Washington
Metropolitan
Area
Transit
Authority

Scope of Work

150LB Third Rail Components:

- -150LB Splicer Joint Bar Assembly
- -150LB Expansion Joint
- -150LB End Approach 11
- -150LB End Approach 5'6"
- -150LB Anchor Arm Assembly

Attachment A

1. Introduction

1.1. The Washington Metropolitan Area Transit Authority (WMATA) requires the purchase of various third rail materials to be used in the system-wide maintenance of third rail components.

2. Scope of Work

2.1. Materials included in this contract are 150lb third rail components to be used in mainline and yard track, i.e., 150lb Splicer Joint Bar Assemblies, 150lb Expansion Joints, 150lb End Approaches 11', 150lb End Approaches 5'6", and 150lb Anchor Arm Assemblies.

2.2. This Scope of Work provides for the design, fabrication, testing, packaging, and delivery of the aforementioned materials, as referenced in this scope of work and the attached technical specifications and drawings.

2.3. All materials and equipment required for this contract will be the responsibility of the vendor.

3. Deliverables

The contractor shall produce, test, and ship the following items in accordance with the identified specifications and drawings:

3.1 150lb Splicer Joint Bar Assemblies
- 3.2A Specification: *See below
- 3.2B Drawing: No. TW6-CR-6

3.2 150lb Expansion Joints
- 3.3A Specification: Section 6.8.5.2
- 3.3B Drawing: No. TW6-CR-7

3.3 150lb End Approaches 11'
- 3.4A Specification: Section 6.5.8.2.3
- 3.4B Drawing: No. TW6-CR-6

3.4 150lb End Approaches 5'6"
- 3.5A Specification: Section 6.5.8.2.3
- 3.5B Drawing: No. TW6-CR-6

3.5 150lb Anchor Arm Assemblies
- 3.6A Specification: Section 6.8.5.1
- 3.6B Drawings: No. TW6-CR-8, TW6-CR-9

*150lb Splicer Joint Bar Assemblies
This will consist of medium steel (ASTM A27, grade 65-35) 7/8" x 2" x 14-3/4" Splice Bar with Drilled Holes and the following hardware:

(2) 7/8" x 6-1/2" Long Galvanized Steel Machine Bolt, A325
(2) 7/8" Galvanized Steel Hex Nut, A325
(2) 7/8" Galvanized Steel Lock Washer, A325

4. Delivery Schedule

90 days after issuance of the Notice to Proceed (NTP) for each line item.

5. Locations/Constraints

5.1. All materials for this contract will be delivered to:

WMATA Auth Road Material Storage Facility
4305 Auth Place
Suitland, MD 20746

and/or

WMATA Industrial Road Material Storage Facility
6851 Industrial Road
Springfield, VA 22151

Alternate locations within the WMATA rail system (DC, MD, VA) as the COTR directs.

Hours of delivery will be between 7:00 am and 2:00 pm Monday through Friday, exclusive of legal holidays in the Washington, DC area. The Vendor shall notify WMATA of material deliveries (48) hours in advance. The supplier shall contact Ms. Kimberly Hammond at (202) 253-4127 for instructions.

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CONTACT RAIL AND APPURTENANCES

SECTION 6.8

CONTACT RAIL AND APPURTENANCES

6.8.1 DESCRIPTION

The work to be performed under this section consists of fabrication and delivery to the job site, of the contact rail system, including the contact rail, insulator assemblies, protective cover assembly, material for electrical connections and all appurtenances as shown on the contract drawings and as specified herein.

6.8.2 SHOP DRAWINGS

The Contractor shall furnish to the Engineer for approval, shop drawings showing the fabrication of all contact rail assemblies and appurtenances not fully detailed on the contract drawings. No shop drawings shall be used for fabrication or manufacturing purposes until approved by the Engineer.

6.8.3 CONTACT RAIL

The contact rail as specified herein shall be rolled from low carbon steel and manufactured by the open hearth, electric furnace, or basic oxygen process. The contact rail shall be capable of conducting 3000 amperes direct current continuous with a temperature rise not to exceed 40 degrees C above 30 degrees C ambient in still air. The steel rail shall conduct electricity at a nominal 700 Volts DC and its resistance shall be compared to the International Annealed Copper Standard (IACS) and as specified in Section 6.8.3.6. The contact rail shall be capable of carrying a fault current of 160,000 amperes direct current, or equivalent alternating current, for 100 milliseconds without mechanical or thermal damage.

