

ARMY TM 5-628

AIR FORCE AFR 91-44

TECHNICAL MANUAL

RAILROAD TRACK STANDARDS

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

DEPARTMENTS OF THE ARMY, AND THE AIR FORCE

APRIL 1991

TECHNICAL MANUAL
 TM 5-628
 AIR FORCE REGULATION
 AFR 91-44



HEADQUARTERS
 DEPARTMENT OF THE ARMY
 AND THE AIR FORCE
 WASHINGTON, DC, 8 April 1991

RAILROAD TRACK STANDARDS

		<i>Paragraph</i>	<i>Page</i>
CHAPTER	1. INTENT AND APPLICATION		
	Purpose	1-1	1-1
	Introduction	1-1	1-1
	References	1-2	1-1
	Intent	1-3	1-1
	Track categories	1-4	1-1
	Application	1-5	1-1
CHAPTER	2. INSPECTION OF TRACK AND RECORDKEEPING		
	Inspection by qualified inspectors	2-1	2-1
	Inspection frequencies	2-2	2-1
	Special <i>inspections</i>	2-3	2-1
	Responsibilities of inspectors	2-4	2-1
	Inspection of partially visible track	2-5	2-1
CHAPTER	3. ROADWAY		
	Roadway	3-1	3-1
	Drainage	3-2	3-1
	Vegetation	3-3	3-1
CHAPTER	4. BALLAST		
	General	4-1	4-1
	Selection criteria	4-2	4-1
	Maintenance	4-3	4-2
CHAPTER	5. TIES		
	General	5-1	5-1
	Identification of defective ties	5-2	5-1
	Tie requirements	5-3	5-2
CHAPTER	6. TIE PLATES, RAIL FASTENINGS, AND OTHER TRACK MATERIALS		
	General	6-1	6-1
	Tie plates	6-2	6-1
	Spikes	6-3	6-1
	Joints	6-4	6-3
	Rail anchors	6-5	6-4
	Gage rods	6-6	6-5
CHAPTER	7. RAIL		
	Defective rail and remedial actions	7-1	7-1
	Rail maintenance	7-2	7-3
	Lightweight rail	7-3	7-3
CHAPTER	8. TURNOUTS		
	General	8-1	8-1
	General requirements	8-2	8-1
	Switches and switch stands	8-3	8-2
	Frogs	8-4	8-4
	Guard rails	8-5	8-6
CHAPTER	9. RAIL CROSSINGS		
	General	9-1	9-1
	Requirements	9-2	9-1
	Anchors	9-3	9-1
CHAPTER	10. ROAD CROSSINGS		
	Drainage	10-1	10-1
	Flangeways	10-2	10-1
	Track	10-3	10-1
	Crossing surfaces and materials	10-4	10-2

		<i>Paragraph</i>	<i>Page</i>
	Crossing protection	10-5	10-2
CHAPTER	11. BRIDGES		
	General	11-1	11-1
	Bridge inspection	11-2	11-1
	Dangerous conditions	11-3	11-1
CHAPTER	12. TRACK GEOMETRY		
	General	12-1	12-1
	Gage	12-2	12-1
	Crosslevel	12-3	12-2
	Superelevation	12-4	12-2
	Warp	12-5	12-3
	Alinement	12-6	12-4
	Profile	12-7	12-5
CHAPTER	13. CLEARANCES		
	Measurement	13-1	13-1
	Clearance requirements, tangent track	13-2	13-1
	Clearance requirements, curved track	13-3	13-2
	Track centers	13-4	13-3
	Changes to clearances	13-5	13-3
CHAPTER	14. MISCELLANEOUS TRACK APPLIANCES		
	Track scales	14-1	14-1
	Bonded and grounded track	14-2	14-1
	Derails	14-3	14-1
CHAPTER	15. TRACK MAPS		
	General	15-1	15-1
	Criteria	15-2	15-1
CHAPTER	16. MAINTENANCE ACTIVITIES FOR CATEGORY "C" TRACK		
	Section I. Army		
	General	16-1	16-1
	Maintenance requirements	16-2	16-1
	Inactivation and disposal	16-3	16-1
	Section II. Air Force		
	General	16-4	16-1
	Maintenance requirements	16-5	16-1
	Disposal	16-6	16-1
APPENDIX A.	REFERENCES		<i>Page</i> A-1
APPENDIX B.	FIELD IDENTIFICATION OF RAIL DEFECTS		B-1
APPENDIX C.	DETAILS OF RAIL SECTIONS		C-1
APPENDIX D.	SUMMARY OF STANDARDS REQUIREMENTS, DEFECTS, AND RESTRICTIONS		D-1

List of Figures

<i>Figure No.</i>		<i>Page</i>
5-1.	Examples of good and defective ties	5-2
5-2.	Required tie support at joints	5-2
6-1.	Single shoulder tie plate	6-1
6-2.	Double shoulder tie plate	6-1
6-3.	Spiking pattern for tangents and curves less than 4 degrees	6-2
6-4.	Spiking pattern for curves 4 degrees and greater	6-2
6-5.	Spiking through angle bars	6-3
6-6.	Proper bolt installation	6-4
6-7.	Recommended minimum anchoring pattern	6-5
7-1.	Rail wear measurement	7-2
7-2.	Rail base corrosion measurement	7-2
7-3.	End batter measurement	7-3
8-1.	Parts of a turnout	8-1
8-2.	Reversing tangent length and switch stand placement	8-2
8-3.	Switch point contour	8-2
8-4.	Switch point plan and elevation	8-3
8-5.	Frog point and tread contours	8-4
8-6.	Allowable wear on guarding face of self-guarded frog	8-4

