bridgeplates, and blocking and bracing materials would be additional.

d. Empty railcars (dedicated train lengths) destined for Fort Chaffee should be positioned, in train-loading sequence, in Fort Smith.

e. The MP representative expressed some reservations regarding the outloading of Fort Chaffee units concurrently with other commercial demands. Therefore, Fort Chaffee transportation personnel should coordinate the planning of impending outloading operations with the MP representative at the earliest possible date.

f. For administrative type moves, when leadtime is plentiful and costs must be considered, special-purpose railcars (such as bilevel autorack, trailer-on-flatcar (TOFC), and container-on-flatcar (COFC) cars) are more cost-effective than the standard types and should be used to the extent they are available.

g. For mobilization moves, when time is more critical than costs, the use of special-purpose railcars may not be possible because of the short leadtime and the relatively short supply of these high-demand cars.

h. For concurrent rail and motor operations, 68 van and 80 flatbed semitrailers could be loaded per 10-hour day (for daylight operations only), and for separate operations, 68 van and 140 flatbed semitrailers could be loaded during the same period. This capability far exceeds the likely available supply of semitrailers.

i. The maximum degree of curve at Fort Chaffee is 10 degrees 44 minutes; consequently, any known length of railcar can be used on the installation.

4. RECOMMENDATIONS

a. Undertake those improvements listed in section II, paragraph D4, "Physical Improvements and Additions." These improvements will provide a rail system capability of 198 railcars per 24-hour day and will perpetuate an effective rail system.

b. Prepare a detailed unit outloading plan, using the simulation in appendix B as an example, that specifies unit assignments at loadout sites and movement functions.

c. Coordinate rail outloading plans with the MP railroad representative at the earliest possible date.

d. Continue rail facility maintenance to insure an effective rail system.

e. Provide advance training for blocking and bracing crews.

f. Station road guards at all railroad crossings during outloading operations, and provide all train crewmen with walkie-talkies to insure a safe and efficient operation.

g. Keep abreast of the MP railroad maintenance plans.

h. Use special-purpose railcars (such as bilevel autoracks for small vehicles, TOFC cars for semitrailers and vans, and COFC cars for MILVANs) for administrative moves and, as available, for mobilization moves.

i. Provide warehousing for the blocking, bracing, and small-tool supplies.

j. Coordinate with MTMC any removal of railroad track that is included in the mobilization outloading plan.

k. Limit the degree of curvature of proposed new track to 12 degrees to accommodate all types of railcars.

I. INTRODUCTION

An onsite rail and motor outloading study of Fort Chaffee, Arkansas (fig 1), was conducted by the Military Traffic Management Command Transportation Engineering Agency, Newport News, Virginia, from 1 through 5 May 1978. The principal objectives of the study were to determine the capability of Fort Chaffee to support the deployment of units to be mobilized there, to determine any physical improvements that could increase present outloading capabilities, and to evaluate commercial rail facilities within 25 miles of Fort Chaffee.

Findings and recommendations contained in this report are based on analysis of data obtained during the field survey and on other pertinent information relating to installation activities at that time. Any problems incurred in implementing the recommendations should be referred to MTMCTEA for resolution.

Mail address:
Director
Military Traffic Management Command
Transportation Engineering Agency
ATTN: MTT-TE
PO Box 6276
Newport News, VA 23606

Telephone: AUTOVON 927-4641

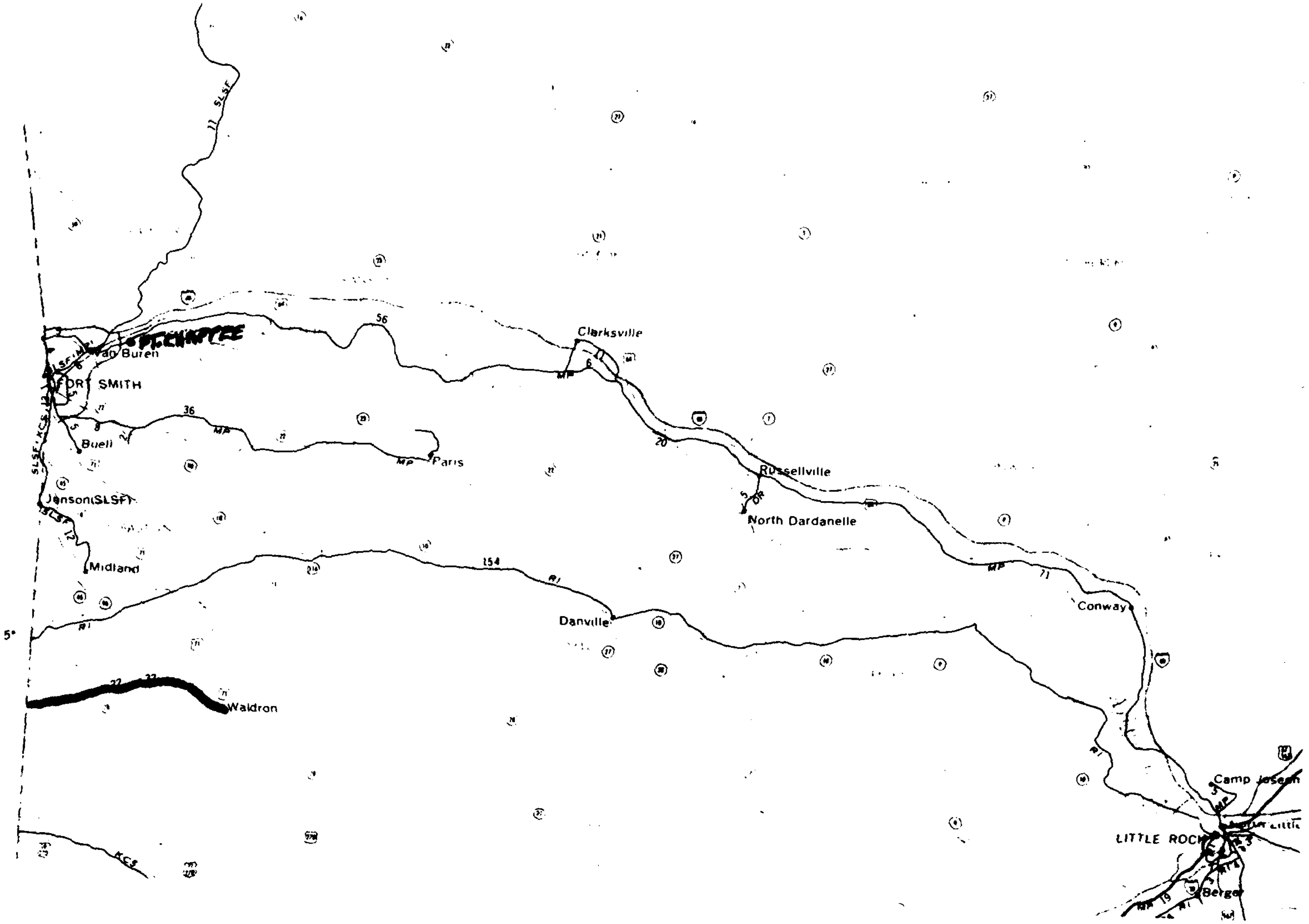


Figure 1. Fort Chaffee and vicinity.

II. ANALYSIS OF FORT CHAFFEE RAIL OUTLOADING FACILITIES

A. GENERAL

The Fort Chaffee rail system, built in 1941, has had only minor maintenance over the past 10 years. The last major rail operations at Fort Chaffee were in support of displaced South Vietnamese who occupied the installation from May to December 1975. Fort Chaffee, now on semiactive status, is used by the Arkansas National Guard. Factual data about locomotive switching and blocking and bracing times were gathered from other studies. Loading, blocking and bracing, and inspection times were obtained from the REFORGER 76 exercise.

B. RAIL FACILITIES

The Fort Chaffee rail system is illustrated in figure 2 and described in table 2. There are about 9.8 miles of trackage on the installation, but only about 7.4 miles of this trackage are presently in service. The remaining tracks have been abandoned east of the Missouri Pacific connection, and several rails have been removed.

The track structure consists of 85-pound conventional rail, connected with 4-hole joint bars fully bolted, laid on 7- by 9-inch single shoulder tie plates with two line-holding spikes per plate. With the exception of the classification yard, very few tie plates are used. Crossties are timber, averaging about 20 ties per 36 feet of track. Ballast consists of crushed rock and cinders. The crossties are in generally good condition, with only a few isolated areas where four or five in succession are weak or defective. The surface and alignment are good. Gage rods have been applied about 10 feet apart on both legs of the wye. The trackage is in generally good condition, meeting FRA requirements for Class 2 track; a few exceptions where maintenance is required are as follows:

1. Replace switch ties in north end of No. 5 and No. 1 turnouts.
2. Replace switch stand on No. 20 turnout on crossover at Darby and Collier Streets. The switch points are open and switch latch missing.
3. Cut trees on south end of No. 5 track (brushing side of railroad cars).

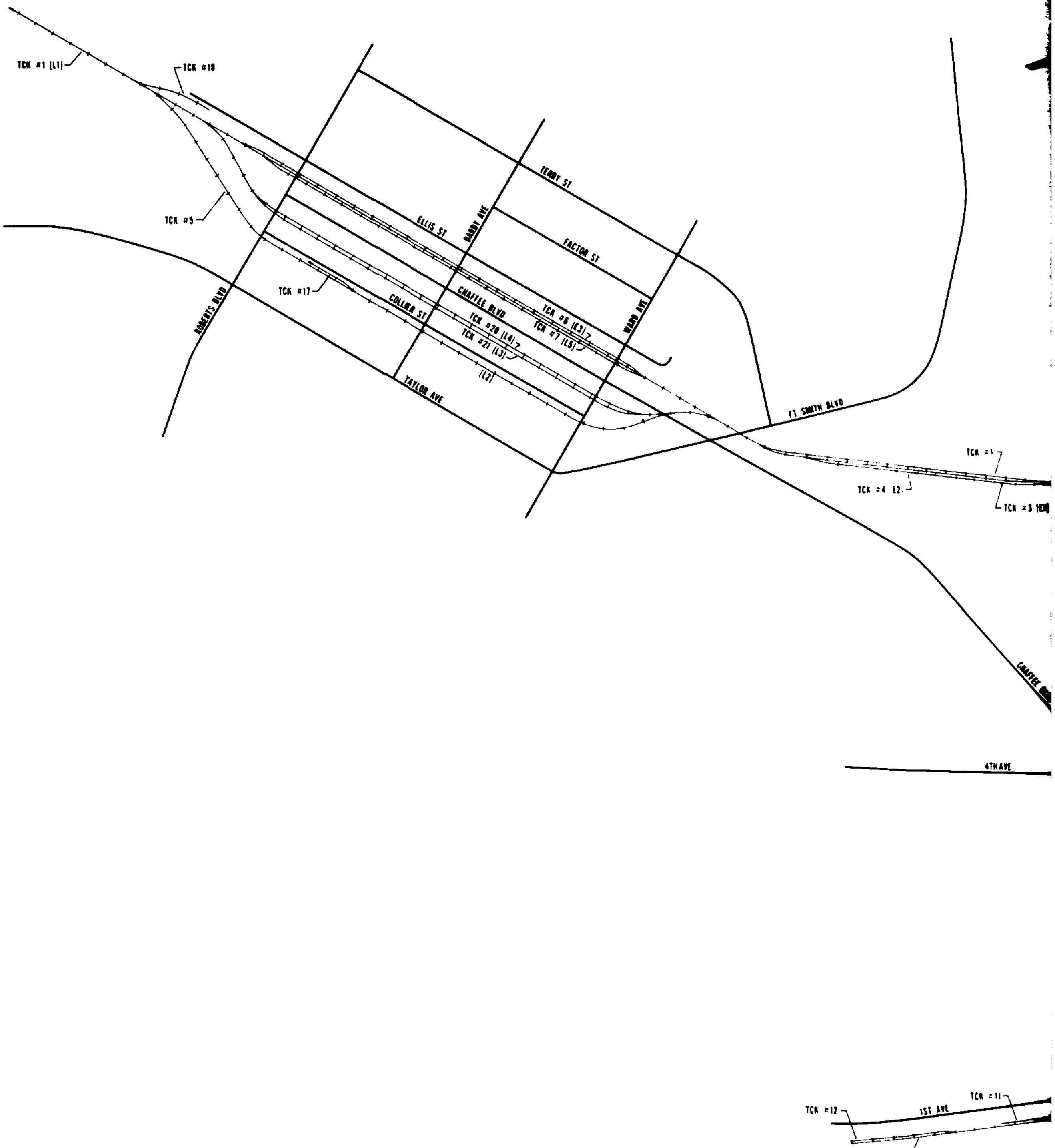


Figure 2. Fort Chaffee rail system.

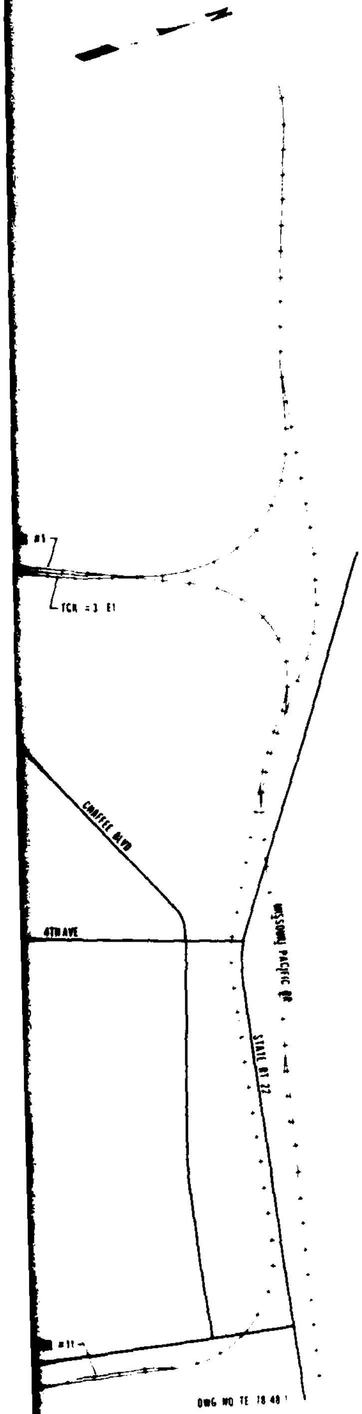

N
#1
TCN =3 E1
CHAFFEE BLVD
4TH AVE
MISSOURI PACIFIC RR
STATE RT 22
#11
DWG NO TE 78 48 1

TABLE 2
FORT CHAFFEE RAIL OUTLOADING FACILITIES

Track and Figure Number	End Ramp	Lighting	Surface Conditions	Staging Area	Railcar Capacity		Access Availability	Pr Tr Cond
					Feet	Cars		
L1 Track 1 (figs 6 and 7)	Yes Concrete End & side	Some	Good	Yes	9,000	40	Good	Fair
L2 Tracks 17 and 5 (figs 8 and 9)	Yes Concrete	Yes	Good	Yes	2,100	38	Good	Fair
L3 Track 21 (fig 10)	None	No	Good	Yes	2,400	40	Good	Fair
L4 Track 20 (fig 10)	None	No	Good	Yes	2,400	40	Good	Fair
L5 Track 7 (fig 11)	None	No	Good	Yes	2,400	40	Good	Fair
E1 Track 3 (figs 12 and 13)	None	No	Good	NA	2,200	35	Good	Fair
E2 Track 4 (figs 12 and 13)	None	No	Good	NA	1,700	26	Good	Fair
E3 Track 6 (fig 11)	None	No	Good	NA	2,400	40	Good	Fair
Main/Running Track 1	None	No	Good	NA	NA	NA	NA	Fair
Y	None	No	Good	NA	NA	NA	NA	Fair
Track 18	None	No	Good	NA	NA	NA	NA	Fair
Track 10	None	No	Good	NA	NA	NA	NA	Poor
Track 11	None	No	Good	NA	NA	NA	NA	Poor
Track 12	None	No	Good	NA	NA	NA	NA	Poor

Present Track Condition	Priority	Note
Fair	1 of 5	Outloading Tracked vehicles as needed
Fair	2 of 5	Outloading Tracked vehicles as needed
Fair	3 of 5	Outloading Wheeled or light tracked vehicles
Fair	4 of 5	Outloading Wheeled or light tracked vehicles
Fair	5 of 5	Outloading Wheeled or light tracked vehicles
Fair	1 of 3	Empty storage
Fair	2 of 3	Empty storage
Fair	3 of 3	Empty storage
Fair	NA	Has to be kept open for through traffic
Fair	NA	Used for switching and turning cars
Fair	NA	
Poor	NA	Abandoned
Poor	NA	Abandoned
Poor	NA	Abandoned

4. Spray weedkiller on all trackage and fill in ballast at small washout in No. 5 track.

The survey of all sites that possibly could be used for outloading equipment revealed that five sites currently are usable for end-loading vehicles. Two sites have permanent concrete end ramps and the other three sites could be supported with portable end ramps. Available portable ramps include a steel end ramp (fig 3), a timber end ramp (fig 4), which was repaired in the summer of 1978, and a light-duty metal end ramp (fig 5).

Figure 3. Portable steel end ramp.

Figure 4. Portable timber end ramp.

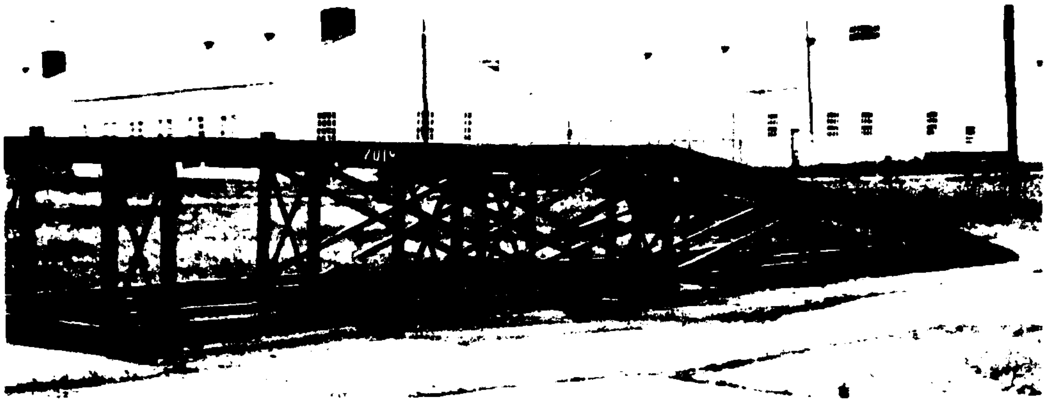


Figure 5. Light-duty metal end ramp.

The proposed loading sites at Fort Chaffee, in descending order of preference, L1 through L5, are:

Track 1 (L1) is a 40-railcar spur, with a concrete end-loading ramp (fig 6) and a concrete side ramp (fig 7). The staging area consists of a gravel and grass area suitable for heavy tracked vehicles and loading large outbound units.

Figure 6. Concrete end-loading ramp, track 1.

