

**AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT**

1. CONTRACT ID CODE \_\_\_\_\_ PAGE \_\_\_\_\_ OF \_\_\_\_\_ PAGES

2. AMENDMENT/MODIFICATION NO. \_\_\_\_\_ 3. EFFECTIVE DATE \_\_\_\_\_ 4. REQUISITION/PURCHASE REQ. NO. \_\_\_\_\_ 5. PROJECT NO. *(If applicable)* \_\_\_\_\_

6. ISSUED BY \_\_\_\_\_ CODE \_\_\_\_\_ 7. ADMINISTERED BY *(If other than Item 6)* \_\_\_\_\_ CODE \_\_\_\_\_

8. NAME AND ADDRESS OF CONTRACTOR *(No., street, county, State and ZIP Code)* \_\_\_\_\_ (X) 9A. AMENDMENT OF SOLICIATION NO. \_\_\_\_\_  
 9B. DATED *(SEE ITEM 11)* \_\_\_\_\_  
 10A. MODIFICATION OF CONTRACT/ORDER NO. \_\_\_\_\_  
 10B. DATED *(SEE ITEM 11)* \_\_\_\_\_  
 CODE \_\_\_\_\_ FACILITY CODE \_\_\_\_\_

**11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS**

The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers  is extended,  is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:  
 (a) By completing items 8 and 15, and returning \_\_\_\_\_ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment your desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)* \_\_\_\_\_

**13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.**

CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: <i>(Specify authority)</i> THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES <i>(such as changes in paying office, appropriation date, etc.)</i> SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER <i>(Specify type of modification and authority)</i>

**E. IMPORTANT:** Contractor  is not,  is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER <i>(Type or print)</i>		16A. NAME AND TITLE OF CONTRACTING OFFICER <i>(Type or print)</i>	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
<i>(Signature of person authorized to sign)</i>		<i>(Signature of Contracting Officer)</i>	

Item 14. Continued.

**CHANGES TO SECTION 00700 CONTRACT CLAUSES**

1. Page 00700-115.- Delete page 00700-115 in its entirety and replace with pages 00700-115 and 00700-116, bearing the notation "Revised by Amendment 0004."

**CHANGES TO THE SPECIFICATIONS**

2. Deleted Sections.- Delete the following specification section:

SECTION 08510 STEEL WINDOWS

3. Replacement Sections - Replace the following section with the accompanying new section of the same number and title, bearing the notation "ACCOMPANYING AMENDMENT NO. 0004 TO SOLICITATION NO. DACA63-01-R-0016:"

SECTION 05650 RAILROADS

**CHANGES TO THE DRAWINGS**

4. Replacement Drawings.- Replace the drawings listed below with the attached new drawings of the same number, bearing the notation "AM #0004":

C204.cal Seq 14 C204 LAYOUT PLAN 4  
C205.cal Seq 15 C205 LAYOUT PLAN 5  
eu39.cal Seq 358 EU39 ELECTRICAL SITE PLAN 23

END OF AMENDMENT

(4) Construction by special trade contractors, at least 25 percent of the cost of the contract performance incurred for personnel will be spent on the concern's employees or the employees of other HUBZone small business concerns.

(e) A HUBZone joint venture agrees that in the performance of the contract, the applicable percentage specified in paragraph (d) of this clause will be performed by the HUBZone small business participant or participants.

(f) A HUBZone small business concern nonmanufacturer agrees to furnish in performing this contract only end items manufactured or produced by HUBZone small business manufacturer concerns. This paragraph does not apply in connection with construction or service contracts.

(End of clause)

**52.219-23 – NOTICE OF PRICE EVALUATION ADJUSTMENT FOR SMALL DISADVANTAGED BUSINESS CONCERNS (May 2001)**

(a) *Definitions.* As used in this clause-

"Small disadvantaged business concern" means an offeror that represents, as part of its offer, that it is a small business under the size standard applicable to this acquisition; and either-

(1) It has received certification by the Small Business Administration as a small disadvantaged business concern consistent with 13 CFR 124, Subpart B; and

(i) No material change in disadvantaged ownership and control has occurred since its certification;

(ii) Where the concern is owned by one or more disadvantaged individuals, the net worth of each individual upon whom the certification is based does not exceed \$750,000 after taking into account the applicable exclusions set forth at 13 CFR 124.104(c)(2); and

(iii) It is identified, on the date of its representation, as a certified small disadvantaged business concern in the database maintained by the Small Business Administration (PRO-Net).

(2) It has submitted a completed application to the Small Business Administration or a Private Certifier to be certified as a small disadvantaged business concern in accordance with 13 CFR 124, Subpart B, and a decision on that application is pending, and that no material change in disadvantaged ownership and control has occurred since its application was submitted. In this case, in order to receive the benefit of a price evaluation adjustment, an offeror must receive certification as a small disadvantaged business concern by the Small Business Administration prior to contract award; or

(3) Is a joint venture as defined in 13 CFR 124.1002(f).

"Historically black college or university" means an institution determined by the Secretary of Education to meet the requirements of 34 CFR 608.2. For the Department of Defense (DoD), the National Aeronautics and Space Administration (NASA), and the Coast Guard, the term also includes any nonprofit research institution that was an integral part of such a college or university before November 14, 1986.

"Minority institution" means an institution of higher education meeting the requirements of Section 1046(3) of the Higher Education Act of 1965 (20 U.S.C. 1067k, including a Hispanic-serving institution of higher education, as defined in Section 316(b)(1) of the Act (20 U.S.C. 1101a)).

"United States" mean the United States, its territories and possessions, the Commonwealth of Puerto Rico, the U.S. Trust Territory of the Pacific Islands, and the District of Columbia.

(b) *Evaluation adjustment.*

(1) The Contracting Officer will evaluate offers by adding a factor of 10 percent to the price of all offers, except-

(i) Offers from small disadvantaged business concerns that have not waived the adjustment;

(ii) An otherwise successful offer of eligible products under the Trade Agreements Act when the dollar threshold for application of the Act is equaled or exceeded (see section 25.402 of the Federal Acquisition Regulation (FAR));

(iii) An otherwise successful offer where application of the factor would be inconsistent with a Memorandum of Understanding or other international agreement with a foreign government;

(iv) For DoD, NASA, and Coast Guard acquisitions, an otherwise successful offer from a historically black college or university or minority institution; and

(v) For DOD acquisitions, an otherwise successful offer of qualifying country end products (see sections 225.000-70 and 252.225-7001 of the Defense FAR Supplement).

(2) The Contracting Officer will apply the factor to a line item or a group of line items on which award may be made. The Contracting Officer will apply other evaluation factors described in the solicitation before application of the factor. The factor may not be applied if using the adjustment would cause the contract award to be made at a price that exceeds the fair market price by more than the factor in paragraph (b)(1) of this clause.

(c) *Waiver of evaluation adjustment.* A small disadvantaged business concern may elect to waive the adjustment, in which case the factor will be added to its offer for evaluation purposes. The agreements in paragraph (d) of this clause do not apply to offers that waive the adjustment.

\_\_\_ Offeror elects to waive the adjustment.

(d) *Agreements.*

(1) A small disadvantaged business concern, that did not waive the adjustment, agrees that in performance of the contract, in the case of a contract for-

(i) Services, except construction, at least 50 percent of the cost of personnel for contract performance will be spent for employees of the concern;

(ii) Supplies (other than procurement from a nonmanufacturer of such supplies), at least 50 percent of the cost of manufacturing, excluding the cost of materials, will be performed by the concern;

(iii) General construction, at least 15 percent of the cost of the contract, excluding the cost of materials, will be performed by employees of the concern; or

(iv) Construction by special trade contractors, at least 25 percent of the cost of the contract, excluding the cost of materials, will be performed by employees of the concern.

(2) A small disadvantaged business concern submitting an offer in its own name agrees to furnish in performing this contract only end items manufactured or produced by small disadvantaged business concerns in the United States. This paragraph does not apply in connection with construction or service contracts.

(End of clause)

**(End of Section 00700)**

SECTION 05650

RAILROADS

12/99

Amendment #0002

Amendment #0004

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION  
(AREMA)

AREMA Manual (1999) Manual for Railway Engineering (4 Vol.)

AREMA Track Plans (1999) Portfolio of Track Work Plans

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/ASNT CP-189 (1995) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 325 (1997) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 325M (1997) High-Strength Bolts for Structural Steel Joints (Metric)

ASTM A 490 (1997) Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength

ASTM A 490M (1993) High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric)

ASTM C 88 (1999a) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

ASTM C 117 (1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing

ASTM C 127 (1988; R 1993e1) Specific Gravity and Absorption of Coarse Aggregate

ASTM C 131 (1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 142	(1978; R 1997) Clay Lumps and Friable Particles in Aggregates
ASTM C 535	(1996el) Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 702	(1998) Reducing Samples of Aggregate to Testing Size
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM D 217	(1997) Cone Penetration of Lubricating Grease (IP50/88)
ASTM D 402	(1997) Distillation of Cut-Back Asphaltic (Bituminous) Products
ASTM D 445	(1997) Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)
ASTM D 566	(1997) Dropping Point of Lubricating Grease
ASTM D 1241	(1968; R 1994el) Materials for Soil-Aggregate Subbase, Base, and Surface Courses
ASTM D 1310	(1986; R 1997el) Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus
ASTM D 1556	(1990; R 1996el) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 1683	(1990a) Failure in Sewn Seams of Woven Fabrics
ASTM D 2171	(1994) Viscosity of Asphalts by Vacuum Capillary Viscometer
ASTM D 2922	(1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 3740	(1999b) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM D 3776	(1996) Mass Per Unit Area (Weight) of Woven Fabric

ASTM D 4354	(1996) Sampling of Geosynthetics for Testing
ASTM D 4355	(1992) Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
ASTM D 4491	(1999) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Trapezoid Tearing Strength of Geotextiles
ASTM D 4595	(1986; R 1994) Tensile Properties of Geotextiles by the Wide-Width Strip Method
ASTM D 4632	(1991; R 1996) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4716	(1995) Determining the (In plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
ASTM D 4751	(1999) Determining Apparent Opening Size of a Geotextile
ASTM D 4759	(1988; R 1996) Determining the Specification Conformance of Geosynthetics
ASTM D 4791	(1999) Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D 4833	(1988; R 1996el) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes
ASTM F 405	(1997) Corrugated Polyethylene (PE) Tubing and Fittings
ASTM F 512	(1995) Smooth-Wall Poly (Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation
AMERICAN WELDING SOCIETY (AWS)	
AWS D1.1	(1998) Structural Welding Code - Steel
AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)	
AWPA C2	(1995) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes
AWPA C6	(1997) Cross Ties and Switch Ties Preservative Treatment by Pressure Processes

AWPA M2 (1997) Standard for Inspection of Treated  
Timber Products

AWPA M6 (1997) Brands Used on Forest Products

AWPA P2 (1995) Standard for Creosote Solutions

## FEDERAL HIGHWAY ADMINISTRATION (FHWA)

FHWA SA-89-006 (1988) Manual on Uniform Traffic Control  
Devices for Streets and Highways

## CORPS OF ENGINEERS (COE)

COE CRD-C 119 (1991) Standard Test Method for Flat or  
Elongated Particles in Course Aggregate

- 1.2 Not Used.
- 1.2.1 [Enter Appropriate Subpart Title Here]
- 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

## As-Built Drawings; G, RE

One set of reproducible originals of the final as-built drawings for each automatic crossing protection installation prior to final acceptance by the Contracting Officer. The materials and methods used to produce these drawings shall meet the requirements of this specification and shall result in drawings which are easy to revise without damage to the drawing.

## SD-03 Product Data

## Wood Ties;

Name of the tie manufacturer, Rail Tie Association membership, the wood species proposed, the quantities of ties for each specie proposed, and product data for the ties to be furnished, including the type of seasoning to be utilized, prior to ordering the ties.

New Jointed Rail; G, RE  
Relay Rail; G, RE  
Joint Bars; ,  
Compromise Joint Bars; , .

Manufacturer's data on new rail including: rail weight, rail section, drilling, rail length, date rolled, and the name of the mill where the rail was rolled. For relay rail the required information shall include weight, section, lengths, and the name of the supplier. The maximum allowable vertical wear on the rail head and the maximum allowable horizontal wear on the side of the rail shall be provided. The design of the joint bars and compromise joint bars proposed to be furnished with each rail section shall also be provided.

Miscellaneous Track Materials; ,

Manufacturer's data for all track materials to be furnished.

Crossing Material or Surface; ,

Within 30 days of the Notice to Proceed, the brand name of the premanufactured crossing material or crossing surface material proposed for use along with manufacturer's literature concerning the product; and for built-in-place crossings, the type of materials to be used along with manufacturer's literature.

Components or Products; G, ED

Performance data for components or products proposed as an equivalent to those specified. The Contracting Officer's written approval is required for any such equivalent type component or product proposed to be used.

Traffic Maintenance and Detour Plans; G, RE

Traffic maintenance and detour plans for approval.

Crossing Material or Surface; ,

Detailed installation procedure for the premanufactured crossing material or crossing surface material proposed for use within 30 days of the notice to proceed.

