Washington Metropolitan Area Transit Authority
600 5th Street, NW
Washington, DC 20001

SPECIFICATIONS PACKAGE

Thermite Field Welding Services
Up To 800 Welds Per Year

REV.	DATE	REVISION DETAILS	RELEASE NO.	INIT.
		APPROVALS	**Signature**	
		Thomas Robinson – TIES CENI		
		Ever Diaz – Compliance, Warranty & Quality Improvement Manager - QAAW		

ORIGINATED BY:_____ **DATE:** _____
Michael Davis ,Asst. General Superintendent TRST,WMATA

APPROVED BY:_____ **DATE:** _____
Clay Bunting –General Superintendent, WMATA

Contents

PART 1 - SCOPE OF WORK

The Washington Metropolitan Area Transit Authority (WMATA) requires contractor services for one inch (1") thermite welding process. The Contractor is responsible for providing a complete non defective thermite weld on mainline, yards and secondary tracks throughout the Metro rail system. Thermite welds shall be used to connect strings of continuous welded rails (CWR) or various size rails not less the nineteen feet, six inches (19'-6"). WMATA exclusively uses AREMA 115 1bs. Rail per yard. The rail may be either Controlled cooled (CC) or high strength rail, which is head harden (HH).

PART 2 - QUALITY ASSURANCE

A. Certified Independent Material Testing Agency:

1. Select and employ a reputable independent material testing agency to qualify welding procedures and test and inspect welds at no additional cost to WMATA.
   a. Submit the qualifications of an independent material testing agency, accredited by the American Association for Laboratory Accreditation, to WMATA for acceptance.
   b. The certified independent material testing agency shall prepare and submit a testing program and procedures to WMATA for acceptance.
      1) The independent material testing agency shall have a certified testing program for each type of test required.
      2) The testing program shall include a description of the proposed procedures, materials, equipment, safety requirements, and test report
      3) Testing personnel provided by the independent material testing agency to perform non-destructive examination of welds shall be certified as Level II or III for non-destructive examination methods in accordance with ASNT CP-189. Submit copies of their certifications to WMATA.
   c. The certified independent material testing agency shall prepare and submit an inspection program and procedures to WMATA for acceptance.
      1) The inspection program shall include a description of proposed procedures, equipment, and reports.

2. Contractor's Agreement with the independent material testing agency:
   a. At least 30 days before initiating welding operations, submit a copy of the Contractor's Agreement with the independent material testing agency to WMATA for acceptance.
   b. The Agreement shall specify that:
      1) The independent material testing agency is directly responsible to WMATA, not the Contractor.
      2) All communication between the independent material testing agency and the Contractor regarding the Work under the Contract shall be copied to WMATA.

B. Quality Assurance/Quality Control
   1. Shall at minimum, comply with FTA-IT-90-50001-02.1 Quality Assurance and Quality Control Guidelines: inclusive of all 15 elements therein.
   2. The Project Specific Quality Management Plan (PSQMP) shall be documented and reviewed by WMATA for approval prior to implementation.
   3. No work shall commence until the PSQMP has been approved by WMATA.
      a. WMATA will provide comments within 10 work days of receipt of the PSQMP.
   4. The PSQMP shall be documented, executed, implemented and Revised as necessary throughout the lifecycle of this contract.
   5. All Quality documents, to include, but not limited to: logs, submittals, transmittals, schedules, drawings, etc. shall be maintenance and accessible to WMATA in real time.

C. Develop and maintain a Quality Control Program for handling, storing, and installing thermite (field) welds to regulate methods, procedures, and processes.

   1. Thermite (Field) Welding Procedure.

   2. Include a complete description of each of the following items and other essential information in each thermite (field) welding procedure:
      a. Submit the Quality Control Program to WMATA for acceptance.
      b. Manufacturer's trade name for the welding process.
      c. Method used for cutting rail and cleaning rail ends.
      d. Rail end spacing, tolerance, and procedure for setting the rail gap.
      e. Methods and equipment to be used to maintain the rail gap and alignment during welding.
      f. Methods for placing and luting prepared molds.
      g. Method used for preheating rail ends, including duration and temperature range.
      h. Procedure for igniting and flashing prior to drop into mold, including minimum duration required before drop.
      i. Procedure for tapping the mold, including minimum duration required to cool the weld under the mold insulation.
      j. Methods used for removing gates and risers, and for finishing the weld to make it suitable for ultrasonic inspection, including a description of special tools and equipment required.
      k. Method for producing the Hardness.
      l. Quality Control procedures.

D. The Contractor shall inspect rail for straightness in the initial qualification weld.

E. General

   1. Using the welding kit, personnel and procedures proposed for production welding, make four (4) qualification welds, two for each type of rail. These welds may be retained for the project if acceptable.

2. The qualification welds shall be made in the presence of the WMATA Representative.

3. Weld tests shall provide sufficient detail to establish capability of the welding apparatus and procedures to meet specified welding requirements with the rail supplied.

F. Qualification Weld Testing - The four (4) qualification welds shall be tested by ultrasonic testing in the following manner:

1. Prior to beginning production thermite welding, qualify the welding crew and thermite (field) welding procedure described herein, by preparing and testing four qualification weld samples as follows:
   a. Prepare and test four qualification weld samples joining high-strength rail.
   b. The qualification weld samples shall be prepared by the welding crew in the presence of WMATA.
   c. To prepare each qualification weld sample, join two pieces of rail, each a minimum of 30 inches in length.
   d. To produce the hardness (Brinell Hardness Numbers (BHN)) administer special cooling processes to the qualification weld samples immediately after stripping weld forms as specified in AREMA Manual for Railway Engineering, Volume 1 Track, Chapter 4 Rail, Specification for Steel Rails, Welding of Standard Chemistry Rail Steel.
   e. Have the testing agency test each of the qualification weld samples to qualify the welding crew and the welding procedure by using the following specified test procedures, and submit certified test results documenting the outcome of the testing:
      1) Visual and dimensional inspection testing
      2) Ultrasonic testing
      3) Brinell Hardness testing
      4) Slow bend testing
   f. The thermite (field) welding procedure will be considered qualified if all tests and inspections, and the weld kit, meet or exceed the acceptance requirements specified.
   g. If tests or inspections fail, re-submit a revised thermite (field) welding procedure to qualify the revised procedure in accordance with the requirements herein.

2. Do not begin production field welding until a thermite (field) welding procedure is qualified and accepted by WMATA in accordance with the requirements herein.