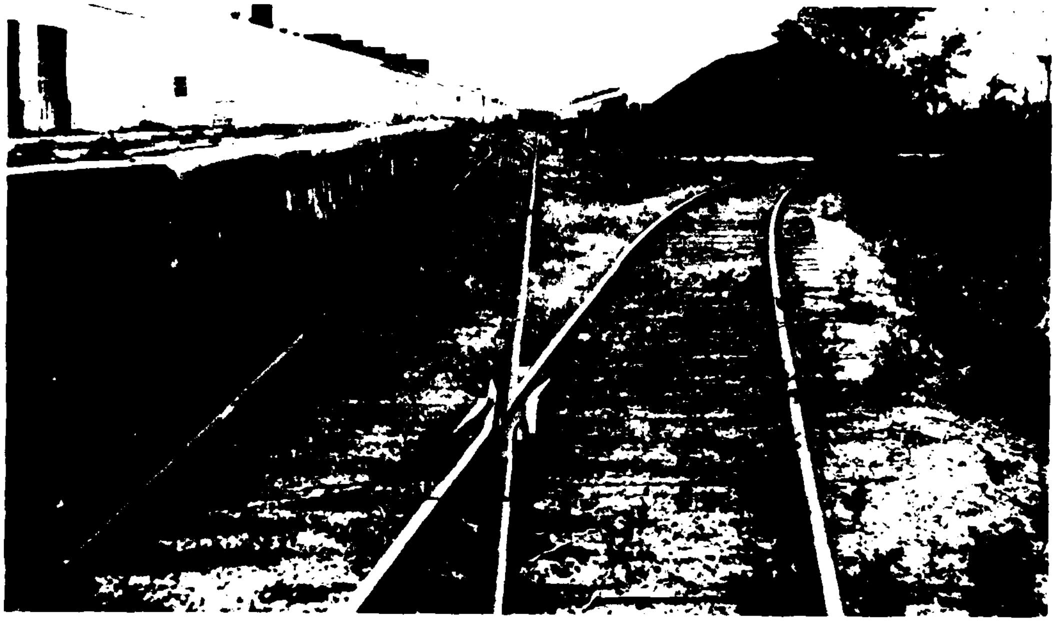


Figure 7. Concrete side ramp, track 1 (left).

Track 17 and 5 (L2) comprise a loading site with a 38-railcar capacity. Track 17 is approximately 380 feet long, with a concrete end ramp (fig 8). Track 5 is approximately 1,700 feet long, extending

Figure 8. Concrete end ramp at track 17.

from track 17 to Ward Avenue (fig 9). The staging area for the site is large and is suitable for outloading tracked vehicles.

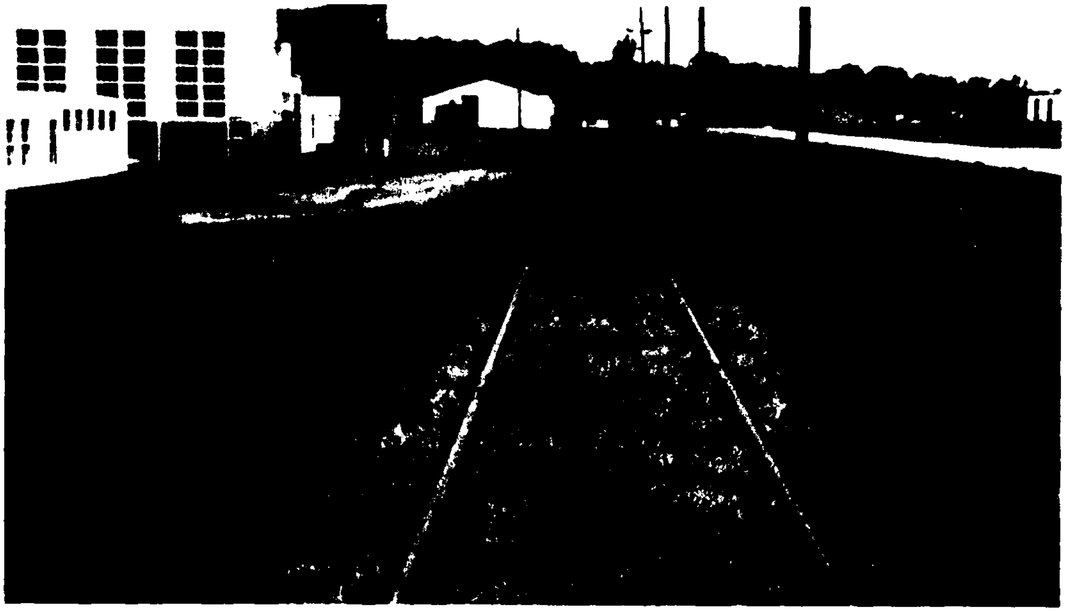


Figure 9. Track 5 (looking westbound).

Track 21 (L3), extending from Roberts Boulevard to Ward Avenue, has a 40-railcar capacity (fig 10). A portable end ramp could be positioned just northeast of Roberts Boulevard and would be suitable for loading wheeled or light tracked vehicles.

Track 20 (L4), located between Roberts Boulevard and Ward Avenue, has a 40-railcar capacity (fig 10). The site is suitable for use of a portable end ramp.

Track 7 (L5), with the installation of a portable end ramp, could be used to outload wheeled and light tracked vehicles (fig 11). The track has a 40-railcar capacity and an adequate staging area.

These sites have a dual function; they are used for the loaded storage also. This is possible because of the large railcar capacity of the sites and the short distance between the interchange yard (empty storage) and the loading site.

Certain tracks have been designated as empty railcar storage at Fort Chaffee and have been assigned a sequence rating ranging from one to three.

Figure 10. Tracks 20 (left) and 21 (right) east of Roberts Boulevard.

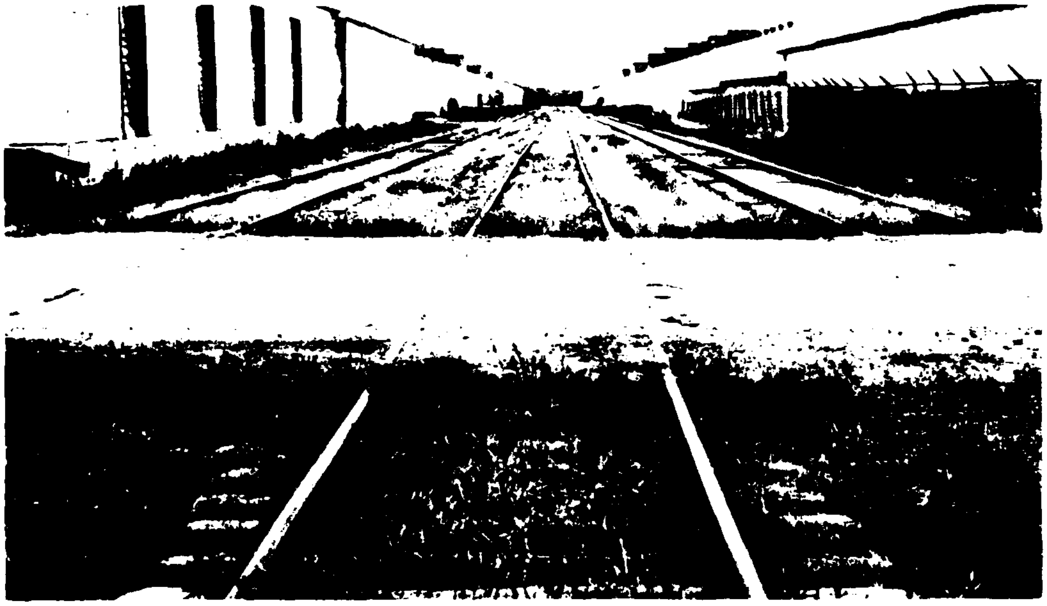


Figure 11. Tracks 6 (left), 1 (center), and 7 (right).

A discussion of the empty storage track sites follows:

Tracks 3 (E1) and 4 (E2), located in the Fort Chaffee interchange yard, are suitable for storage of 38 and 26 railcars, respectively (figs 12 and 13).

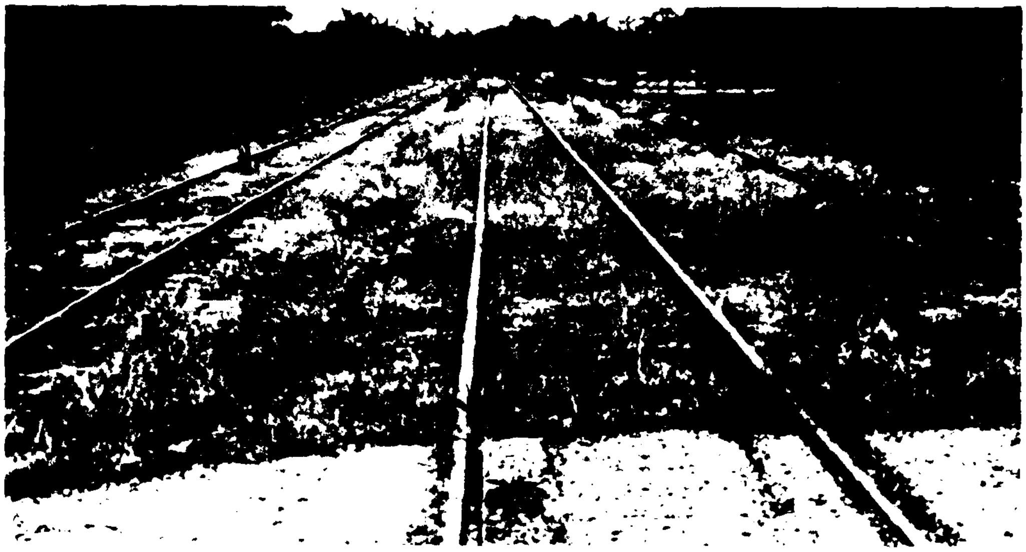


Figure 12. Tracks 1 (left), 3 (center), and 4 (right), Fort Chaffee.

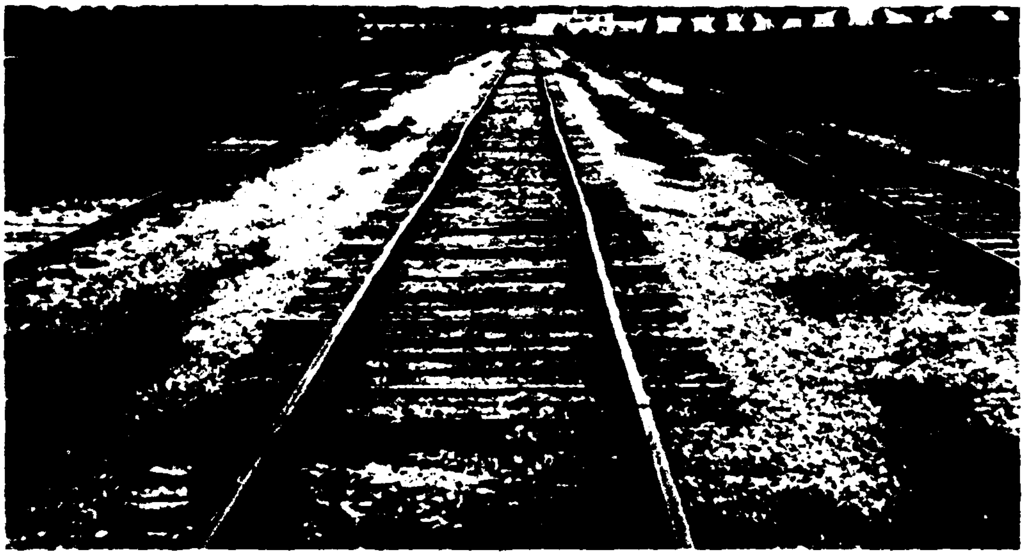


Figure 13. Tracks 4 (left), 3 (center), and 1 (right) (looking westbound).

Track 6 (E3) has storage for 40 railcars (see fig 11).

C. CURRENT PROCEDURES

In an agreement between the US Government and the MP railroad, MP provides all railroad operating and switching service to and from Fort Chaffee. The Missouri Pacific railroad also provides for periodic track inspection at no cost to the government. Currently, most incoming supplies are delivered by truck, with rail operations averaging only about two railcars per month. No rail outloading plans have been developed by Fort Chaffee personnel.

D. RAIL SYSTEM ANALYSIS

1. Current Outloading Capability

Potential capability of the Fort Chaffee rail system is greater than current capability, due primarily to a shortage of handtools, bridgeplates, and blocking and bracing materials, and a lack of trained personnel. Blocking and bracing materials are on hand for about 25 carloads; and some, but not enough, handtools and bridgeplates are available. If these deficiencies were corrected, the existing physical rail system could outload approximately 200 railcars per day.

2. Rail Outloading Analysis

A complex system structure can be viewed as a series of interconnected subsystems. The limiting subsystem within the system establishes the maximum outloading capability. Therefore, in ascertaining the maximum rail outloading capability of Fort Chaffee, the following subsystem separation was used:

a. Commercial Service Capabilities

The common carrier serving the post is the MP railroad, and its operations in the vicinity of Fort Chaffee are well organized. Also, since Fort Smith, Arkansas, is a rail center and is only about 10 miles from Fort Chaffee, rail support for the outloading operation should not be a major problem.

b. Moving to and Loading on Railcars at a Particular Site

The movement of cargo to loading sites is relatively quick and efficient, since most of the unit equipment is self-propelled and access is along good paved roads. Traffic patterns and traffic control would have to be set up, but such measures should be standard for full-scale outloading operations. Staging areas near the outloading sites are adequate, but queuing will block some streets. Recent field tests conducted during loading operations revealed that vehicles move along the flatcars at an average speed of 1 mile per hour, with only one vehicle moving on a railcar at any one time. The longest string of empty flatcars used by the recommended outloading plan, assuming 57-foot car lengths (coupler to coupler), was 40 cars. Using that figure, the first vehicle would reach the end of the last car 26 minutes after driving up the ramp; then blocking and bracing could begin. Loading time is insignificant in comparison with blocking and bracing time (table 3). Therefore, moving to and loading on the railcars is not the limiting subsystem. However, driving wheeled vehicles on flatcars "circus style"[3/] depends on the use of bridgeplates to span the gap between the cars. According to the plan employed in our analysis, bridgeplates are required for simultaneous loading at all sites where wheeled vehicles are to be loaded.

c. Blocking, Bracing, and Safety Inspections

Blocking, bracing, and safety inspection times are difficult to project. They depend on a number of variables such as:

(1) Crew size and experience.

(2) Extent of the safety inspection.

(3) Documentation.

(4) Availability of blocking and bracing material and materials-handling equipment (MHE).

[3/] Circus-style load equipment is end loaded under its own power with little or no effort to fully utilize all floor space on the railcar; time is critical.

TABLE 3

TIMES REQUIRED TO PERFORM VARIOUS LOADING FUNCTIONS

	Action	Type Vehicle or Item Being Loaded	How Loaded	Time Required Min-Sec	Considerations
Bilevels	Vehicles Driving on Bilevel Railcars (89-ft long)	Jeep	Own power	1'-00" per Railcar Length	Average of 5 timings
	Vehicles Driving on Bilevel Railcars (89-ft long)	1-1/4-Ton Pickup	Own power	1'-03" per Railcar Length	Average of 6 timings
	Vehicles Driving on Bilevel Railcars (89-ft long)	Gama Goat	Own power	1'-32" per Railcar Length	Average of 8 timings
	Average Total Time to Load, Tiedown Vehicles on Bilevel Railcar, Complete	The three types above plus 3/4-ton trucks, mixed	Own power	34'-00" per Railcar	Average number of Bilevels loaded in string of cars - 15
TOFC's	Truck Tractor Backing Semitrailers on String of 89-ft TOFC Railcars	Semitrailers	Truck tractor	0'-42" per Railcar Length	Average number of TOFC cars in string --11, 2 trailers per car
	Average Total Time to Load and Secure Semitrailer to Hitch on TOFC Railcar	Semitrailers	Truck tractor	10'-00" per Semitrailer	Average number of TOFC cars in string --11, 2 trailers per car
Flats	2-1/2-Ton Trucks Circus Loading on 60-ft flats	2-1/2-Ton Trucks	Own power	30"-45" per Railcar Length	Average of several timings
	Total Time to Circus Load 11 60-ft Flats With 2-1/2-Ton Trucks, 2 per car (load only)	2-1/2-Ton Trucks	Own power	35'-00" per 11 60-ft Cars	
Forklift	Average Time for Rough Terrain Forklift Truck to Pick Standard-Size Containers (6-ft Wide, 8-ft Long, 5-ft High Approx) off Flatbed Truck, Transit 75 ft, and Load on Rail Flatcar.	Containers	Forklift	2'-12" per Container	Average of loading of 18 containers

During REFORGER 76, the establishment of a 5-1/2 to 7-hour time limit for loading, blocking, and bracing railcars at a loading site as a reasonable goal for crews was based on experience and actual field tests of circus-style loadings. In addition, discussions with the blocking and bracing instructors at Fort Eustis, Virginia, indicated that, to avoid wasted man-hours, there should be no more than eight men per crew, regardless of experience.

At Fort Chaffee, blocking and bracing materials and small handtools are in short supply. These items, which are available locally, should be acquired to assure that the National Guard equipment can be outloaded within the time specified by the contingency plan. Blocking and bracing crews should be trained on a periodic basis.

d. Interchange of Empty and Loaded Railcars

An efficient interchange of empty and loaded railcars requires careful planning and good coordination with the common carrier. Such an interchange can be established at Fort Chaffee because the MP railroad has good rail access to the post and adequate trackage exists for interchange and storage of railcars.

The existence of several commercial railyards in Fort Smith and Van Buren makes it possible to accumulate the number of empty cars required to maintain the operation. The various plans for spotting railcars depend on the type of operation. A place or location must be provided for railcars (1) in empty storage, (2) in loaded storage, and (3) at the loading sites. In general, three balanced or equally divided areas must exist somewhere in the vicinity.

Empty railcars destined for Fort Chaffee should be accumulated and classified in Fort Smith prior to being moved to Fort Chaffee. Thus, if the interchange of railcars follows some semblance of the organization presented in the simulation (app B), this subsystem will not limit the rail outloading capabilities of Fort Chaffee.

e. Summary

Considering all the subsystems, the shortage of blocking and bracing materials, bridgeplate supply, and small handtools, along with the lack of trained blocking and bracing crews, emerges as the primary factor restraining any large rail outloading operation at Fort Chaffee. Therefore, provision of these items is the major prerequisite of a successful operation.

3. Rail System Outloading Options

The various options for outloading plans are shown in table 4. Four plans for daylight-only loading were developed, using various combinations of recommended rail loading sites at Fort Chaffee. The loading sites at Fort Chaffee have a dual function by providing the loaded storage also. This is possible because of the large railcar capacity of the loading sites and the short distance between the interchange yard and the loading sites. As soon as the loading, blocking and bracing, and inspection of the cars are completed, the MP main line locomotives can bring empties for the next cycle and pick up loaded cars from the loaded sites. Four plans were developed to provide the approximate daily outloading rates of 50, 100, 150, and 200 railcars. All plans function similarily. Plan 1 uses track L1 to produce an output of 40 railcars per day. Plan 2 adds tracks L2 and L3 for a total output of 118 railcars per day. Plan 3, which produces an outloading rate of 158 railcars per day, requires the addition of track L4. Plan 4, the recommended plan, adds track L5 and is shown in detail in appendix B. This plan achieves an outloading capability of 198 railcars per day, which fulfills the requirement to outload National Guard units within 4 days.