Thermite Welding Procedures; G, RE

A detailed statement covering the step-by-step procedures to be employed in making the welds, including a complete description of each of the following items, as applicable, and any other essential characteristics included in the welding procedures:

- a. The manufacturer's trade name for the welding process.
- b. The method used for cutting and cleaning the rail ends. Flame cutting of rail ends will not be allowed.
- c. The minimum and maximum spacing between rail ends.
- d. The method used for maintaining the rails in alignment during welding.
- e. The method used for preheating, including time and temperature.
- f. The tapping procedure, including the minimum time required to cool the weld under the mold insulation.
- g. The method used, including a description of special tools and equipment, for removing the upset metal and finishing the weld to the final contour.
- h. Quality control procedures to be followed.
- i. The contractual agreements with any subcontractor employed by the Contractor in doing the work.

Electric Arc Welding; G, RE

A detailed specification covering the step-by-step procedures to be employed in making the electric arc welds. A complete description of each of the following items as applicable and any other essential characteristics shall be included in the procedure specifications.

- a. Type, size, and capacity of electric welding machine (250 amp minimum), grinder and other equipment. Also, type and size of material (welding rod or wire).
- b. The method to be used to remove defective and excess metal prior to welding (arccair or grinding).
- c. The method to be used to prevent warping.
- d. The method used for preheating, including time and temperature.
- e. The method of applying metal buildup and slag removal.
- f. The method of securing original contour of items welded.
- g. Quality control procedures to be followed.
- h. Welding materials (rod or wire), name and manufacturer of materials (low carbon steel) for welding rail, rail frogs, guard rails, switch point protectors, and switch points without manganese inserts and materials (manganese alloy) for welding manganese frogs, RBM frogs, manganese switch point inserts and manganese railroad crossing inserts or castings.

#### Materials and Equipment;

A complete schedule of the materials proposed for installation within 60 days of receipt of notice to proceed, and before installation of the materials; the schedule shall include a list of equipment proposed for the work.

Tie Plates; G.

Turnouts; G.

Rail Bonding and Grounding; G.

#### SD-04 Samples

##### Geotextile;

Geotextile samples for testing. Samples shall be submitted a minimum of 30 days prior to the beginning of installation of the geotextiles. One sample shall be provided for each 20 units (rolls, panels, etc.) of geotextile to be used in the contract. All samples shall be from the same production lot as will be supplied for the contract. Samples shall be identified by the manufacturer's name, brand name, lot designation, and project name. The minimum size of sample submitted for testing shall be the full width of the geotextile by 1.7 m .

##### Ballast;

Samples of the ballast material for testing. Samples shall be submitted a minimum of 60 days prior to the installation of the material. Samples shall be obtained from the quarry, supplier, or

other source that will be used to provide the ballast materials for this project using the methods described in ASTM D 75. One representative sample of not less than 90.6 kg of ballast material shall be submitted for each 9070 MT of ballast to be installed.

#### SD-06 Test Reports

##### Sampling and Testing;

One certified copy of Test Reports for each test performed on the ballast within 2 working days of the test completion.

##### Wood Ties;

Certified test and inspection reports for crossties and switch ties subsequent to treatment, a minimum of seven calendar days prior to any ties being installed in track. Test and inspection reports shall contain the information required by Part 7 of AWP A M2.

##### Geotextiles;

Independent testing laboratory's certified test reports for geotextiles, including necessary analysis and interpretation. These reports shall provide results of the laboratory testing performed on samples of the geotextile material delivered to the jobsite. Test reports shall be submitted at least 30 working days prior to the installation of the geotextile.

##### Ultrasonic Test;

Results of the ultrasonic rail testing. Results shall list defects and rail stationing.

#### SD-07 Certificates

##### Wood Ties;

Certificates of compliance prior to any ties being installed in track.

##### Ballast;

Certificates of Compliance for the ballast materials to be installed in this project.

##### Materials and Equipment;

Manufacturer's certificates of conformance for the following materials:

- a. Rail.
- b. Tie plates.
- c. Track bolts, nuts, and spring washers.
- d. Joint bars.
- e. Rail anchors.
- f. Track spikes.
- g. Turnouts.
- h. Rail welding process.
- i. Premanufactured car bumpers.
- j. Premanufactured road crossings and/or crossing surfaces.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

##### 1.4.1 Materials and Samples

The Contracting Officer will notify the Contractor of the materials approved or disapproved. Disapproved materials that have already been delivered to the project site, shall be promptly segregated from the approved materials and removed from the premises. If materials are disapproved, acceptable replacement materials shall be provided at no additional cost to the Government. Initial approval by the Contracting Officer will not prevent the removal and replacement of materials that are materially defective or materials not meeting this specification that are discovered during construction and/or routine quality control/quality assurance operations.

##### 1.4.2 Geotextiles

Geotextiles shall be shipped and stored in their original ultraviolet resistant cover until the day of installation. Geotextiles shall be protected from vandalism, temperatures greater than 60 degrees C, dirt, dust, mud, debris, moisture, sunlight, and ultraviolet rays. Geotextiles delivered to the project site shall be clearly labeled on the material cover to show the manufacturer's name, brand name, fabric type, location and date manufactured, lot identification, width, and length.

#### 1.5 QUALIFICATIONS

##### 1.5.1 Track Construction

Track construction shall be performed under the direction of qualified and competent supervisory personnel experienced in railroad construction.

##### 1.5.2 Welding

Welding shall be performed under the direct supervision of an experienced welding supervisor or foreman.

#### 1.6 PROJECT/SITE CONDITIONS

##### 1.6.1 Temporary Work

During construction, suitable roads and crossings with all necessary lights, signs, drainage, and other appurtenances required for safe public and local travel shall be provided. Suitable temporary fences shall be erected and maintained where required to prevent trespass upon work or damage to adjoining property. Drainage shall be maintained, and the accumulation of water that might affect the stability of the roadbed will not be permitted.

##### 1.6.2 Traffic Control

Traffic control devices shall comply with FHWA SA-89-006. Suitable warning signs shall be placed near the beginning of the work site and well ahead of the work site for alerting approaching traffic from both directions. Small markers shall be placed along newly painted lines or freshly placed raised markers to control traffic and prevent damage to newly painted surfaces or displacement of raised pavement markers. Painting equipment shall be marked with large warning signs indicating slow-moving painting equipment in operation.

##### 1.6.3 Welding

Welding shall not be performed in rain, snow, or other inclement weather

without adequately protecting the weld from the elements.

1.6.4 [Enter Appropriate Subpart Title Here]1.6.4.1 [Enter Appropriate Subpart Title Here]

## PART 2 PRODUCTS

### 2.1 BALLAST

Prepared ballast shall be crushed stone, Size No. 4, or 5 conforming to Chapter 1, Part 2, of AREMA Manual for quality, soundness and gradation. In the portion retained on each sieve specified, the crushed stone shall contain at least 90 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the plane. When two fractures are contiguous, the angle between planes of the fractures shall be at least 30 degrees in order to count as two fractured faces. Flat and elongated particle dimension ratio used in ASTM D 4791 shall be 1:3. Ballast materials shall meet the property requirements shown in TABLE I.

TABLE I. MINIMUM PROPERTY REQUIREMENTS - BALLAST

Property	Maximum Value	Minimum Value	Test Method
Percent passing	--		
0.075 sieve (No. 200 Sieve)			ASTM C 117
Granite	1.0%	--	
Traprock	1.0%	--	
Quartzite	1.0%	--	
Dolomitic Limestone	1.0%	--	
Bulk specific gravity			ASTM C 127
Granite	--	2.55	
Traprock	--	2.60	
Quartzite	--	2.60	
Dolomitic Limestone	--	2.65	
Absorption			ASTM C 127
Granite	1.0%	--	
Traprock	1.0%	--	
Quartzite	1.0%	--	
Dolomitic Limestone	2.0%	--	
Clay lumps and friable particles			ASTM C 142
Granite	0.5%	--	
Traprock	0.5%	--	
Quartzite	0.5%	--	
Dolomitic Limestone	0.5%	--	
Degradation			See Note 1
Soundness			
Granite	40%	--	
Traprock	25%	--	
Quartzite	30%	--	
Dolomitic Limestone	35%	--	

TABLE I. MINIMUM PROPERTY REQUIREMENTS - BALLAST

Property	Maximum Value	Minimum Value	Test Method
Sodium sulfate - 5 cycles			ASTM C 88
Granite	5%	--	
Traprock	5%	--	
Quartzite	5%	--	
Dolomitic Limestone	5%	--	
Flat or elongated particles			CRD-C-119
Granite	10%	--	
Traprock	5%	--	
Quartzite	5%	--	
Dolomitic Limestone	10%	--	

Note 1 - Materials having gradations containing particles retained on the 25mm sieve shall be tested by ASTM C535. Materials having gradations with 100% passing the 25mm sieve shall be tested by ASTM C131.

Note 2 - The limit for bulk specific gravity is a minimum value. Limits for the remainder of the tests are maximum values.

2.2 Not Used

2.3 GEOTEXTILE

2.3.1 Physical Property Requirements

The geotextile shall be a nonwoven, needle-punched material. The geotextile's fiber shall consist of at least 85 percent by weight polyamide, polypropylene, or polyethylene. The geotextile shall contain stabilizers and/or inhibitors as necessary to make the filaments resistant to deterioration from ultraviolet light and heat exposure, particularly prior to placement and coverage. The fibers shall be formed into a network which will be dimensionally stable. The edges of the geotextile shall be finished in a way to prevent the outer fibers from being pulled away from the geotextile. The geotextile shall exceed the applicability property requirements stated in TABLE II.

TABLE II - PROPERTY REQUIREMENTS-GEOTEXTILE

PROPERTY	MINIMUM REQUIREMENTS*	TEST METHOD
Weight**	0.57 kg/0.836 sq m (15 oz/sq yd)	ASTM D 3776 Option B
Color	Grey or tinted	--
Grab tensile strength	158.6 kg (350 lbs)	ASTM D 4632
Puncture strength	83.8 kg (185 lbs)	ASTM D 4833
Trapezoidal tear strength	68 kg (150 lbs)	ASTM D 4533

TABLE II - PROPERTY REQUIREMENTS-GEOTEXTILE

PROPERTY	MINIMUM REQUIREMENTS*	TEST METHOD
Apparent opening size (AOS) (maximum required valve)	Less than 0.22 mm (No. 70 sieve)	ASTM D 4751
Normal permeability (k)	0.1 cm/sec	ASTM D 4491
Permittivity	0.2 per sec	ASTM D 4491
Planar water flow/transmissivity at $i = 1$ and normal stress = 1.6 kg per sq cm (3.5 psi)	5.53 sq cm/min (0.006 sq ft/min)	ASTM D 4716
Ultraviolet degradation at 150 hours	70 percent strength retained	ASTM D 4355
Seam strength	158.6 kg (350 lbs)	ASTM D 1683

\*These property requirements are Minimum Average Roll Values in the weaker principal direction.

\*\*Geotextile selection shall not be limited by the minimum weight shown. Selection shall be based on the other property requirements listed. Heavier geotextiles have shown greater resistance to abrasion.

### 2.3.2 Dimensional Requirements

Each roll of geotextile shall be at least 3 m wide and 6 m long.

### 2.3.3 [Enter Appropriate Subpart Title Here]

## 2.4 JOINT BARS

Joint bars shall be of the size, shape, and punching pattern to fit the rail being joined.

### 2.4.1 New Joint Bars

New joint bars shall be used with new rail, and shall be of the "toeless" and "head free design" to match rail section. New joint bars shall conform to the requirements of "Specifications For High-Carbon Steel Joint Bars" or "Specifications For Quenched Carbon-Steel Joint Bars and Forged Compromise Joint Bars" found in Chapter 4, Part 2 of AREMA Manual for the joint bar and assemblies recommended in Chapter 4, Part 1 of AREMA Manual.

### 2.4.2 Used Joint Bars

Used joint bars in good condition shall be used with relay rail only. The type of joint bar shall be "toeless". The "long toe" type of joint bar shall not be used. Used joint bars shall be straight, free from cracks, breaks, and other visual defects. Excessive rust, dirt, and other foreign materials on the joint bars are not permitted. Used joint bars shall be of the proper size to make good contact with the underside of the rail head and the top of the rail base on the rails being joined. Joint bars shall have alternating round and oval bolt holes. Bolt holes shall not show excessive wear that would prevent use of the oval neck track bolt normally

used with that joint bar. Joint bars that have been flame-gouged, flame cut, or otherwise altered shall be considered scrap and shall not be used.

#### 2.4.3 Compromise Joint Bars

Compromise joint bars shall be of the size, shape, and punching pattern to fit the rail sizes and sections being joined. Only factory designed and constructed (forged or cast) compromise joint bars shall be used to join rails of different sizes.

##### 2.4.3.1 New Compromise Joint Bars

Compromise joint bars shall conform to the requirements of "Specifications For Quenched Carbon-Steel Joint Bars and Forged Compromise Joint Bars" found in Chapter 4, Part 2 of AREMA Manual.

##### 2.4.3.2 Used Compromise Joint Bars

Requirements for joint bars in paragraph Used Joint Bars shall also apply to used compromise joint bars.

#### 2.5 GREASE

Grease for lubricating moving parts in turnouts and other trackwork shall have the following typical characteristics:

Calcium Soap, percent	9.0
Solid Additive (Graphite), percent	11.5
Penetration, ASTM D 217 at 25 degrees C worked	340
Dropping Point ASTM D 566 at 25 degrees C	101/214
Oil Viscosity, square mm/record at 40 degrees C	81.8
ASTM D 445 SUS at 38 degrees C	379

Other types of grease or lubricating oil may be used provided that the grease or oil has been used successfully by local commercial railroads and has the approval of the Contracting Officer.