List of Figures—Continued

<i>Figure No.</i>		<i>Page</i>
8-7.	Measurement of flangeway width, flangeway depth, guard check gage, and guard face gage	8-6
10-1.	Track construction for road crossing	10-1
12-1.	Gage measurement	12-1
12-2.	Required gage measurement locations within turnouts	12-1
12-3.	Crosslevel measurement	12-2
12-4.	Determination of warp	12-4
12-5.	Measurement of curve alinement	12-5
13-1.	Minimum clearances for tangent track	13-1
B-1.	Common rail nonmenclature	B-1
B-2.	Relative positions of planes through a rail	B-1
B-3.	General appearance of bolt hole cracks	B-2
B-4.	General appearance of broken base	B-2
B-5.	General appearance of broken rail	B-3
B-6.	General appearance of corrugation	B-3
B-7.	General appearance of crushed head	B-3
B-8.	Rail end batter	B-4
B-9.	Typical appearance of an engine burn	B-4
B-10.	General appearance of an engine burn fracture	B-5
B-11.	General appearance of flaking	B-5
B-12.	General appearance of flow	B-6
B-13.	General appearance of head/web separation	B-6
B-14.	General appearance of horizontal split head	B-7
B-15.	General appearance of mill defects	B-7
B-16.	General appearance of piped rail	B-7
B-17.	Cross-sectional view of piped rail	B-8
B-18.	General appearance of vertical head and side wear	B-8
B-19.	General appearance of shelling	B-8
B-20.	General appearance of slivers	B-9
B-21.	General appearance of split web	B-9
B-22.	General appearance of torch cut rail	B-9
B-23.	General appearance of traverse defects	B-10
B-24.	General appearance of vertical split head	B-10
C-1.	Details of rail sections	C-1

List of Tables

<i>Table No</i>		<i>Page</i>
4-1.	AREA recommended gradations for ballast	4-1
7-1.	Rail defects, operating restrictions, and remedial actions	7-1
7-2.	Recommended rail defect inspection frequencies	7-3
8-1.	Measurements and operating restrictions for frogs and guard rails	8-5
8-2.	Minimum length of straight guarding face in advance of frog point	8-6
12-1.	Recommended gage for curved track	12-2
12-2.	Superelevation for curved track	12-3
13-1.	Clearance requirements for tangent track	13-1
C-1.	Details of rail sections	C-1
D-1.	Summary of standards, requirements, defects, and restrictions	D-1

CHAPTER 1

INTENT AND APPLICATION

1-1. Introduction.

a. The Army's and the Air Force's railroad system is a critical asset for both peacetime and mobilization missions.

b. The standards contained herein are promulgated to protect investments in track maintenance and rehabilitation and to ensure that Army and Air Force track is maintained at the level needed to support mission requirements.

c. Simply meeting the minimum standard required herein is not necessarily the best, most cost effective, long-term maintenance policy. The frequent occurrence of substandard or restricted conditions indicates the need for a comprehensive track evaluation to determine if major repair or rehabilitation is warranted.

1-2. References. Appendix A contains a list of references used in this document.

1-3. Intent.

a. These standards define the *minimum* required condition levels for Army and Air Force railroad track. For Army railroads, these standards shall be used for the inspection and routine maintenance of Army railroad track by in-house or contract personnel as prescribed in AR 420-72. For Air Force railroads, these standards shall be used for the inspection and routine maintenance of Air Force railroad track by in-house or contract personnel.

b. These standards are not intended for, and shall not be used as specifications for new construction or major track rehabilitation. The guidance given in TM 5-850-2/AFM 88-7, Chap. 2 and the American Railway Engineering Association (AREA) "Manual for Railway Engineering" and/or host nation industry/government standards will continue to apply to new construction and to the complete reconstruction of segments of existing facilities.

c. Should the commercial carrier serving the installation require a more restrictive standard or criteria not included in these standards, the installation track shall be maintained to meet the carrier's requirements.

d. The judgement of the certified track inspector

and the criteria presented herein must supplement each other in the application of these standards. *

1-4. Track categories.

All Army and Air Force track shall be maintained in accordance with one of the following categories:

<i>Track Category</i>	<i>Types of Track</i>
A	Active main lines Any track where the operating speed exceeds 10 miles per hour (mph) Track (both active and inactive) required for mobilization and where the operating speed will exceed 10 miles per hour (mph)
B	Active passing tracks, loading tracks, classification yard tracks, and storage tracks All other tracks (both active and inactive) required for mobilization that are not previously identified as Category A track Tracks having an occasional use or a foreseeable need
C	Inactive track with no current mission requirements

1-5. Application.

a. Requirements versus recommendations. In this manual the words "shall" and "is required" indicate requirements of the standards which must be met as prescribed by Army AR 420-72 and this AFR. Recommendations are indicated by the words "may", "should", and "it is recommended that . . .". These recommendations represent good maintenance practice.

b. *Condition levels.* These standards establish four levels of track condition. These condition levels indicate relative seriousness of defects, allow comparison of different types of defects, and provide a means for prioritizing repair work. The four track condition levels are as follows:

(1) Full compliance—Track that meets all the requirements of the standards. Track at this level has, at most, only minor defects and should be fully capable of handling all train operations within the operating rules of the installation. Routine

* For Air Force users: throughout this regulation, substitute "qualified track inspector" where the text reads "certified track inspector." The Air Force has not established a training and certification program at this time. See paragraph 2-1 for details.

maintenance is required to maintain this condition level, and repair work will generally be only minor.