6.8.3.1 Chemical Composition

Each heat of steel used in the manufacturing of the contact rail shall contain an amount, not to exceed the following percentages, of each chemical element.

Chemical Element	Percentage
Copper	0 to 0.30
Carbon	0.10
Manganese	.0.20
Phosphorus	.0.015
Sulphur	.0.06
Silicon	.0.05

Total chemical elements other than iron shall not exceed 0.70%.

6.8.3.2 Chemical Analyses

Chemical analyses shall be made by and at the expense of the Contractor to determine the percentage of copper, carbon, manganese, phosphorus, sulphur and silicon in the steel. The Contractor shall be responsible for determining that all steel used for the contact rail meets the requirements of Section 6.8.3.1 Six (6) certified copies of all test results for the above tests shall be submitted to the Engineer for approval.

6.8.3.3 Weight

The weight of the contact rail shall be 150 pounds per linear yard for the cross section as shown on the contract drawings. A variation from the specified weight not to exceed two percent for any rail or one percent for the total amount of rail furnished for the contract will be permitted.

6.8.3.4 Geometry

The geometry of the contact rail shall conform to the dimensions and tolerances indicated on the contact drawings.

6.8.3.5 Length

The standard length of contact rail shall be thirty-nine (39) feet at a temperature of sixty (60) degrees F. Shorter lengths varying in increments of one foot from 39 to 25 feet will be accepted for a maximum of eleven (11) percent of the rails furnished for the contract. A maximum variation of plus or minus one-half (1/2) inch for each rail will be permitted.

6.8.3.6 Rail Classifications

Contact rail shall be classified in accordance with their electrical and physical characteristics as Number 1 or Number 2, as follows:

Number 1 rails shall be classified as those rails which have a resistance of not more than 6.85 times the resistance of pure copper (IACS) and which meet the specified physical requirements, and which are free from injurious flaws and defects.

Number 2 rails shall be classified as those rails which have a resistance of more than 6.85 times but not exceeding 7 times the resistance of pure copper (IACS) or rails which, because of surface imperfections, can not be classified as Number 1 rails.

No Number 2 rail shall contain imperfections, the number and character of which, in the judgement of the Engineer, render it unsuitable for use as a contact rail. Number 2 rails will be accepted for not more than 16 percent (by weight) of the total contact rail furnished.

All contact rails which, because of physical imperfections, cannot be classified as Number 2 rails or rails which have flaws in the head of more than 1/4 inch in depth or in the flange of more than 3/8 inch in depth, and all rails which have a resistance exceeding 7.0 times the resistance of pure copper (IACS) of equal cross section and length and at a corresponding temperature will be rejected.

6.8.3.7 Drilling

Drilling of the contact rails by the Supplier will not be permitted except for chemical analyses.

6.8.3.8 Finish

All contact rails shall be protected from snow and water while on the cooling beds. The distance between supports of rails in the gauging press shall not be less than forty-two (42) inches. Finished rails shall be smooth on the head and base, straight in line, without kinks, twists or waves. The maximum vertical offset in the contact surface at any location shall not exceed 1/64 inch when measured with a 3 foot straight edge. The ends of the rails shall be sawed perpendicular to the horizontal axis. A variation not to exceed 1/32 of an inch will be permitted for perpendicularity. Rough burs shall be removed and rails shall be straight in line and surface when removed from the gauging beds.

6.8.3.9 Branding

The name of the maker, the month and year of manufacture, the rail classification, the number of the heat, the weight of the rail and letters to indicate the process of manufacture shall be stamped or rolled on the web of each rail.

6.8.3.10 Marking

Number 1 rails of shorter than standard length and all

Number 2 rails shall be distinguished from standard length Number 1 rails. Eight inches from each end of each short length Number 1 rail a green stripe shall be painted, two inches in width. Each Number 2 rail shall be similarly designated with a two inch wide stripe of white paint. Standard length Number 1 rails shall not be painted.

6.8.3.11 Electrical Tests

Electrical resistance tests shall be performed on at least two rails, one from the beginning and one from the end, of each heat. These tests shall be performed by and at the expense of the Contractor. The average of the tests from each heat shall constitute the resistance of all rails of that heat. The Contractor shall provide all necessary test # instruments and sufficient storage battery capacity and perform continuous current tests at 300 amperes. #

Resistance readings across the rails shall be made using instruments capable of measuring micro-ohms. All instruments shall have an accuracy of 1/2% of full scale reading and shall be calibrated and certified prior to the start of the tests.