#### 2.6 OIL FOR CORROSION PROTECTION

Oil for protecting rail and other track materials from corrosion, except joints, shall conform to the following general specification:

Asphalt, 100 penetration minimum 45 percent	ASTM D 402
Flash point, minimum 55 degrees C	ASTM D 1310
Viscosity, kinematic, 60 degrees C 480 to 700 sq mm/s	ASTM D 2171

#### 2.7 RAIL

##### 2.7.1 New Jointed Rail

New jointed rail shall comply with the following:

- a. Rail Lengths: New rail shall be a 57 kg/m (115 lbs/yd), 65 kg/m (132 lbs/yd), 66 kg/m (133 lbs/yd) or 67 kg/m (136 lbs/yd) section and shall conform to the specifications in Chapter 4, Parts 1 and 2 of AREMA Manual that were in effect at the time of its

manufacture. New rail shall be provided in 11.9 or 24.4 m lengths.

- b. Rail Drilling: New rail shall be provided with the rail ends drilled. Drilling shall be uniform and to the patterns specified.

RAIL	DRILLING
115RE	89-152-152 mm (3-1/2, 6, 6 inch)
132RE	89-152-152 mm (3-1/2, 6, 6 inch)
133RE	89-152-152 mm (3-1/2, 6, 6 inch)
136RE	89-152-152 mm (3-1/2, 6, 6 inch)

## 2.7.2 Used Jointed Rail

### 2.7.2.1 Relief Rail

Used rail for spot rail replacement of defective rails (relief rail) shall be the same weight, section, drilling, and length as the rail being replaced. Relief rail shall meet the requirements specified for relay rail.

### 2.7.2.2 Relay Rail

Relay rail shall be control cooled. Used rail provided by the Contractor for out of face replacement and new construction shall be 57 kg/m or heavier and shall have the same section and drilling pattern for each rail weight. Acceptable rail weights and sections for material provided by the Contractor are: 115 AREA, 132 AREA, 133 AREA, and 136 AREA. All relay rail provided shall be the same section. Rail sections 90 ARA-A, 90 ARA-B, and 110 AREA that are removed as part of the track demolition in this project and meet the requirements of this specification may be reused where indicated

- a. Rail Drilling: Relay rail shall be provided with the rail ends drilled. Drilling shall be uniform and to the patterns specified.

RAIL	DRILLING
115RE	89-152-152 mm (3-1/2, 6, 6 inch)
132RE	89-152-152 mm (3-1/2, 6, 6 inch)
133RE	89-152-152 mm (3-1/2, 6, 6 inch)
136RE	89-152-152 mm (3-1/2, 6, 6 inch)

- b. Length: Relay rail shall be standard 11.9 m lengths. Not more than 10 percent of the lot may be shorts. No rail shorter than 8.2 m will be accepted.
- c. Maximum Allowable Wear: For each rail, the average top wear shall meet the requirements on Table IV, except rail in turnouts which shall conform to paragraph Maximum Wear Used Rails Installed in Turnouts. Side wear shall be measured 16 mm below the original top of rail.
- d. Condition and Appearance: Relay rail shall be free from obvious defects and clean in appearance. Rail that has severe pitting and corrosion or has been flame-gouged, or spike nipped will not be accepted. Rail shall be straight from line and surface and free from any kinks or bends. Rail bases shall be solid and free from visual defects such as plate wear, spike notching, pitting, and flame-gouging.

(1) Maximum Allowable Lip: Lip or overflow shall not exceed 3 mm on either side of the rail head.

(2) Engine Burns: Engine burns shall not be greater than 13 mm diameter and 0.8 mm deep. A maximum of 6 engine burns is allowed per rail and engine burns shall not affect more than 25 percent of the total order.

(3) End Batter and Chipping: Rail end batter shall not exceed a maximum of 3 mm when measured 13 mm from the rail end with a 460 mm straightedge laid only on the rail being measured. Chipped or broken rail ends will not be accepted.

(4) Running Surface Damage: Running surface damage shall not exceed 6 mm long by 13 mm wide, and shall be not greater than 1.5 mm deep. Flat spots are not permitted on the rail head.

(5) Defects Not Permitted: Relay rail having any of the following defects shall not be accepted: bolt hole cracks or breaks, broken base, breaks, crushed head, detail fracture, engine burn fracture, head-web separation, piped rail, horizontal split head, vertical split head, torch cut rail ends, torch cut bolt holes, and compound or transverse fissures. The presence of any of these defects in the rail render that rail as scrap.

Nominal Rail Weight, kg/m	Maximum Allowable Wear, mm	
	Top	Side
57.0 or less	3.2	6.4
Greater than 57.0	6.4	9.5

### 2.7.3 Welded Rail

Welded rail will not be permitted. The welding of rail joints will not be permitted, except as stated in this specification.

## 2.8 TIE PLATES

### 2.8.1 General

Tie plates shall be of the dimensions and punching pattern (A or B) to fit the rail. New tie plates conforming to Chapter 5, Part 1 of AREMA Manual shall be used with new rail. Used tie plates in good condition may be used with relay rail. The used tie plates shall not be smaller than 190.5 by 279 mm double-shoulder for use with relay rail having nominal weights of 49.6 kg/m and greater. Both flat and canted plates will be required to match the existing tie plates that are in track. Canted tie plates shall be used in all new rail and relay out-of-face rail replacements.

### 2.8.2 Used Tie Plates

Used tie plates shall be free from excessive rust, pitting, mechanical damage, and dirt and other foreign materials. Cracked or broken plates shall be considered as scrap and shall not be used. Shoulders on the tie plates shall project a minimum of 6 mm above the plane of the rail seat. The thickness of the tie plate shall be at least 13 mm when measured anywhere in the rail seat area. Spike holes shall be square and not corroded, worn, or mechanically enlarged.

## 2.9 WOOD TIES

Species shall be Ash, Beech, Red and White Oak. Switch ties shall be Ash or Oak. Conditioning and seasoning shall conform to the requirements of

AWPA C6 for the individual wood species. Ties shall be well seasoned. Prior to preservative treatment, wood ties shall be dried to the oven dry moisture content, or less, as specified in paragraph 3.14 of AWPA C6. The wood may be air dried, vapor dried, or boultonized. Ties which are to be dried by artificial means shall be conditioned and treated as soon as possible after sawing, but no more than 30 days later. The temperature used for boultonizing shall be as high as possible but in no case less than 94 degrees C. Vapor dried ties shall be transferred from drying cylinders to treatment cylinders as quickly as possible to avoid loss of heat from the seasoned ties. Ties shall be pressure treated in accordance with Chapter 3, Part 6 of AREMA Manual by the empty cell process with a 60/40 creosote/coal tar solution (Grade C) in accordance with AWPA P2 to a minimum retention of 3.6 kg/0.28 cu m of wood. The Contractor shall record treatment as specified in AWPA M2. Treated ties shall be permanently marked or branded by the producer in accordance with AWPA M6. Ties shall be produced by a member of the Railway Tie Association. All ties shall be incised on all four sides in the pattern specified in AREMA Manual, Chapter 3, Part 6, prior to treatment. Splits shall not be longer than 100 mm and not wider than 5 mm at either end. Splits longer than 100 mm but not longer than the width of the face in which the split appears, will be acceptable if specified anti-splitting devices are installed with the splits compressed. Any required adzing and drilling for spikes shall be performed prior to treatment. The Contractor shall notify the Contracting Officer at least 15 days prior to the shipment of any treated ties or timbers from the manufacturer's plant, to provide the Government the opportunity to inspect the materials before shipment. When inspections of onsite materials result in product rejection, the Contractor shall promptly segregate and remove rejected material from the premises. The Government may also charge the Contractor any additional cost of inspection or test when prior rejection makes reinspection or retesting necessary.

#### 2.9.1 Crossties

Wood crossties shall conform to Chapter 3, Part 1 of AREMA Manual.

- a. Wood crossties except at road crossings: Wood ties shall be sawed and shall be not less than 178 mm thick and 229 mm wide. The length shall be 2.6 m.
- b. Wood crossties at road crossings: Wood ties shall be sawed and shall not be less than 178 mm thick and 229 mm wide. The length shall be 2.75 m, unless recommended otherwise by the manufacturer of crossing surface materials.

#### 2.9.2 Switch Ties

Switch ties shall conform to Chapter 3, Part 2 of AREMA Manual and shall be sawed 178 mm thick and 229 mm wide. The length and quantities shall be as shown.

#### 2.9.3 Not Used

##### 2.9.3.1 [Enter Appropriate Subpart Title Here]

#### 2.9.4 Tie Plugs

Tie plugs shall fit holes from which spikes are drawn. The plugs shall comply with Chapter 3, Part 1 of AREMA Manual and shall be treated in accordance with Chapter 3, Part 6 of AREMA Manual.

#### 2.10 Not Used

2.11 Not Used

2.12 Not Used

### 2.13 ANTI-SPLITTING DEVICES

Crossties and switch ties shall be equipped on each end with gang nail end plates anti-splitting devices of the type specified, regardless of whether or not the wood has shown any tendency to split. Products used shall conform to Chapter 3, Part 1 of AREMA Manual. Anti-splitting devices shall be applied in accordance with Chapter 3, Part 1, Section 10 of AREMA Manual.

2.14 Not Used

### 2.15 TURNOUTS

The component parts of the turnouts to be furnished shall be the products of manufacturers regularly engaged in the manufacture of such products, and shall essentially duplicate items that have been in satisfactory use at least 2 years prior to bid opening. The parts need not all be made by the same manufacturer, but each turnout shall be the product of a single firm. Switch assemblies, stands, frogs, and guardrails assemblies shall conform to the requirements of AREMA Track Plans.

#### 2.15.1 Rail and Joint Bars

Rail, joint bars, and miscellaneous track materials used in turnout construction shall be furnished and installed as part of the complete turnout. Rail and miscellaneous track materials used in turnout construction shall be the weight and section as specified in Paragraph NEW JOINTED RAIL.

#### 2.15.2 Maximum Wear Used Rails Installed in Turnouts

The average top (vertical) wear shall be 3 mm or less. Gage side head wear shall not exceed 3 mm

#### 2.15.3 Frogs, Switches, Guardrails and Appurtenances

Frogs, switches, guardrails and appurtenances shall be materials suitable for use in heavy tonnage main track. Used turnout materials shall have been fully reconditioned and shall be within plus or minus 3 mm of the original specification for that turnout design. Materials used in the turnout shall be of the same weight and section. Materials shall be in good condition and free from excessive rust, dirt, and other foreign materials. The rail weight and section shall be as specified.

##### 2.15.3.1 Switches

Switches for new turnout construction or complete turnout replacement shall be 5029 mm reinforced straight split switches with graduated risers generally conforming to AREMA Track Plans, Plan Number 112.

- a. Switch points shall be new. Switch point detail shall be AREMA Track Plans, Plan No. 221, Detail 4000 or 6100.

- b. Switch rods and connecting rods shall be new.
- c. Gage plates, switch plates, slide plates, and heel plates shall either be new or used and in good condition and not worn or corroded. Rail braces shall be [AM #4]\_\_\_\_\_ adjustable. For a given turnout all rail braces shall be of the same design.
- d. Heel blocks shall be either cast or forged steel and be either new or used and in good condition. New heel block bolt assemblies shall be provided and shall be heat treated. The heel joint bars shall be either new or used in good condition and manufactured for the purpose.

#### 2.15.3.2 Frogs

Frogs shall be railbound manganese, as shown in AREMA Plan 600, or solid manganese self-guarded, as shown in AREMA Plans 641 and 691 (Section B-B) in the sizes indicated. Self-guarded frogs shall not be used in turnouts on the Yard Lead Track or Tracks I1, I2, and I3.

- a. Frogs shall be new or remanufactured. Cracked or broken used frog castings shall not be used. Cracked or broken frog castings that have been repaired by welding are not acceptable and shall not be used. Remanufactured frogs shall meet the following wear requirements:

(1) Frog points shall be in good condition and not be worn, chipped, or broken.

(2) Maximum allowable wear on used or reconditioned frogs shall be:

Frog Point:	3 mm
Top Surface:	3 mm
Raised Guarding Face (Self-Guarded)	3 mm
All Wear Surfaces	3 mm

(3) Minimum flangeway depth for used frogs shall be 45 mm .  
Minimum flangeway width shall be 48 mm .

- b. Frog bolts, nuts, lock washers, and headlocks shall all be new.

#### 2.15.3.3 New or Replacement Guard Rails

New or replacement guard rails shall be a minimum of 4.6 m in length and shall be new or used in good condition. Guard rails shall be of any of the following designs: Tee rail per AREMA Track Plans, Plan No. 504, solid manganese steel per AREMA Track Plans, Plan No. 510, or an acceptable hook flange design. For used guard rails the guard face shall be smooth and not worn more than 3 mm from its new condition. Guard rails bolted to the running rails shall be equipped with fillers. When fillers are installed or repaired new bolt assemblies shall be used. All bolts, nuts, and associated hardware shall be new. Clamped guard rails shall be equipped with block wedges, filler wedges, and cotter keys. Guard rail plates shall be new or acceptable replacements. Single-shoulder tie plates used with guard rails shall be installed with the shoulder on the inside flush against the base of the guard rail.