(2) 10 mph—Track has defects serious enough to make it unsuitable for operations greater than 10 mph, essentially “normal yard speed”. Track at this condition level would be considered “marginal”.

(3) 5 mph—Track has defects serious enough to make it unsuitable for operations greater than 5 mph. Essentially, a train may be allowed to “crawl” over the track. This level is intended as a warning zone to indicate that the track is approaching a condition that will require removal from service.

(4) No operation—Track has defects serious enough to require removal from service. At this level, the operation of trains over the track is generally considered hazardous. Operations shall not be allowed except as noted in paragraph 1-5d(5).

c. Minimum required condition levels. The minimum required condition levels for Army and Air Force track are:

<i>Track Category</i>	<i>Minimum Required Condition Level</i>
A	Full compliance
B	10mph
C	Maintenance as per chapter 16 of these standards

For Army track these minimum required condition levels are established by AR 420—72.

d. *Operating restrictions.*

(1) These standards establish minimum required condition levels for Army and Air Force track and also identify track conditions requiring restriction or suspension of train operations. It is intended that a track inspector apply the required restriction or suspension immediately upon discovery of the substandard condition, and that the track be repaired to meet the appropriate condition level as soon as practical.

(2) Notification of track restriction. For Army track, the certified track inspector shall notify both the train operating personnel and the Director of Engineering and Housing (DEH) immediately upon the discovery of any condition which would warrant a restriction beyond normal operating practices or a suspension in operations. The DEH shall notify the Installation Transportation Officer (ITO) verbally and in writing of any condition requiring train operations to be restricted beyond normal operating practices or suspended. For Air Force track, the track inspector shall notify both the train operating personnel and the Base Civil Engineer (BCE) immediately upon the discovery of

any condition which would warrant a restriction beyond normal operating practices or a suspension in operations. The BCE shall notify the Base Traffic Management Officer (TMO) verbally and in writing of any condition requiring train operations to be restricted beyond normal operating practices or suspended.

(3) *Operations over restricted track.* For locations ‘where operating restrictions have been imposed, the speed of the train or other on-track vehicle shall be reduced to the required level before the first wheel reaches the defective area and not increased until the last wheel has passed the defective area.

(4) *Removal of track restriction.* A track restriction may be removed after all defects resulting in the restriction have been repaired. For Army track, the certified track inspector shall notify the DEH upon completion of the repairs. The DEH shall notify the ITO in writing that the restrictions have been lifted. The restriction shall not be considered removed until the ITO receives written notification of removal from the DEH. For Air Force track, the track inspector shall notify the BCE upon completion of the repairs. The BCE shall notify the TMO in writing that the restrictions have been lifted. The restriction shall not be considered removed until the TMO receives written notification of removal from the BCE.

(5) *Track removed from service.* Any portion of track where conditions fall below the minimum operable track condition (track condition is at the No Operation level) shall be closed to operations until repairs are completed. However, such track may be used under written permit from the DEH (BCE) and in the presence of a certified track inspector. During operations over the closed portion of track the certified track inspector shall have visual contact with the train operator at all times and be prepared to signal the train crew to stop.

(6) Any deficiency in Category A track requiring the track to be removed from service should be corrected within 30 days of discovery.

e. Judgment of the certified track inspector shall govern. A certified track inspector shall have the authority to impose operating restrictions beyond the minimum required in these standards when conditions warrant.

f. Defective conditions not addressed in these standards. Defective conditions or combinations of conditions may be found which are not directly addressed in these standards. In such cases, a certified track inspector shall exercise judgment in applying an appropriate operating restriction.

CHAPTER 2

INSPECTION OF TRACK AND RECORD KEEPING

2-1. Inspection by qualified inspectors.

a. Army track. For Army track, the individual who completes the required track inspections shall be a certified track inspector as specified in AR 420-72.

b. Air Force track. For Air Force track, the individual who completes the required track inspections shall be qualified to perform such inspections as designated by the BCE.

2-2. Inspection frequencies.

a. Category A and Category B track. As a minimum, track designated as either Category A or Category B shall be inspected at the intervals shown below:

<i>Traffic Frequency</i>	<i>Minimum Required inspection Frequency</i>
Two or more movements per week	Once every month
Greater than one movement per month but less than two movements per week.	Once every 2 months
Less than one movement per month	Once every 6 months

b. Category C track. Category C track shall be inspected annually in accordance with chapter 16 of these standards.

c. Electric/electromechanical grade crossing signals. The inspection of electric/electromechanical signals at road-railroad grade crossings shall be performed at the same frequency as track inspections (para 2-2a); however, inspections of signals shall be performed not less than once per quarter (at approximately 3 month intervals). See chapter 10 for additional information on the inspection of these signals.

d. Internal rail defect inspection. Internal rail defect inspection shall be performed every 3 to 6 years as specified in paragraph 7-2b.

2-3. Special inspections.

a. Infrequently used track. Track that has not been used for a period of 6 months or more shall be inspected prior to the first movement over the track.

b. Mass rail movement. For track that has not been inspected within the last 2 months, a track inspection is recommended prior to any mass rail movement (50 cars or more).

c. Unusual occurrences. Track inspections shall be conducted following unusual occurrences such as a derailment, accident, flood, fire, earthquake,

severe storm, or other occurrence which could have an adverse effect on the track structure. These inspections shall be conducted prior to the first movement over the track following the unusual occurrence.