The Contractor shall provide facilities for weighing all rails which are subjected to electrical tests. These facilities shall be such that accurate weights may be obtained with permissive error of not more than 0.5 percent. Weights shall be taken to the nearest pound and lengths to the nearest sixteenth of an inch and the average cross section of each rail determined, using 0.28375 pound per cubic inch as the density of steel. From the resistance and cross sectional area of each rail tested, its resistivity shall be computed per unit length and compared with the resistivity of pure copper (International Annealed Copper Standard) of equal cross section and length and at the corresponding temperature.

All tests shall be conducted at the place of manufacture. Six (6) certified copies of all test data and results shall be submitted to the Engineer for approval within one week after completion of each test. Test data shall include the type of instruments used as well as certified calibration and accuracy of each instrument.

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6.8.4 INSULATORS

Contact rail support insulators shall consist of wet or dry process porcelain conforming to the electrical and mechanical requirements specified herein. All insulators supplied shall be of the same material. The insulator shall be furnished to support the contact rail on various types of track structure as shown on the contract drawings.

All dimensional data for insulators shall be as shown on the contract drawings. The maximum dimension between the top and bottom faces of any type insulator shall not vary more than plus or minus 3/32 of an inch. Diameters of holes shall not vary from the dimensions specified on the contract drawings by more than plus or minus 1/16 of an inch. Other dimensions shall not vary more than plus or minus 1-1/2 percent.

Alternate insulator assembly design shall maintain the dimensional requirements of the contact rail system, as shown on the contract drawings. The alternate insulators shall meet all the requirements of these specifications.

6.8.4.1 Porcelain Insulators

Wet process porcelain insulators shall conform to the requirements of ANSI Standard C29.5, "Wet-Process Porcelain Insulators (Low and Medium Voltage Pin Type)." Dry process porcelain insulators shall conform to the requirements specified herein.

6.8.4.1.1 Quality of Material

Insulators shall be symmetrical, and not warped and shall be of close grained, homogeneous, non-absorbent porcelain. Insulators shall be free from cracks, flaws, voids, air pockets, laminations, metallic substances or any other defects which would render them unsuitable for the service for which they are intended.

6.8.4.1.2 Glazing

Glazing shall be colored and shall be of a reasonably uniform shade. Glazing shall be of a smooth, hard, firmly adherent coating of uniform thickness, free from checks or bubbles which entend completely through the glaze, and shall be continuous over all surfaces except as shown on the contract drawings. Glazing shall be impervious to moisture and unaffected by weather, acid, alkali, dust or sudden changes in temperature over the atmospheric range. The insulator glazing shall have the same thermal expansion properties as the porcelain body. The Authority will select the glazing color from a suitable range of samples requested by the Authority and submitted by the Contractor.

6.8.4.1.3 Electrical Characteristics

Insulators shall be rated for a service voltage of 700 volts direct current. The minimum creepage distance over the external surface of the insulator from the contact rail or from any energized metal component to ground or to the insulator fasteners shall be eight (8) inches. The insulator shall have a dry withstand test voltage of 30 KV, 60 hertz for one minute and a wet withstand test voltage of 20 kV, 60 hertz for ten seconds.

Test shall be made in accordance with the requirements of ANSI Standard C29.1, "Test Methods for Electrical Power Insulators".

6.8.4.1.4 Resistance Test

A test shall be performed on two percent of each lot of 500 insulators, randomly selected, to determine the insulation resistance after 72 hours of immersion in water at room temperature. With all surfaces carefully dried, the insulator shall have a resistance of not less than 8 megohms. Good contacts shall be provided for this test by use of a wet clay pad on the top and bottom, half filling the bottom pin hole. The resistance shall be measured by a 1000 Volt direct current megohmeter or other method approved by the Engineer. If any insulator fails to meet the resistance test, the entire lot of insulators shall be rejected.

6.8.4.1.5 Flashover

Each insulator shall be subjected to a routine flashover test in accordance with the requirements of ANSI Standard C29.1, Section 7.1. All insulators that puncture under test fail to meet the requirements of this specification and shall be rejected.