TABLE 4
FORT CHAFFEE RAIL SYSTEM OUTLOADING OPTIONS

Track Section and Facilities	Railcar Capacity 57-ft Coupler to Coupler	Type End Ramp	Plan 1 40 RCPD	Plan 2 118 RCPD	Plan 3 158 RCPD	Plan 4 198 RCPD
L1	40	Concrete	X	X	X	X
L2	38	Concrete		X	X	X
L3	40	No ramp		X	X	X
L4	40	No ramp			X	X
L5	40	No ramp				X

Legend
X - Track is upgraded if required and used for that option
RCPD - Railcars per 24-hour day

4. Physical Improvements and Additions

Items listed below are all minimum requirements to provide the recommended outloading rate of 198 railcars per day (Plan 4) using existing trackage.

a. Acquire a minimum stock of blocking and bracing material needed to supplement the post organic supply for handling all equipment when a rapid deployment of post units is required.

b. Acquire bridgeplates for volume outloading of wheeled vehicles.

c. Acquire sufficient small tools, including powersaws, cable cutters, wrecking bars, cable tensioning devices, hammers, and so forth, to permit operation of blocking and bracing crews at all outloading sites.

d. Replace switch ties in the north end of No. 5 and No. 1 turnouts.

e. Replace switch stand on No. 20 turnout on crossover at Darby and Collier Streets. The switch points are open and the switch latch is missing.

f. Cut trees on south end of No. 5 track (brushing sides of railcars).

g. Spray weedkiller on all trackage and fill in ballast at small washout in No. 5 track.

h. Replace defective ties where necessary.

5. Discussion of Time and Costs

a. Physical Improvements

No costs for track repairs were used in this section since all selected tracks are generally in good condition and meet federal track safety standards, Class 2 (app A). The few exceptions where minor maintenance would be required are indicated above.

b. Load Time Versus Equipment Type

(1) Mobilization Moves

Two basic types of outloading operations are mobilization and administrative. Since mobilization moves occur only during national emergencies, urgency is paramount.

The most rapid method of loading and securing mobile equipment on railcars is circus style. For example, if unit integrity is to be maintained, 2-1/2-ton trucks that are to pull trailers drive onto the string of railcars towing their trailers, and the equipment is secured in this configuration. This procedure is fast, but it wastes railcar space. During actual field tests on standard-type railcars for the loading, securing, and inspection of 2-1/2-ton trucks, two per railcar, site times varied from 5 hours for flatcars with chain tiedowns to 6-1/2 hours for flatcars without chain tiedowns; figure 14 and table 5 (items 4 and 5). This was a fast, efficient operation. Other similar operations that could occur in a mobilization move include loading various sizes of containers onto standard-type flatcars by using forklifts. This operation, including loading, securing, and so forth, was accomplished in 5-1/2 hours (item 9).

Figure 14. Circus-style loading of 2-1/2-ton trucks.

TABLE 5

TYPICAL SITE LOADING AND BLOCKING AND BRAC

LEGEND

Type Railcar

B1 - Bilevel

TOFC - Trailer on flatcar

COFC - Container on Flatcar

DF - Flatcar/Integral Chain Ti

F - Standard-Type Flatcar

Type Railcar	Average Number Loaded (Range)	Type Load	How Loaded	Total Site Time Required (hrs) and Other Considerations	Details on Type L
B1 89 ft	16 15-17	C	End, own power	7.5 All cars had chain tiedowns. Cars did not have bridge PL's, wooden PL's used	Typical Load: 50 jeeps, 15-3/4 6-1¼ ton, 14 Gama Goats, each 1 number vehicles - 170
B1 89 ft	14½ 11-18	C	End, own power	10.7 All cars did not have chain tiedowns, used wooden bridge PL's.	Typical Load: 50 jeeps, 15-3/4 6-1¼ ton, 14 Gama Goats, each 1 number vehicles - 170
TOFC 89 ft	12 10-12	C	End, backed on by tractor	4.0	Semitrailers - mostly MILVAN to form 40-ft semis. Some 20-f military vans on semis. Two pe
DF 60 ft	11 9-14	C	End, own power	5.1 Chain tiedowns on all cars, wood wheel chocks, lateral wood blocking at wheels	All 2-1/2-ton trucks, various k per railcar.
F 54 ft	10	C	End, own power	6.5 Cable tiedowns made at site. Wheel chocks, lateral wheel blocking	All 2-1/2-ton trucks, various k per railcar.
F 54 ft	10 9-10	A	End, own power. Some forklift	10.0 Cable tiedowns made at site. Wood blocking as required.	1/4-ton trailers Wreckers Forklifts Mules, jeeps, CONEX containers
F 54 ft	9	A	Forklift, manpower	10.8 Cable tiedowns made at site. Wood blocking as required.	All 1/4-ton trailers or high pe of similar small items.
DF 60 ft	10 8-13	A	Rough terrain forklifts	8.3 Chain tiedowns on all cars. Wheel blocking used also	All two-wheeled trailers (variou pulled by 2-1/2-ton trucks) 5 trailers/railcar
F 54 ft	9	A	Rough terrain forklifts	5.5 Cable tiedowns made at site. Blocking as required.	All containers - 5 cars with 8 containers each. 3 cars with 4 containers each. 1 car with 10 containers each.

AND BRACING TIMES (TOTAL)

Chain Tiedowns
atcar

Type Load
A - Administrative
C - Circus
S - Semitrailers

on Type Load	Manpower	Typical Problems
ps, 15-3/4-ton trucks, ts, each level, total	1½-2 men per vehicle	No bridge PL's on cars had to use wooden PL's. Man has to walk to front of vehicle as guide and to straighten bridge PL's. Delays if all vehicles not at site at loading time.
ps, 15-3/4-ton trucks, ts, each level, total	1½-2 men per vehicle	Same as above; and, missing tiedowns; cable tiedowns had to be fabricated and used. (Storm, rain not included in total time)
MILVAN married together Some 20-ft semis and s. Two per TOFC car.	6-8 man crew	Some older cars have trailer hitches which have to be "pulled-up" into position by a cable attached to the tractor.
various kinds, two	10 men per railcar	None
various kinds, two	10 men per railcar	None
ontainers	10 men per railcar	Improper installation of tiedowns and blocking. Large number of small items, 1/4-ton trailer slow the installation of blocking since work has to proceed from one end of railcar to the other.
or high percentage .	10 men per railcar	Improper installation of tiedowns and blocking. Large number of small items, 1/4-ton trailer slow the installation of blocking since work has to proceed from one end of railcar to the other.
rs (various types rucks)	10 men per railcar	None noted
rs each. rs each. rs each.	10 men per railcar	None noted

2

All things considered, the circus-style loading operations indicate that, for mobilization moves using standard-type flatcars, the loading, blocking and bracing, and inspections can be accomplished within 5-1/2 to 7 hours for most equipment types (items 9 and 5). However, if a unit has a significant number of small items, such as "mules" (item 6), they are likely to require a 10-hour site time; this should be considered rather than to assume that the work can be accomplished within 7 hours.

(2) Administrative Moves

For an administrative move, ample time exists for planning; night operations are unnecessary except to finish work that is not completed during daylight hours and to switch railcars. This added flexibility helps to solve unforeseeable problems. The administrative move allows time for accumulating special-type railcars, such as bilevel autoracks and TOFC and COFC cars, which significantly reduce both labor and other costs. For instance, small vehicles, jeeps, 3/4-ton trucks, 1-1/4-ton trucks, and gama goats can be loaded on bilevel cars (fig 15), semitrailers and vans can be loaded on TOFC cars, and MILVANs, for which there are no chassis, can be loaded on COFC cars. Mobile equipment, some 2-1/2-ton trucks, and all smaller vehicles can be loaded on bilevel railcars. These three types of specific railcars require no blocking and bracing except that integral to the car.

Loading and securing times for bilevels varied from an average of 7-1/2 hours for a string of cars that were fully equipped with chain tiedowns to 10-3/4 hours for those where cable tiedowns had to be fabricated to replace missing chain tiedowns (see table 5). The average total time for TOFC cars was 4 hours. Administrative loads,[4/] which require relatively longer times and efforts, are illustrated in figures 16 and 17. This type of load required a total site time of 10 to 11 hours.

[4/] Administrative load - equipment to be loaded (wheeled or otherwise) is placed on the car so as to achieve maximum utilization of floor space, it may be stacked; cost is important. Both types of loads, circus and administrative, may be used in either a mobilization or administrative move depending upon the type of equipment to be moved. Example - item 9 in a mobilization move, item 5 in an administrative move.

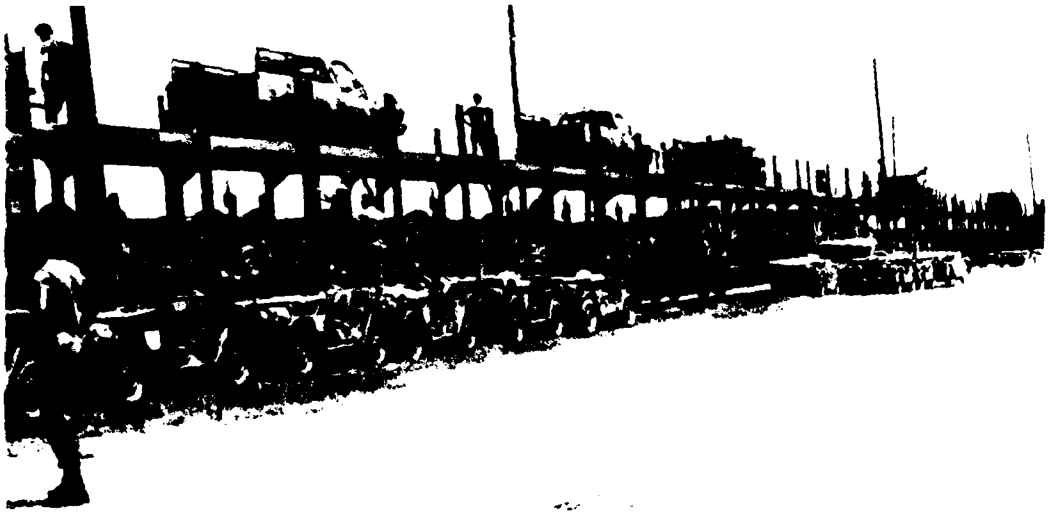


Figure 15. Lower level of bilevel cars loaded with jeeps, gama goats, 3/4-ton trucks, and 1-1/4-ton trucks.

Figure 16. Administrative load, mules.

In general, administrative moves should be planned for daylight hours, leaving night hours available for finishing up sites that started late or were slowed by problems and railcar switching. This type of planning allows enough flexibility to resolve problems and complete the operation on schedule.

Figure 17. Administrative load, with 1/4-ton trailers.

The time/motion studies conducted during the REFORGER 76 exercise resulted in the accumulation of valuable information for planning future station outloading operations and is included in tables 3 and 5. It should be noted that times required to load are relatively minor as compared with times required to secure the equipment. As an example, a jeep can drive across an 89-foot-long bilevel car in 1 minute and a forklift truck can load a container in 2 minutes 12 seconds. Also, as soon as the first vehicle is in position, several simultaneous operations are in effect--loading, blocking, and tieing down. Thus, for future planning, site times should be, as a general rule, 5-1/2 to 7 hours for a mobilization move, and 4 to 11 hours for an administrative move. The 5-1/2-hour minimum for a mobilization move is based on the assumption that only standard-type railcars are available. The 4-hour minimum for an administrative move carries the assumption that there is time to plan and assemble the most appropriate type of railcars for the equipment to be moved. The 4 hours, in this instance, was the average time required to load and secure semitrailers and vans on a string of twelve 89-foot-long TOFC cars.

To minimize the number of faulty or unacceptable loads that have to be redone, inspection of the loaded cars by the railroad inspector should proceed simultaneously with the work.

c. Transportation Equipment Costs--Bilevel Railcars Versus 54-Foot Standard Flatcars

A cost comparison, using nine different types of equipment scheduled for outloading in the REFORGER 77 exercise, revealed that $129,431 in transportation and materials (timber, cable, and so forth) could be saved by shipping the equipment on bilevel railcars rather than on standard-type 54-foot flatcars. The equipment items vary from 1/4-ton trailers to 2-1/2-ton trucks. A total of 623 vehicles could be transported on 55 bilevel railcars; see table 6 for details and appendix C for more information on special-purpose railcars.

TABL

COST COMPARISON, BILEVELS

Column Number	1	2	3	4	5	6
Item No.	Vehicle Type	Model Number	Weight (lbs)	Height (in.)	Length (in.)	Quantity to be Shipped
1	2-1/2-Ton Truck	M35A2	13,360	80.8	264.8	110
2	Gama Goat, 1-1/4-Ton	M561	7,480	71.9	231.1	27[1/]
3	M105A2 1-1/2-Ton Trailer	M105A2	2,670	82.0	166.0	113
4	1/4-Ton Trailer	M416	580	44.0	108.5	136
5	400-Gal Water Trailer	M149A1	2,530	80.6	161.4	20
6	1-1/4-Ton Truck	M880	4,695	73.5	218.5	11
7	3/4-Ton Trailer	M101	1,350	50.0	147.0	8
8	1/4-Ton Truck	M151	2,350	52.5	131.5	180
9	1-1/4-Ton Como Truck	M884	4,648	67.5	218.5	18
	Total					623

SUMMARY

Total cost to ship the 9 different items (623 vehicles) by 54-foot-long standard flatcars, C

Total cost to ship the 9 different items (623 vehicles) by 89-foot-long bilevel flatcars, Co

Savings in transportation costs if shipped by bilevel flats (Column 10-- Column 14)

Additional costs of blocking and bracing materials if shipped by 54-foot standard flatcars

Total savings if these nine items shipped by bilevel versus 54-foot flatcar

[1/] Excess vehicles shipped on other railcars that are not completely utilized.

[2/] Estimated average additional costs of blocking and bracing materials per vehicle.

TABLE 6

LEVELS VERSUS 54-FOOT FLATCARS

ity e ed	7 Quantity on 54-ft Railcar	8 Dollars	9 No. of 54-ft Cars Required	10 (8 x 9) Trans Cost for Item	11 Quantity on 89-ft Bilevel	12 Dollars	13 No. of Bilevels Required	14 (12 x 13) Trans Cost for Item
	2	2,413	55	132,715	6	7,238	18	130,284
[1]	2	2,167	13	28,171	8	5,402	4	21,608
	3	2,167	37	80,179	12	3,612	9	32,508
	10	2,167	14	30,338	36	3,612	4	25,284
	4	2,167	5	10,835	12	3,612	2	7,224
	2	2,167	5	10,835	8	3,612	2	7,224
	4	2,167	2	4,334	12	3,612	1	3,612
	7	2,167	25	54,175	14	3,612	13	46,956
	2	2,167	9	19,503	8	3,612	2	4,334
				371,085			55	279,034

tcars, Column 10	$371,085	
ars, Column 14	279,034	
	$ 92,051	
atcars	37,380	($60[2] x 623)
	$129,431	

III. ANALYSIS OF COMMERCIAL RAIL FACILITIES WITHIN 25 MILES OF FORT CHAFFEE

Currently the rail facilities at Fort Chaffee are adequate to handle the continuing rail outloading requirement of the installation. However, the Missouri Pacific (MP), the St. Louis-San Francisco (SLSF), and the Kansas City Southern (KCS) commercial rail facilities at Fort Smith and Van Buren were surveyed to determine the feasibility of using them during full-scale rail outloading operations at the installations (table 7). Many factors were considered in making the determinations, including:

a. Road access to the facility.

b. Type of facility available--ramps, lighting.

c. Equipment staging and queuing areas.

d. Railcar storage and loading capacities.

e. Track and facility maintenance conditions.

f. Main line activity levels.

g. Added expense of using commercial facilities.

h. Security problems.

TABLE 7
RAILROAD FACILITIES WITHIN 25 MILES OF FORT CHAFFEE

Location and Figure Number	End Ramp	Lighting	Surface Consitions	Staging Area	Railcar Capacity 57-ft Coupler to Coupler	Access Availability	Track Condition
MP Yard, Fort Smith, fig 18	Single, timber	No	Good	Yes	30	Good	Fair
MP Yard, Van Buran, fig 19	Double, timber	No	Good	Yes	30	Good	Good
MP Yard, Van Buran, fig 20	Portable, steel	No	Good	Yes	10	Good	Good
SLSF Yard, Fort Smith, fig 21	Double, concrete	No	Good	Yes	18	Good	Good
KCS Yard, Fort Smith, fig 22	Timber and gravel	No	Fair	No	2	Good	Fair
KCS Yard, Fort Smith, fig 23	Timber and gravel	No	Fair	Yes	10	Good	Fair

The MP has a single timber end ramp (fig 18) at its rail facilities in Fort Smith. It also has a double timber end ramp (fig 19) and a metal portable end ramp (fig 20) at its classification yard in Van Buren. The SLSF has a double permanent concrete end ramp (fig 21) available at its Fort Smith classification yard. The KCS has two single gravel and timber end ramps (figs 22 and 23) at its Fort Smith rail facilities.

Figure 18. Timber end ramp, MP yard, Fort Smith.

Portable ramps could possibly be used at some of the other sites for daytime operations, but this is not recommended for any of the sites because most trackage will be needed for storage to support local service and the outloading operations at Fort Chaffee. Because of possible complications resulting from the lack of security and from the splitting of operations, off-post facilities should be used only to store railcars.

Figure 19. Double timber end ramp, MP yard, Van Buren.

Figure 20. Portable metal end ramp, MP yard, Van Buren.

Figure 21. Double concrete end ramp, SLSF yard, Fort Smith.

Figure 22. Timber and earth ramp, KCS yard, Fort Smith.

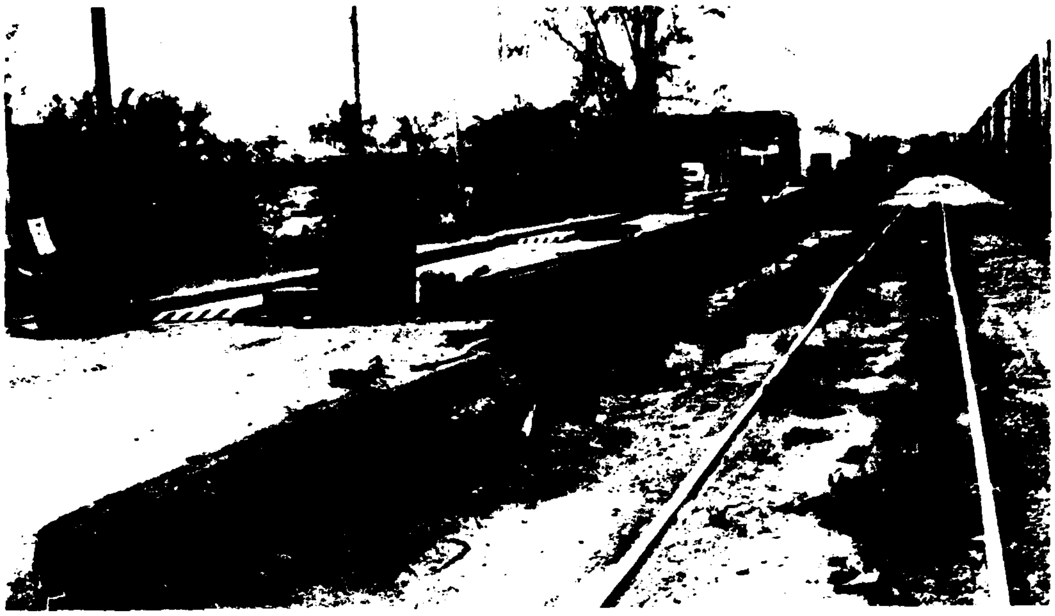


Figure 23. Timber and earth ramp, KCS yard, Fort Smith.