2-4. Responsibilities of inspectors.

a. The certified track inspector is responsible for:

(1) Assuring that inspections of Army and Air Force track are performed in accordance with paragraphs 2-2, 2-3, 2-4, and 2-5 of these standards.

(2) Examining the track to determine whether the track condition complies with the requirements of these standards.

(3) Reporting any deviations from the full compliance condition level.

b. Track inspections prescribed in paragraphs 2-2 and 2-3 shall be made on foot or in an on-track vehicle at a speed which is conducive to effective track inspection, but in no case to exceed 5 mph. Turnouts, road crossings, rail crossings, bridges, and drainage structures shall be inspected on foot.

c. The inspector shall complete and keep a copy of this inspection on file for at least 3 years. Inspection reports which document deficiencies resulting in a track falling below its designated condition level shall be kept on file until all those deficiencies have been corrected.

2-5. Inspection of partially visible track.

a. At locations where vegetation, dirt, debris, or other undesirable materials cover the ties and/or rail preventing effective track inspection, train operations shall not exceed 10 mph until the undesirable materials are removed and a thorough track inspection is performed.

b. Paved areas. In road crossings and other paved areas where complete inspection of the track is not possible, the certified track inspector must be alert for external signs of track deterioration. External signs indicating track deterioration are:

- (1) Changes in gage and/or crosslevel.
- (2) Settlement of the rails (changes in track profile).
- (3) Excessive vertical movement of the rails as a train passes.
- (4) Settlement of the pavement in the vicinity of the track.

TM 5-628/AFR 91-44

(5) Deterioration (cracking or breaking up) of the pavement in the vicinity of the track.

c. Operating restrictions for track in pavement. When external signs of track deterioration develop, particular attention should be given to the track geometry measurements through the paved area. Track geometry measurements, combined with visual indications of lateral and vertical movement,

and the requirements for road crossing flangeways shall be used to assign operating restrictions for the track through the paved area. Operating restrictions shall be consistent with the operating restrictions required for road crossings and for track geometry deviations given in chapters 10 and 12 of these standards.

CHAPTER 3

ROADWAY

3-1. Roadway.

a. Inspection. The roadway shall be inspected for the following defects:

- (1) Ballast/subgrade pumping.
- (2) Erosion of embankments and cut slopes.
- (3) Embankment sliding or slippage.
- (4) Potential slope stability problems.
- (5) Settlement at approaches to bridge ends.
- (6) Washouts under the track.

If any of these are present, remedial action is required within a time frame necessary to prevent damage to the track structure.

b. Hazardous conditions. Any condition presenting a hazard to the safe movement of trains shall be corrected prior to the first movement over that location.

3-2. Drainage.

a. General.

(1) A well-drained roadbed is essential to good track maintenance.

(2) Any attempts to divert water onto the roadway or to obstruct ditches or drainage structures shall be reported immediately to the DEH (BCE).

(3) Drains, ditches, and other open drainage structure shall be protected to prevent hazards to personnel.

b. Size and design. Ditches and other drainage structures (culverts, drains, and drop inlets) shall be of sufficient size and construction to handle the expected flow of water, in accordance with TM 5-820-4/AFM 88-5, Chap. 4.

c. Obstructions. Ditches and drainage structures shall be maintained to allow the free passage of water. At locations where flow is obstructed or otherwise inadequate, remedial action is required. During construction operations adjacent to the track structure all ditches and other drainage structures shall be kept unobstructed.

d. Inspection.

(1) Inspection and cleaning of drainage structures and channels shall be performed at least annually.

(2) Inspections of ditches and other drainage structures during and after heavy rains are recommended to ensure that these structures are adequate to carry the runoff.

(3) Drainage ditches and structures shall be inspected for the presence of:

- (a) Brush.
- (b) Drift
- (c) Excessive ice and snow.

(d) Other obstructions which may interfere with the flow of water.

If any of these are present, immediate remedial action is required to prevent damage to the roadway and track structure.

(4) Particular attention shall be given to drainage conditions at turnouts, rail crossings, road crossings, bridge ends, and all locations where conditions may restrict adequate drainage.

3-3. Vegetation.

a. Vegetation shall be controlled so that it does not:

(1) Grow within the ballast section or obstruct ballast drainage.

(2) Interfere with adequate visibility at grade crossings.

(3) Obstruct visibility of location markers, switch position indicators, signs, or signals.

(4) Obstruct drainage.

(5) Interfere with the safe operation of trains.

(6) Prevent proper track inspection.

(7) Present a fire hazard to timber structures.

(8) Interfere with personnel walking within 8 feet of the track centerline.

(9) Brush the sides of rolling stock.

b. Vegetation interference.

(1) At locations where vegetation interferes with the effective inspection of the track, train operations shall not exceed 10 mph until the vegetation is removed and a thorough track inspection is performed.

(2) At locations where vegetation interferes with train operations, operations shall not exceed 5 mph until the vegetation is removed and an additional track inspection is performed.

c. Vegetation control. Undesirable vegetation growing within the roadway shall be removed by chemical or manual means. For Army Track, chemical vegetation control shall be accomplished as prescribed by AR 420-76, TM 5-629, and TM 5-630. For Air Force track, chemical vegetation control shall be accomplished as prescribed by AFR 91-21, and AFM 91-19.