#### 2.15.3.4 Hook Plates

Hook plates shall be new or acceptable used material and shall be of the designs and lengths indicated on AREMA Track Plans, Plan Nos. 112 and 241.

#### 2.15.3.5 Switch Stands

- a. New or replacement switch stands shall conform to AREMA Track Plans, Plan 251-64 and shall be new or fully reconditioned, low-stand type. Switch stand shall be positive-action (rigid)] with adjustment from the top with shims through a moveable cover.
- b. Existing switch stands, staffs and targets, if reused, shall be fully reconditioned.
- c. Each stand shall be equipped with one of the following switch lamps:
  - (1) Reflecting Type: Approved reflecting switch lamps fitted with standard commercial-type double red and white reflecting lenses but without day signal targets.
  - (2) Reflecting Type with Daylight Disk: Approved reflecting switch lamps fitted with standard commercial-type double red and white reflecting lenses, and with day signal targets. This lamp type shall be located at all turnouts on the Yard Lead Track and the turnouts at the juncture of Track I3 and the existing track.

#### 2.15.4 Not Used

#### 2.15.5 Rail Braces

Rail braces shall be adjustable type and shall be of standard manufacture.

#### 2.16 GRADE CROSSINGS

##### 2.16.1 Crossing Material or Surface

Roadway width shall be as indicated in the contract drawings. Crossing material or surface shall comply with the following:

Premanufactured, precast concrete panels for grade crossings shall be constructed of reinforced concrete having a minimum 28-day compressive strength of 34.5 MPa. Precast crossing panels shall be the product of a company regularly engaged in the manufacture of such panels, and whose products have been successfully used in the commercial railroad industry for at least 2 years. Panels removed from existing crossings may be reused in the yard track crossings. New panels shall be used on all paved road and tank trail crossings.

##### 2.16.2 Rail

Rail within the road crossing and for at least 6 m on either side of the crossing shall be 115RE as specified in paragraph Rail and Joint Bars. Rail joints shall not be located within the crossing or for at least 6 meters on either side of the crossing.

##### 2.16.3 Ties

Ties within the road crossing and for at least 6 m on either side of the

crossing shall be hardwood and shall be as specified in paragraphs Crossties and Switch Ties.

#### 2.16.4 Track Materials

Tie plates, spikes or other rail fasteners, rail anchors, and other track materials shall conform to the manufacturer's recommendations. Unless specified by the crossing manufacturer, track materials shall be as specified in paragraph MISCELLANEOUS TRACK MATERIALS.

#### 2.16.5 Threaded Fasteners and Screw Spikes

Threaded fasteners for use in grade crossings shall be of the sizes and lengths specified by the grade crossing manufacturer or as indicated for built-in-place crossings. Screw spikes shall have a minimum ultimate tensile strength of 414 MPa and shall be galvanized for corrosion protection.

#### 2.16.6 Pipe for Subdrains

Pipe for subdrains shall be 152 mm diameter corrugated, perforated polyethylene complying with ASTM F 405, or bituminous coated galvanized corrugated steel.

#### 2.16.7 Cable Conduit

Cable conduit under grade crossings shall be PVC pipe conforming to ASTM F 512, size as indicated, and shall be a minimum of Schedule 80.

### 2.17 MISCELLANEOUS TRACK MATERIALS

Miscellaneous track materials shall be as follows:

#### 2.17.1 Spikes

##### 2.17.1.1 Track Spikes

Track spikes shall be new and shall conform to Chapter 5, Part 2 of AREMA Manual. Track spikes size 152 by 16 mm shall be used with 49.6 kg/m or heavier rail. Track spikes 140 by 14 mm shall be used with 44.6 kg/m and under rail.

##### 2.17.1.2 [Enter Appropriate Subpart Title Here]

#### 2.17.2 Bolts, Nuts, and Spring Washers

New track bolts, nuts, and spring washers shall be used throughout the project for both new and relay rail.

##### 2.17.2.1 Bolts and Nuts

The various rail, joint bars, and rail drillings require various lengths and diameters of bolt assemblies. The Contractor shall determine the number of bolt assemblies of each size required. All bolt diameters shall be the largest possible for a given rail drilling and joint bar punching. Track bolts and nuts shall conform to Chapter 4, Part 2 of AREMA Manual. Track bolts shall be long enough to leave at least two threads exposed after the nut is tightened.

##### 2.17.2.2 Spring Washers

Spring washers and nuts shall be sized to ensure that the spring washer develops its full reactive force and does not jam into the joint bar hole.

Spring washers shall be of the size to fit the bolt and nut used and shall conform to Chapter 4, Part 2 of AREMA Manual, and Section M12 of AREMA Track Plans.

### 2.17.3 Rail Anchors

Where special tools are required to install or remove anchors, the Contractor shall furnish a minimum of one tool for each 5,000 anchors, or fraction thereof, not to exceed 5 tools per job.

#### 2.17.3.1 New Installation

Rail anchors for new installations shall be new. Sizes shall conform to the various sizes of rail on the project and conform to "Specifications for Rail Anchors" in Chapter 5, Part 7 of AREMA Manual. Anchors may be either drive-on or spring type.

#### 2.17.3.2 Salvaged Rail Anchors

Rail anchors salvaged from the track being removed shall become the property of the Contractor and shall be removed from the site. No used anchors shall be reinstalled.

### 2.17.4 Insulated Joints

Insulated joints shall conform to applicable portions of Chapter 4, Part 2 of AREMA Manual. Conventional continuous insulated joints with fibre insulation shall not be used. Unless otherwise directed by the Contracting Officer, insulated joints shall be for the rail sections and rail drilling specified in Paragraph RAIL JOINT BARS. Location of insulated joints shall be as indicated on the Electrical Plans.

### 2.17.5 Bumping Posts, Cushion Heads and Wheelstops

Bumping posts, and cushion heads shall be new and shall be of a standard design that has been in use by commercial railroad industry for at least 5 years. Bumping posts, and cushion heads shall be manufactured by a company regularly engaged in the manufacture of these products.

#### 2.17.5.1 Bumping Posts

Bumping posts shall be of all-steel construction, shall bolt firmly onto the rail, and shall be of a type designed for general service. Bumping posts shall have tension and compression members with a moment of inertia not less than  $435 \times 10^4 \text{ mm}^4$ .

#### 2.17.5.2 Cushion Heads

Cushion heads shall be of all steel construction, shall firmly bolt, attach, or clamp onto the bumper or end dock (platform or ramp). Cushion heads shall resist 36,240 kg of compression.

#### 2.17.5.3 [Enter Appropriate Subpart Title Here]

#### 2.17.6 Used Bumping Posts

Used bumping posts shall not be furnished by the Contractor. The Contractor shall furnish new fastening materials conforming to the applicable sections of this specification.

### 2.17.7 Inner Guard Rail

Inner guard rail shall be Class IV or better used rails as indicated in Part 2, Chapter 4, "Inspection Classification of Second Hand Rail for

Welding", of AREMA Manual. Rail shall be 36.2 kg or greater. All rails used at any one inner guard rail location shall be the same weight and section. Joint bars shall match the rail provided and shall be in good condition.

#### 2.17.8 Gage Rods

##### 2.17.8.1 New Gage Rods

New gage rods shall be the double-clamp style manufactured in conformance with "Specifications for Special Trackwork" of AREMA Track Plans. The double clamp style gage rods shall be threaded on both ends and shall be equipped with four malleable steel casting clamps to rigidly hold both sides of the base of both rails.

##### 2.17.8.2 Used Gage Rods

Used gage rods shall not be furnished by the Contractor. Salvaged gage rods shall not be used.

#### 2.17.9 Derails

##### 2.17.9.1 New Derails

New double switch point derails shall be of a standard design that has been in use by the commercial railroad industry for at least 5 years. When the type of derail indicated requires a derail stand, connecting rod, and operating mechanism for proper operation, the derail and all necessary components shall be provided as a unit. The locations, sizes, and directions of the derails shall be as indicated on the contract drawings.

##### 2.17.9.2 Used Derails

Used derails shall not be furnished by the Contractor. Used derails shall be salvaged from existing tracks that are removed and turned over to the Government.

#### 2.18 SALVAGED MATERIALS

##### 2.18.1 Dunnage

Pallets, sills, and other material used for packaging and stacking salvaged track items shall be clean, free of decay or other defect, and sufficiently sturdy for the service intended.

##### 2.18.2 Marking Paint

Marking paint shall be a good quality oil-based spray marking paint or a good quality oil-based paint marker.

##### 2.18.3 Salvaging Rail

The Contractor shall salvage rail as directed; the Government will make available salvaged rail to the Contractor subject to the following:

- a. Nondefective and reclaimable rails salvaged from existing tracks may be used to execute rail replacement work and new work at other locations of the project, subject to review and approval of the materials by the Contracting Officer.
- b. Reclaimable defective rails may be used to construct inner guard rails provided all defects can be cropped off. Detailed inspection shall be made of such rails to ensure that rails which

contain critical defects such as transverse defects, head-web separations, vertical split heads, pipe, split webs, etc., are not incorporated in the work.

#### 2.18.4 Joint Bars

Nondefective joint bars salvaged from existing tracks may be used to execute spot replacement work and new work at other locations of the project, subject to review and approval of the material by the Contracting Officer. Government furnished joint bars may only be used with Government furnished rail from track demolition.

#### 2.18.5 Tie Plates

Tie plates salvaged from existing tracks, which are not either broken, cracked, or severely corroded or worn, may be used to execute the work subject to review and approval of the material by the Contracting Officer. Government furnished tie plates, from track demolition, may be used with Contractor furnished rail of the appropriate rail section for which the plates were manufactured. The "mixing" of different tie plate designs on the same section of track will not be permitted.

### 2.19 RAIL BONDING AND GROUNDING

#### 2.19.1 Rail Bonds

Rail bonds shall be exothermic type ("Cadweld") bonds applied to the field side of the rail head (signalized grade crossings only), or 1154 mm bonds welded to the rail web. The bond cables shall be flexible bare copper stranded 1/0 AWG cables with preformed ends. Bond cables shall be flexible bare copper stranded cables with preformed ends and shall conform to applicable requirements of AREMA Manual Vol. 3.

#### 2.19.2 Grounding Rods

Grounding rods shall be 19 mm diameter copper clad steel rods. The minimum length of ground rods shall be 2.5 m .

#### 2.19.3 Ground Connection Cables

Connections between the grounding system or ground rods and rails shall be made with a bare flexible copper stranded 1/0 AWG cable.

#### 2.19.4 Electrical Connecting Hardware

Electrical connecting hardware shall be bronze pressure bar type materials having no rotating parts coming in direct contact with conductors.

### 2.20 WELDING

#### 2.20.1 Rail Welding Kits

Kits for thermite type rail welds shall be approved by the Contracting Officer before use.

#### 2.20.2 Rail

Rail for welding includes Contractor furnished material. The Contractor shall provide welding kits for all rail sections used.

## PART 3 EXECUTION

### 3.1 REMOVAL, SALVAGE, AND DISPOSITION OF MATERIALS

Tracks and segments of track shall not be dismantled until approved to do so by the Contracting Officer. The following materials shall be salvaged by the Contractor for later use by the Government. Some of these items will be used in the construction of new tracks as indicated.

### 3.1.1 Materials To Be Salvaged

Materials to be salvaged for later use by the Government are:

- a. 90RA rail, tie plates, and joint bars required to construct EMF Track.
- b. 110RE rail, tie plates and joint bars.
- c. 115RE rail, tie plates and joint bars.
- d. Grade crossing signals and controllers as indicated.

[AM #2]

- e. 112RE rail, tie plates, and joint bars

Other materials shall become the property of the Contractor and shall be removed from the project.

### 3.1.2 Methods and Procedures

The Contractor may use any methods to dismantle the track, provided proper measures are taken to ensure the safety of the laborers and the general public, and no damage is caused to track components to be salvaged or other tracks and structures which are indicated to remain. Methods of removal of existing tracks shall not cause damage to adjacent sidewalks or paved roadways. Damage to these facilities caused by the Contractor shall be restored at Contractor's expense.

### 3.1.3 Inventory of Track Materials

The Contractor shall keep a detailed inventory of excess and salvaged track materials stockpiled for the Government. Detailed inventory shall be recorded in appropriate format and furnished to the Contracting Officer.

### 3.1.4 Inspection and Reconditioning of Used Track Materials

Salvaged track materials shall be cleaned and inspected for defects to determine their suitability for further use.

#### 3.1.4.1 Cleaning By Hand or Mechanical Means

Rail, joint bars, tie plates, and other materials shall be cleaned by hand or mechanical means to remove all adhering dirt and heavy rusting so that the [AM #2]\_\_\_\_\_ steel can be examined.

#### 3.1.4.2 Visual Examination of Rails

Rails shall be visually examined for evidence of defects such as those illustrated on Form 402-A found in Part 3 of AREMA Manual. Such defects shall be brought to the attention of the Contracting Officer who will be the final judge as to the serviceability of the rail. Rails having bolt hole cracks or end batter under paragraph TRACK REPAIR that can be reconditioned for use by cropping and re-drilling shall be marked at the location of the defect with yellow paint. Rails with other defects or which cannot be reconditioned shall be rejected as scrap and shall be marked with bright red paint and stacked separately.