3. WMATA has, at its sole discretion, the authority to waive either in whole or in part the requirements for qualification weld testing provided that the Contractor presents information that documents that the welding processes herein, and crews proposed for the Work have passed similar testing within a 12-month period immediately preceding the commencement of rail welding operations.

4. All test samples are to be permanently marked for identification and returned to the Authority Representative at the completion of testing.

G. Visual and Dimensional Inspection

1. Subsequent to finishing the weld, visually and dimensionally inspect each weld to determine conformance with the alignment and finishing tolerances in AREMA Manual for Railway Engineering, Volume 1, Chapter 4 Rail, Specifications for Fabrication of Continuous Welded Rail, except as modified by this Section.
   a. Inspect each weld using a 3-foot straightedge along the centerline of the rail and 0.625 inch below top of rail on the gauge side of the railhead.
   b. Center the straightedge over the weld; the gap between the end of the straightedge and the railhead shall not exceed AREMA Chapter 4 criteria.
   c. Cut out and re-weld out-of-tolerance welds in accordance with these Specifications and at no additional cost to WMATA.

H. Ultrasonic Testing – **Contractor is required to have the four qualification welds tested only. All other ultrasonic testing will be performed by WMATA employees.**

1. Use test technicians holding ASNT Level II or Level III certification to ultrasonically test each of the six (6) welds in accordance with ASTM E164.
2. Scan the rail in a zigzag pattern to scan the full rail weld at a scanning level of plus 20 dB minimum, twisting the probe on one side of the weld only, and at a rate not exceeding 6 inches per second.
3. Scan longitudinally to the rail and overlap each pass a minimum of 10 percent.
4. When a reflection of greater amplitude than the acceptance criteria is found, scan the full perimeter of the weld from both sides to ensure full weld coverage and determination of the discontinuity size, type, and location.

Table 2.1

Minimum Acceptance Levels (decibels) Weld Thickness (inches) and Transducer Angle					
Reflector	5/16" to 3/4"	3/4"to 1-1/2"	1-1/2" to 2-1/2"	2-1/2" to 4"	4" to 6"
Severity	70^0	70^0	70^0 45^0	70^0 45^0	70^0 45^0
Large Reflectors	+8	+3	+1 + 4	-4 + 1	-7 - 2
Small Reflectors	+9	+4	+1 + 6	-2 + 3	-5 0
Minor Reflectors	+10	+5	+3 + 8	0 +5	-3 + 2

I. Brinell Hardness Test:

1. Perform Brinell Hardness testing on 10 percent of the production welds of the Contract.

a. For each weld found to have unacceptable Brinell Hardness numbers, test one additional weld on either side of the substandard weld. If both welds pass, repair the substandard weld. If either of the additional welds have substandard Brinell Hardness numbers, suspend the welding program and undertake an evaluation of equipment and procedures to establish the cause of substandard hardness. Report on the cause and remedial action, and recommence welding only when approved by WMATA.
b. The two additional welds do not count as part of the 10 percent of welds required to be tested. No less than one weld but no more than 10% of all welds made per shift shall be tested.
c. Perform Brinell Hardness testing in accordance with this Section, except do not longitudinally section the rail along the centerline but measure hardness in the weld area and heat-affected zones on the head of the rail.

J. Slow Bend Test:

1. Test Procedure: After the third qualification weld sample has passed the visual, magnetic, and ultrasonic testing, subject it to the slow bend test described in the AREMA Manual for Railway Engineering Volume 1, Chapter 4 Rail, Slow Bend Tests.
2. Acceptance Criteria:
   a. Minimum deflection: 3/4 inch before visible failure for 115RE rail.
   b. Modulus of rupture: 125,000 pounds per square inch minimum for 115RE rail.

K. Rolling Load Test for Dynamic Testing:

1. Test Procedure:
   a. From the remaining qualification weld samples, select one of the samples made after it has passed the visual, magnetic, and ultrasonic testing and subject it to the dynamic rolling load test.
   b. Place the test sample on supports separated by 36 inches on center with the weld located between the supports as shown in **Exhibit E.**
   c. To simulate a rolling load, use two hydraulic rams to repeatedly apply loads to the rail alternately at Points A and B as shown in **Exhibit E.**
      1) Vary each load approximately sinusoidal from 0 to 44,400 pounds for 115RE rail.
         a) Monitor the loads with load cells placed between each ram and the rail head.
         b) Calibrate the load cells prior to commencement of the test program.
      2) Apply loading for 2 million load cycles, where one application of the load at Point A followed by one application of the load at Point B constitutes one load cycle.
   d. Measure permanent rail deflection at Point A every 500,000 load cycles, and record the measurement to the nearest 0.001 inch.

2. Acceptance Criteria:
    a. There are no visual cracks and permanent deflection following the full 2 million load cycle test is no greater than 0.094 inch.

PART 3 - MATERIALS

A. Thermite Welding Kits:

1. Select and furnish a welding kit that conforms to the requirements of AREMA Manual for Railway Engineering, Vol. I, Chapter 4 Rail, Specification for the Quality Assurance of Thermite Welding of Rail, except as modified herein.
    a. All materials used on any given thermite field weld shall be the products of a single manufacturer or recommended by the manufacturer for use with their welding process. Only use welding products that have passed the manufacturer's quality programs, have been handled and stored in accordance with the manufacturers written recommendations, and are within the stipulated shelf life of the material.
    b. Submit certification from the material manufacturer that the powder portions of the thermite welding kit comply with the referenced requirements, including hardness requirements of AREMA high strength rail, where used.
    c. Submit the manufacturer's instructions or procedures for the thermite welding process prior to performing the thermite welding to qualify the thermite welding procedure, welding foreman, and welding crews.
    d. Submit and comply with the manufacturer's recommendations concerning handling, storage, and shelf life of thermite rail welding products.

B. Provide all other materials required to perform the Work specified herein.

PART 4 - EQUIPMENT

A. Furnish all testing equipment required to perform weld quality and qualification testing as specified herein as part of the testing agency service.