IV. SPECIAL EQUIPMENT FOR EXPEDITING THE OUTLOADING OF MILVANS

A large supply of trailer-on-flatcar railcars is usually in the system, and container-on-flatcar railcars may be available. These cars should be used to transport semitrailers and MILVANs. If COFC or TOFC flatcars are not available, some blocking and bracing time and expense can be saved by using bulkhead flatcars for transporting MILVANs. See appendix C for additional information.

V. ANALYSIS OF MOTOR SYSTEM OUTLOADING CAPABILITY

A. GENERAL

Currently, major highway access to Fort Chaffee is by Arkansas Route 22, which runs north of the installation. The internal road network of Fort Chaffee is capable of handling all types of highway vehicles along its major arteries. Neither access to the highway system nor the system itself restrains motor outloading capability or movement of roadable military vehicles.

B. MOTOR LOADING FACILITIES

Basically, two types of motor vehicles--flatbeds and van semitrailers--would be required to meet the motor outloading needs of Fort Chaffee. A description of the loading facilities associated with each vehicle type follows:

1. Loading Ramps

A survey of facilities that might have end-loading ramps for loading vehicles onto commercial flatbed semitrailers revealed that there are six such ramps with eight outloading positions that could be used concurrently with a rail outloading operation (table 8 and figs 24 through 29). As a separate operation (without concurrent rail outloading), there are 11 ramps (including all existing rail ramps), with 13 outloading positions, that could be used.

2. Loading Platforms/Docks

The loading platform/dock from which van semitrailers are loaded is used along with the forklift to transfer cargo from truck to truck, truck to warehouse, and vice versa. At Fort Chaffee, there are no van loading platforms per se; however, van semitrailers back up directly to the warehouse doors for cargo transfer. Seventeen van outloading positions could be utilized for van semitrailer loading at Fort Chaffee.

TABLE 8
VEHICLE END-LOADING RAMPS

Ramp or Other Device and Figure Number	Location	Type of Ramp	Surface Conditions	Staging	Access	Remarks
Concurrent With Rail Operations						
2 Fig 24	Near Bldg 2469	Double concrete end	Good	Yes	Good	
1 Fig 25	Near Bldg 2516	Concrete end	Good	Yes	Good	
1 Fig 26		Concrete end	Good	Yes	Good	
1 Fig 27	DFAC yard	Concrete end	Good	Yes	Good	
2 Fig 28	DFAC yard	Double concrete end	Good	Yes	Good	
1 Fig 29	DFAC yard	Concrete end	Good	Yes	Good	
1 Forklift 15,000-pound capacity	Mobile	N/A	Depends on site selected	Depends on site selected	Depends on site selected	It is assumed that this forklift is being used for loading railcars
Numerous (cut sloping ditch with bulldozer)	Any graveled area	Sloping earth ditch	Depends on site selected	Depends on site selected	Depends on site selected	These ramps will not be included in the estimate of outloading capability
Without Rail Operations						
8 above	See above					
1 above (forklift)	See above					
2	Tracks 1 and 17	Concrete	Good	Yes	Good	
3	Portable	2 metal and 1 timber	Depends on site selected	Depends on site selected	Depends on site selected	

Figure 24. Bilevel concrete end ramp near Building 2469.

Figure 25. Concrete end ramp near Building 2516.

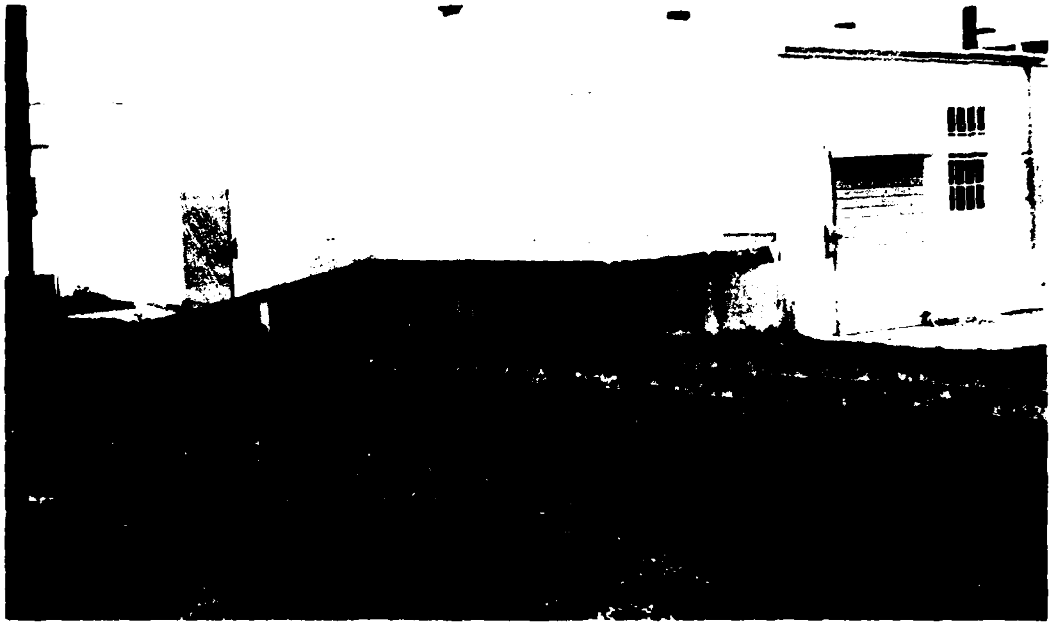


Figure 26. Concrete end ramp adjacent to track 5.

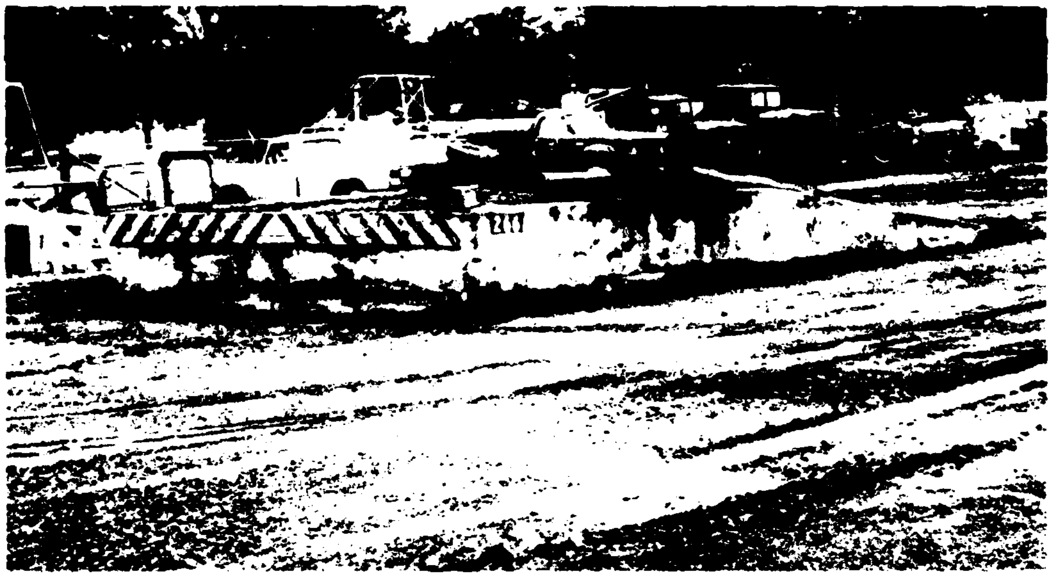


Figure 27. Concrete end ramp, DFAC yard.

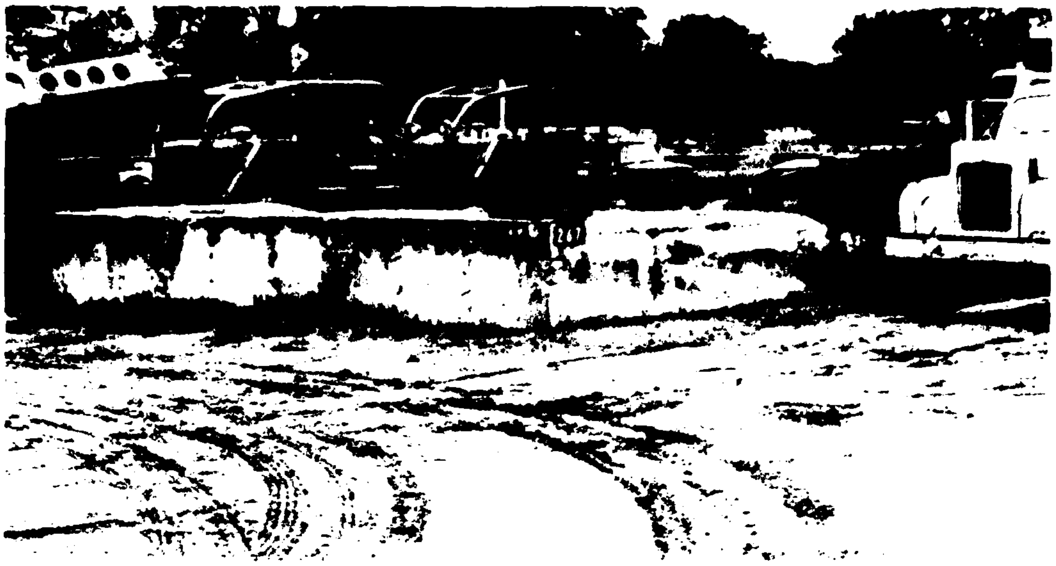


Figure 28. Double concrete end ramp, DFAC yard.

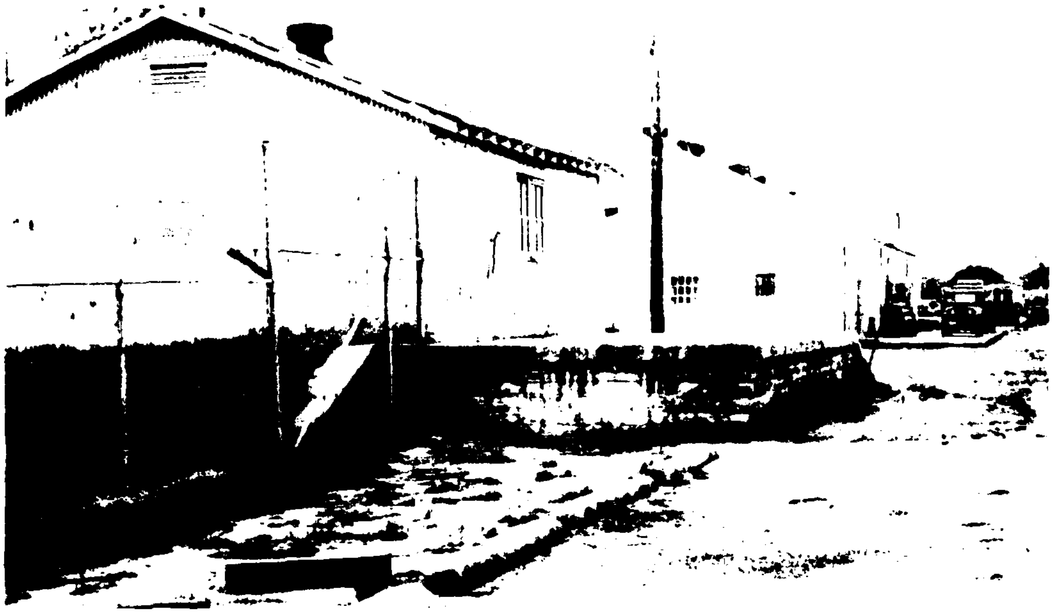


Figure 29. Concrete end ramp, DFAC yard.

C. FLATBED SEMITRAILER OUTLOADING

The loading procedure could be as follows: A vehicle is driven up the ramp and onto the waiting semitrailer, temporary chocks are placed, and the loaded truck is driven slowly away from the ramp to a designated location where the loaded vehicle is secured with tie-down chains. The next semitrailer is backed up to the ramp, and the procedure is repeated. This procedure does not occupy the ramp while loaded vehicles are being secured. Using a conservative 60 minutes for each cycle, 1 semitrailer could be loaded per hour per ramp, or 10 vehicles per ramp per 10-hour shift. In most cases, 60 minutes would not be required.

1. Concurrent With Rail Operations

There are six ramps with eight outloading positions that could be used while rail operations are in progress. Using a 60-minute cycle per ramp, a 10-hour workday could produce 80 semitrailer loads, for daylight operation only. This does not include expedient means such as excavating sloping ditches into which semitrailers could be backed for loading, nor the 15,000-pound commercial forklift truck that could be used if not assigned to railcar loading. Numerous possibilities exist for increasing motor outloading facilities.

2. Without Rail Operations

If rail operations are not in progress, there are 11 loading ramps, with 13 outloading positions plus one forklift, that could be used to load commercial semitrailers. At 60 minutes per cycle per ramp, 140 semitrailers could be outloaded in a 10-hour workday. However, the possibility of obtaining 140, or even 80, commercial semitrailers locally on any day seems highly unlikely. Therefore, since Fort Chaffee has facilities for outloading a high volume of semitrailers, the constraint on its semitrailer outloading capability would not be the lack of facilities but probably the lack of semitrailers.

D. VAN SEMITRAILER OUTLOADING

The loading procedure could be as follows: A van is backed up to the warehouse door and cargo is transferred to the van from either an adjacent van or a warehouse, using one forklift per loading van. A cycle time of approximately 2-1/2 hours will be used to load a 40-foot van. Using this rate, one van could be loaded per 2-1/2 hours per position, or four vehicles per position per 10-hour shift.

With 17 loading positions available at the warehouses, at least 17 forklifts of the 2,000- to 4,000-pound size are required. At present, Fort Chaffee has 12 forklifts of this size that could be utilized. Assuming that the required number of forklifts are acquired, 17 van outloading positions are used; at 2-1/2 hours per loading cycle per position, 68 vans could be outloaded in a 10-hour workday.

VI. CONCLUSIONS

a. The Fort Chaffee railroad tracks are in basically good condition. The primary constraint limiting its rail outloading capability is the shortage of blocking and bracing materials, small handtools, bridgeplates, and trained blocking and bracing crews.

b. After the deficiencies noted above are corrected and on receipt of a sufficient number of railcars to permit full-scale outloading, Fort Chaffee could achieve an outloading rate of 198 railcars per 24-hour day. At this rate, the National Guard units' equipment could be outloaded in 4 days.

c. With a few exceptions where minor maintenance would be required, no costs for track repairs were indicated since selected tracks are generally in good condition and meet federal track safety standards, Class 2. Costs for needed handtools, bridgeplates, and blocking and bracing materials would be additional.

d. Empty railcars (dedicated train lengths) destined for Fort Chaffee should be positioned, in train-loading sequence, in Fort Smith.

e. The MP representative expressed some reservations regarding the outloading of Fort Chaffee units concurrently with other commercial demands. Therefore, Fort Chaffee transportation personnel should coordinate planning of impending outloading operations with the MP representative at the earliest possible date.

f. For administrative-type moves, when leadtime is plentiful and costs must be considered, special-purpose railcars (such as bilevel autorack, trailer-on-flatcar (TOFC), and container-on-flatcar (COFC) cars) are more cost-effective than the standard types and should be used to the extent they are available.

g. For mobilization moves, when time is more critical than costs, the use of special-purpose railcars may not be possible because of the short leadtime and the relatively short supply of these high-demand cars.

h. For concurrent rail and motor operations, 68 van and 80 flatbed semitrailers could be loaded per 10-hour day (for daylight operations only), and for separate operations, 68 van and 140 flatbed semitrailers could be loaded during the same period. This capability far exceeds the likely available supply of semitrailers.

i. The maximum degree of curve at Fort Chaffee is 10 degrees 44 minutes; consequently, any known length of railcar can be used on the installation.

VII. RECOMMENDATIONS

a. Undertake those improvements listed in section II, paragraph D4, "Physical Improvements and Additions." These improvements will provide a rail system capability of 198 railcars per 24-hour day and will perpetuate an effective rail system.

b. Prepare a detailed unit outloading plan, using the simulation in appendix B as an example, that specifies unit assignments at loadout sites and movement functions.

c. Coordinate rail outloading plans with the MP railroad representative at the earliest possible date.

d. Continue rail facility maintenance to insure an effective rail system.

e. Provide advance training for blocking and bracing crews.

f. Station road guards at all railroad crossings during outloading operations, and provide all train crewmen with walkie-talkies to insure a safe and efficient operation.

g. Keep abreast of the MP railroad maintenance plans.

h. Use special-purpose railcars (such as bilevel autoracks for small vehicles, TOFC cars for semitrailers and vans, and COFC cars for MILVANs) for administrative-type moves and, as available, for mobilization moves.

i. Provide warehousing for the blocking, bracing, and small-tool supplies.

j. Coordinate with MTMC any removal of railroad track that is included in the mobilization outloading plan.

k. Limit the degree of curvature of proposed new track to 12 degrees, to accommodate all types of railcars.

APPENDIX A

TRACK SAFETY STANDARDS[5/]

PART 213—TRACK SAFETY STANDARDS

AUTHORITY: The provisions of this Part 213 issued under sections 202 and 209, 84 Stat. 971, 975; 45 U.S.C. 431 and 438 and § 1.49(n) of the Regulations of the Office of the Secretary of Transportation; 49 CFR 1.49(n).

SOURCE: The provisions of this Part 213 appear at 36 F.R. 20336, Oct. 20, 1971, unless otherwise noted.

Subpart A—General

§ 213.1 Scope of part.

This part prescribes initial minimum safety requirements for railroad track

---

[5/] Extracted from Title 49 Transportation, Parts 200 to 999, pp 8-19, Code of Federal Regulations, 1973.

that is part of the general railroad system of transportation. The requirements prescribed in this part apply to specific track conditions existing in isolation. Therefore, a combination of track conditions, none of which individually amounts to a deviation from the requirements in this part, may require remedial action to provide for safe operations over that track.

§ 213.3 Application.

(a) Except as provided in paragraphs (b) and (c) of this section, this part applies to all standard gage track in the general railroad system of transportation.

(b) This part does not apply to track—

(1) Located inside an installation which is not part of the general railroad system of transportation; or

(2) Used exclusively for rapid transit, commuter, or other short-haul passenger service in a metropolitan or suburban area.

(c) Until October 16, 1972, Subparts A, B, D (except § 213.109), E, and F of this part do not apply to track constructed or under construction before October 15, 1971. Until October 16, 1973, Subpart C and § 213.109 of Subpart D do not apply to track constructed or under construction before October 15, 1971.

§ 213.5 Responsibility of track owners.

(a) Any owner of track to which this part applies who knows or has notice that the track does not comply with the requirements of this part, shall—

(1) Bring the track into compliance; or

(2) Halt operations over that track.