TM 5-628/AFR 91-44

d. Desirable vegetation. Vegetation may be planted and grown on the slopes of cuts and fills and in other locations within the roadway to prevent

erosion. The growth of desirable vegetation should be controlled to meet the requirements of paragraph 3-3*a*.

CHAPTER 4

BALLAST

4-1. General. Ballast is a select material placed on the subgrade to:

- a. Restrain the track laterally, longitudinally, and vertically under the dynamic loads imposed by trains and the thermal stresses induced in the rails by changing temperature.
- b. Provide adequate drainage of the track.
- c. Distribute the load of the track and trains to prevent overstressing the subgrade.

- (1) Size and gradation.
- (2) Shape (angularity).
- (3) Weight.
- (4) Strength.
- (5) Durability.
- (6) Cleanliness.
- (7) Economics.

b. New ballast materials used in the maintenance of Army track shall meet the requirements specified in the *AREA Manual For Railway Engineering*, chapter 1, part 2, for the gradation requirements given in table 4-1.

4-2. Selection criteria.

a. Considerations for selecting materials to be used as ballast include:

Table 4-1. AREA recommended gradations for ballast

Size No.	Nominal Size Square Opening in.	Amounts Finer Than Each Sieve (Square Opening)							
		Percent by Weight							
		2-1/2 in.	2 in.	1-1/2 in.	1 in.	3/4 in.	1/2 in.	3/8 in.	No. 4
3	2 to 1	100	95-100	35-70	0-15		0-5		
4A	2 to 3/4	100	90-100	60-90	10-35	0-10		0-3	
4	1-1/2 to 3/4		100	90-100	20-55	0-15		0-5	
5	1 to 3/8			100	90-100	40-75	15-35	0-15	0-5

Note: Size Numbers 3, 4A, and 4 are typically mainline ballast materials. Size Number 5 is typically yard ballast material.
 Copyright 1987, American Railway Engineering Association; used by permission.

Table 4-1. AREA recommended gradations for ballast.

4-3. Maintenance.

a. The ballast section should be clean, free-draining, and free of vegetation, soil (mud), and other foreign materials.

b. During major maintenance or track rehabilitation, dirty or fouled crushed stone or slag ballast meeting the requirements of paragraph 4-2b may be cleaned or reconditioned and reused.

c. Ballast materials shall not be allowed to cover or be at a level above the top of the ties.

CHAPTER 5

TIES

5-1. General.

a. The functions of a tie are to:

- (1) Maintain gage.
- (2) Maintain surface.
- (3) Maintain alinement.
- (4) Distribute the load from the rail to the ballast and subgrade.

The inability of a tie to adequately perform any of the above functions constitutes a defective tie.

b. Tie selection and treatment.

(1) *Tie selection.* New ties selected for use in the maintenance of Army track shall meet the requirements specified in the *AREA Manual For Railway Engineering*, chapter 8, part 1 for 6-inch grade and 7-inch grade ties. The preferred species for ties are the following hardwoods: Red Oak, White Oak, Hickory, Ash, Beech, and Gum. Where softwoods are used, the Pine and Fir species are preferred.

(2) *Treatment.* Ties shall be pressure treated in accordance with the most current version of American Wood-Preserver's Association (AWPA) Standard C6. As a general recommendation, the preferred preservative for ties is a creosote-coal tar solution (60/40) as specified in AWPA Standard P2, "Standard for Creosote and Creosote Solutions". For ties used West of the Mississippi River where attack of the wood by organisms such as fungi and termites is generally not as severe, a creosote-petroleum solution (50/50) as specified in AWPA

Standard P3, "Standard for Creosote-Petroleum Oil Solution" may be used.

(3) *Switch ties.* It is recommended that switch ties be hardwood selected from the list of preferred species given in paragraph 5-1b(1).

c. *Installation.* Ties shall be installed perpendicular to the rails and properly tamped and spiked. Ties shall be installed with the top of the tie (or the tie plate) in full contact with the base of the rail and the bottom of the tie near the rail seat in full contact with the ballast.

5-2. Identification of defective ties.

a. *Defective ties.* A tie is defective if it is:

- (1) Broken through.
- (2) Split or otherwise impaired to the extent that it will not hold spikes or other rail fasteners.
- (3) So deteriorated that the tie plate can move laterally more than ½ (0.5) inch relative to the crosstie.
- (4) Cut by the tie plate more than 2 (2.00) inches.
- (5) Cut by wheel flanges, dragging equipment, fire, etc., to a depth of more than 2 (2.00) inches within 12 inches of the base of the rail, frog, or load-bearing area.
- (6) Rotted, hollow, or generally deteriorated to a point where a substantial amount of the material is decayed or missing. These defects are shown in figure 5-1.