1. Visual and Dimensional Testing Measuring Tools:
    a. Taper Gauge:
        1) Manufacturer: L.S. Starrett Company Catalog Number 270, or accepted tool of the same standard of quality.
    b. Straightedge:
        1) Material: Stainless Steel.
        2) Length: 3 feet.
        3) Manufacturer: L.S. Starrett Company Catalog Number 380-36, or accepted tool of the same standard of quality.
2. Ultrasonic Testing Equipment:

a. Furnish an ultrasonic, pulsed echo instrument capable of inspecting rail welds and detecting a 3/64-inch discontinuity 6-1/2 inches below the top of rail, and having the following features:
    1) A calibrated decibel gain control with 2-dB, minimum, increments.
    2) Operation in the 1 to 5 MHz range.
    3) A graduated CRT screen.
    4) Calibrated paper tape recording attachments to record accurately the CRT screen indications when a non-complying weld is located
    5) 2.25 MHz angle beam transducers, 1/2 inch by 1 inch at 70 degrees and 45 degrees.
    6) Suitable high-viscosity couplings with good wetting characteristics.
b. Furnish standard IIW calibration blocks of rail steel for primary reference response and to construct the distance-amplitude correction curve.
c. Furnish DSC blocks of rail steel for calibration checks.
d. Furnish an 18-inch long calibration tee rail having whole patterns as shown in **Exhibit F**.

3. Brinell Hardness Testing Equipment:
    a. Furnish equipment capable of performing Brinell Hardness testing in accordance with ASTM E10 with a 10mm ball and an applied load of 3,000 kg.
4. Testing service shall furnish dynamic testing equipment required to conduct testing indicated in this Section.
5. Provide all other equipment required to perform the Work specified herein. Tools used shall meet the minimum requirements of the manufacturer of the rail welding kit.

PART 5 - RAIL BOUND VEHICLE QUALIFICATIONS

A. The Contractor's rail equipment (to include hi-rail) must have an excellent historical record of performance and maintenance. The hi-rail equipment shall be inspected by WMATA personnel for approval, prior to use on the WMATA system. The equipment shall meet the minimum requirements are as follows:
B. Contractor shall supply, operate and maintain a convertible rail bound equipment meeting AREMA standards for passenger railroads.
    1. Must be diesel powered.
    2. Must be able to operate quietly for night work in urban areas.
    3. Must clear all WMATA tunnels, platforms, contact rail, assemblies and structures as indicated in the drawings included in **Appendix A**.
    4. For the purposes of towing in an emergency situation, the equipment shall have One (1) Tow Eye of 2 1/16" in diameter at each-end of the. Vehicle.
    5. The Tow Eye shall be 14", +or-, from the top of rail to centerline of tow eye as measured with new wheels.

C. Refer to OAP 208-04 for full requirements.
    1. Equipment must be able to operate on standard gage of track set at 56 1/4" track gage.
D. The contractor must be escorted by a WMATA qualified employee at all times while on or operating on WMATA right of way.

E. A vehicle inspection certificate must be submitted to WMATA prior to acceptance for all
    1. Vehicles operations.
    2. Hi-rail assembly.
    3. Rail wheels.

PART 6 - SITE VERIFICATIONS FOR WELDING

A. Do not perform thermite (field) welding during periods of precipitation, when winds exceed 25 mph or in the presence of atmospheric electrical activity.

B. During the setup and performance of thermite (field) welding, prohibit other work that would move or vibrate the rails, or otherwise interfere with properly performing the field welding and obtaining satisfactory welding results from occurring.

C. When welds must be made adjacent to at-grade road crossings or other locations where vibrations might be induced in the rail, take all necessary precautions to prevent disturbance of the weld immediately after the molten pour.

PART 7 - PREPARATION FOR WELDING

A. Thermite (Field) Weld Locations:

1. Stagger the locations of thermite welds in rails on opposite sides of the track a minimum of 5 feet for connecting CWR strings and a minimum of 2 feet at all other locations.
2. Except for welded rail joints in shop curved rail and special track work, do not locate field welds within at-grade road crossings or within 10 feet of the edge of the traveled portion or sidewalk area.
3. Do not position field welds either on or within 6 inches of the edge of the rail seat of a concrete crosstie or direct fixation rail fastener.
4. Do not position field welds within 6 inches from edge of a switch tie plate.

B. The welding location may be set up on WMATA property as approved by the WMATA Representative.

C. Rail welding shall be in accordance with the current AREMA Manual of Railway Engineering Specification for Fabrication of Continuous Welded Rail, and as specified herein.

D. Rail Inspection Prior to Welding:

1. Inspect each rail end prior to welding for deviations from lateral line in either direction and for upsweep, down sweep or droop.
2. Rail with upsweep, down sweep or droop and rail failing to comply with the tolerances shown on **Exhibit A** shall be cut back a sufficient distance to achieve the required alignment. Rails shall be cut clean and within 1/32 inch of square by means of rail saws or abrasive cutting discs.
3. Torch cutting of rail is prohibited. Cutting shall be done at no additional cost to WMATA.

E. Rail End Preparation:

1. Cut the rail ends by using a power actuated saw, or abrasive rail cutting machine, after arranging and aligning the face of the rail ends at right angles to the saw.
   a. Torch cutting of rail ends is prohibited.
2. Bolt Holes: Do not make or include holes in the ends of the rail to be welded.
3. Clean all rail surfaces on the rails to be welded a minimum of 6 inches back from the rail ends to remove all grease, oil, dirt, loose scale, and moisture.
   a. Use a wire brush to completely remove all dirt and loose oxide, and then use an oxy-acetylene torch with a minimum temperature of 250 degrees Fahrenheit to remove grease, oil, or moisture.
4. Clean the rail ends further to remove all scale and rust for 2 inches on each side of the weld by using a power-actuated grinder with an abrasive wheel.
5. Remove all burrs and lipped metal that would interfere with the fit of the mold.

PART 8 - FIELD WELDING PROCEDURES

A. All welding procedures shall be approved prior to use and as a minimum shall be in accordance with the following:

1. Produce welds with upset of 5/8 inch minimum before shearing.
2. Each weld to achieve complete fusion, and be free of flaws and inclusions.

B. Weld Gap:

1. The minimum and maximum gap shall be in accordance with the instructions of the manufacturer of the weld kit. Verify that the joint gaps in shop fabricated special track work are within the kit manufacturer's criteria.

2. Make the minimum measurement with a go or no-go gauge of the specified dimensions for the thermite process used.
3. Adjust the gap if it is under the minimum or more than 1/8 inch over the specified gap.
4. Wide Gap Thermite Welds:
    a. Wide gap thermite welds are not allowed, except as herein specified.
    b. At the discretion of WMATA and only at special track work weld locations, wide-gap welds may be considered to salvage a special track work component.
        1) Obtain prior written approval before procuring the special wide weld kits.
        2) Wide weld kits, methods, and a qualification test sample shall be qualified in accordance with the thermite weld qualification procedure specified herein.