(b) If an owner of track to which this part applies assigns responsibility for the track to another person (by lease or otherwise), any party to that assignment may petition the Federal Railroad Administrator to recognize the person to whom that responsibility is assigned for purposes of compliance with this part. Each petition must be in writing and include the following—

(1) The name and address of the track owner;

(2) The name and address of the person to whom responsibility is assigned (assignee);

(3) A statement of the exact relationship between the track owner and the assignee;

(4) A precise identification of the track;

(5) A statement as to the competence and ability of the assignee to carry out the duties of the track owner under this part; and

(6) A statement signed by the assignee acknowledging the assignment to him of responsibility for purposes of compliance with this part.

(c) If the Administrator is satisfied that the assignee is competent and able to carry out the duties and responsibilities of the track owner under this part, he may grant the petition subject to any conditions he deems necessary. If the Administrator grants a petition under this section, he shall so notify the owner and the assignee. After the Administrator grants a petition, he may hold the track owner or the assignee or both responsible for compliance with this part and subject to penalties under § 213.15.

§ 213.7 Designation of qualified persons to supervise certain renewals and inspect track.

(a) Each track owner to which this part applies shall designate qualified persons to supervise restorations and renewals of track under traffic conditions. Each person designated must have—

(1) At least—

(i) One year of supervisory experience in railroad track maintenance; or

(ii) A combination of supervisory experience in track maintenance and training from a course in track maintenance or from a college level educational program related to track maintenance;

(2) Demonstrated to the owner that he—

(i) Knows and understands the requirements of this part;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements in this part.

(b) Each track owner to which this part applies shall designate qualified persons to inspect track for defects. Each person designated must have—

(1) At least—

(i) One year of experience in railroad track inspection; or

(ii) A combination of experience in track inspection and training from a course in track inspection or from a college level educational program related to track inspection;

(2) Demonstrated to the owner that he—

(i) Knows and understands the requirements of this part;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements of this part, pending review by a qualified person designated under paragraph (a) of this section.

(c) With respect to designations under paragraphs (a) and (b) of this section, each track owner must maintain written records of—

(1) Each designation in effect;

(2) The basis for each designation, and

(3) Track inspections made by each designated qualified person as required by § 213.241.

These records must be kept available for inspection or copying by the Federal Railroad Administrator during regular business hours.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973]

§ 213.9 Classes of track: operating speed limits.

(a) Except as provided in paragraphs (b) and (c) of this section and §§ 213.57 (b), 213.59(a), 213.105, 213.113 (a) and (b), and 213.137 (b) and (c), the following maximum allowable operating speeds apply:

[In miles per hour]

Over track that meets all of the requirements prescribed in this part for—	The maximum allowable operating speed for freight trains is—	The maximum allowable operating speed for passenger trains is-
Class 1 track...........	10	15
Class 2 track...........	25	30
Class 3 track...........	40	60
Class 4 track...........	60	80
Class 5 track...........	80	90
Class 6 track...........	110	110

(b) If a segment of track does not meet all of the requirements for its intended class, it is reclassified to the next lowest class of track for which it does meet all of the requirements of this part. However, if it does not at least meet the requirements for class 1 track, no operations may be conducted over that segment except as provided in § 213.11.

(c) Maximum operating speed may not exceed 110 m.p.h. without prior approval of the Federal Railroad Administrator. Petitions for approval must be filed in the manner and contain the information required by § 211.11 of this chapter. Each petition must provide sufficient information concerning the performance characteristics of the track, signaling, grade crossing protection, trespasser control where appropriate, and equipment involved and also concerning maintenance and inspection practices and procedures to be followed, to establish that the proposed speed can be sustained in safety.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973; 38 FR 23405, Aug. 30, 1973]

§ 213.11 Restoration or renewal of track under traffic conditions.

If, during a period of restoration or renewal, track is under traffic conditions and does not meet all of the requirements prescribed in this part, the work and operations on the track must be under the continuous supervision of a person designated under § 213.7(a).

§ 213.13 Measuring track not under load.

When unloaded track is measured to determine compliance with requirements of this part, the amount of rail movement, if any, that occurs while the track is loaded must be added to the measurement of the unloaded track.

[38 FR 875, Jan. 5, 1973]

§ 213.15 Civil penalty.

(a) Any owner of track to which this part applies, or any person held by the Federal Railroad Administrator to be responsible under § 213.5(c), who violates any requirement prescribed in this part is subject to a civil penalty of at least $250 but not more than $2,500.

(b) For the purpose of this section, each day a violation persists shall be treated as a separate offense.

Exemptions.

(a) Any owner of track to which this part applies may petition the Federal Railroad Administrator for exemption from any or all requirements prescribed in this part.

(b) Each petition for exemption under this section must be filed in the manner and contain the information required by § 211.11 of this chapter.

(c) If the Administrator finds that an exemption is in the public interest and is consistent with railroad safety, he may grant the exemption subject to any conditions he deems necessary. Notice of each exemption granted is published in the FEDERAL REGISTER together with a statement of the reasons therefor.

Subpart B—Roadbed

§ 213.31 Scope.

This subpart prescribes minimum requirements for roadbed and areas immediately adjacent to roadbed.

§ 213.33 Drainage.

Each drainage or other water carrying facility under or immediately adjacent to the roadbed must be maintained and kept free of obstruction, to accommodate expected water flow for the area concerned.

§ 213.37 Vegetation.

Vegetation on railroad property which is on or immediately adjacent to roadbed must be controlled so that it does not—

(a) Become a fire hazard to track-carrying structures;

(b) Obstruct visibility of railroad signs and signals;

(c) Interfere with railroad employees performing normal trackside duties;

(d) Prevent proper functioning of signal and communication lines; or

(e) Prevent railroad employees from visually inspecting moving equipment from their normal duty stations.

Subpart C—Track Geometry

§ 213.51 Scope.

This subpart prescribes requirements for the gage, alinement, and surface of track, and the elevation of outer rails and speed limitations for curved track.

§ 213.53 Gage.

(a) Gage is measured between the heads of the rails at right angles to the rails in a plane five-eighths of an inch below the top of the rail head.

(b) Gage must be within the limits prescribed in the following table:

Class of track	The gage of tangent track must be—		The gage of curved track must be—	
	At least—	But not more than—	At least—	But not more than—
1	4′ 8″	4′ 9¾″	4′ 8″	4′ 9¾″
2 and 3	4′ 8″	4′ 9½″	4′ 8″	4′ 9¾″
4	4′ 8″	4′ 9¼″	4′ 8″	4′ 9½″
5	4′ 8″	4′ 9″	4′ 8″	4′ 9½″
6	4′ 8″	4′ 8¾″	4′ 8″	4′ 9″

§ 213.55 Alinement.

Alinement may not deviate from uniformity more than the amount prescribed in the following table:

Class of track	Tangent track	Curved track
	The deviation of the mid-offset from 62-foot line[1] may not be more than—	The deviation of the mid-ordinate from 62-foot chord[2] may not be more than—
1	5″	5″
2	3″	3″
3	1¾″	1¾″
4	1½″	1½″
5	¾″	⅝″
6	½″	⅜″

[1] The ends of the line must be at points on the gage side of the line rail, five eighths of an inch below the top of the railhead. Either rail may be used as the line rail, however, the same rail must be used for the full length of that tangential segment of track.

[2] The ends of the chord must be at points on the gage side of the outer rail, five-eighths of an inch below the top of the railhead.

§ 213.57 Curves; elevation and speed limitations.

(a) Except as provided in § 213.63, the outside rail of a curve may not be lower than the inside rail or have more than 6 inches of elevation.

(b) The maximum allowable operating speed for each curve is determined by the following formula:

$$V_{max} = \sqrt{\frac{E_a + 3}{0.0007d}}$$

where

V_{max} = Maximum allowable operating speed (miles per hour).

E_a = Actual elevation of the outside rail (inches).

d = Degree of curvature (degrees).

Appendix A is a table of maximum allowable operating speed computed in accordance with this formula for various elevations and degrees of curvature.

§ 213.59 Elevation of curved track; runoff.

(a) If a curve is elevated, the full elevation must be provided throughout the curve, unless physical conditions do not permit. If elevation runoff occurs in a curve, the actual minimum elevation must be used in computing the maximum allowable operating speed for that curve under § 213.57(b).

(b) Elevation runoff must be at a uniform rate, within the limits of track surface deviation prescribed in § 213.63, and it must extend at least the full length of the spirals. If physical conditions do not permit a spiral long enough to accommodate the minimum length of runoff, part of the runoff may be on tangent track.

§ 213.61 Curve data for Classes 4 through 6 track.

(a) Each owner of track to which this part applies shall maintain a record of each curve in its Classes 4 through 6 track. The record must contain the following information:

(1) Location;
(2) Degree of curvature;
(3) Designated elevation;
(4) Designated length of elevation runoff; and
(5) Maximum allowable operating speed.

[38 FR 875, Jan. 5, 1973]

§ 213.63 Track surface.

Each owner of the track to which this part applies shall maintain the surface of its track within the limits prescribed in the following table:

Track surface	Class of track					
	1	2	3	4	5	6
The runoff in any 31 feet of rail at the end of a raise may not be more than	3½"	3"	2"	1½"	1"	½"
The deviation from uniform profile on either rail at the midordinate of a 62-foot chord may not be more than	3"	2¾"	2¼"	2"	1¼"	½"
Deviation from designated elevation on spirals may not be more than	1¾"	1½"	1¼"	1"	¾"	½"
ariation in cross level on spirals in any 31 feet may not be more than	2"	1¾"	1¼"	1"	¾"	½"
Deviation from zero cross level at any point on tangent or from designated elevation on curves between spirals may not be more than	3"	2"	1¾"	1¼"	1"	½"
The difference in cross level between any two points less than 62 feet apart on tangents and curves between spirals may not be more than	3"	2"	1¾"	1¼"	1"	½"

Subpart D—Track Structure

§ 213.101 Scope.

This subpart prescribes minimum requirements for ballast, crossties, track assembly fittings, and the physical condition of rails.

§ 213.103 Ballast; general.

Unless it is otherwise structurally supported, all track must be supported by material which will—

(a) Transmit and distribute the load of the track and railroad rolling equipment to the subgrade;

(b) Restrain the track laterally, longitudinally, and vertically under dynamic loads imposed by railroad rolling equipment and thermal stress exerted by the rails;

(c) Provide adequate drainage for the track; and

(d) Maintain proper track cross-level, surface, and alinement.

§ 213.105 Ballast; disturbed track.

If track is disturbed, a person designated under § 213.7 shall examine the track to determine whether or not the ballast is sufficiently compacted to perform the functions described in § 213.103. If the person making the examination considers it to be necessary in the interest of safety, operating speed over the disturbed segment of track must be reduced to a speed that he considers safe.

§ 213.109 Crossties.

(a) Crossties may be made of any material to which rails can be securely fastened. The material must be capable of holding the rails to gage within the limits prescribed in § 213.53(b) and distributing the load from the rails to the ballast section.

(b) A timber crosstie is considered to be defective when it is—

(1) Broken through;

(2) Split or otherwise impaired to the extent it will not hold spikes or will allow the ballast to work through;

(3) So deteriorated that the tie plate or base of rail can move laterally more than one-half inch relative to the crosstie;

(4) Cut by the tie plate through more than 40 percent of its thickness; or

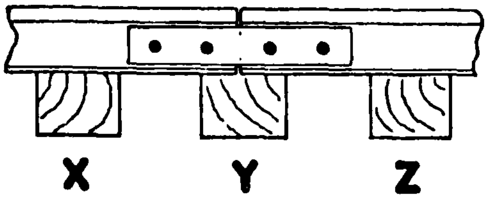
(5) Not spiked as required by § 213.127.

(c) If timber crossties are used, each 39 feet of track must be supported by nondefective ties as set forth in the following table:

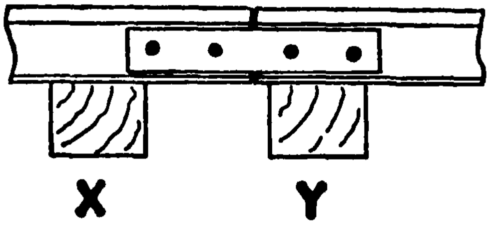
Class of track	Minimum number of nondefective ties per 39 feet of track	Maximum distance between nondefective ties (center to center) (inches)
1	5	100
2, 3	8	70
4, 5	12	48
6	14	48

(d) If timber ties are used, the minimum number of nondefective ties under a rail joint and their relative positions under the joint are described in the following chart. The letters in the chart correspond to letters underneath the ties for each type of joint depicted.

SUPPORTED JOINT



SUSPENDED JOINT



Class of track	Minimum number of nondefective ties under a joint	Required position of nondefective ties	
		Supported joint	Suspended joint
1	1	X, Y, or Z.	X or Y.
2, 3	1	Y	X or Y.
4, 5, 6	2	X and Y, or Y and Z.	X and Y.

(e) Except in an emergency or for a temporary installation of not more than 6-months duration, crossties may not be interlaced to take the place of switch ties.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973]

§ 213.113 Defective rails.

(a) When an owner of track to which this part applies learns, through inspection or otherwise, that a rail in that track contains any of the defects listed in the following table, a person designated under § 213.7 shall determine whether or not the track may continue in use. If he determines that the track may continue in use, operation over the defective rail is not permitted until—

(1) The rail is replaced; or

(2) The remedial action prescribed in the table is initiated:

REMEDIAL ACTION

Defect	Length of defect (inch)		Percent of railhead cross-sectional area weakened by defect		If defective rail is not replaced, take the remedial action prescribed in note—
	More than	But not more than	Less than	But not less than	
Transverse fissure			20		B.
			100	20	B.
				100	A.
Compound fissure			20		B.
			100	20	B.
				100	A.
Detail fracture			20		C.
Engine burn fracture			100	20	D.
Defective weld				100	A, or E and H.
Horizontal split head	0	2			H and F.
	2	4			I and G.
Vertical split head	4				B.
	(Break out in railhead)				A.
Split web	0	½			H and F.
Piped rail	½	3			I and G.
Head web separation	3				B.
	(Break out in railhead)				A.
Bolt hole crack	0	½			H and F.
	½	1½			I and G.
	1½				B.
	(Break out in railhead)				A.
Broken base	0	6			E and I.
	6				(Replace rail).
Ordinary break					A or E.
Damaged rail					C.

NOTE:

A—Assign person designated under § 213.7 to visually supervise each operation over defective rail.

B—Limit operating speed to 10 m.p.h. over defective rail.

C—Apply joint bars bolted only through the outermost holes to defect within 20 days after it is determined to continue the track in use. In the case of classes 3 through 6 track, limit operating speed over defective rail to 30 m.p.h. until angle bars are applied; thereafter, limit speed to 50 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.

D—Apply joint bars bolted only through the outermost holes to defect within 10 days after it is determined to continue the track in use. Limit operating speed over defective rail to 10 m.p.h. until angle bars are applied; thereafter, limit speed to 50 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.

E—Apply joint bars to defect and bolt in accordance with § 213.121 (d) and (e).

F—Inspect rail 90 days after it is determined to continue the track in use.

G—Inspect rail 30 days after it is determined to continue the track in use.

H—Limit operating speed over defective rail to 50 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.

I—Limit operating speed over defective rail to 30 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.

(b) If a rail in classes 3 through 6 track or class 2 track on which passenger trains operate evidences any of the conditions listed in the following table, the remedial action prescribed in the table must be taken:

Condition	Remedial action	
	If a person designated under § 213.7 determines that condition requires rail to be replaced	If a person designated under § 213.7 determines that condition does not require rail to be replaced
Shelly spots	Limit speed to 20 m.p.h. and schedule the rail for replacement.	Inspect the rail for internal defects at intervals of not more than every 12 months.
Head checks		
Engine burn (but not fracture).		
Mill defect		
Flaking	do	Inspect the rail at intervals of not more than every 6 months.
Slivered		
Corrugated		
Corroded		

(c) As used in this section—

(1) "Transverse Fissure" means a progressive crosswise fracture starting from a crystalline center or nucleus inside the head from which it spreads outward as a smooth, bright, or dark, round or oval surface substantially at a right angle to the length of the rail. The distinguishing features of a transverse fissure from other types of fractures or defects are the crystalline center or nucleus and the nearly smooth surface of the development which surrounds it.

(2) "Compound Fissure" means a progressive fracture originating in a horizontal split head which turns up or down in the head of the rail as a smooth, bright, or dark surface progressing until substantially at a right angle to the length of the rail. Compound fissures require examination of both faces of the fracture to locate the horizontal split head from which they originate.

(3) "Horizontal Split Head" means a horizontal progressive defect originating inside of the rail head, usually one-quarter inch or more below the running surface and progressing horizontally in all directions, and generally accompanied by a flat spot on the running surface. The defect appears as a crack lengthwise of the rail when it reaches the side of the rail head.

(4) "Vertical Split Head" means a vertical split through or near the middle of the head, and extending into or through it. A crack or rust streak may show under the head close to the web or pieces may be split off the side of the head.

(5) "Split Web" means a lengthwise crack along the side of the web and extending into or through it.

(6) "Piped Rail" means a vertical split in a rail, usually in the web, due to failure of the sides of the shrinkage cavity in the ingot to unite in rolling.

(7) "Broken Base" means any break in the base of a rail.

(8) "Detail Fracture" means a progressive fracture originating at or near the surface of the rail head. These fractures should not be confused with transverse fissures, compound fissures, or other defects which have internal origins. Detail fractures may arise from shelly spots, head checks, or flaking.

(9) "Engine Burn Fracture" means a progressive fracture originating in spots where driving wheels have slipped on top of the rail head. In developing downward they frequently resemble the compound or even transverse fissure with which they should not be confused or classified.

(10) "Ordinary Break" means a partial or complete break in which there is no sign of a fissure, and in which none of the other defects described in this paragraph are found.

(11) "Damaged rail" means any rail broken or injured by wrecks, broken, flat, or unbalanced wheels, slipping, or similar causes.

(12) "Shelly spots" means a condition where a thin (usually three-eighths inch in depth or less) shell-like piece of surface metal becomes separated from the parent metal in the railhead, generally at the gage corner. It may be evidenced by a black spot appearing on the railhead over the zone of separation or a piece of metal breaking out completely, leaving a shallow cavity in the railhead. In the case of a small shell there may be no surface evidence, the existence of the shell being apparent only after the rail is broken or sectioned.

(13) "Head checks" mean hair fine cracks which appear in the gage corner of the rail head, at any angle with the length of the rail. When not readily visible the presence of the checks may often be detected by the raspy feeling of their sharp edges.

(14) "Flaking" means small shallow flakes of surface metal generally not more than one-quarter inch in length or width break out of the gage corner of the railhead.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973; 38 FR 1508, Jan. 15, 1973]

§ 213.115 Rail end mismatch.

Any mismatch of rails at joints may not be more than that prescribed by the following table:

Class of track	Any mismatch of rails at joints may not be more than the following—	
	On the trend of the rail ends (inch)	On the gage side of the rail ends (inch)
1	¼	¼
2	¼	3/16
3	3/16	3/16
4, 5	⅛	⅛
6	⅛	⅛

§ 213.117 Rail end batter.