6.8.4.1.6 Mechanical Test

A minimum of one (1) percent of the insulators from each kiln of 500 insulators fired shall be selected at random by the Engineer and tested as follows for mechanical strength. This test shall be conducted at no additional cost to the Authority.

An oak block with the insulator centering cup attached shall be mounted on a rigid foundation, in a manner similar to service conditions. The insulator shall be placed directly on the centering cup. A suitable malleable iron cap shall be placed on top of the insulator and a disc of hardened steel 1/2 inch thick of the same diameter shall be riveted to the malleable iron cap. Between the insulator and the cap a lead disc 1/4 inch thick or a canvas pad

1/16 inch thick shall be placed. The insulators shall be subjected to 10 blows of a 15 pound spherical iron weight dropped from a height of 36 inches. If 50 percent or more of the insulators tested are cracked or fractured during the test, the entire kiln-lot represented by the samples shall be rejected. Insulators used as test specimens will not be accepted as part of the order.

6.8.4.1.7 Porosity Test

Ten specimens shall be selected at random from insulators destroyed in other tests and tested in accordance with the requirements of ANSI Standard C29.1, Section 5.4. Penetration of the dye into the body of the dielectric shall constitute failure of the entire lot represented by that specimen to meet the requirements of this specification and all insulators represented in that lot shall be rejected.

6.8.4.1.8 Rejection

All insulators which have been chipped or otherwise damaged or do not meet all test requirements, as specified above, shall be rejected.

6.8.4.1.9 Marking

All insulators shall be marked on the underside with the model number and identification of the manufacturer.

6.8.4.2 Color

The Authority will select the insulator color from a suitable range of samples requested by the Authority and submitted by the Contractor.

6.8.5 CONTACT RAIL APPURTENANCES

Contact rail appurtenances shall include, but not be limited to, anchors, end approaches, and expansion joints. All components shall be manufactured in accordance with the requirements of the contract drawings and these specifications.

6.8.5.1 Anchors

Contact rail anchor strain insulators shall be as shown on the contract drawings and as specified herein. Anchor base plate, clevis ends, and clamps shall be as shown on the contract drawings and as specified herein under

"Cast Parts". Hardware components shall be as shown on the contract drawings and as specified herein under "Hardware".

6.8.5.1.1 Strain Insulator Material

Anchor strain insulators shall be made of reinforced plastic, composed of glass fibers uniformly impregnated with thermosetting type polyester. The resultant mixture shall consist of not less than sixty percent (60%) nor more than sixty-five percent (65%) glass fibers and not more than forty percent (40%) nor less than thirty-five percent (35%) polyester. The strain insulator rod shall be welded and cured to provide a smooth, weatherproof exterior surface, maintaining all glass fibers completely embedded in the plastic matrix.

6.8.5.1.2 Physical Testing

One percent of the strain insulator rods from each lot, of the dimensions shown on the contract drawings, shall be subjected to the following physical tests. Failure of an insulator rod to meet the requirements specified herein shall cause rejection of the entire lot represented by that specimen.

Each strain insulator rod shall have a minimum tensile strength of 60,000 pounds per square inch when tested within a temperature range of $0^{\circ}F$ to $100^{\circ}F$ in accordance with ASTM Designation D638 "Tensile Properties of Plastics".

An impact resistance test shall be performed to prove the rigidity of the glass fiber reinforced plastic material when impacted by a fifty (50) pound weight falling freely from successive heights of four (4), eight (8) and twelve (12) inches. The strain insulator rod, 5/8" in diameter, 22-1/4 inches long shall be mounted and supported as a simple beam of twenty-one inches (21") free span, with the impact occuring at mid-span. Such determinations shall be made at $0^{\circ}F$ and $70^{\circ}F$ in accordance with ASTM Designation D256 "Impact Resistance of Plastics and Electrical Insulating Materials".

A water absorption test shall be performed in accordance with ASTM Designation D570 "Water Absorption of Plastics". Samples shall be immersed in water at a temperature between $68^{\circ}F$ and $104^{\circ}F$ for 48 hours. Total weight gained shall not exceed 0.15 percent of its original weight.

6.8.5.1.3 Electrical Testing

Strain insulator rods shall be subjected to the following electrical tests:

Following the water absorption test as specified herein under "Physical Testing", one eight (8) inch length of 5/8" diameter strain insulator rod shall undergo a dc resistance test. The rod shall show a resistance of not less than eight (8) megohms, measured between the end surfaces of the rod.