C. Properly gap and align the ends of the rails to be welded to produce a weld that conforms to the following tolerances:
1. Alignment of the rail shall be done on the head of the rail.
2. Vertical alignment shall provide for a flat running surface within 0.01 inch between the abutting rail ends.
3. Horizontal alignment shall distribute head width differences evenly between each side of the head. No horizontal offset shall exceed 0.03 inch on either side of the head. No horizontal offset shall exceed 0.10 inch on either side of the base of the rail.
4. Gauge Misalignment Tolerance: Combined horizontal offset and horizontal kink shall not exceed 0.040 inch per foot at 60 degrees Fahrenheit.

D. Hold the rail gap and alignment without change during the complete thermite (field) welding cycle by using a hydraulic rail puller/expander and alignment jig.

E. Sealing the Molds:
1. Seal the molds, but do not introduce mold sealant or luting material into the weld chamber.

F. Preheating:
1. Prior to welding, preheat the rail ends to a temperature and for time sufficient, as indicated in the approved thermite (field) welding procedure, to ensure full fusion of the weld metal to the rail ends without cracking of the rail or weld.
2. Check the quality of the gas used for preheating to ensure even temperatures are maintained during preheating.
3. Check the rail temperature by using temp sticks, or as directed by WMATA.

G. Tapping:

1. Follow the thermite welding kit manufacturer's instructions and timing to melt the weld metal in the crucible and tap it into the mold.
2. After the metal has cooled sufficiently to begin solidifying, shear the upset weld metal that overflowed into the mold pans to form the basic rail cross-sectional shape.

H. Post Heating:

1. Leave the molds for thermite field welds in place after tapping for a sufficient time to permit complete solidification of the molten metal and proper slow cooling to prevent cracking and to provide a complete weld with the proper hardness and ductility.

I. Grinding shall be done immediately following welding at an elevated temperature.

J. Finishing Welds shall be ground to meet the following finishing tolerances:

1. Finish the weld with a rail-mounted railhead grinder specifically designed for the Work.
   a. Blend all grinding to the parent rail section and do not overheat the steel.
   b. Complete heavy grinding while the steel is still hot from welding process.
2. A finished deviation of not more than plus or minus 0.005 inch of the parent section of the rail head shall be allowed.
3. The weld at the top and sides of the rail head shall be finished to plus or minus 0.010 inch of the parent section.
4. The bottom and sides of rail base, the web zone, underside of head, web, top of base, fillet each side, shall be finished to within 1/4 inch of parent contour or closer but shall not be deeper than parent section.
5. Finishing shall eliminate all cracks visible to the unaided eye.
6. All notches created by offset conditions or twisted rails shall be eliminated by grinding to blend the variations on both sides of the head and base for a distance of 18 inches.
7. All fins on the weld due to grinding and/or shear drag shall be removed prior to final inspection.

K. Welds at pedestal tracks shall not be suspended; i.e., the rail weld shall be located at the pedestal support plate. The rail base of these welds shall be ground to the same tolerances as the rail head.

PART 9 - FIELD QUALITY CONTROL

A. Manufacturer's Field Services:

1. Provide the services of a representative from the thermite weld kit manufacturer who is experienced with the thermite welding method being used to be on site and witness the making of at least the first three acceptable qualification field welds.

B. Contract the testing agency to perform all inspection and testing of field production rail welding specified in this Article, prepare test reports for all tests performed, and do the following:.

1. Submit the test reports to the Contractor and WMATA within 5 days of testing the weld.
2. Certify whether or not each weld meets the quality criteria specified.
3. Indicate acceptance or rejection of each tested weld by marking the weld.
4. Unless otherwise allowed by WMATA, thermite field welds shall be tested within 7 days of completion and test reports shall not be more than 10 weld tests behind.

C. Inspection of Welds: Each weld shall be examined by the visual method as follows:

1. Visual Inspection for Final Alignment of Finished Welds:
   a. Subsequent to finishing the weld, visually and dimensionally inspect each weld to determine conformance with the alignment and finishing tolerances in AREMA Manual for Railway Engineering, Volume 1, Chapter 4 Rail, Specifications for Fabrication of Continuous Welded Rail.
   b. The combined vertical offset and crown camber at ambient temperature shall not exceed 0.060 inches as shown on **Exhibit B.**
   c. No dip camber shall be allowed as shown on **Exhibit B.**
   d. Combined horizontal offer and horizontal kink camber at ambient temperature shall not exceed 0.060 inches as shown on **Exhibit B.**
   e. Welds shall be free of cracks, fins, and sharp edges.
2. Brinell Hardness Test for Testing Field Welds:
   a. Test Procedure:
      1) Prior to testing, remove mill scale or surface residue that may affect test results.
      2) Perform Brinell Hardness testing in accordance with ASTM E10, measuring hardness in the weld area and heat affected zones on the head of the rail at 1/2 intervals.
   b. Acceptance Criteria:
      1) The Brinell Hardness shall be equal to the Brinell Hardness or the parent metal within a tolerance of plus 30 or minus 50 BHN.
3. Relief from the hardness requirements will not be considered or granted.

D. Correction of Defective Welds: Each production weld failing to meet all acceptance criteria will be considered defective. This shall include welds considered defective by the WMATA contracted Ultrasonic Inspector.

1. Defective welds shall be cut out by means of rail saw or abrasive disc.
2. Use extra initial flash to burn off cut surface, re-clamp, and re-weld.
3. Re-welds shall be inspected as specified for initial welds.

E. Submit Production Welding Records to the WMATA Representative at the end of each day's production.

1. Production welding record in accordance with **Exhibit C and D**

PART 10 - DELIVERABLES

A. Report indicating contractors work activity and all prudent information at the end of each shift.
B. Non defective welds throughout the WMATA System.
C. 100 % Ultrasonic testing of all welds (WMATA Responsibility).

PART 11 - SAFETY TRAINING

Prior to working on WMATA property, at no additional cost to WMATA, ALL contractor personnel shall be required to attend a Right-Of-Way training class, to be held at a WMATA facility. ALL contractor personnel must have their WMATA access pass in their possession at ALL times while on WMATA property.

PART 12 - SAFETY REQUIREMENT

ALL Contractor personnel will be required to wear appropriate safety apparel while working on WMATA property to include, but not limited to safety goggles, work boots, and hard hats.