(a) Rail end batter is the depth of depression at one-half inch from the rail end. It is measured by placing an 18-inch straightedge on the tread on the rail end, without bridging the joint, and measuring the distance between the bottom of the straightedge and the top of the rail at one-half inch from the rail end.

(b) Rail end batter may not be more than that prescribed by the following table:

Class of track	*Rail end batter may not be more than— (inch)*
1	½
2	⅜
3	⅜
4	¼
5	⅛
6	⅛

§ 213.119 Continuous welded rail.

(a) When continuous welded rail is being installed, it must be installed at, or adjusted for, a rail temperature range that should not result in compressive or tensile forces that will produce lateral displacement of the track or pulling apart of rail ends or welds.

(b) After continuous welded rail has been installed it should not be disturbed at rail temperatures higher than its installation or adjusted installation temperature.

§ 213.121 Rail joints.

(a) Each rail joint, insulated joint, and compromise joint must be of the proper design and dimensions for the rail on which it is applied.

(b) If a joint bar on classes 3 through 6 track is cracked, broken, or because of wear allows vertical movement of either rail when all bolts are tight, it must be replaced.

(c) If a joint bar is cracked or broken between the middle two bolt holes it must be replaced.

(d) In the case of conventional jointed track, each rail must be bolted with at least two bolts at each joint in classes 2 through 6 track, and with at least one bolt in class 1 track.

(e) In the case of continuous welded rail track, each rail must be bolted with at least two bolts at each joint.

(f) Each joint bar must be held in position by track bolts tightened to allow the joint bar to firmly support the abutting rail ends and to allow longitudinal movement of the rail in the joint to accommodate expansion and contraction due to temperature variations. When out-of-face, no-slip, joint-to-rail contact exists by design, the requirements of this paragraph do not apply. Those locations are considered to be continuous welded rail track and must meet all the requirements for continuous welded rail track prescribed in this part.

(g) No rail or angle bar having a torch cut or burned bolt hole may be used in classes 3 through 6 track.

§ 213.123 Tie plates.

(a) In classes 3 through 6 track where timber crossties are in use there must be tie plates under the running rails on at least eight of any 10 consecutive ties.

(b) Tie plates having shoulders must be placed so that no part of the shoulder is under the base of the rail.

§ 213.125 Rail anchoring.

Longitudinal rail movement must be effectively controlled. If rail anchors which bear on the sides of ties are used for this purpose, they must be on the same side of the tie on both rails.

§ 213.127 Track spikes.

(a) When conventional track is used with timber ties and cut track spikes, the rails must be spiked to the ties with at least one line-holding spike on the gage side and one line-holding spike on the field side. The total number of track spikes per rail per tie, including plate-holding spikes, must be at least the number prescribed in the following table:

MINIMUM NUMBER OF TRACK SPIKES PER RAIL PER TIE, INCLUDING PLATE-HOLDING SPIKES

Class of track	Tangent track and curved track with not more than 2° of curvature	Curved track with more than 2° but not more than 4° of curvature	Curved track with more than 4° but not more than 6° of curvature	Curved track with more than 6° of curvature
1	2	2	2	2
2	2	2	2	3
3	2	2	2	3
4	2	2	3	....
5	2	3	....	....
6	2	....	....	....

(b) A tie that does not meet the requirements of paragraph (a) of this section is considered to be defective for the purposes of § 213.109(b).

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.129 Track shims.

(a) If track does not meet the geometric standards in Subpart C of this part and working of ballast is not possible due to weather or other natural conditions, track shims may be installed to correct the deficiencies. If shims are used, they must be removed and the track resurfaced as soon as weather and other natural conditions permit.

(b) When shims are used they must be—

(1) At least the size of the tie plate;

(2) Inserted directly on top of the tie, beneath the rail and tie plate;

(3) Spiked directly to the tie with spikes which penetrate the tie at least 4 inches.

(c) When a rail is shimmed more than 1½ inches, it must be securely braced on at least every third tie for the full length of the shimming.

(d) When a rail is shimmed more than 2 inches a combination of shims and 2-

inch or 4-inch planks, as the case may be, must be used with the shims on top of the planks.

§ 213.131 Planks used in shimming.

(a) Planks used in shimming must be at least as wide as the tie plates, but in no case less than 5½ inches wide. Whenever possible they must extend the full length of the tie. If a plank is shorter than the tie, it must be at least 3 feet long and its outer end must be flush with the end of the tie.

(b) When planks are used in shimming on uneven ties, or if the two rails being shimmed heave unevenly, additional shims may be placed between the ties and planks under the rails to compensate for the unevenness.

(c) Planks must be nailed to the ties with at least four 8-inch wire spikes. Before spiking the rails or shim braces, planks must be bored with ⅝-inch holes.

§ 213.133 Turnouts and track crossings generally.

(a) In turnouts and track crossings, the fastenings must be intact and maintained so as to keep the components securely in place. Also, each switch, frog, and guard rail must be kept free of obstructions that may interfere with the passage of wheels.

(b) Classes 4 through 6 track must be equipped with rail anchors through and on each side of track crossings and turnouts, to restrain rail movement affecting the position of switch points and frogs.

(c) Each flangeway at turnouts and track crossings must be at least 1½ inches wide.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.135 Switches.

(a) Each stock rail must be securely seated in switch plates, but care must be used to avoid canting the rail by overtightening the rail braces.

(b) Each switch point must fit its stock rail properly, with the switch stand in either of its closed positions to allow wheels to pass the switch point. Lateral and vertical movement of a stock rail in the switch plates or of a switch plate on a tie must not adversely affect the fit of the switch point to the stock rail.

(c) Each switch must be maintained so that the outer edge of the wheel tread cannot contact the gage side of the stock rail.

(d) The heel of each switch rail must be secure and the bolts in each heel must be kept tight.

(e) Each switch stand and connecting rod must be securely fastened and operable without excessive lost motion.

(f) Each throw lever must be maintained so that it cannot be operated with the lock or keeper in place.

(g) Each switch position indicator must be clearly visible at all times.

(h) Unusually chipped or worn switch points must be repaired or replaced. Metal flow must be removed to insure proper closure.

§ 213.137 Frogs.

(a) The flangeway depth measured from a plane across the wheel-bearing area of a frog on class 1 track may not be less than 1⅜ inches, or less than 1½ inches on classes 2 through 6 track.

(b) If a frog point is chipped, broken, or worn more than five-eighths inch down and 6 inches back, operating speed over that frog may not be more than 10 miles per hour.

(c) If the tread portion of a frog casting is worn down more than three-eighths inch below the original contour, operating speed over that frog may not be more than 10 miles per hour.

§ 213.139 Spring rail frogs.

(a) The outer edge of a wheel tread may not contact the gage side of a spring wing rail.

(b) The toe of each wing rail must be solidly tamped and fully and tightly bolted.

(c) Each frog with a bolt hole defect or head-web separation must be replaced.

(d) Each spring must have a tension sufficient to hold the wing rail against the point rail.

(e) The clearance between the hold-down housing and the horn may not be more than one-fourth of an inch.

§ 213.141 Self-guarded frogs.

(a) The raised guard on a self-guarded frog may not be worn more than three-eighths of an inch.

(b) If repairs are made to a self-guarded frog without removing it from service, the guarding face must be restored before rebuilding the point.

§ 213.143 Frog guard rails and guard faces; gage.

The guard check and guard face gages in frogs must be within the limits prescribed in the following table:

Class of track	Guard check gage	Guard face gage
	The distance between the gage line of a frog to the guard line[1] of its guard rail or guarding face, measured across the track at right angles to the gage line,[2] may not be less than—	The distance between guard lines,[1] measured across the track at right angles to the gage line,[2] may not be more than—
1	4' 6⅛"	4' 5¼"
2	4' 6¼"	4' 5⅛"
3, 4	4' 6⅜"	4' 5⅛"
5, 6	4' 6½"	4' 5"

[1] A line along that side of the flangeway which is nearer to the center of the track and at the same elevation as the gage line.

[2] A line ⅝ inch below the top of the center line of the head of the running rail, or corresponding location of the tread portion of the track structure.

Subpart E—Track Appliances and Track-Related Devices

§ 213.201 Scope.

This subpart prescribes minimum requirements for certain track appliances and track-related devices.

§ 213.205 Derails.

(a) Each derail must be clearly visible. When in a locked position a derail must be free of any lost motion which would allow it to be operated without removing the lock.

(b) When the lever of a remotely controlled derail is operated and latched it must actuate the derail.

§ 213.207 Switch heaters.

The operation of a switch heater must not interfere with the proper operation of the switch or otherwise jeopardize the safety of railroad equipment.

Subpart F—Inspection

§ 213.231 Scope.

This subpart prescribes requirements for the frequency and manner of inspecting track to detect deviations from the standards prescribed in this part.

§ 213.233 Track inspections.

(a) All track must be inspected in accordance with the schedule prescribed in paragraph (c) of this section by a person designated under § 213.7.

(b) Each inspection must be made on foot or by riding over the track in a vehicle at a speed that allows the person making the inspection to visually inspect the track structure for compliance with this part. However, mechanical or electrical inspection devices approved by the Federal Railroad Administrator may be used to supplement visual inspection. If a vehicle is used for visual inspection, the speed of the vehicle may not be more than 5 miles per hour when passing over track crossings, highway crossings, or switches.

(c) Each track inspection must be made in accordance with the following schedule:

Class of track	Type of track	Required frequency
1, 2, 3	Main track and sidings.	*Weekly* with at least 3 calendar days interval between inspections, or *before use*, if the track is used less than once a week, or *twice weekly* with at least 1 calendar day interval between inspections, if the track carries passenger trains or more than 10 million gross tons of traffic during the preceding calendar year.
1, 2, 3	Other than main track and sidings.	*Monthly* with at least 20 calendar days interval between inspections.
4, 5, 6		*Twice weekly* with at least 1 calendar day interval between inspections.

(d) If the person making the inspection finds a deviation from the requirements of this part, he shall immediately initiate remedial action.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.235 Switch and track crossing inspections.

(a) Except as provided in paragraph (b) of this section, each switch and track crossing must be inspected on foot at least monthly.

(b) In the case of track that is used less than once a month, each switch and track crossing must be inspected on foot before it is used.

§ 213.237 Inspection of rail.

(a) In addition to the track inspections required by § 213.233, at least once a year a continuous search for internal defects must be made of all jointed and welded rails in Classes 4 through 6 track, and Class 3 track over which passenger trains operate. However, in the case of a new rail, if before installation or within 6 months thereafter it is inductively or ultrasonically inspected over its entire length and all defects are removed, the next continuous search for internal defects need not be made until 3 years after that inspection.

(b) Inspection equipment must be capable of detecting defects between joint bars, in the area enclosed by joint bars.

(c) Each defective rail must be marked with a highly visible marking on both sides of the web and base.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.239 Special inspections.

In the event of fire, flood, severe storm, or other occurrence which might have damaged track structure, a special inspection must be made of the track involved as soon as possible after the occurrence.

§ 213.241 Inspection records.

(a) Each owner of track to which this part applies shall keep a record of each inspection required to be performed on that track under this subpart.

(b) Each record of an inspection under §§ 213.233 and 213.235 shall be prepared on the day the inspection is made and signed by the person making the inspection. Records must specify the track inspected, date of inspection, location and nature of any deviation from the requirements of this part, and the remedial action taken by the person making the inspection. The owner shall retain each record at its division headquarters for at least 1 year after the inspection covered by the record.

(c) Rail inspection records must specify the date of inspection, the location, and nature of any internal rail defects found, and the remedial action taken and the date thereof. The owner shall retain a rail inspection record for at least 2 years after the inspection and for 1 year after remedial action is taken.

(d) Each owner required to keep inspection records under this section shall make those records available for inspection and copying by the Federal Railroad Administrator.

APPENDIX A—MAXIMUM ALLOWABLE OPERATING SPEEDS FOR CURVED TRACK

Elevation of outer rail (inches)

Degree of Curvature	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
	Maximum allowable operating speed (mph)												
0°30′	93	100	107										
0°40′	80	87	93	98	103	109							
0°50′	72	78	83	88	93	97	101	106	110				
1°00′	66	71	76	80	85	89	93	96	100	104	107	110	
1°15′	59	63	68	72	76	79	83	86	89	93	96	99	101
1°30′	54	58	62	66	69	72	76	79	82	85	87	90	93
1°45′	50	54	57	61	64	67	70	73	76	78	81	83	86
2°00′	46	50	54	57	60	63	66	68	71	73	76	78	80
2°15′	44	47	50	54	56	59	62	64	67	69	71	74	76
2°30′	41	45	48	51	54	56	59	61	63	66	68	70	72
2°45′	40	43	46	48	51	54	56	58	60	62	65	66	68
3°00′	38	41	44	46	49	51	54	56	58	60	62	64	66
3°15′	36	39	42	45	47	49	51	54	56	57	59	61	63
3°30′	35	38	40	43	45	47	50	52	54	55	57	59	61
3°45′	34	37	39	41	44	46	48	50	52	54	55	57	59
4°00′	33	35	38	40	42	44	46	48	50	52	54	55	57
4°30′	31	33	36	38	40	42	44	45	47	49	50	52	54
5°00′	29	32	34	36	38	40	41	43	45	46	48	49	51
5°30′	28	30	32	34	36	38	40	41	43	44	46	47	48
6°00′	27	29	31	33	35	36	38	39	41	42	44	45	46
6°30′	26	28	30	31	33	35	36	38	39	41	42	43	45
7°00′	25	27	29	30	32	34	35	36	38	39	40	42	43
8°00′	23	25	27	28	30	31	33	34	35	37	38	39	40
9°00′	22	24	26	27	28	30	31	32	33	35	36	37	38
10°00′	21	22	24	26	27	28	29	31	32	33	34	35	36
11°00′	20	21	23	24	26	27	28	29	30	31	32	33	34
12°00′	19	20	22	23	24	26	27	28	29	30	31	32	3

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

APPENDIX B

PROPOSED RAIL OUTLOADING PROCEDURE FOR A MOBILIZATION MOVE AT FORT CHAFFEE

Maximum rail outloading operations use a cyclic schedule to minimize conflicts and improve control. The recommended rail outloading plan, Plan 4, is shown in figure 30. The simulation begins with the assumption that it takes several days to accumulate the necessary number of railcars to start full-scale outloading operations. The locomotives position the arriving cars at the designated loadout sites according to a preconceived plan. Simultaneously, the equipment to be loaded aboard the cars is prepared and staged. Personnel are used to throw switches and act as road guards at all rail/highway crossings to reduce delays and insure a safe operation.

Initial conditions: empty railcars have been accumulating for several days and have been spotted at loading sites - tracks L1 through L5 (see fig 2). The number of railcars in position is 198, and the loading sites previously mentioned will be used for loading on a cyclic basis. When the unit equipment is loaded on the railcars, the MP main line (ML) engines will pick them up for movement to the assigned POE after they have dropped off the incoming empty railcars at the empty storage sites, tracks E1 through E3. The switching engine assigned to Fort Chaffee will spot these empty railcars at the appropriate tracks. There will be three incoming trains of empties and three outgoing trains of loaded unit equipment per 24-hour day.

Loading, blocking, and bracing of the empty cars at the loading sites will be accomplished during daylight hours and is assumed to last about 7 hours. The switching operations will follow and will be carried out until they are completed.

The switching operation begins with the arrival of the main line engine (the first train) at track E1, where 34 empty cars plus a caboose are placed on track E1, 25 empty cars on track E2, and 6 empty cars plus a switching locomotive on track E3. The ML engines transit to track L1 to pick up 40 loaded railcars, and then to track L5 to couple with 25 loaded railcars, for a total of 65 loaded railcars. The main line engines then travel to the main line track where the train waits to be coupled with the caboose before its journey to the POE. The switch engine (SL), which has been waiting on track E3, uncouples from the 6 empty railcars, goes to track E1 where it couples with the caboose, and then to the main line track to couple the caboose to the train. The switch engine goes back to track E1, picks up 34 empty cars, and spots them on track L1. After the brakes

7

ELAPSED TIME IN HOURS
SINCE LOADING, BLOCKING,
& BRACING BEGAN

+ CABOOSE

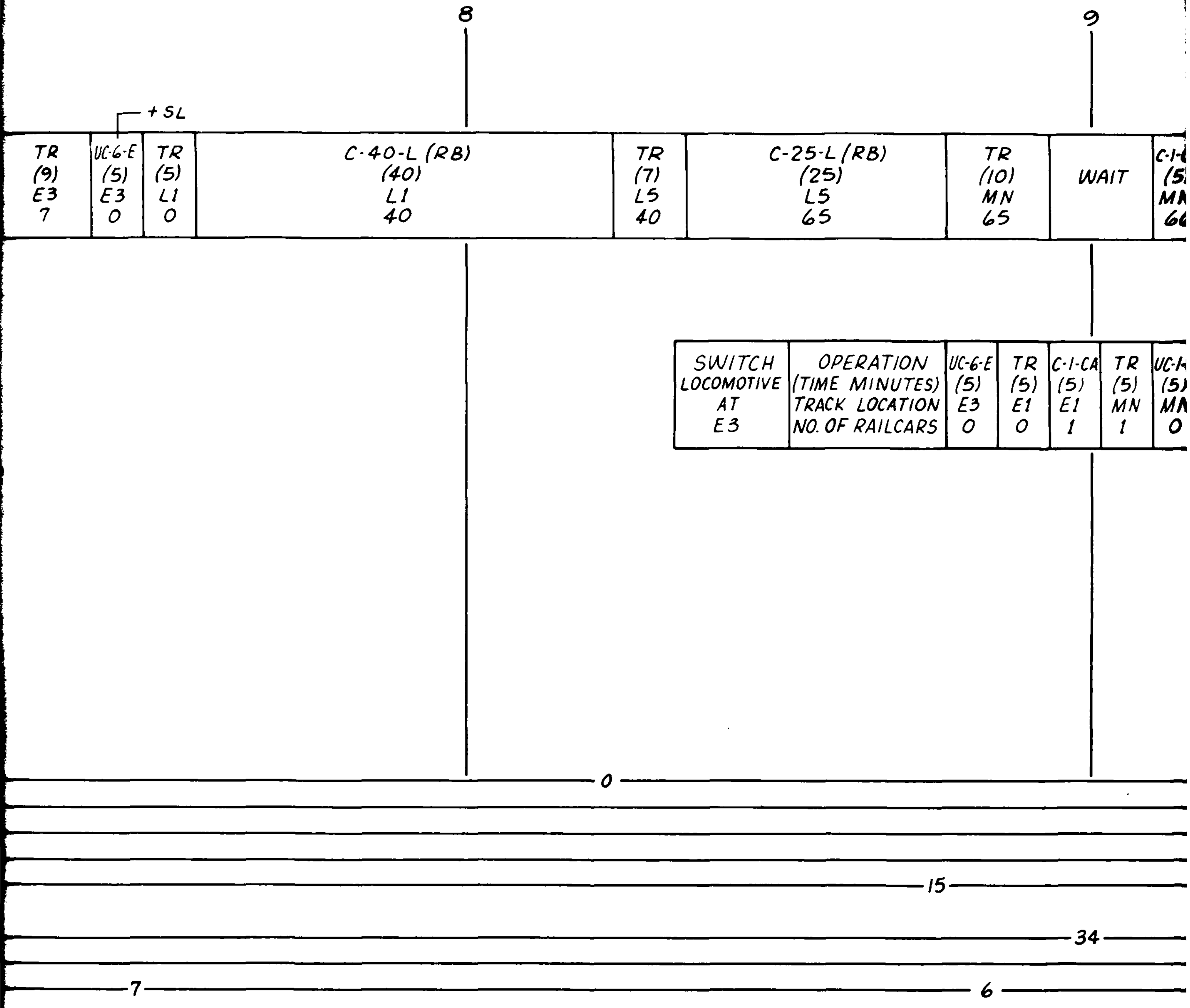
LEGEND	
CA	CABOOSE
C	COUPLE
UC	UNCOUPLE
TR	TRANSIT
L	LOADED
E	EMPTY
39	NO. OF RAILCARS
(15)	TIME EXPENDED IN MINUTES
L1	TRACK LOCATION
MN	MAIN
TRK	TRACK
SB	SET BRAKE
WT	WAIT
SL	SWITCHING LOCOMOTIVE
ML	MAIN LINE LOCOMOTIVE
13	EMPTY RAILCARS FOR NEXT CYCLE