#### 3.1.4.3 Visual Examination of Joint Bars

Existing joint bars and compromise joint bars which are removed and no longer required at that location due to rail replacement or other work may be cleaned and reused at other locations, subject to review and approval of the Contracting Officer. Joint bars and compromise joints that are not reused shall be salvaged or scrapped. Joint bars shall be visually examined for defects and wear. Joint bars with bolt hole or spike slot cracks shall be scrapped. Bars which do not fit tightly against the rail or bars in which the bolt holes are excessively corroded or worn shall be scrapped. The Contracting Officer will be the final judge of the serviceability of joint bars. Scrapped bars shall be marked with bright red paint and stacked separately.

#### 3.1.4.4 Not Used

#### 3.1.4.5 Visual Examination of Tie Plates

Tie plates shall be visually examined for cracks, breaks, excessive wear, and excessive corrosion. Track material with these defects shall be considered scrap, marked with bright red paint and stacked separately.

#### 3.1.4.6 Not Used

#### 3.1.4.7 Grade Crossing Materials

Existing premanufactured grade crossing panels, rail and other track materials shall be salvaged as indicated, or as designated by the Contracting Officer. All salvaged materials shall remain the property of the Government, and shall be reinstalled as indicated or shall be transported to the military installation storage yard. Grade crossing materials to be salvaged shall be removed, cleaned as required for proper reinstallation, marked or labeled as necessary for proper reinstallation, and transported to the reinstallation location or to the storage yard.

#### 3.1.5 Transport and Stack Excess and Salvaged Materials

##### 3.1.5.1 Material Not Used In Track Work

Excess and salvaged materials which are not used in track work shall be stacked at a site on the military installation designated by the Contracting Officer.

##### 3.1.5.2 Stacking of Rails

Rails shall be stacked on approved sills a minimum of 152 mm above the ground. Rails shall be stacked with the heads up and with the ends even. Each layer shall be separated by at least three 50 by 100 mm wood strips evenly spaced along the length of the rail. Rail shall be grouped by weight, section, drilling, condition, length, and amount of wear. The weight, section, drilling, and length shall be marked on one of the rails near the mid-height of the stack. These markings shall be painted neatly near one end of the rail.

##### 3.1.5.3 Stacking of Joint Bars and Tie Plates

Joint bars and tie plates shall be sorted by section, punching and condition and shall be stacked on pallets. Each pallet stack shall be steel banded for forklift handling. The maximum weight on any pallet shall

be 679.5 kg. Compromise joint bars shall be wired together in pairs and stacked on pallets, separate from other bars.

#### 3.1.5.4 Not Used

#### 3.1.5.5 Stacking of Special Trackwork Materials

Special trackwork materials shall be palletized and stacked as directed by the Contracting Officer.

#### 3.1.6 Material to be Scrapped

All materials not specified to be salvaged shall be scrapped and shall become the property of the Contractor.

### 3.2 PLACEMENT OF BALLAST

Ballast shall be placed to the lines and grades indicated. The average thickness shall be within 6mm of the thickness shown on the drawings. Subbase shall conform to the requirements of Section 02721 SUBBASE COURSES.

Subgrade shall conform to the requirements of Section 02300 EARTHWORK. Ballast shall not be placed on soft, muddy, or frozen areas. Where the prepared subbase course (roadbed) is soft, muddy, rutted, exhibits severe depressions, or is otherwise damaged, the ballast shall not be placed until the damaged subbase course has been repaired and the area has been approved by the Contracting Officer.

#### 3.2.1 Not Used

##### 3.2.1.1 [Enter Appropriate Subpart Title Here]

#### 3.2.2 Ballast

##### 3.2.2.1 Ballast Placement

Number 5 AREMA ballast shall be placed in the tracks where indicated; 100 mm of Number 5 ballast shall be used near turnouts and for 10 M each side of the switch stand to provide a smooth walking surface for railroad employees. All other areas shall require size AREMA Number 4 ballast.

##### 3.2.2.2 Ballast Distribution

Ballast shall not be distributed until the subbase course has been approved by the Contracting Officer. No payment will be made for ballast which is distributed without the Contracting Officer's approval.

- a. Ballast distribution shall be to the depth indicated and may be from either trucks or railroad cars. [A government locomotive is not available for unloading ballast.
- b. Forming of ruts that would impair proper roadway drainage shall be prevented when distributing ballast from trucks and off track equipment. Any ruts formed greater than 25 mm shall be leveled and graded to drain.
- c. Ballast shall be unloaded as close as possible to the point of use so that unnecessary handling is prevented. Excess ballast shall be picked up and redistributed at the Contractor's expense. If additional ballast is required for dressing, it shall be added by the Contractor at no increase in unit price.
- d. Ballast cars shall not be released until they have been inspected.

Ballast cars may be weighed by the Government before and after dumping the ballast at no cost to the Contractor.

### 3.2.2.3 Ballast Below Ties

For new construction, the last 100 mm ballast below the tie, the shoulder ballast and the ballast in the tie cribs shall be placed subsequent to the rail and tie installation. For surfacing existing track, the ballast shall be placed subsequent to rail and tie replacements.

## 3.3 TRACK CONSTRUCTION AND OUT-OF-FACE RELAY

Track construction not covered specifically herein shall be in accordance with AREMA recommendations and recommended practices.

### 3.3.1 Roadbed Preparation

Clearing and grubbing, grading, excavation, embankment preparation, subgrade preparation, and subbase preparation shall be performed in accordance with Section 02230 CLEARING AND GRUBBING, Section 02300 EARTHWORK, and 02721 SUBBASE COURSES. Roadbed surface, grade, and drainage shall be approved prior to any distribution of construction material. Where the subgrade or roadbed is damaged during distribution of materials, ruts and depressions shall be filled and compacted and the roadbed surface reapproved prior to track construction.

### 3.3.2 Not Used

### 3.3.3 Unloading the Materials

The use of picks in the handling of ties will not be permitted. Rails shall be unloaded from cars with an approved derrick or crane and placed with the head up without dropping and with sufficient support under the base. Rails of proper length shall be distributed as necessary for road crossings, switches, joint spacing, and other special conditions.

### 3.3.4 Ties

Standard center-to-center spacing of crossties shall be 560 mm . Switch ties shall be spaced as indicated on the drawings. Ties shall be laid perpendicular to the center line of the track with the grain up (heartwood side down). The best ties shall be used at the rail joints. The ends of ties on one side of the track shall be parallel to the rail and the center of the tie shall be on the approximate center line of the track. The ends shall be aligned on the inside of curves and shall continue on that side until reaching a curve in the opposite direction. On double tracks, the ties shall be aligned on the outside ends. The top surface of ties shall provide full bearing for the tie plates. Adzing shall be restricted to that necessary to provide a sound true bearing for the tie plate. Adzing in excess of 5 mm will not be permitted. Where adzing is necessary, the cut surface shall be completely saturated with creosote or other approved preservatives.

### 3.3.5 Tie Plates

Tracks shall be fully tie-plated. Tie plates shall be free of dirt and other foreign material when installed. Tie plates shall be placed so that the rails will have full bearing on the plate, and the plate will have full bearing on the tie. Tie plates shall be set at right angles to the rail with the outside shoulder against the base of the rail, and centered on the tie. Canted tie plates shall be installed to cant the rail inward.

## 3.3.6 Rail

The base of the rail and the surface of the tie and tie plate shall be free of dirt and other foreign materials prior to laying rail.

## 3.3.6.1 Laying Rail

Rail shall be laid without bumping or striking, to standard gage (1.435 m between points 16 mm below the top of the rail) on tangents and on curves up to 12 degrees. For curves 12 degrees and greater, the gage shall be widened 3.2 mm for each increment of 2 degrees to a maximum of 1.448 m, in accordance with TABLE V. The track shall be gauged at every third tie as spikes are being driven.

TABLE V. TRACK GAGE FOR HIGH DEGREE OF CURVATURE

Degree of Curvature (per 30.5 m (100-ft) chord)

Equal to or Greater Than (Deg - Min)	But Less Than (Deg - Min)	Track Gage m (Ft - In.)
0 - 00	12 - 00	1.435 (4 - 8-1/2)
12 - 01	14 - 00	1.438 (4 - 8-5/8)
14 - 01	16 - 00	1.441 (4 - 8-3/4)
16 - 01	18 - 00	1.445 (4 - 8-7/8)
18 - 01	20 - 00	1.448 (4 - 9)

- a. Jointed rails shall be laid, one at a time, with space allowance for expansion being provided between rail ends in accordance with TABLE VI.
- b. Gaps between rail ends in insulated joints shall only be sufficient to permit insertion of standard end posts.
- c. A standard rail thermometer shall be used to determine the rail temperature. The thermometer shall be laid close to the web on the side of the rail base which is shaded from the sun's rays in advance of the laying operation and left there long enough to accurately record the temperature. The contractor quality control representative shall see that rail temperature is checked frequently and that proper rail expansion shims are used. All thermometers shall be calibrated against the Contracting Officer's rail thermometer which will have been accurately calibrated and will be considered as the standard.
- d. Except through turnouts and at insulated joints, the staggering of the joints on one side shall not vary more than 460 mm in either direction from the center of the opposite rail.
- e. Rails less than 10 m in length shall not be used in out-of-face rail relay. However, rails not less than 4 m long may be used for final connections to existing rails to prevent joints from occurring at prohibited locations or to provide the specified joint stagger in curves.
- f. Rail joints shall not occur in or within 6 m of a road crossing, alongside of or within 1.5 m of the end of any switch or turnout guard rail.

### 3.3.6.2 Joints

The joints in opposite rails shall be staggered one-half the rail length but not less than 3.5 m apart, except closer joints may be required at turnouts and insulated joints. Rail less than 4 m in length shall not be installed in track. No joint shall be less than 2 m from the ends of open-deck bridges, or less than 1 m from switch points. No joint shall be installed within 6 m of a road crossing, outer perimeter of any structure, or any location which restricts access to the joint. Where joints are required in these areas, the joints shall be welded.

### 3.3.6.3 Expansion Allowance

Allowance for expansion shall be provided at rail joints by using rail-expansion metal shims. Shims shall be removed to within 12 rails of the laying. Shims shall be of the thickness shown in TABLE VI. The temperature of the rail shall be determined by use of a thermometer placed on the rail base on the side away from the sun. Typical rail gap gauges are as shown.

TABLE VI. SHIM THICKNESS

10.1 m (33 Ft) Rail 99 Joints per km		11.9 m (39-Ft) Rail 84 Joints per km		24.4 m (78-Ft) Rail 42 Joints per km	
Rail Temperature (degrees C)	Shim Thickness (mm)	Rail Temperature (degrees C)	Shim Thickness (mm)	Rail Temperature degrees C)	Shim Thickness (mm)
Below -23	8	Below -14	8	Below 2	8
-23 to -10	6	-14 to -4	6	2 to 8	6
-9 to 1	5	-3 to 7	5	9 to 16	5
2 to 15	3	8 to 18	3	17 to 23	3
over 16	2	over 19	2	over 24	2

### 3.3.6.4 Cutting Rail

Only rail saws or track chisels shall be used to cut rail. New holes shall be drilled using a standard template. Holes shall not be burned in rail. Holes cut with a torch will not be accepted. When drilling of rail is necessary, all chips and burrs shall be removed before applying joints.

### 3.3.6.5 Matching Rails

Where relay rail is used, matching adjacent rails shall not cause lipped or uneven joints. Any mismatched rail ends shall be welded to provide proper match. Rail end mismatch shall not exceed 3 mm on gage or tread portions of rail.

### 3.3.6.6 Rail Replacement

The following procedures apply to rail replacement work:

- a. Spot rail replacement is defined as replacement of 30 m or less of contiguous rails, usually with rails of the same section. Installation of relief rail in place of defective rail is considered spot rail replacement. Replacement of more than 30 m of contiguous rails shall be considered to be out-of-face rail relay.
- b. If spikes are withdrawn, the holes shall be plugged with treated

tie plugs of proper size to fit the hole, prior to replacement of rail. If spikes are withdrawn and spikes are to be redriven in existing spike holes, the holes shall be plugged with treated tie plugs prior to redriving the spike. Tie plugs shall not be installed in prebored holes unless spikes have been driven and withdrawn.

- c. All ties shall be spiked with new spikes in accordance with paragraph Spot Tie Replacement.
- d. The Contractor shall ensure that rail ends at joints are not lipped or uneven. Tread portion (vertical) or gage side (horizontal) rail end mismatch shall be no greater than 2 mm. Rail end mismatch greater than 2 mm shall be corrected by welding and grinding on the smaller rail. Grinding the larger rail is not permitted unless approved by the Contracting Officer. Welded transitions shall be made at a rate of 1 to 80.
- e. Rails removed from track will be designated by the Contracting Officer as relay (for use on project), reclaimer (to be salvaged and stockpiled), or scrap. Joint bars removed from track will be designated as relay, reclaimer, or scrap. The Contractor shall mark scrap materials as scrap using bright red paint, transport them off the military installation. Relay materials required to complete other work of this contract shall be transported to the location of need. Reclaimer materials shall be classified and inventoried and stacked at the military installation storage site, all as indicated for salvage materials in paragraph Removal, Salvage, and Disposition of Materials.
- f. Metal rail expansion shims shall be used when laying rail. Wood sticks or other material shall not be used as shims. The Contractor shall have a sufficient supply of each shim available to permit rail laying to progress without delay.