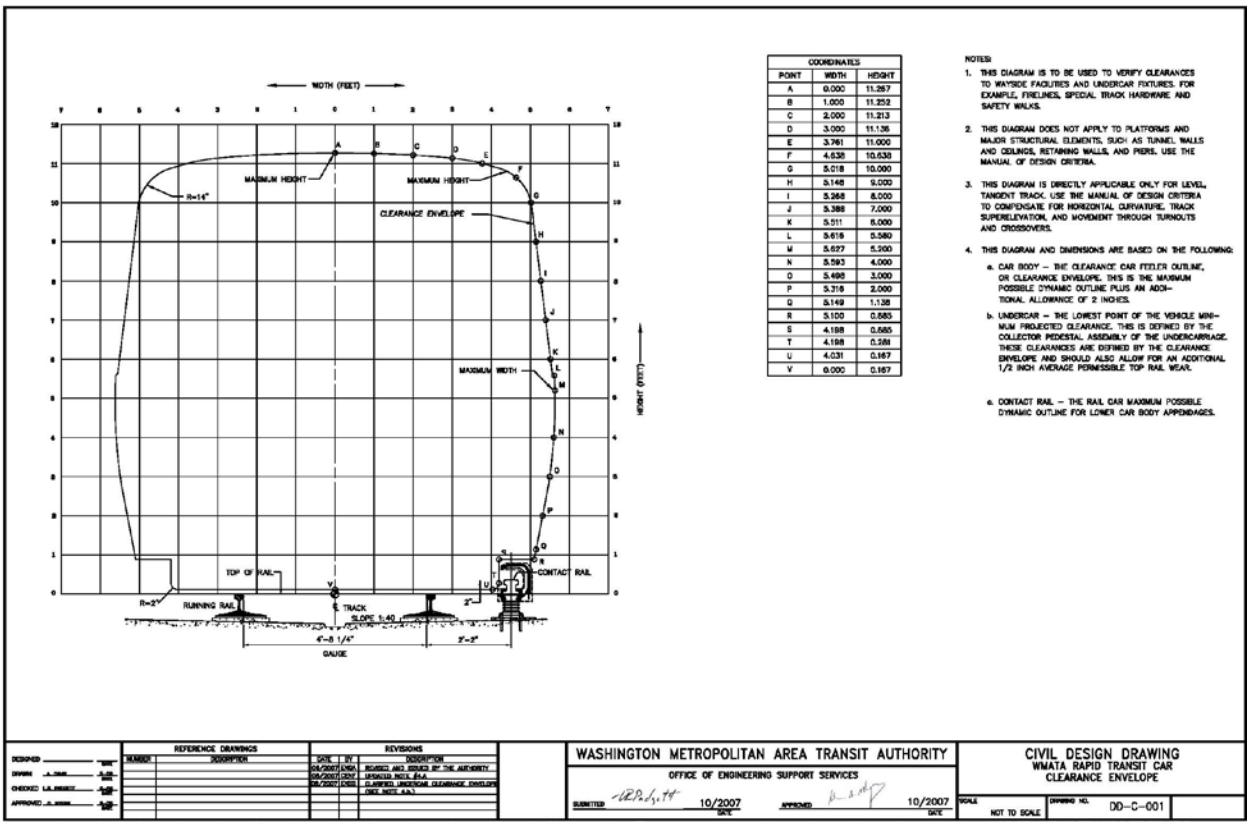
PART 13 - PERIOD OF PERFORMANCE

Up to 800 welds per year for a period of five years. Two base years and three option years.

PART 14 - ADDITIONAL REQUIREMENTS / SPECIAL INSTRUCTIONS

A. The successful contractor must be capable of producing, at minimum, one (1) finished weld per hour, per work crew.
   1. The Authority will schedule a **minimum** four (4) welds per contractor shift.
B. The successful contractor will supply all equipment, tools, materials, and labor required to complete the rail welding per the specification.
C. The contractor will work under the direction and control of a WMATA escort at all times.
D. The contractor will remove rail joint bars from existing joints, prepare rail ends, install thermite weld, and return the track to WMATA standards. All joint bars and associated hardware removed from rail joints are to be returned to the point of access (rail yard) each day.
E. Rail welding will be performed at various locations throughout the WMATA system and the work hours will be variable and determined by WMATA.
F. The contractor will not be permitted to use gasoline powered equipment**, NO GASOLINE POWERED EQUIPMENT IS ALLOWED ON THE WMATA SYSTEM**.
G. The successful contractor should contact **Mr. Michael Davis (703) 667-8203 msdavis@wmata.com** at least two (2) weeks prior to starting the job.
H. WMATA will operate a non-revenue test train over all Contractor welds prior to replacing the track into revenue service.

PART 15 - APENDIX A



COORDINATES		
POINT	WIDTH	HEIGHT
A	0.000	11.267
B	1.000	11.252
C	2.000	11.213
D	3.000	11.136
E	3.761	11.000
F	4.638	10.638
G	5.018	10.000
H	5.148	9.000
I	5.268	8.000
J	5.388	7.000
K	5.511	6.000
L	5.618	5.580
M	5.627	5.300
N	5.593	4.000
O	5.498	3.000
P	5.318	2.000
Q	5.149	1.138
R	5.100	0.885
S	4.198	0.585
T	4.198	0.385
U	4.031	0.167
V	0.000	0.167

NOTES:

1. THIS DIAGRAM IS TO BE USED TO VERIFY CLEARANCES TO WAYSIDE FACILITIES AND UNDERCAR FIXTURES. FOR EXAMPLE, FIRELINES, SPECIAL TRACK HARDWARE AND SAFETY WALKS.
2. THIS DIAGRAM DOES NOT APPLY TO PLATFORMS AND MAJOR STRUCTURAL ELEMENTS, SUCH AS TUNNEL WALLS AND CEILINGS, RETAINING WALLS, AND PIERS. USE THE MANUAL OF DESIGN CRITERIA.
3. THIS DIAGRAM IS DIRECTLY APPLICABLE ONLY FOR LEVEL, TANGENT TRACK. USE THE MANUAL OF DESIGN CRITERIA TO COMPENSATE FOR HORIZONTAL CURVATURE, TRACK SUPERELEVATION, AND MOVEMENT THROUGH TURNOUTS AND CROSSOVERS.
4. THIS DIAGRAM AND DIMENSIONS ARE BASED ON THE FOLLOWING:
   a. CAR BODY – THE CLEARANCE CAR FEELER OUTLINE, OR CLEARANCE ENVELOPE. THIS IS THE MAXIMUM POSSIBLE DYNAMIC OUTLINE PLUS AN ADDITIONAL ALLOWANCE OF 2 INCHES.
   b. UNDERCAR – THE LOWEST POINT OF THE VEHICLE MINIMUM PROJECTED CLEARANCE. THIS IS DEFINED BY THE COLLECTOR PEDESTAL ASSEMBLY OF THE UNDERCARRIAGE. THESE CLEARANCES ARE DEFINED BY THE CLEARANCE ENVELOPE AND SHOULD ALSO ALLOW FOR AN ADDITIONAL 1/2 INCH AVERAGE PERMISSIBLE TOP RAIL WEAR.
   c. CONTACT RAIL – THE RAIL CAR MAXIMUM POSSIBLE DYNAMIC OUTLINE FOR LOWER CAR BODY APPENDAGES.