ML# 1 ARRIVES WITH 65 EMPTY RAILCARS + CABOOSE & SWITCHING LOCOMOTIVE	OPERATION	UC-34-E	TR	UC-25-E
	(TIME MINUTES)	(5)	(5)	(5)
	TRACK LOCATION	E1	E2	E2
	NO. OF RAILCARS	32	32	7

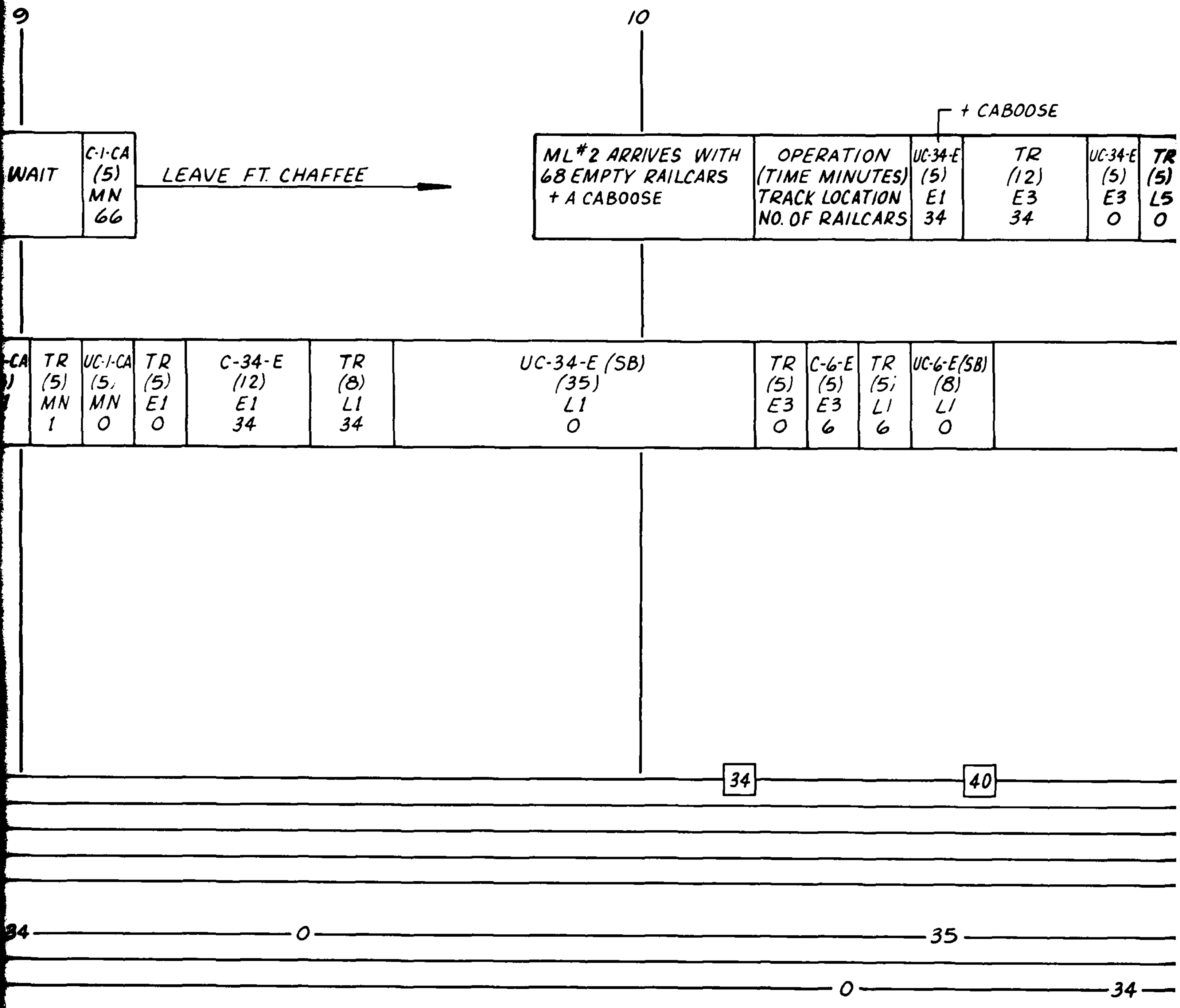
CAP 57	DESCRIPTION	TRK NO.	CAP CARS
	PRIORITY OF USE LOADING SITES		
40	TRACK 1	L1	40
38	TRACK 17 & 5	L2	38
40	TRACK 21	L3	40
40	TRACK 20	L4	40
40	TRACK 7	L5	40
	EMPTY STORAGE		
35	TRACK 3	E1	0
26	TRACK 4	E2	0
40	TRACK 6	E3	0

35

25


8
9
+ SL
TR (9) E3 7
UC-6-E (5) E3 0
TR (5) L1 0
C-40-L (RB) (40) L1 40
TR (7) L5 40
C-25-L (RB) (25) L5 65
TR (10) MN 65
WAIT
SWITCH LOCOMOTIVE AT E3
OPERATION (TIME MINUTES) TRACK LOCATION NO. OF RAILCARS
UC-6-E (5) E3 0
TR (5) E1 0
C-1-CA (5) E1 1
TR (5) MN 1
0
15
34
7
6

2


9
10
+ CABOOSE
WAIT
C-1-CA (5) MN 66
LEAVE FT. CHAFFEE
ML#2 ARRIVES WITH 68 EMPTY RAILCARS + A CABOOSE
OPERATION (TIME MINUTES) TRACK LOCATION NO. OF RAILCARS
UC-34-E (5) E1 34
TR (12) E3 34
UC-34-E (5) E3 0
TR (5) L5 0
-CA
TR (5) MN 1
UC-1-CA (5) MN 0
TR (5) E1 0
C-34-E (12) E1 34
TR (8) L1 34
UC-34-E (SB) (35) L1 0
TR (5) E3 0
C-6-E (5) E3 6
TR (5) L1 6
UC-6-E(SB) (8) L1 0
34
40
34
0
35
0
34

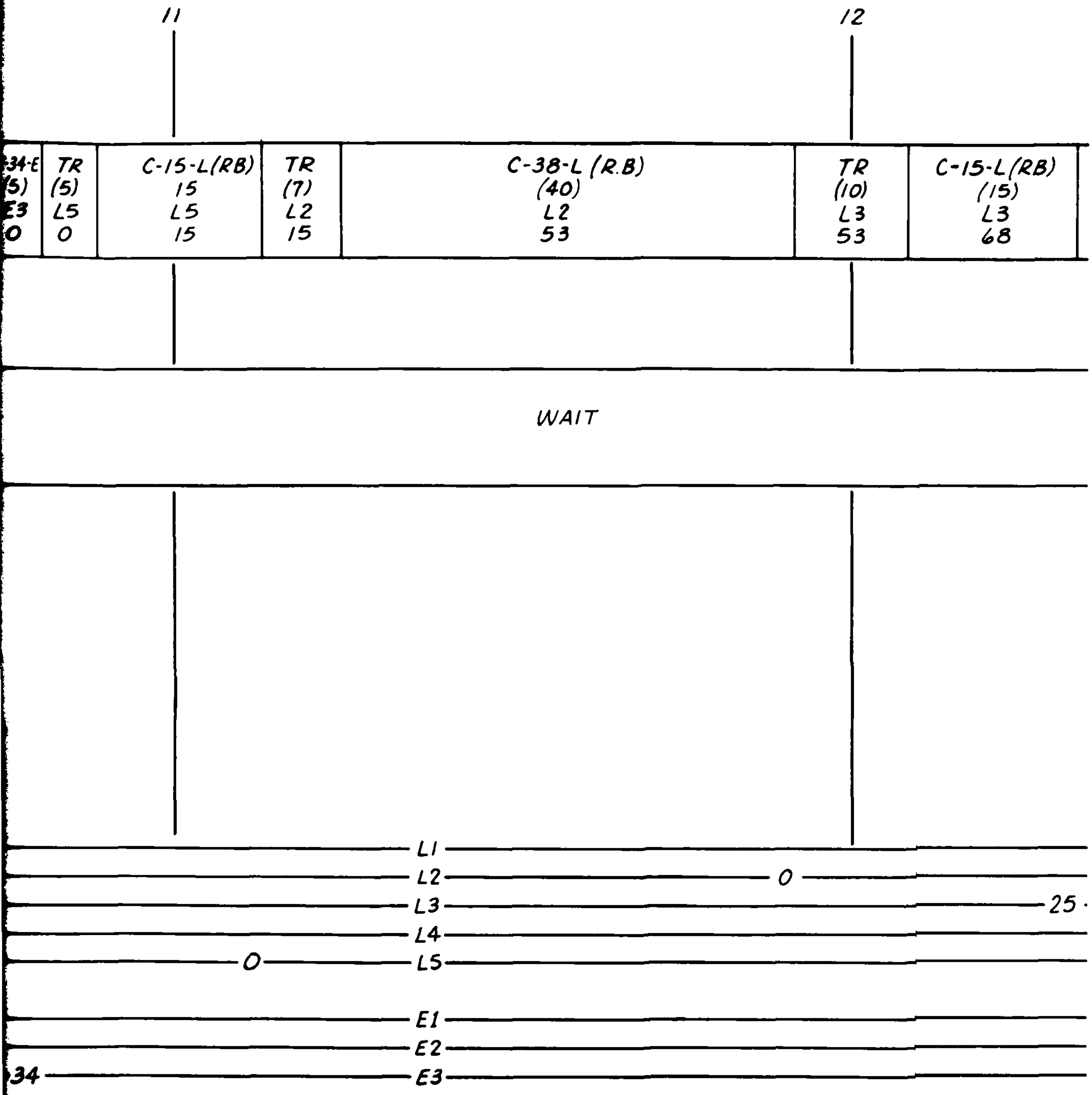


Figure 30. Rail outloading simulation, Plan 4.

4

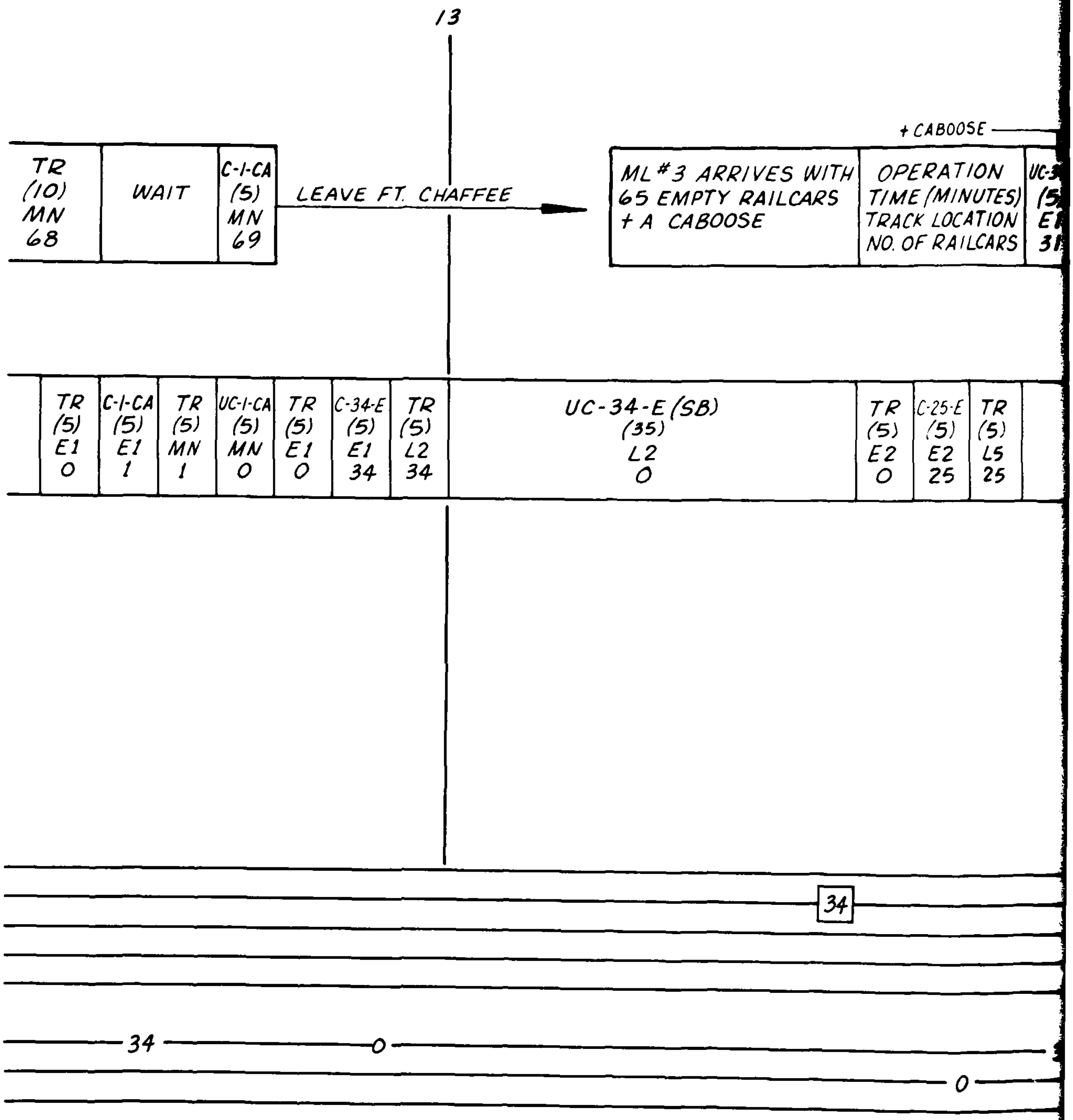
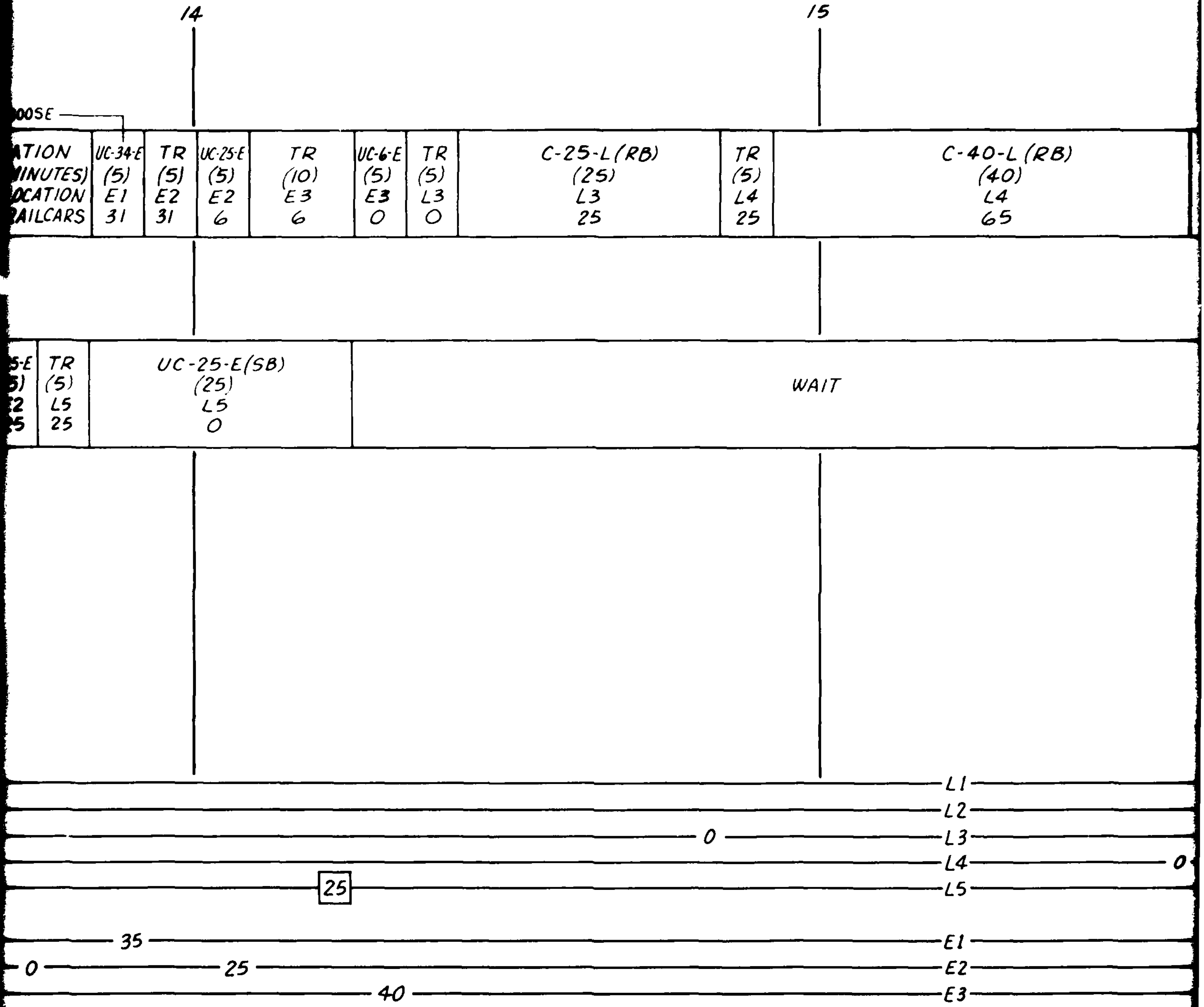
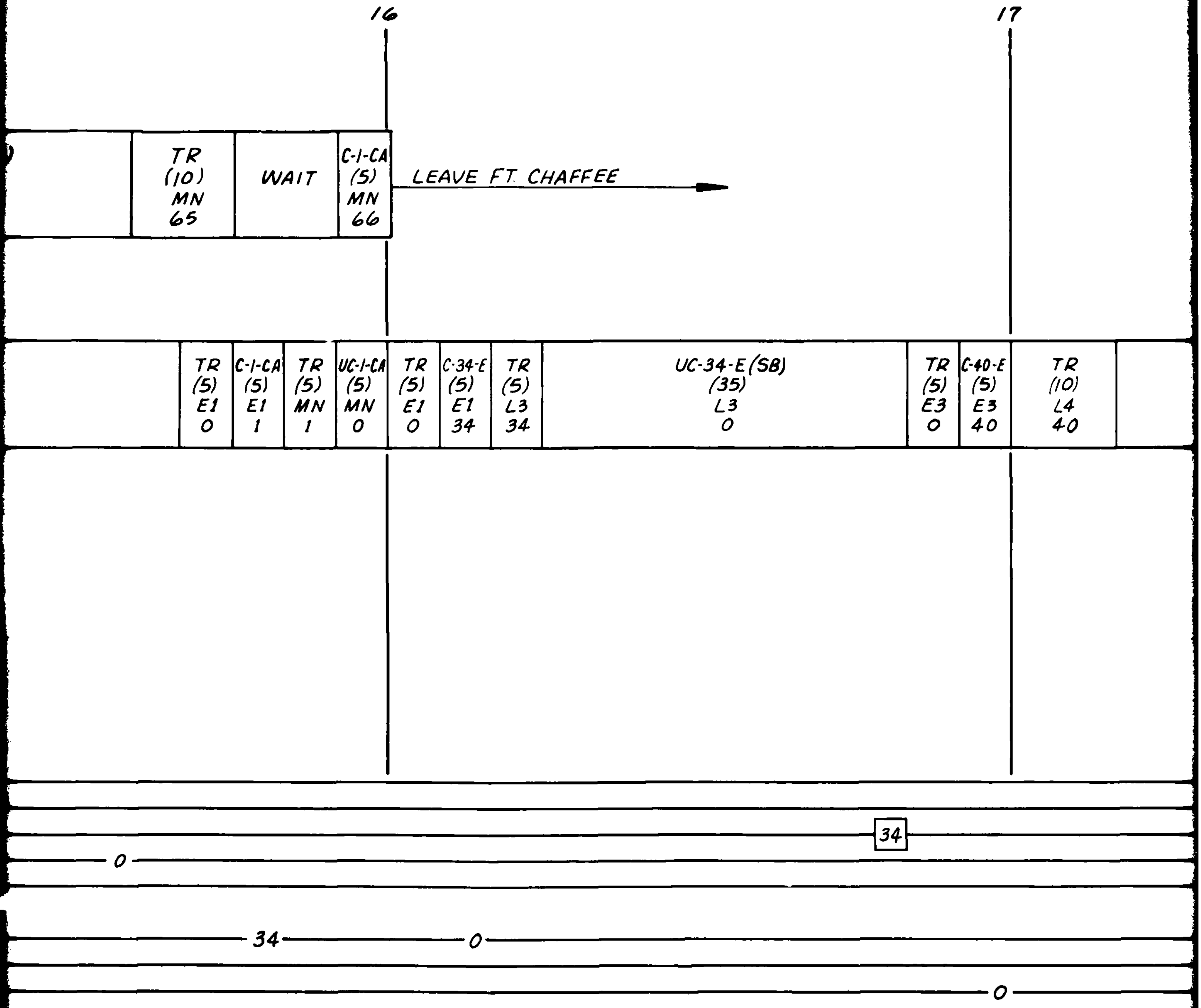
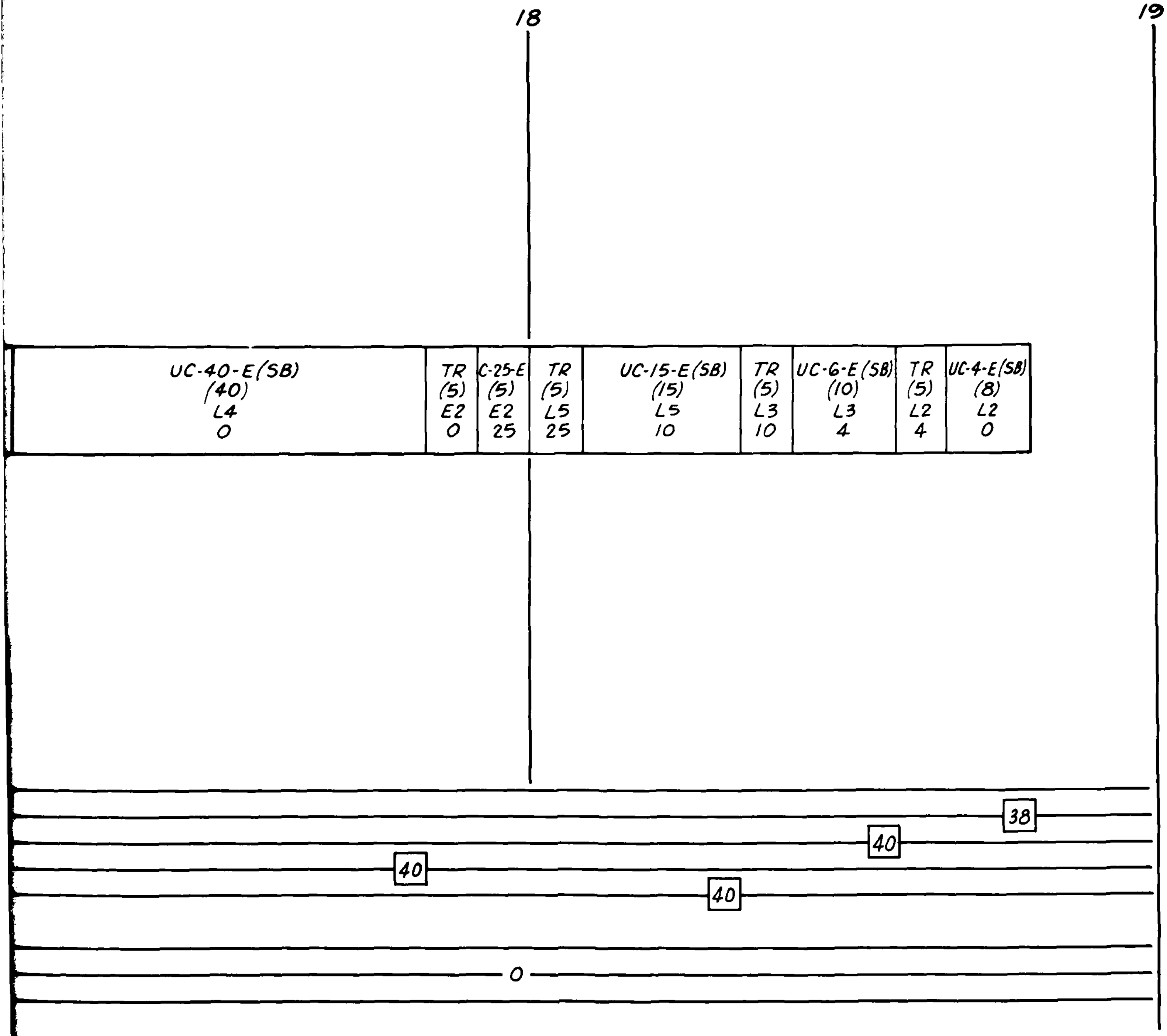