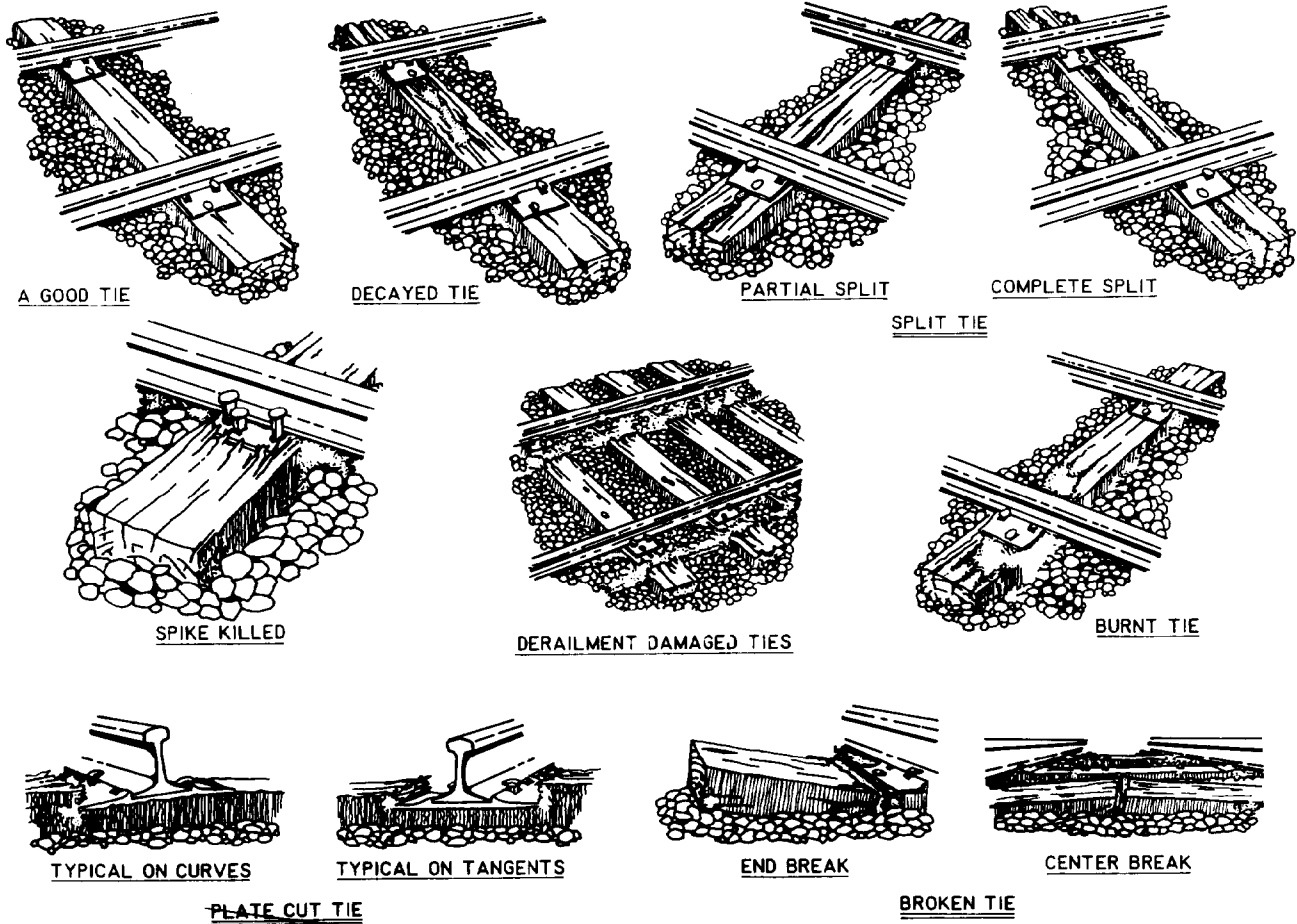


Figure 5-1. Examples of good and defective ties.

b. *Improper tie support (down or hanging ties).* Ties that do not support both rails are considered defective. If these down ties are not materially defective (see para 5-2a), they shall be tamped up and respiked to fully support the rails.

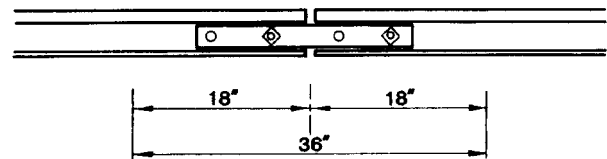
5-3. Tie requirements.

a. *Consecutive defective ties.* The occurrence of consecutive defective ties in Categories A and B track requires operating restrictions as specified below:

<i>Number of Consecutive Defective ties</i>	<i>Operating Restrictions</i>
0 to 2.....	None
3.....	Limit maximum speed to 10 mph
4.....	Limit maximum speed to 5 mph
5 or more	No operation

b. *Joint ties.* All joints shall be supported by at least one nondefective tie whose centerline is within 18 inches of the rail ends as shown in figure 5-2. At

any location where a rail joint is not supported by at least one nondefective tie, operations shall not exceed 10 mph.



AT EACH JOINT, AT LEAST ONE TIE WITHIN THIS AREA MUST BE NON-DEFECTIVE.

Figure 5-2. Required tie support at joints.

c. *Tie spacing.* If the existing tie spacing averages greater than 22 inches within the distance of a rail length, the desired spacing should be established during the next major maintenance cycle. For track constructed with an average tie spacing greater than 22 inches, the desired spacing should be established during the next track rehabilitation.

d. Missing or skewed ties. Missing or skewed (crooked) ties are undesirable in track. At any location where the center-to-center tie spacing measured along either rail exceeds 48 inches, operations

shall not exceed 10 mph until additional tie support is provided, or skewed ties are straightened to reduce the spacing. Slightly skewed ties should be straightened during the next track rehabilitation.

CHAPTER 6

TIE PLATES, RAIL FASTENINGS, AND OTHER TRACK MATERIALS

6-1 General.

a. Tie plates, rail fastenings, and other track materials shall be the proper size and type as specified in TM 5-850-2/AFM 88-7, Chap. 2 and TM 5-627/AFM 91—33 and shall conform to the requirements of chapters 4 and 5 of the *AREA Manual For Railway Engineering*.

b. Tie plates, rail fastenings, and other track materials shall not be flame cut or otherwise altered.

c. Tie plates, rail fastenings, and other track materials which are of improper type, broken, or

otherwise defective shall be replaced with the proper size and type material.