DESIGNED ____ DATE
DRAWN ____ DATE
CHECKED ____ DATE
APPROVED ____ DATE

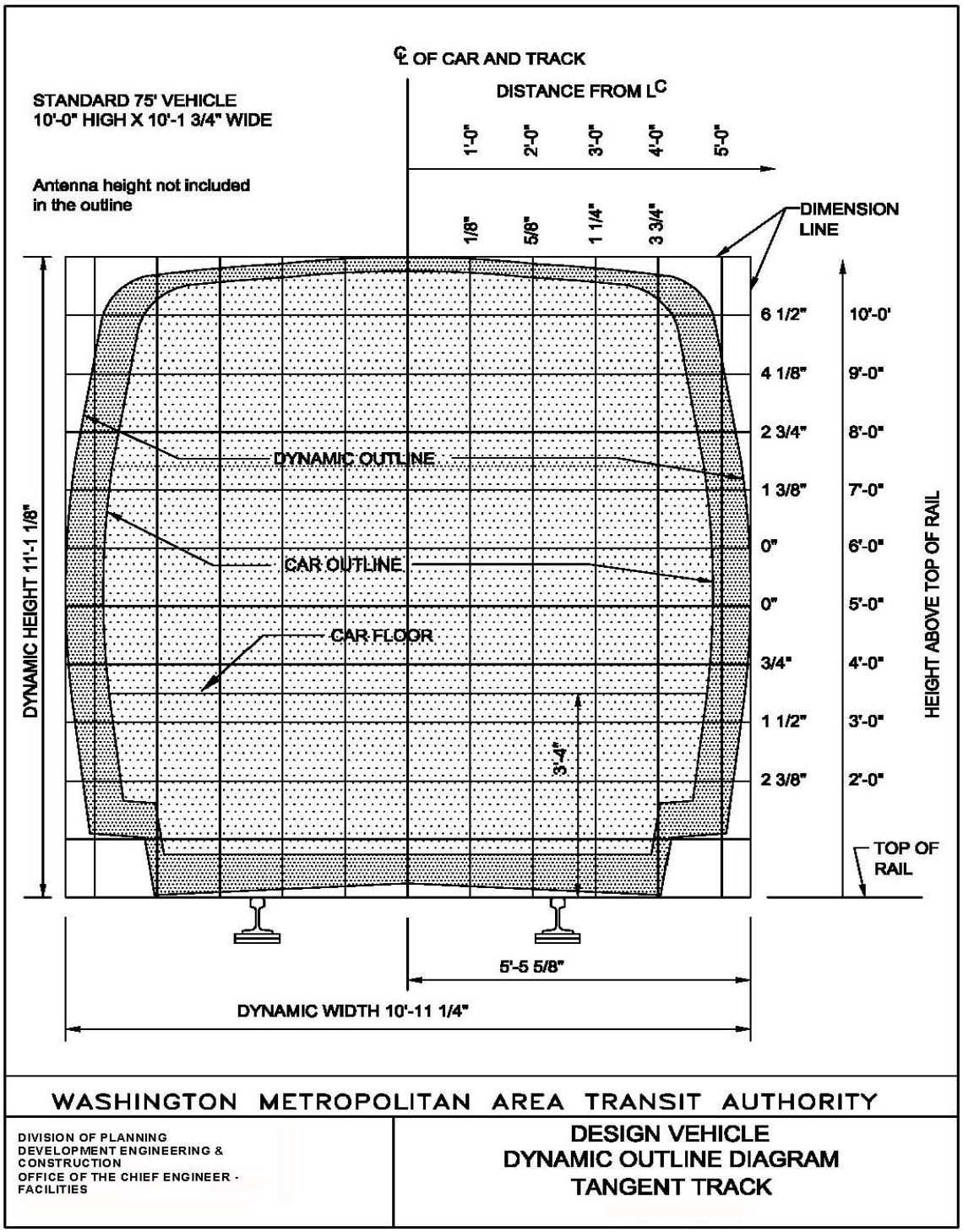
REFERENCE DRAWINGS	
NUMBER	DESCRIPTION

REVISIONS		
DATE	BY	DESCRIPTION
05/2007	LNDA	REVISED AND ISSUED BY THE AUTHORITY
09/2007	CENT	UPDATED NOTE #4.A
09/2007	CKSS	CLARIFIED UNDERCAR CLEARANCE ENVELOPE (SEE NOTE 4.b.)

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
OFFICE OF ENGINEERING SUPPORT SERVICES
SUBMITTED ____ 10/2007 DATE
APPROVED ____ 10/2007 DATE

CIVIL DESIGN DRAWING
WMATA RAPID TRANSIT CAR
CLEARANCE ENVELOPE

SCALE: NOT TO SCALE
DRAWING NO.: DD-C-001


℄ OF CAR AND TRACK
STANDARD 75' VEHICLE
10'-0" HIGH X 10'-1 3/4" WIDE
Antenna height not included
in the outline
DISTANCE FROM LC
1'-0"
2'-0"
3'-0"
4'-0"
5'-0"
1/8"
5/8"
1 1/4"
3 3/4"
DIMENSION LINE
6 1/2"
4 1/8"
2 3/4"
1 3/8"
0"
0"
3/4"
1 1/2"
2 3/8"
10'-0'
9'-0"
8'-0"
7'-0"
6'-0"
5'-0"
4'-0"
3'-0"
2'-0"
HEIGHT ABOVE TOP OF RAIL
DYNAMIC OUTLINE
CAR OUTLINE
CAR FLOOR
DYNAMIC HEIGHT 11'-1 1/8"
3'-4"
TOP OF RAIL
5'-5 5/8"
DYNAMIC WIDTH 10'-11 1/4"
WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
DIVISION OF PLANNING
DEVELOPMENT ENGINEERING & CONSTRUCTION
OFFICE OF THE CHIEF ENGINEER - FACILITIES
DESIGN VEHICLE
DYNAMIC OUTLINE DIAGRAM
TANGENT TRACK