#### 3.3.6.7 Out-of-Face Rail Relay

The Contractor shall replace existing rail with the designated new or used rail between designated limits in a continuous operation. It is expected that replacement of one rail of a given track will be completed prior to replacement of the opposite rail. Used rail shall be laid with previous gage side wear facing out, unless required to match existing wear patterns.

#### 3.3.6.8 Spot Rail Replacement

Spot rail replacements shall be made where necessary to replace existing defective rails or to compensate for rail joint gap adjustments.

- a. Replacement Rail: Replacement rail shall be of equal length or longer than the rail it replaces. The minimum length of rail used shall be 4 mm.
- b. Spot Rail Replacement Resulting in Joint Stagers: Unless otherwise approved by the Contracting Officer on a case by case basis, spot rail replacement shall not result in joint stagers less than 1.33 m.

#### 3.3.7 Joint Bars

Joint bars shall be clean, and the contact surfaces coated with petrolatum or petrolatum base compound with a corrosion inhibitor. Rail joints shall be installed so that bars are not cocked between the base and head of the rail. Bars shall be properly seated in the rail and the full number of

correct-size bolts, nuts, and spring washers installed. Bolts shall be placed with nuts alternately on inside and outside of rail. A corrosion resistant lubricant shall be applied to the bolt threads prior to application of nuts. Bolts shall be tightened to torque of approximately the value shown below for the applicable bolt size, beginning at the center of the joint and working both ways to the ends of the joint. After the track has been in service, but before acceptance of the work, all bolts shall be checked and retightened to a torque of approximately the value shown below for the applicable bolt size. Rail of different sections shall be connected by properly fitting compromise joint bars. The mismatch for compromise joints for either tread surface or on the gage side shall not exceed 3 mm . Defective joint bars discovered by the Contractor during track work operations, or as identified by the Contracting Officer shall be replaced with acceptable joint bars.

BOLT DIAMETER		TORQUE	
(mm)	(in.)	(N m)	(ft-lbs)
19	3/4	340	250
22	7/8	408	300
25	1	476	350
29	1-1/8	544	400

### 3.3.8 Spiking

#### 3.3.8.1 Spiking Procedures

Rail shall be spiked promptly after being laid. Spikes shall be started and driven vertically and square with the rail. Spikes shall be driven to allow approximately 3 to 5 mm space between the underside of the spike and the top of the rail base. Spikes shall not be overdriven, or straightened while being driven. Spikes shall not be installed through the slots in skirted-type, slotted joint bars (angle bars). Spikes shall not be driven against the ends of joint bars.

#### 3.3.8.2 Number of Spikes

Four rail-holding spikes shall be used on each tie on tangents and curves less than 4 degrees. Spikes on the gage side of the running rail shall be placed directly across from each other and the spikes on the field side of the running rail shall be placed directly across from each other. This pattern shall be held consistent. On curves 4 degrees or greater but not more than 8 degrees, six spikes shall be used on each tie with the spikes located as follows: High rail, one rail-holding spike and one plate holding spike on the field side and one on the gage side; Low rail, one rail-holding spike on the gage side, one rail-holding spike on the field side, and one plate-holding spike on the field side. Curves 8 degrees and greater shall be spiked with eight spikes per tie, located as follows: High rail, one rail-holding spike and one plate-holding spike on the field side and two rail-holding spikes on the gage side; Low rail, one rail-holding and one plate-holding spike on both the gage and field sides. Eight rail-holding spikes shall be used on each tie through road crossings.

#### 3.3.9 Tie Plugs

If spikes are withdrawn, the holes shall be swabbed with creosote and plugged with creosoted tie plugs of proper size to fit the hole. If spikes are withdrawn and spikes are to be reinserted in existing spike holes, the holes shall be swabbed with creosote and plugged with creosoted tie plugs prior to re-driving the spike. Tie plugs shall not be installed in prebored holes unless spikes have been driven and withdrawn.

#### 3.3.10 Rail Anchor Placement

Rail anchors shall be located as indicated on the project plans. Where the use of rail anchors is indicated, apply the anchors per 11.9 m of rail in the number and pattern indicated on the project drawings. The rail anchors shall be spaced approximately uniformly along the rail length. Rail anchors shall be installed to the gage side of the rail against the same tie face on opposite rails. Rail anchors shall grip the base of the rail firmly and shall have full bearing against the face of the tie. Rail anchors shall not be moved by driving them along the rail. Rail shall be anchored immediately after spiking and before rail has experienced a large temperature change.

### 3.3.11 Not Used

### 3.3.12 Derails

Derails shall be properly installed where indicated. Derailed equipment shall not foul other tracks. Installation shall be in accordance with the manufacturer's instructions. Where no specific installation instructions are available for salvaged derails, reinstallation shall be in accordance with good track construction practice to ensure proper performance of their intended function.

### 3.3.13 Superelevation

Curves located on the Yard Lead Track (south of the main facility), the Wye Track, and the Biggs Spur realignment shall be superelevated unless otherwise directed by the Contracting Officer. Superelevation shall be obtained by raising the outside rail of the curve. The inside rail shall be maintained at grade. The maximum superelevation will be 15 mm. Full superelevation shall be carried throughout each curve. Superelevation runoff shall be at a uniform rate, and shall be applied on the tangents at the beginning and end of the curve. Where the required tangent length is not available due to the proximity of a turnout, the runoff can be extended into the curve. The rate of superelevation runoff shall be 13 mm in 9.4 m.

### 3.3.14 Preliminary Surfacing

The preliminary alignment and surfacing gangs shall follow the unloading of the ballast. Rail renewal, tie renewal, bolt tightening, and ballast placement shall be complete prior to commencement of surfacing and alignment work.

#### 3.3.14.1 Lifts

- a. The track, after being aligned, shall be brought to grade and surface in lifts not exceeding 100 mm each. After each lift, the ballast shall be tamped. When using jacks, they shall be placed close enough together to prevent undue bending of rail or stress of rail and joint. Both rails shall be raised at one time and as uniformly as possible, except where superelevation is required. The track shall be so lifted that after a period of not less than 5 train operations (70 metric ton ballast car) after the last lift, it will be necessary to give the track a final lift of between 25 and 50 mm to bring it to grade.
- b. In areas where major track resurfacing is not required, the Contractor shall perform a "skim lift" tamping operation to ensure that the ties are adequately tamped, the ballast section is adequately compacted and dressed, and to correct minor deficiencies in surface and alignment. The rise in skim lift

areas shall be 25 mm or less and usually will not require that additional ballast be placed.

- c. A 50 mm rise shall provide an average 50 mm raise in the track being surfaced.
- d. A 100 mm rise shall provide an average 100 mm raise in the track being surfaced, and shall be made in at least two lifts not to exceed 50 mm per lift.
- e. A 150 mm raise shall provide an average 150 mm raise in the track being surfaced, and shall be made in at least 2 lifts. The initial lift shall not exceed 100 mm with the final lift not to exceed 70 mm.

#### 3.3.14.2 Tamping

Raising and tamping of track shall be performed with an automatic, vibratory, squeeze type power tamper with 16 tamping heads, capable of raising both rails simultaneously and maintaining cross-level. The equipment to be used for surfacing operations is subject to approval by the Contracting Officer. Every tie in the track shall receive two or more full insertions of the tamping heads. Ballast shall be power-tamped under both sides of ties from each end to a point 380 mm inside each rail for 2.6 m ties,. The center shall be filled with ballast, but tamping will not be permitted in the center of the tie between the above stated limits. Both ends of the ties shall be tamped simultaneously and tamping inside and outside of the rail shall be done at the same time. Tamping tools shall be worked opposite each other on the same tie. Ballast under switch ties and road crossing ties shall be tamped the entire length of each tie. All ties shall be tamped to provide solid bearing against the base of the rail after the track or turnout is raised to grade at final surfacing. All down ties shall be brought up to the base of rail and shall be machine tamped. The resultant track surface and alignment shall be uniform and smooth. Tamping of track in snow or frozen ballast conditions will not be permitted.

#### 3.3.14.3 Replacement of Ties

After tamping has been completed and the jacks removed, all ties pulled loose shall be replaced to their proper position, respiked and retamped to provide full bearing against the rail.

#### 3.3.14.4 Not Used

#### 3.3.14.5 Runoff of Track Raises

The runoff at the end of a rise shall not exceed 13 mm in 9.4 m of track unless otherwise approved by the Contracting Officer.

#### 3.3.14.6 Horizontal Realignment

Horizontal realignment of curved track shall be established by the Contractor using manual or mechanical means as described in the AREMA Manual Chapter 5, Part 3 article titled, "String Lining of Curves by the Chord Method".

#### 3.3.15 Final Surfacing

After preliminary surfacing has been completed, grade and line stakes shall be checked and the track brought to grade and alignment.

##### 3.3.15.1 Final Tamping

Track shall be brought to grade and the ballast retamped in the manner described for preliminary surfacing, except that the tamping distance inside the rail shall be decreased from 380 to 330 mm for 2.6 ties.

#### 3.3.15.2 Final Alignment

The track shall be given a final aligning conforming to the established track centers.

#### 3.3.15.3 Final Dressing

After the final alignment the ballast shall be dressed to the section indicated. After final dressing ballast shall not cover the tops of the ties. The portion of the subgrade outside the ballast line shall be left with a full, even surface and the shoulder of the subgrade shall be properly dressed to the indicated section to provide proper drainage away from the track.

#### 3.3.15.4 Surplus Ballast

Surplus ballast remaining after final surfacing and dressing of the ballast section shall be distributed or otherwise disposed of as directed by the Contracting Officer.

#### 3.3.16 Cleanup

Upon completion of the work, the Contractor shall remove all rubbish, waste, and discarded materials generated by the work from the project area. Areas where the Contractor has worked, including but not limited to, project areas, material storage sites, and borrow or disposal areas shall be left in a clean, well-graded, and well-drained condition.

##### 3.3.16.1 Shoulder Removal and Reconstruction

Where track construction operations result in deposition of materials along the track shoulders that would impede the free drainage of the track structure, the Contractor shall remove the material. Where undercutting or ploughing operations leave fouled shoulder materials that impede free drainage of the the track structure, the shoulder material shall be removed, and the ballast shoulders shall be reconstructed using the materials and dimensions as indicated.

##### 3.3.16.2 Spoil Materials

Spoil materials removed from the track shall be disposed of off site at the Contractor's expense. Spoil materials shall not be placed on the shoulders, in ditches, in drains, or in other areas where they would impede the flow of water away from the track.

#### 3.3.17 Final Adjustments

Sixty calendar days after the track has been accepted and put into operation, the Contractor shall perform, at no cost to the Government, necessary resurfacing adjustments to leave the track in alignment and on grade.

#### 3.3.18 Tolerances for Finished Track

Completed track shall meet the following tolerances. Track not meeting the tolerances specified below shall be repaired to meet these requirements, at no additional cost to the Government.

### 3.3.18.1 Gage

Track gage shall be within plus 6 mm or minus 3 mm of standard gage.

### 3.3.18.2 Alignment

Alignment shall be measured as the deviation of the mid-offset of a 18.9 m line, with the ends of the line at points on the gage side of the line rail, 16 mm below the top of the railhead. Either rail may be used as the line rail on tangent track; however, the same rail shall be used for the entire length of the tangent. The outside rail in a curve is always the line rail. Alignment on tangents shall not deviate from uniformity more than 13 mm. Alignment on curves shall not deviate from uniformity more than 10 mm.

### 3.3.18.3 Track Surface

Track surface shall meet the following requirements:

- a. The runoff at the end of a raise shall not exceed 13 mm in any 9.4 m of rail.
- b. The deviation from design profile on either rail at the mid-ordinate of a 18.9 m chord shall not exceed 13 mm.
- c. Deviation from zero cross level at any point on tangent or from designated superelevation on curves shall not exceed 13 mm.
- d. The difference in cross level between any two points less than 18.9 m apart on tangents.

### 3.3.18.4 Guard Face Gage

Guard face gage is the distance between the guard lines measured across the track at right angles to the gage line, and is measured at the point of frog on both sides of the turnout. The design value for guard face gage is 1340 mm. Guard face gage shall be within plus or minus 3 mm of the design value.

### 3.3.18.5 Guard Check Gage

Guard check gage is the distance between the gage line of a frog and the guard line of its guard rail, or guarding face, measured across the track at right angles to the gage line. The design value for guard check gage is 1388 mm. Guard check gage shall be within plus or minus 3 mm of the design value.

## 3.4 TURNOUTS

Turnouts shall be located as indicated on the drawings. Switch, frog and guardrail assemblies shall be complete. Stock rails shall be accurately bent. Changes in rail weight or section will not be permitted within the limits of the switch ties. Headblocks shall be at right angles to the main track and shall be securely spiked in place. Except where directed otherwise, switch stands shall be installed so that when the switch is set for the normal position, the connecting rod keeps the points closed with a pulling force. Switches shall be properly adjusted. Switch components and slide plates shall be lubricated.

### 3.4.1 Not Used

#### 3.4.1.1 [Enter Appropriate Subpart Title Here]

### 3.4.2 Not Used

#### 3.4.2.1 [Enter Appropriate Subpart Title Here]

### 3.5 ROAD CROSSINGS

Road crossings within the project shall be constructed as indicated on the contract drawings.