6-2. Tie plates.

a. *Use.* Tie plates distribute the applied loads from the rail to the tie as well as assist in keeping the rail in position. Their use is especially important on curves where they provide additional lateral restraint.

b. *Type.* Tie plates may be of either the single shoulder type (fig 6-1) or the double shoulder type (fig 6-2).

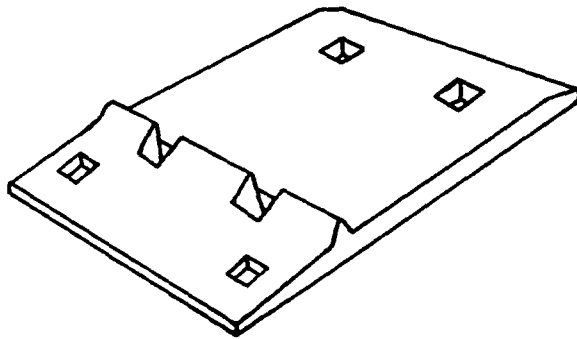


Figure 6-1. Single shoulder tie plate.

c. *Installation.* For track without tie plates, plates shall be installed during the next track rehabilitation or rail replacement.

6-3. Spikes

a. The rail shall have a sufficient number of fasteners (spikes) to effectively maintain gage and provide sufficient rail restraint.

b. *Spikes shall be:*

(1) Of proper size for the tie plates used.

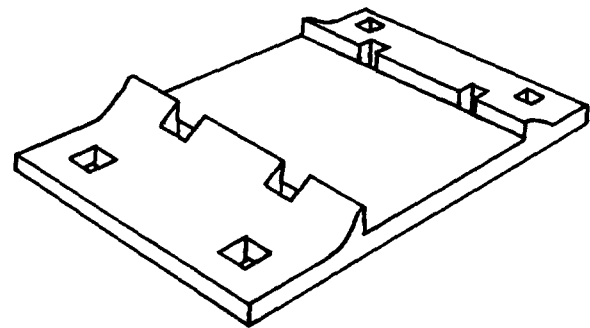


Figure 6-2. Double shoulder tie plate.

(2) Driven vertical and square with the rail.
 (3) Either of the cut or screw type.
 (4) Driven with approximately $\frac{1}{8}$ (0.125) inch of space remaining between the head of the spike and the base of the rail.

c. *Spiking pattern.*

(1) On tangent track and curves less than 4 degrees, spikes shall be installed as shown in figure 6-3.

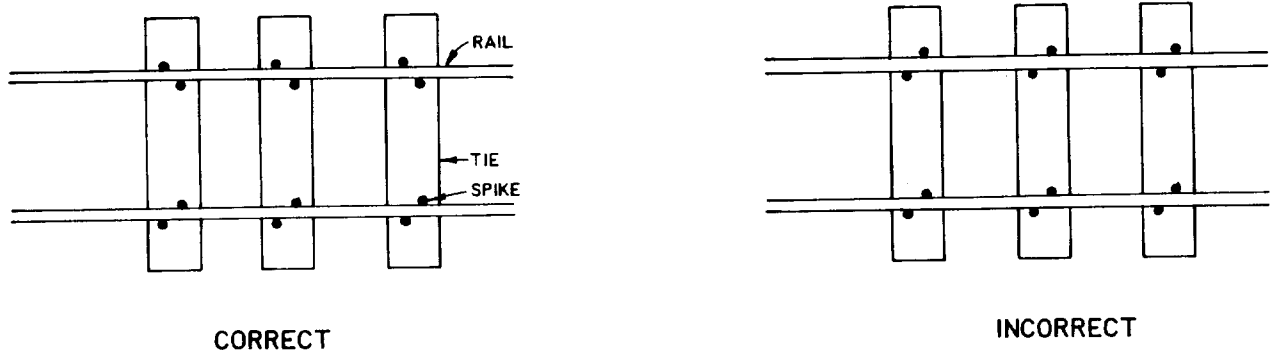


Figure 6-3. Spiking pattern for tangents and curves less than 4 degrees.

(2) On curves 4 degrees and greater and on the curved side of turnouts, the use of an additional spike as shown in figure 6-4 is recommended.