PART 16 - EXHIBIT A
TOLERANCES FOR INSPECTION OF RAIL

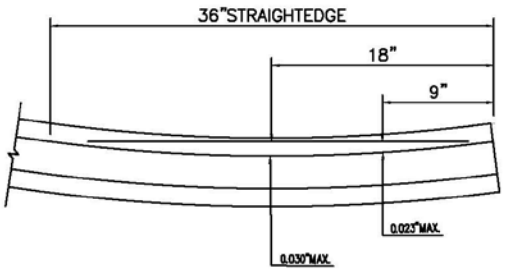


FIGURE 1

TOP VIEW OF RAIL
LATERAL (HORIZONTAL) LINE
TOLERANCE AT RAIL ENDS

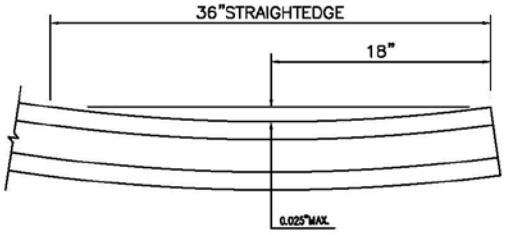


FIGURE 2

SIDE ELEVATION OF RAIL
UNIFORM UPSWEEP
TOLERANCE AT RAIL ENDS

TOLERANCES FOR INSPECTION OF RAIL	DRAWING NO. EXHIBIT 05092-B	
	SCALE AS NOTED	SHEET NO. 1 of 1
DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES		CONTRACT NO. N/A

PART 17 - EXHIBIT B
TOLERANCES FOR INSPECTION OF WELDED RAIL

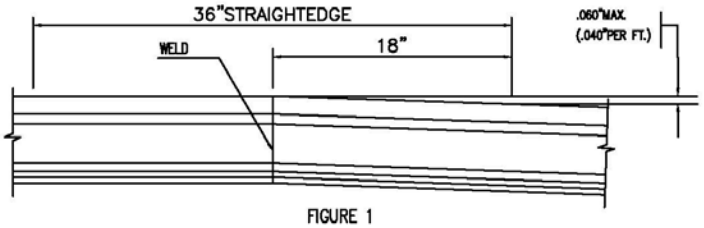


FIGURE 1
ELEVATION OF RAIL SHOWING WELD MISALIGNMENT
TOLERANCE IN VERTICAL ALIGNMENT

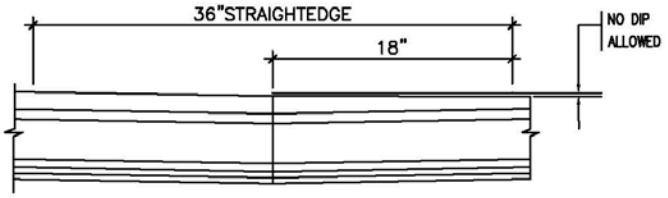


FIGURE 2
ELEVATION OF RAIL SHOWING WELD MISALIGNMENT
TOLERANCE IN VERTICAL ALIGNMENT

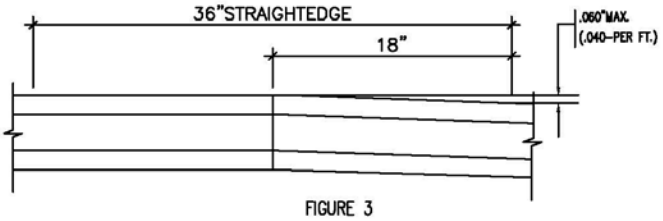


FIGURE 3
PLAN VIEW OF RAIL SHOWING WELD MISALIGNMENT
TOLERANCE IN HORIZONTAL ALIGNMENT

metro TOLERANCES FOR INSPECTION OF WELDED RAIL	DRAWING NO. EXHIBIT 05092-C	
	SCALE AS NOTED	SHEET NO. 1 of 1
DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES		CONTRACT NO. N/A

PART 18 - EXHIBIT C
PRODUCTION WELDING RECORD

RAIL STRING NUMBER _____

RAIL TYPE: STANDARD _____ HIGH STRENGTH _____ (CHECK ONE)

FINISH STRING LENGTH (NEAREST FOOT)_____

STAMPING ON FIRST AND LAST RAIL IN STRING:

FIRST _____

LAST _____

WELD NO.	WELD MACHINE RECORD IDENTIFIER	MAGNETIC PARTICLE TEST RESULT	VISUAL INSPECTION RESULTS MAXIMUM DIMENSION RECORDED	
			VERTICAL ALIGNMENT	HORIZONTAL AUGMENT
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				

REWELDS

metro PRODUCTION WELDING RECORD	DRAWING NO. EXHIBIT 05092-D	
	SCALE AS NOTED	SHEET NO. 1 of 1
DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES		CONTRACT NO. N/A

EXHIBIT D

PART 19 - WELDER'S TIME SHEET

DATE _____ OPERATORS OPERATORS Straight–time Overtime

MACHINE _____ _____ _____ _____

SHIFT _____ _____ _____ _____

WELD NO.	TIME	REMARKS	WELD NO.	TIME	REMARKS

HO – Horizontal Offset VO – Vertical Offset EB – Electrode Burn MI – Mag. Ind.
M8800 & M81200 Circuit Breaker RL – Read Light – Explain. Other remarks on reverse side.

metro WELDER'S TIME SHEET	DRAWING NO. EXHIBIT 05092-E	
	SCALE AS NOTED	SHEET NO. 1 of 1
DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES		CONTRACT NO. N/A