A dielectric test shall be performed on the same rod used in the resistance test. The strain insulator rod shall be capable of withstanding an ac potential of 15,000 volts, 60 hertz, applied to the rod surface for three (3) minutes without insulator breakdown or damage.

6.8.5.1.4 Assembly

Glass fiber reinforced strain insulator rods shall be assembled to the clevis ends using a resin compound or a similar approved adhesive. After curing for 24 hours, the assembled insulator shall develop a tensile strength of eighty-five (85) percent of the insulator rod as specified herein under "Physical Testing". All assemblies shall be proof-tested to 15,000 Lbs.

6.8.5.2 Cast Parts

Cast parts for the contact rail assembly, including but not limited to insulator seats, caps, anchor base plates, clevis ends, end approaches and explansion joints shall be manufactured in accordance with the contract drawings and as specified herein.

6.8.5.2.1 Medium Steel Castings

All steel for casting shall be medium steel made by the open-hearth, basic oxygen or electric furnace process. Medium steel casting shall conform to the requirements of ASTM Designation A27, "Mild-To-Medium-Strength Carbon Steel Castings", grade 65-35. All castings shall be heat treated by full annealing which provides for the castings to be heated to a temperature above the transformation range and, after being held for a proper time at this temperature, cooled slowly and uniformly in the furnace.

Castings shall then be tempered by uniformly reheating to a temperature below the transformation range to refine the

grain, and allowed to cool uniformly in the furnace. Steel castings shall be free from injurious defects such as cracks, machining flaws, porosity or excessive shrinkage and shall be finished to a true and homogeneous surface where required. Grinding shall be permitted to assure the fit specified or required.

6.8.5.2.2 Malleable Iron Castings

All parts to be cast from malleable iron, including anchor clevis ends and rail clamps shall be made in accordance with the requirements of ASTM Designation A47, "Malleable Iron Castings".

Test specimens shall be cast, attached to the casting and must be broken off by the Engineer. All castings shall be free from cracks, flaws, blemishes, scale, or any other defect that would be detrimental to the service for which they are intended. The finish surface shall be smooth and shall accurately fit all adjoining parts. Grinding will be permitted to assure the fit specified or required.

6.8.5.2.3 Gray Iron Castings (Cast Iron)

All end approaches shall be made of cast iron. Physical properties of the test requirements for gray iron castings shall conform to the requirements of ASTM Designation A48, "Gray Iron Castings", Class 40C. Test bars shall be separate castings poured from the same iron as the castings they represent. All castings shall be free from injurious defects including cracks, cold shuts and blow holes.

Surface of the castings shall be free from fused-on-sand, and smooth. Runners, risers, fins and other cast-on pieces shall be removed. Where necessary, the castings shall be ground by the manufacturer to assure that they accurately fit all adjoining parts and that the fit specified or required is met, as determined by the Engineer.

6.8.5.3 Rolled Steel Parts

All rolled steel parts used in connection with appurtenances for the contact rail shall be made by the open-hearth, basic oxygen or electric furnace process and shall conform to the requirements of ASTM Designation A36, "Structural Steel", ASTM Designation A283, "Low and Intermediate Tensile Strength Carbon Steel Plates of Structural Quality", and ASTM Designation A306, "Carbon Steel Bars Subject to Mechanical Property Requirements". Finished rolled material shall be free from cracks, flaws, seams blisters, ragged or imperfect edges, and other surface

defects. The finished material shall have a surface roughness range from 32 microinches to 125 microinches in accordance with ANSI Standard B46.1, "Surface Texture".

6.8.5.4 Tolerances for Fits

Tolerances for fits shall be in accordance with ANSI Standard B4.1, "Preferred Limits and Fits for Cylindrical Parts".

6.8.6 NUTS, BOLTS, AND MISCELLANEOUS HARDWARE

All nuts, bolts, and flat washers shall be manufactured in accordance with ASTM Designation A325, "High Strength Bolts for Structural Steel Joints, Including Suitable Nuts and Plain Hardened Washers". The minimum percentage of carbon shall be 0.15, except that for medium carbon nuts, the carbon percentage shall be not less than 0.04 nor more than 0.55.

The dimensional data and type hardware for all nuts, bolts and miscellaneous parts shall be as shown on the contract drawings. All steel bolts, nuts, screws and washers shall be galvanized as specified herein under, "Galvanizing".