#### 3.5.1 Subgrade

Drainage areas shall be cleaned and sloped away from the crossing in both directions along the track and the roadway. Surface ditches and Subdrains shall be installed as indicated.

#### 3.5.2 Geotextile Installation

Geotextile shall be placed between the subgrade and the ballast section in the crossing area and for 6 m beyond each end of the crossing.

##### 3.5.2.1 Preparation

Surfaces on which geotextiles will be placed shall be prepared in accordance with the applicable portions of this specification and shall be free of irregularities such as sags, cavings, erosion, or vegetation. Any irregularities shall be corrected to ensure continuous, intimate contact of the geotextile with the whole surface. Any loose material or debris shall be removed prior to geotextile placement.

##### 3.5.2.2 Placement

- a. Not used.
- b. Not used.
- c. The geotextile shall be carefully placed on the prepared surface with the long dimension parallel to the prepared surface. The geotextile shall be placed free of wrinkles, folds, creases, and tension. The geotextile shall be held in place by pins, small aggregate piles or ballast bags, until it is completely covered. The geotextile shall be covered immediately after placement in track. The maximum exposure time for the geotextile, from removal of the protective shipping cover to placement of the ballast cover materials which prevent exposure to sunlight, shall be 2 consecutive days.
- d. The minimum overlap of geotextile splicing seams shall be 900 mm.  
If several geotextile units are placed with the required overlap prior to the placement of the ballast, the overlap distance of each overlap shall be checked as placement of ballast approaches the overlap. The Contractor shall ensure that the required overlap exists when the geotextile is covered.
- e. The geotextile shall remain free of any contamination such as mud, dust, sediment, debris, etc., that will impair its function. Contamination shall be removed without damage to the geotextile or to the prepared surface at the Contractor's expense. If the geotextile is damaged, its function impaired by the cleaning efforts, or if it cannot be properly cleaned, the Contractor shall repair the prepared surface, if necessary, and replace the damaged or impaired geotextile with geotextile meeting requirements of this specification. Equipment shall not operate in direct contact with the geotextile. Surface drainage, as much as possible, shall be directed away from the geotextile installation area to prevent

accumulation of mud, debris, and sediment.

#### 3.5.2.3 Placement of Cover Material

Placement of ballast cover material in contact with the geotextile shall be performed ensuring intimate contact of the geotextile with the prepared surface and with the cover material. The placement shall be performed without damage to the geotextile including tears, punctures, or abrasion.

#### 3.5.2.4 Equipment Operations on the Cover Material

A minimum depth of 200 mm of cover material shall be placed over the geotextile before equipment is allowed to operate on the covered geotextile. Equipment operations on the covered geotextile shall be limited to those necessary for track construction and equipment turning will not be allowed on the covered geotextile.

#### 3.5.2.5 Minimum Ballast Depth

The minimum depth of ballast between the bottom of the tie and the top of the geotextile shall be 406 mm.

#### 3.5.2.6 Tamping Operations

Tamping of ballast materials shall be performed by setting the tamping force and insertion depth to the minimum necessary to adequately tamp the track. The tamper operator shall monitor the depth of tamping and limit the depth to prevent detrimental effects of the tamper feet on the geotextile.

#### 3.5.2.7 Double Layers

Double layers of geotextile will not be allowed, except for splicing overlaps at seams.

#### 3.5.3 Ballast Placement and Surfacing

Ballast shall be placed and tamped as specified in paragraph TRACK CONSTRUCTION AND OUT-OF-FACE RELAY except that in crossings, the ballast between the ties shall be thoroughly compacted with a vibratory compactor, or other approved means, after each raise. The ballast shall be tamped for the entire length of the crossties for road crossings. The track shall receive final alignment and surfacing prior to placement of the crossing surface. Final surfacing shall bring the track to the final grade and alignment as indicated on the contract drawings. The ballast in the cribs and on the shoulders shall be compacted using a vibratory plate compactor or other approved means.

#### 3.5.4 Ties

Hardwood ties shall be used. Spacing shall be a minimum of 500 mm center to center. For premanufactured grade crossings, ties shall conform to the manufacturer's recommendations for the type of grade crossing surface materials being used.

#### 3.5.5 Tie Plates, Spikes, and Anchors

All ties within the crossing and for 6 m beyond each end of the crossing shall be fully tie plated, and spiked with 4 rail-holding spikes per tie plate.

#### 3.5.6 Rail

Rail within the crossing area and for 6 m beyond each end of the crossing shall be, at a minimum, 57 kg/m (115 RE). Rail shall not be protected from corrosion by application of an approved rust inhibitor. Bolted joints will not be permitted in any crossing or within 6 m of either edge of the crossing surface. Bolted joints will be eliminated by either field welding the joints to form continuous rail throughout this area or by using 24.4 m rail lengths.

### 3.5.7 Lining and Surfacing

Rail shall be spiked to line and the track mechanically tamped and surfaced to the grade and alignment of the existing track and roadway.

### 3.5.8 Crossing Surface

The surface of the roadway shall be in the same plane as the top of the rails for a distance of 600 mm outside of the rails for either single or multiple-track crossings. A smooth transition shall be made between the crossing surface and the adjoining pavement.

#### 3.5.8.1 Not Used

#### 3.5.8.2 Not Used

#### 3.5.8.3 Not Used

#### 3.5.8.4 Not Used

#### 3.5.8.5 Not Used

#### 3.5.8.6 Not Used

#### 3.5.8.7 Type 4b Prefabricated Concrete Panel Crossings

Type 4A crossings and crossing materials shall be installed in accordance with the crossing manufacturer's instructions. Tie spacings and track materials used in the crossing shall be in accordance with the installation instructions and manufacturer's recommendations.

#### 3.5.8.8 Not Used

### 3.5.9 Signs and Signals

The type and location of railroad-roadway crossing warning signs and signals shall conform to the requirements of FHWA SA-89-006, Part VIII.

#### 3.5.9.1 Location and Positioning of Signs

Signs for both roadway and railroad track installation shall be located and erected as shown. Unless otherwise shown, signs shall be erected so that sign face is vertical and at a deflection angle of 87 degrees from the center of the roadway lane or track which the sign serves and facing the direction of travel. Where lanes or tracks are on curves, sign faces shall be on a deflection angle of 87 degrees to the tangent to the curve. Signs shall be erected so that specular reflection is minimized or eliminated. After installation is completed, the signs will be inspected during the day

and at night by the Contracting Officer. If specular reflection is apparent on any sign, its positioning shall be adjusted to eliminate or minimize this condition. This adjustment and any subsequent adjustments shall be at no additional cost to the Government.

#### 3.5.9.2 Traffic Control

During installation of roadway signs, the Contractor shall provide for the safe and expeditious movement of traffic through the work area. Schedule of lane closures, work zone safety and traffic control, and related items shall be provided.

#### 3.5.10 Crossing Flangeways

Upon completion of the grade crossing installation, the flangeways through the crossing shall be a minimum of 50 mm deep and between 65 and 75 mm wide. The Contractor shall ensure that adequate flangeways are provided prior to installation of the final crossing surface.

##### 3.5.10.1 Flangeway Filler

Except for Type I crossings all open crossing flangeways shall be filled with asphaltic concrete and compacted as indicated on the drawings.

##### 3.5.10.2 Clean Grade Crossing Flangeways

Where grade crossing flangeways are obstructed (filled in), the Contractor shall remove foreign material to provide a minimum 50 mm depth and 65 mm width flangeways on the gage side of the rails.

### 3.6 BONDING AND GROUNDING TRACK

Track shall be bonded and grounded as indicated. Where track is designated for bonding and grounding, the rails shall be bonded electrically continuous and effectively grounded. Connections shall be made by exothermite welds in accordance with the manufacturer's instructions.

#### 3.6.1 Rail Joint Bond

Rail joints on both rails of designated track shall be bonded using an exothermic type bond. The bond shall be applied to the field side of the rail web unless otherwise approved by the Contracting Officer. Track to be bonded and grounded shall be electrically insulated from the remaining track using one of the specified insulated joints.

#### 3.6.2 Rail Cross-Bond and Ground

Rail cross-bond and ground shall be installed using an exothermic type bond. The cross-bond shall be applied to the rail web. One cross-bond and ground shall be installed at 30.5 m intervals along the designated tracks.

Connections between grounding system or ground rods and rails shall be made with bare stranded copper cable, installed at least 300 mm below the bottom of the ties. Ground rods shall be driven vertically full-length. The top of the ground rod shall be located at the toe of the ballast slope and shall be a minimum of 300 mm below the top of the subgrade. Maximum resistance to ground from any grounded rail or structure shall not exceed 25 ohms. The Contractor shall make any corrections needed to reduce the resistance to below 25 ohms at no cost to the Government.

#### 3.6.3 Inspection of Rail Bond and Ground

Loose, damaged, or missing rail bond wires, cross bond wires, ground connections, and ground rods shall be visually inspected. If there is a

signal failure, bonding can be tested for current loss in the joints using a volt meter. Defective items shall be marked for repair.

#### 3.6.4 Rail Bonds At Signalized Grade Crossings

Bolted rail joints within the approach circuits to signalized roadway grade crossings shall be double-bonded using both a rail head bond and a web bond.

#### 3.6.5 Existing Bonds

The Contractor shall protect existing rail bonds, cross-bonds,, ground connections, and grounding rods from damage. Except for bonds attached to rails which are designated to be replaced in this contract, replacement of bonds damaged or destroyed by the Contractor's operation shall be replaced at no cost to the Government.

#### 3.6.6 Removal of Defective Bonds

Bonds shall be removed by shear cutting old cables immediately adjacent to the weld. Flames or torches shall not be used to remove defective bonds.

### 3.7 INSTALLATION OF MISCELLANEOUS TRACK MATERIALS

#### 3.7.1 Tie Plates

Tie plates shall be furnished to the work sites as required. Excess tie plates, remaining at the conclusion of the contract, shall be delivered to the military installation storage site and stacked where directed by the Contracting Officer.

#### 3.7.2 Insulated Joints

Insulated joints shall be installed where indicated and in accordance with the manufacturer's installation instructions.

#### 3.7.3 Bumping Posts and Cushion Head

Bumping posts and cushion head shall be installed where indicated. Installation shall be in accordance with the manufacturer's instructions. Existing bumping posts and cushion heads on tracks to be removed shall become property of the Contractor.

#### 3.7.4 Not Used

#### 3.7.5 Gage Rods

##### 3.7.5.1 Installation of Rods in The Crib and Closure Rail

One gage rod shall be installed in the crib immediately ahead of the switch point of all turnouts. Two gage rods shall be installed on the curved closure rail, one ahead of the joint, and one ahead of the toe of the frog in all turnouts.

##### 3.7.5.2 Rods Per Rail Length

Three gage rods shall be installed per rail length on all curved track with a greater than 10 degrees curvature (0.174 radians, 174.86 m radius).

#### 3.7.6 Installation of Joint Bars

Joint bars shall be installed with their full number of bolt assemblies

unless otherwise noted. Bars shall be properly seated on the rail and the bolts tightened beginning at the center of the joint and working toward the ends of the bars, alternating between rails. Bolts used shall be of the proper diameter and length for the rail and joint bars at the joint. The use of extra washers to shim out track bolt nuts is prohibited. Bolts with nuts shall be placed alternately on inside and outside of rail.

### 3.8 Not Used

#### 3.8.1 [Enter Appropriate Subpart Title Here]

### 3.9 ELECTRIC ARC WELDING

Welding shall be done in accordance with AREMA Manual, Chapter 5, Part 5, "Electric Arc Welding".

#### 3.9.1 Welding Supervision

Electric arc welding shall be performed under the direct supervision of an experienced welding supervisor or foreman and by a certified welder.

#### 3.9.2 Weather Conditions

Welding shall not be performed in rain, snow, or other inclement weather without adequate protection of the welding from the elements.

#### 3.9.3 Not Used

##### 3.9.3.1 [Enter Appropriate Subpart Title Here]

#### 3.9.4 Not Used

#### 3.9.5 Not Used

##### 3.9.5.1 [Enter Appropriate Subpart Title Here]

#### 3.9.6 Not Used

##### 3.9.6.1 [Enter Appropriate Subpart Title Here]

#### 3.9.7 Welding Rail Joints

Bolts in the joint bars shall be tightened and the joint pulled to a level surface. Joint bars shall be checked for wear and replaced if they are badly worn. Six hole bars shall be used if available. A straightedge shall be placed across the joint to determine the amount of batter. The straightedge shall be a minimum of 450 mm in length. A rail joint with less than 3 mm of batter shall not be welded. If batter is 3 mm or more, the rail joint shall be built up. If rail cracks or chipped out places are present in rail ends, they shall be melted out with acetylene torch, gouged out with arcair or ground out with grinder. If cracks or chips extend below ball, rail shall be replaced. If horizontal crack in ball of rail extends more than 200 mm rail shall be replaced. Rail ends shall be preheated to approximately 93 degrees C before welding. Starting 40 mm from the end, the rail shall be built back as follows: A strip shall be welded 25 mm into bead; the rail ends shall be ground to a level surface with surface grinder or cup wheel attachment; and rail joint shall be cross slotted with 5 mm grinding stone to keep rail ends from overlapping and chipping out.