EXHIBIT E

PART 20 - DYNAMIC TEST – LOADING ARRANGEMENT / MOMENT DIAGRAM

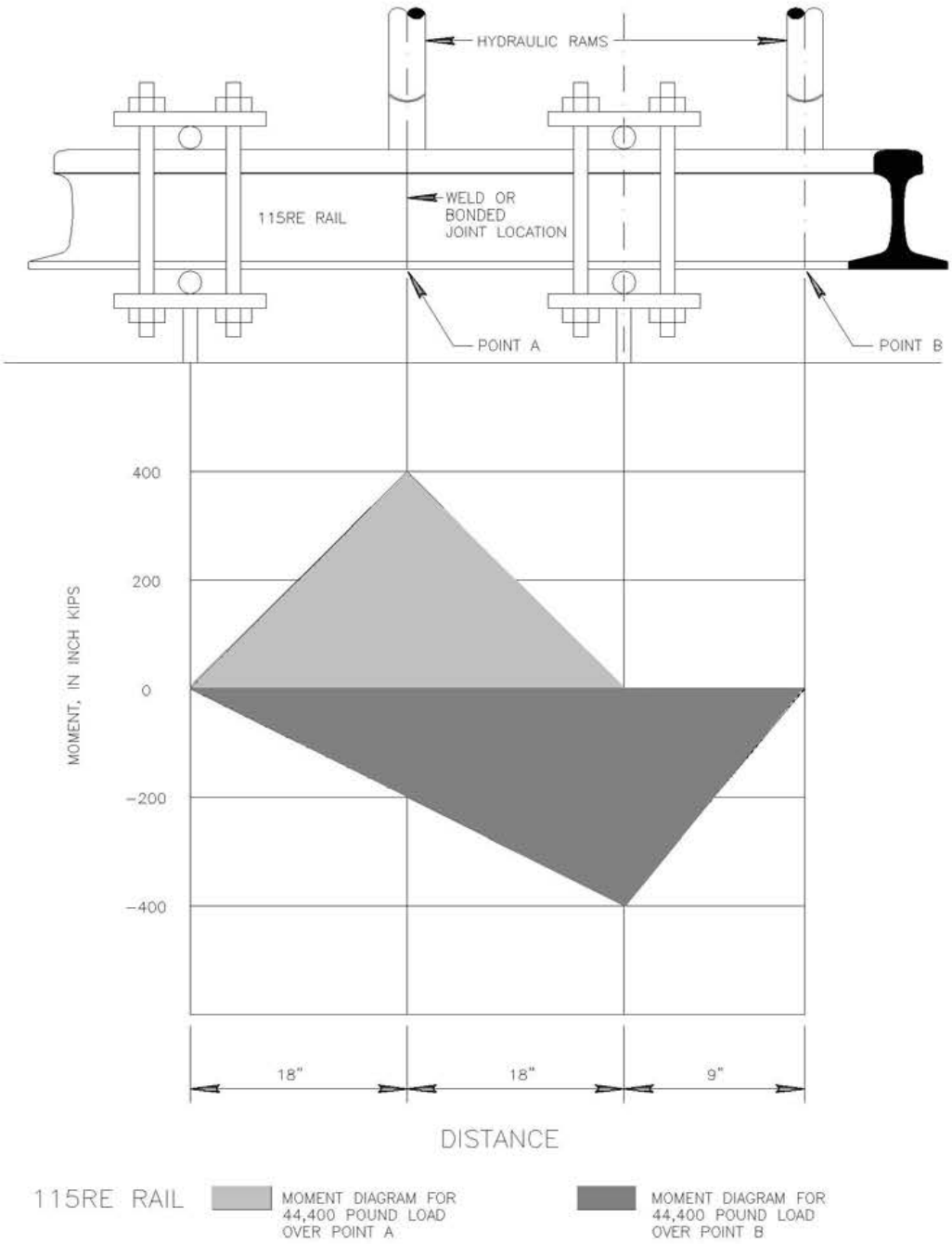
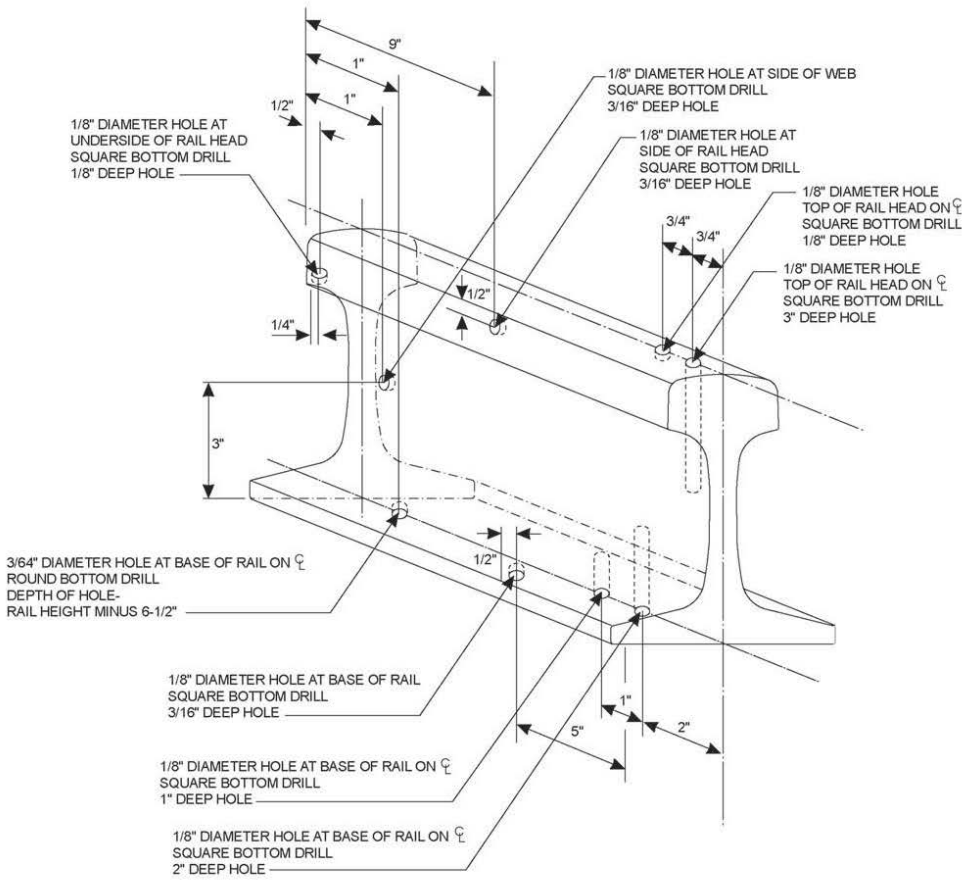


Exhibit F

PART 21 - Calibration Rail



END OF SECTION