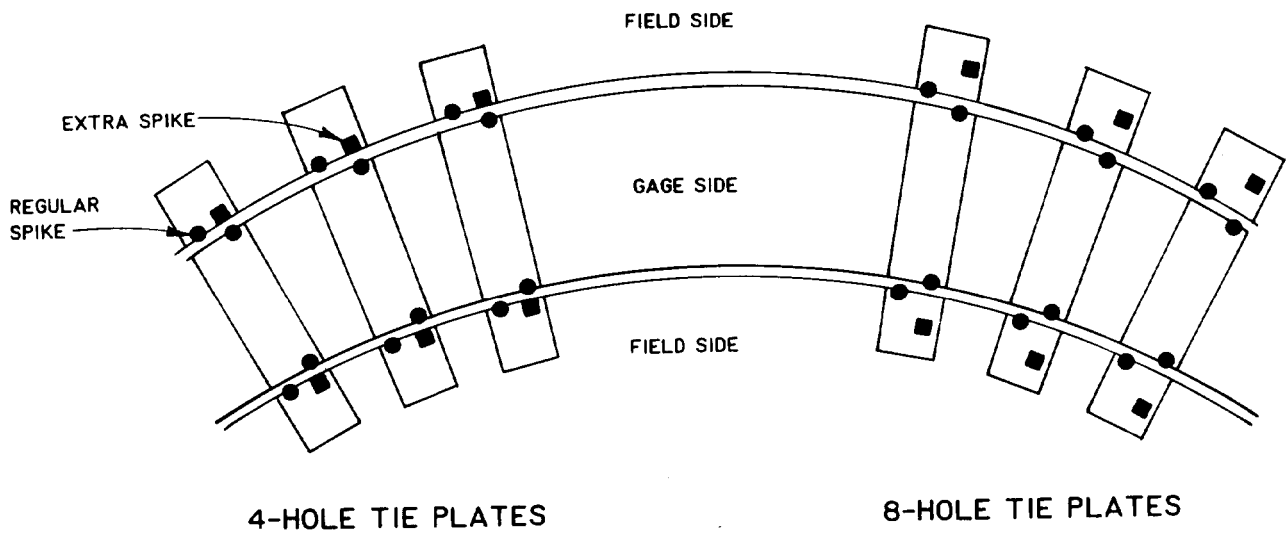


Figure 6-4. Spiking pattern for curves 4 degrees and greater.

(3) Spikes in angle bars. Spikes shall not be installed through the slots in skirted-type, slotted joint bars (angle bars) as shown in figure 6-5.

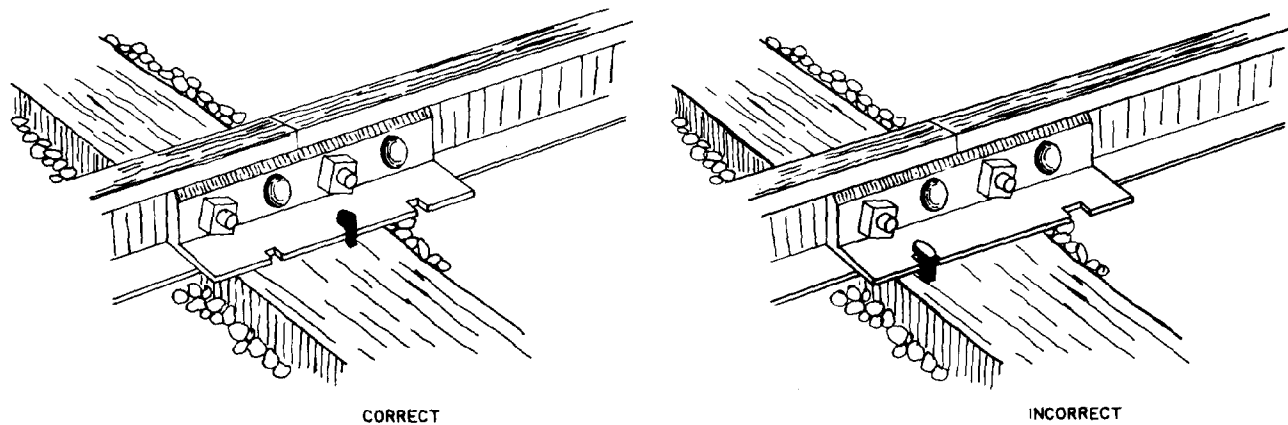


Figure 6-5. Spiking through angle bars.

(4) Correction on incorrect spiking patterns. An incorrect spiking pattern by itself is not a cause for removing and redriving spikes. However, an incorrect spiking pattern shall be corrected when other maintenance requires the spikes to be removed. Old spike holes shall be plugged to prevent accelerated tie deterioration.

d. Missing and loose spikes. Missing spikes shall be replaced. Old spike holes shall be plugged with a treated tie plug prior to replacing the spikes. Loose spikes shall be removed, the holes plugged, and the spikes redriven.

e. Spikes beneath rail base. Where the head of a spike has become lodged beneath the base of a rail, the spike shall be removed and properly redriven. A spike lodged beneath the rail base is an undesirable condition that can lead to a broken rail base.

6-4. Joints.

a. Joint bars. Rails shall be joined with proper factory designed and constructed joint bars. Joint bars may not be altered with a flame in any manner,

including the bolt holes. Joint bars not meeting these requirements shall be replaced.

b. Compromise joints. Rails of different size or section shall be joined with proper factory designed and constructed compromise bars, taper rails, or offset welds.

c. Cracked or broken joint bars. Cracked or broken joint bars shall be replaced.

(1) If one joint bar at a rail joint is cracked or broken between the center holes, operations over that location shall not exceed 10 mph.

(2) If both joint bars at a rail joint are cracked between the center holes, operations over that location shall not exceed 5 mph.

(3) Operations shall not be permitted over any location where both joint bars are broken, or where worn or loose joint bars allow vertical movement of either rail with respect to the other.

d. Bolts. Each joint shall be bolted with at least two bolts in each rail.

(1) All bolts shall be of proper size and tightly in place. A bolt is not considered tight unless the spring washer is compressed closed and is flat against the joint bar, as shown in figure 6-6.

Thank You for previewing this eBook

You can read the full version of this eBook in different formats:

- HTML (Free /Available to everyone)
- PDF / TXT (Available to V.I.P. members. Free Standard members can access up to 5 PDF/TXT eBooks per month each month)
- Epub & Mobipocket (Exclusive to V.I.P. members)

To download this full book, simply select the format you desire below