### 3.10 THERMITE WELDING PROCEDURES

Thermite welding procedures shall be performed by a technician certified to meet ANSI/ASNT CP-189, level II or III qualifications and comply with the following paragraphs:

### 3.10.1 End Preparation

Rails to be welded shall meet the requirements of Paragraph 1, "Specifications for Fabrication of Continuous Welded Rail" given in Chapter 4, Part 2 of AREMA Manual. The rail ends shall be aligned in accordance with paragraph GAP AND ALIGNMENT. Rail ends shall show no steel defects, dents, or porosity before welding. Bolt holes shall not be made in, or permitted to remain in, the ends of the rail to be welded. One handling hole may be made in each end of welded string. Rail ends containing such holes shall be cut off during track construction. Rail which must be cut for any reason shall be cut square and clean by means of approved rail saws or abrasive cutting wheels in accordance with Chapter 5 of AREMA Manual, article, "Recommended Practice For Use of Abrasive Wheels".

#### 3.10.1.1 Cleaning

The rails to be welded shall be cleaned of grease, oil, dirt, loose scale, and moisture to a minimum of 150 mm back from the rail ends, including the railhead surface. Cleaning shall be accomplished by use of a wire brush, to completely remove dirt and loose oxide and by use of oxygen-acetylene torch to remove grease, oil and moisture. A power grinder with an abrasive wheel shall be used to remove scale rust, burrs, lipped metal and mill brands which would interfere with the fit of the mold, for 50 mm on each side of the ends.

#### 3.10.1.2 Gap and Alignment

The minimum and maximum spacing between rail ends shall be as specified by the rail welding kit manufacturer and the approved welding procedures.

- a. The ends of the rails to be welded shall be properly gapped and aligned to produce a weld which shall conform to the alignment tolerances below. Alignment of rail shall be done on the head of the rail. The rail gap and alignment shall be held without change during the complete welding cycle.
- b. Vertical alignment shall provide for a flat running surface. Any difference of height of the rails shall be in the base.
- c. Horizontal alignment shall be done so that any difference in the width of heads of rails shall occur on the field side. Horizontal offsets shall not exceed 1 mm in the head and/or 3 mm in the base.

#### 3.10.2 Surface Misalignment Tolerance

Combined vertical offset and crown camber shall not exceed 3 mm per meter at 315 degrees C or less. Combined vertical offset and dip camber shall not exceed 1 mm/m at 315 degrees C or less.

#### 3.10.3 Gage Misalignment Tolerance

Combined horizontal offset and horizontal kink camber shall not exceed 3 mm/m at 315 degrees C or less.

#### 3.10.4 Thermitic Welding

Welding shall be done in accordance with Chapter 4, Part 2 of AREMA Manual, articles "Thermitic Welding - Rail Joints" and "Specifications for Fabrication of Continuous Welded Rail", except as modified by these specifications. All welds shall be visually inspected at the time of welding.

#### 3.10.4.1 Thermite Weld Preheating

The rail ends shall be preheated prior to welding to a sufficient temperature and for sufficient time as indicated in the approved welding procedures to ensure full fusion of the weld metal to the rail ends without cracking of the rail or weld.

#### 3.10.4.2 Thermite Weld Cooling

The molds shall be left in place after tapping for sufficient time to permit complete solidification of the molten metal and proper slow cooling to prevent cracking and provide a complete weld with proper hardness and ductility.

#### 3.10.5 Weld Finishing and Tolerances

Welded joints in the finished track shall be brought to a true surface and alignment by means of a proper grinding or planing machine (shear). Finish grinding shall be performed with an approved grinder operated by a skilled workman grinding evenly and leaving the joints in a smooth and satisfactory condition. Finishing shall eliminate all cracks. The completed weld shall be finished by mechanically controlled grinding in conformance with the following requirements:

- a. A finishing deviation of not more than plus or minus 1 mm of the parent section of the rail head surface will be allowed. The gage side of the rail head shall be finished to plus or minus 1 mm of the parent section.
- b. Welds produced by welding kits which are specially designed to produce reinforced welds need not be ground in the finishing area except as necessary to remove fins, burrs, cracks, etc.

#### 3.10.6 Weld Quality

Each completed weld shall have full penetration and complete fusion and be entirely free of cracks or fissures. Welds shall meet the acceptance criteria given in AWS D1.1.

#### 3.10.7 Weld Numbering

The Contractor shall semi-permanently mark a sequential weld number on the rail immediately adjacent to the weld, using a quality lead paint marker at the time the weld is made. Welds shall be numbered sequentially in the order in which they are made. The Contracting Officer will provide the Contractor with the initial weld number. Defective welds which are replaced shall be assigned a new sequential number by adding a letter to the defective weld number (e.g., defective weld 347 would be replaced by 347A).

#### 3.11 Not Used

##### 3.11.1 [Enter Appropriate Subpart Title Here]

#### 3.12 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor, subject to approval. If the Contractor elects to establish testing facilities, approval of such facilities shall be based on compliance with ASTM D 3740. Work requiring testing will not be permitted until the Contractor's facilities have been inspected and approved. The first inspection of the facilities will be at the expense of the Government and any subsequent inspections required because of failure

of the first inspection shall be at the expense of the Contractor. Such costs will be deducted from the total amount due the Contractor.

### 3.12.1 Ballast Samples

Periodic sampling and testing of ballast material shall be performed to ensure continued compliance with this specification. During construction, one representative sample of the ballast material shall be taken from each 1818 metric tons of ballast delivered to determine the material gradation.

For each 9090 metric tons or a fraction thereof of ballast delivered, an additional amount of material shall be obtained in order to perform the quality and soundness tests specified. Samples for material gradation, quality, and soundness tests shall be taken in conformance with ASTM D 75. Test samples shall be reduced from field samples in conformance with ASTM C 702. Sample sizes shall be sufficient to provide the minimum sample sizes required by the designated test procedures. If any individual sample fails to meet the gradation requirement, placement shall be halted and immediate corrective action shall be taken to restore the specified gradation. If any individual sample fails to meet the specified quality and soundness requirements, placement shall be halted and immediate corrective action shall be taken to restore the specified quality.

### 3.12.2 Ballast Tests

#### 3.12.2.1 Sieve Analyses

Sieve analyses shall be made in conformance with ASTM C 117 and ASTM C 136. Sieves shall conform to ASTM E 11.

#### 3.12.2.2 Bulk Specific Gravity and Absorption

Bulk specific gravity and absorption tests shall be made in conformance with ASTM C 127.

#### 3.12.2.3 Percentage of Clay Lumps and Friable Particles

The percentage of clay lumps and friable particles shall be determined in conformance with ASTM C 142.

#### 3.12.2.4 Degradation Resistance

Resistance to degradation of materials shall be determined in conformance with ASTM C 131 and ASTM C 535. Materials with gradations having 100 percent passing the 25 mm sieve, shall be tested in conformance with ASTM C 131. Materials having gradations with particles larger than 25 mm shall be tested in conformance with ASTM C 535.

#### 3.12.2.5 Soundness Test

Soundness tests shall be made in conformance with ASTM C 88.

#### 3.12.2.6 Percentage of Flat or Elongated Particles

The percentage of flat or elongated particles shall be determined in conformance with CRD-C-119.

### 3.12.3 Tie Inspection

The Contractor shall be responsible for the quality of the treated ties. Each tie shall be permanently marked or branded by the producer in accordance with AWPA M6. Each treated wood tie shall be inspected, in accordance with AWPA M2, for conformance with the specified AWPA standards. The 100 percent inspection shall be performed by an independent inspection

agency approved by the Contracting Officer. Inspection shall be made at the wood treatment site. The agency's report of inspection shall accompany delivery of the ties. The Contractor shall core and check preservative treatment once per 1000 ties delivered to the construction site.

#### 3.12.4 Examination of Geotextile

The Contracting Officer may examine any geotextiles for defects, damage, or nonconformance prior to installation. Any geotextile not meeting the minimum property requirements of paragraph GEOTEXTILE, or geotextile that is determined to be damaged or defective shall be removed from the site and shall be replaced with additional geotextile meeting the requirements of this specification at no additional cost to the Government.

### 3.13 INSPECTION AND FIELD TESTING

Quality control inspection and field testing shall be performed by a technician certified to meet ANSI/ASNT CP-189 level II or III qualifications with a minimum of one year experience in testing rail for defects.

#### 3.13.1 Track

Inspection shall be performed to ensure that all the requirements of these specifications are met. Bolted joints shall be inspected for loose bolts and for smooth transitions between rails of different sections. Rail, tie plates, and ties shall be checked to ensure that the rail is properly seated and has full bearing on the tie plate and tie. Upon completion of construction, measurements of track gage, cross level, and alignment shall be taken and recorded at least once every 60 m of track centerline length. A copy of these measurements shall be provided to the Contracting Officer.

#### 3.13.2 Welded Joints - Visual Inspection

Each welded joint shall be inspected by the Contractor in the presence of the Contracting Officer after removal of the mold and grinding of excess metal. The Contractor shall pay particular attention to surface cracking, slag inclusion, gas pockets, and lack of fusion. The Contractor shall correct or replace, at no extra cost to the Government, any weld found defective. The method of correction shall be as approved by the Contracting Officer.

#### 3.13.3 Electric Arc Welding Inspection

Electric arc welds shall be inspected to determine that the item welded conforms to the desired contour and contains no visible cracks or voids.

#### 3.13.4 Thermite Weld Joints Testing

Each thermite weld joint shall be ultrasonically tested following the visual inspection. The method of inspection and acceptance shall be in accordance with AWS D1.1. The Contractor shall correct or replace defective welds, at no additional cost to the Government. The method of correction shall be as approved by the Contracting Officer. Ultrasonic testing shall be performed by the Contractor after the rail has been installed in track. The testing will determine whether or not each weld meets the criteria of paragraphs Gap and Alignment, Weld Finishing and Tolerances, and Weld Quality. Welds made in the track which the Contracting Officer determines to be unacceptable shall be cut out of the rail and replaced by a section of new rail and two new welds. Saw cuts shall be made at least 150 mm from the centerline of the faulty weld. Replacement welds and replacement rails shall be at the sole expense of the Contractor. Replacement welds shall be renumbered as indicated.

Replacement welds made in track shall be ultrasonically tested.

### 3.13.5 Electric Arc Weld Testing

The welds shall be visually inspected and the contours checked after completion and later tested by the ultrasonic method. The Contractor shall have the welds tested by the ultrasonic method. The testing will determine whether or not each weld meets the quality criteria. Defective welds will be removed and the item rewelded at the Contractors expense.

### 3.13.6 Not Used

### 3.13.7 Testing Relay Rail

#### 3.13.7.1 Testing for Wear

Each relay rail shall be checked for wear by the Contractor's quality control representative in the presence of the Contracting Officer after the material is delivered to the construction site. The Contractor shall monitor the installation of track for defects in rail and joint bars being installed. Rail and joint bars that are found to be defective shall not be installed in track.

#### 3.13.7.2 Testing for Defects

Upon completion of the track construction, the Contractor shall have the rail tested by ultrasonic methods. Ultrasonic testing shall be done by a contractor normally engaged in this type of testing with a minimum of 5 years of experience. The Contractor shall schedule a rail testing machine and notify the Contracting Officer of the type of machine and schedule. Contractor furnished rails which are found to be defective at that time shall be removed and replaced by the Contractor at no additional cost to the Government. Contractor furnished joint bars and compromise joint bars that are found to be cracked or broken shall be removed and replaced at no additional cost to the Government.

RECORD OF FIELD WELD

-----  
INSTALLATION \_\_\_\_\_ WELD NUMBER \_\_\_\_\_

FINAL INSTALLED

LOCATION \_\_\_\_\_ TRACK \_\_\_\_\_  
STATION \_\_\_\_\_ RAIL Left Right (Circle)

DATE \_\_\_\_\_ TIME \_\_\_\_\_ AM  
PM (Circle)

AIR TEMPERATURE \_\_\_\_\_ F\*. WEATHER \_\_\_\_\_  
RAIL TEMPERATURE \_\_\_\_\_ F\*. \_\_\_\_\_

WELD KIT MANUFACTURER \_\_\_\_\_

RAIL GAP

NEAREST 1.6 MM \_\_\_\_\_  
RAIL CUT REQUIRED? YES NO (Circle)

BACK RAIL

MANUFACTURER \_\_\_\_\_ USED RAIL? YES NO (Circle)  
YEAR/MONTH ROLLED \_\_\_\_\_ HEAT NUMBER \_\_\_\_\_

AHEAD RAIL

MANUFACTURER \_\_\_\_\_ USED RAIL? YES NO (Circle)  
YEAR/MONTH ROLLED \_\_\_\_\_ HEAT NUMBER \_\_\_\_\_

REMARKS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

ULTRASONIC TEST DATE & RESULTS \_\_\_\_\_

KIT MFG. REPRESENTATIVE

PRESENT \_\_\_\_\_ WELDING FOREMAN \_\_\_\_\_  
(Initial) (Signed)

CONTRACTING OFFICER'S

REPRESENTATIVE

PRESENT \_\_\_\_\_ RECORDER \_\_\_\_\_  
(Initial) (Signed)

\_\_\_\_\_ RECORDER \_\_\_\_\_  
(Initial) (Signed)

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FOR GOVERNMENT USE ONLY

ULTRASONIC TEST DATE AND RESULTS \_\_\_\_\_  
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\*NOTE: Determination will be made to the nearest 1/2 degree.

-- End of Section --