Figure 30. Continued.


14
15
OOSE
ATION
INUTES)
OCATION
AILCARS
UC-34-E (5) E1 31
TR (5) E2 31
UC-25-E (5) E2 6
TR (10) E3 6
UC-6-E (5) E3 0
TR (5) L3 0
C-25-L (RB) (25) L3 25
TR (5) L4 25
C-40-L (RB) (40) L4 65
5-E 5) E2 25
TR (5) L5 25
UC-25-E (SB) (25) L5 0
WAIT
L1
L2
0
L3
L4
0
25
L5
35
E1
0
25
E2
40
E3


16
17
TR (10) MN 65
WAIT
C-1-CA (5) MN 66
LEAVE FT. CHAFFEE
TR (5) E1 0
C-1-CA (5) E1 1
TR (5) MN 1
UC-1-CA (5) MN 0
TR (5) E1 0
C-34-E (5) E1 34
TR (5) L3 34
UC-34-E (SB) (35) L3 0
TR (5) E3 0
C-40-E (5) E3 40
TR (10) L4 40
34
0
34
0
0


18
19
UC-40-E(SB)
(40)
L4
0
TR
(5)
E2
0
C-25-E
(5)
E2
25
TR
(5)
L5
25
UC-15-E(SB)
(15)
L5
10
TR
(5)
L3
10
UC-6-E(SB)
(10)
L3
4
TR
(5)
L2
4
UC-4-E(SB)
(8)
L2
0
38
40
40
40
0

have been set on the 34 railcars, it transits to track E3, couples with 6 empty cars, and places them on track L1, for a total of 40 empty railcars on track L1.

The second train, with 68 empty railcars plus the caboose, arrives about 10-1/2 hours after the start of the operation (elapsed time). It spots 35 railcars, including the caboose, on track E1, and 34 on track E3. The main line engines then pick up 15 loaded railcars from track L5, 38 from track L2, and 15 from track L3, for a total of 68 loaded railcars. The main line engines then transit to the main line track where the switch engine will couple the caboose to the train. This second train of 68 loaded railcars plus the caboose then proceeds toward the POE.

After coupling the caboose to the second train, the switch engine transits to track E1, picks up 34 empty railcars, and places them on track L2, where the brakes are set. The SL then proceeds to track E2 and collects 25 empty cars. The 25 empty railcars are then spotted on track L5 and the brakes are set.

The third train of empties arrives at the installation, about 14 hours (elapsed time) after the start of the operation, with 65 empty railcars plus the caboose. It positions 34 empty railcars plus the caboose on track E1, 25 on track E2, and 6 on track E3. The main line engines then transit to track L3 to pick up 25 loaded railcars and to track L4 for 40 loaded railcars. The ML engines, with 65 loaded railcars, travel to the main line track where the caboose is attached to the train by the SL. This last train of loaded railcars then leaves Fort Chaffee for its POE at about 16 hours (elapsed time) after the start of the operation.

After the third train leaves Fort Chaffee, the SL transits to track E1, picks up 34 empty railcars, and spots them on track L3. After the brakes have been set on the 34 railcars, the SL travels to track E3, picks up 40 empty cars, and positions them on track L4. The SL then transits to track E2 and couples with 25 empty cars. Of these 25 cars, 15 are placed on track L5, 6 on track L3, and 4 on track L2. The rail switching operations terminate about 19 hours (elapsed time) after start, which included approximately 7 hours for loading and blocking and bracing.

APPENDIX C

SPECIAL-PURPOSE RAILCARS AND LOADING/UNLOADING PROCEDURES

Specially designed railcars, in particular those used for transporting vehicles, can greatly increase the speed and efficiency of a rail outloading operation. Bilevel, trilevel, and integral chain tiedown flatcars are the primary means of enhancing the loadout routine of most military vehicles. Bilevel and trilevel railcars are best suited for the smaller vehicles, including 2-1/2-ton trucks.

The integral tiedown flatcars will accommodate larger vehicles, including tanks. Loading and securing equipment on these railcars can be accelerated to 15 minutes per vehicle, for small vehicles, versus approximately 45 minutes for blocking and bracing procedures used on standard-type railcars. Also, the BTTX 89-foot flatcar has a capacity of six 2-1/2-ton trucks, doubling the single level capacity. Thus, in speed and capacity, special-purpose railcars are an advantage worth investigating.

There are essentially five methods of loading/unloading multilevel railcars, they are:

1. The "K" loader of 463L aircraft cargo-loading system.
2. The forklift and pallet used in conjunction with a crane and/or ramp.
3. The crane and ramp combination.
4. Adjustable ramps.
5. Adjustable built-in ramp on multilevel railcars.

The procedures used with each of the above are described in detail in TM 55-625[2/], as are tiedown procedures.

As of 1970, more than 70 percent of DOD installations had no organic capability to load/unload multilevel railcars. No outloading plans should include the use of these railcars until a thorough investigation verifies

---

[2/] TM 55-625, Transportability Criteria and Guidanee, Loading and Unloading Multilevel Railcars at Military Installations in the United States.

their availability at the time required. The supply of special-purpose flatcars with integral tiedowns is also limited. As a result, even though these types of railcars are very valuable for volume rail outloading operations, their availability is seriously in question unless advance preparations are made.

The following trends in flatcar supply are now operative and have been since the development of modern piggyback service in the mid-1950's:

1. The size of the flatcar fleet has been growing, both in number of flatcars and in relation to the size of the car fleet as a whole. This gain has been confined to specialized cars; for example, trailer-on-flatcar, container-on-flatcar, bilevel, trilevel, and bulkhead flatcars.

2. The size of the general-purpose flatcar fleet has decreased, though average length and capacity have increased.

3. A majority of all flatcars are owned by car companies, not by the railroads. Therefore, more flexibility in assignment, with improved utilization, has resulted. Fewer idle cars available for short-notice use than would be if each railroad maintained an adequate supply for its own needs.

Considering these trends, the sizes of the various components of the specialized flatcar fleet, and the blocking and bracing requirements for the various types of equipment to be shipped by rail, it does not appear prudent to express an installation's needs and outloading plan using only general-purpose flats. The TOFC fleet, in particular, is now most likely large enough to fill military requirements (table 9). The COFC fleet also has expanded to the point that it could carry most of the military's container movements, especially since COFC cars are used almost exclusively for import/export movements, which likely would be greatly disrupted in a mobilization period.

Accordingly, vans or containers should be outloaded on TOFC cars. If the movement is to a port for ocean shipment by other than RORO vessel, the use of COFC cars should be considered. However, the availability of COFC cars in the quantity desired without disrupting civilian container movements is highly improbable.

Other cars in the specialized flatcar fleet generally are assigned to specific services or to a carpool for one shipper's exclusive use. Therefore, although these cars can save blocking and bracing and should be requested when they can be employed profitably in a specific move, the likelihood of obtaining the cars is too weak to base outloading requirement on their use.

TABLE 9
TRAILER TRAIN COMPANY FLEET

Trailer Train Company ownership of selected car types as contained in the April 1976 Official Railway Equipment Register. Trailer Train owns in excess of 95 percent of total US ownership of TOFC, COFC, and autorack cars.

Type	Reporting Marks	Quantity
TOFC	*TTX	29,661
	TTAX	5,033 (see also COFC cars)
	GTTX	2,287
	LTTX	1,876
	XTTX	733
	Total	39,590

Each car has a capacity of two 40-foot (nominal length) trailers. Some can handle one 40-foot and one 45-foot trailer. The XTTX cars also have the capability of transporting three 28-foot trailers.

COFC	TTAX	5,033 (see also TOFC cars)
	TTCX	708
	Total	5,741

Each car can handle four 20-foot container equivalents. Note that the TTAX cars can handle either containers or trailers and so are counted in both TOFC and COFC totals.

Bilevels	TTBX	4,333
	BTTX	2,776
	Total	7,109
Trilevels	TTKX	6,133
	RTTX	3,500
	KTTX	2,685
	TTRX	2,196
	ETTX	796
	Total	15,310

*Definitions of Trailer Train Company reporting marks (all are flatcars)

TTX - Equipped with hitches and bridge plates for the transportation of trailers.
TTAX - Equipped with movable foldaway container pedestals, knockdown hitches and bridge plates for transporting trailers or containers or combinations of both. (A = all).
GTTX - Equipped with hitches and bridge plates for the transportation of trailers built by General American Transportation Corporation. (G = general)
LTTX - Low deck (2' 8" or 2' 9" instead of 3' 6"), equipped with hitches and bridge plates. (L = low)
XTTX - Equipped with four hitches and bridge plates for the transportation of two trailers; one 45-foot and one 40-foot or three 28-foot trailers.
TTCX - Equipped with movable foldaway container pedestals for transporting containers. (C = container)
BTTX - Equipped with bilevel autoracks furnished by member railroads. (B = bilevel)
TTBX - Length 89' 4" or over, equipped with bilevel autoracks furnished by member railroads. (B = bilevel)
TTKX - Length 89' 4" or over, equipped with hinged-end trilevel autoracks furnished by member railroads.
RTTX - Length 89' 4" or over, equipped with fixed trilevel autoracks furnished by member railroads.
KTTX - Equipped with hinged-end trilevel autoracks furnished by member railroads.
TTRX - Equipped with fixed trilevel autoracks furnished by member railroads.
ETTX - Equipped with fully enclosed trilevel autoracks furnished by member railroads. (E = enclosed).

Factors affecting the use of specialized flatcars include:

1. **First priority for use of general-purpose flats should be to load tracked vehicles and nonstandard wheeled vehicles; for example, artillery.**

2. **First priority for requesting specialized flats should be for TOFC and COFC cars to load vans and containers, which require very extensive blocking and bracing to move on general-purpose cars.**

3. **TOFC and COFC cars require no blocking and bracing.**

4. Bilevel and trilevel flats will require heavier chains and possibly different hooks to handle other than commercial specification vehicles.

5. Chain tiedown flats may require heavier chains, depending on the loads for which they were designed.

6. Where TOFC cars must be loaded using a ramp rather than side or overhead loading, the number of cars at a ramp should be limited to about 10 because of the delay involved in backing the trailers down the length of the cars and returning with the tractor.

7. Where sufficient suitable aprons and MHE are available, it may be desirable to load containers directly onto COFC cars rather than to place them on bogies and use TOFC cars.

8. If COFC or TOFC cars are not available, some blocking and bracing time and expense can be saved by using bulkhead flatcars to carry containers.

9. Bilevel and trilevel cars require, obviously, bilevel and trilevel ramps or other equipment as indicated in TM 55-625.

10. TOFC, COFC, bilevel, and trilevel cars average 89 feet long. TOFC cars can handle two 40-foot trailers or one 40-foot and one 45-foot trailer. COFC cars can handle four 20-foot container equivalents. Autorack cars can accommodate four to seven vehicles per deck, depending on vehicle length and the number of tiedown chain sets.

11. Tracks used to store or load cars over 65 feet long should be reachable without going through curves exceeding 10-degree curvature, and tracks used for cars between 55 and 65 feet should be reachable without going through curves exceeding 12-degree curvature.

DISTRIBUTION

Commander
USAG Fort Chaffee (Semiactive)
Fort Chaffee, AR 72905 (2)

USAG Fort Chaffee (Semiactive)
ATTN: Traffic Manager
Fort Chaffee, AR 72905 (25)

Chief Army National Guard Bureau
Room 2D424 Pentagon
ATTN: NGB-ARL-T
Washington, DC 20310 (2)

Commander
US Army Forces Command
ATTN: AFLG-TRU (2); AFEN-FEB (1); AFEN-ME (1)
Fort McPherson, GA 30330 (4)

DA-DALO-TSN
Room 1D616 Pentagon
Washington, DC 20310 (1)

USA TSARCOM
Systems Analysis Office
ATTN: DRSTS-FR
4300 Goodfellow Boulevard
St Louis, MO 63120 (2)

Army Materiel Systems Analysis Activity
ATTN: DRXSY-CL
Aberdeen Proving Ground, MD 21005 (2)

Commander
Military Traffic Management Command
ATTN: MT-SA (2); MT-PLM (2)
Washington, DC 20315 (4)

Commander
Military Traffic Management Command, Eastern Area
Bayonne, NJ 07002 (2)

Commander
Military Traffic Management Command, Western Area
Oakland Army Base
Oakland, CA 94626 (2)

Commandant
US Army Transportation School
ATTN: Transportation Library
Fort Eustis, VA 23604 (1)

Director
Military Traffic Management Command
Transportation Engineering Agency
Newport News, VA 23606 (10)