Spring washers shall be manufactured in accordance with the requirements of ANSI Standard B27.1, "Lock Washers".

Neoprene washers shall be in accordance with the requirements of ASTM Designation D2000, "Elastomeric Material for Automotive Applications," Type, Class and Number BC 415, Grade Number 1.

Plain brass washers shall conform to the requirements of ASTM Designation B36, "Brass Plate, Sheet, Strip and Rolled Bar".

Cotter pins, where indicated on the contract drawings, shall conform to the requirements of ASTM Designation B134, "Brass Wire", for materials and to the requirements of ANSI Standard B5.20, "Machine Pins".

Eye bolts shall conform to the requirements of ASTM Designation A489, "Carbon Steel Eyebolts", except for the length which shall be as shown on the contract drawings.

Steel drive spikes for fastening insulator seats and anchor brackets to timber ties shall conform to the current AREA "Specifications for Steel Drive Spikes". The spikes for the insulator seats shall conform to AREA Plan 3M-63 and shall be six (6) inches in length and 1/2 inch in

diameter. Spikes for anchor bracket shall conform to AREA Plan 2M-63 and shall be six (6) inches in length and 3/4 inches in diameter. Drive spikes shall be galvanized as specified herein under "Galvanizing".

Polycarbonate plastic fasteners shall conform to the requirements of ASTM Designation D2473, "Polycarbonate Plastic Molding Extension, and Casting Materials".

6.8.7 GALVANIZING

All parts to be galvanized shall be galvanized after manufacture. Unless otherwise specified, parts to be galvanized shall be coated in accordance with the requirements of ASTM Designation A123, "Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strips," with not less than two (2) ounces of zinc per square foot of galvanized surface.

Bolts, drive spikes, and nuts to be galvanized, as shown on the contract drawings or as specified herein, shall be coated in accordance with ASTM Designation A153, "Zinc Coating (Hot Dip) or Iron and Steel Hardware," with not less than one and one-quarter (1-1/4) ounces of zinc per square foot of galvanized surface. An alternate method of galvanizing shall be in accordance with Type GS, ASTM Designation A164, "Electro-deposited Coatings of Zinc on Steel".

Before galvanizing, the finished parts shall be pickled, and the scale and adhering impurities thoroughly removed. The pickling shall be done in properly diluted sulfuric acid, after which the parts shall be thoroughly cleaned in cold running water. The parts shall then be immersed in a solution of either zinc chloride or hydrochloric acid. Immediately following thorough drying, the parts shall be dipped into the zinc bath before corrosion has again started.

6.8.8 CONTACT RAIL PROTECTION EQUIPMENT

The contact rail protection equipment shall be designed, fabricated and tested by the Contractor in accordance with the requirements shown on the contract drawings and these specifications.

The assembled protection equipment system shall be designed to facilitate ready removal and replacement of the protection cover without disassembly of the support brackets.

6.8.8.1 Protection Cover

The contact rail protection cover shall be designed to protect personnel from accidental contact with the contact rail assembly; permit the unimpaired passage of the current collector mounted on the vehicle; and resist sagging under its own weight, external loads from wind, air turbulance, ice, and snow.

6.8.8.1.1 Geometry

The geometric configuration of the protection cover shall be as shown on the contract drawings. Deviations from the geometric configuration shown on the contract drawings will be considered and shall be submitted to the Engineer for approval; however, the basic geometry of the cover shall be curved or chorded and the cover shall not be an integral part of the support bracket. The protection cover shall provide clearances from the contact rail equal to or ## greater than those shown on the contract drawings and shall lie within the specified clearance envelope as shown on the contract drawings. The ## assembled tandem protection cover system shall present a continuous homogeneous appearance with gaps at the support bracket not to exceed 1/16 inch between adjoining sections of protection cover.

6.8.8.1.2 Material

The contact rail protection cover shall be manufactured of glass reinforced resin, or a composite non-conductive # reinforced material having a plastic coating. The outer surfaces of the protective cover shall be coated with 3 mils of a polyvinyl fluoride film such as Tedlar, or approved equal. #

Materials used in the manufacturing of the cover shall not separate or warp under service conditions during an expected life period of 30 years. The chlorine content of the material used shall not exceed an amount which will emit more than 10 parts per million of chlorine into the surrounding atmosphere when tested in accordance with Section 6.8.8.3.4 of these specifications. The material shall be rated Class A incombustible with a tunnel flame spread rating not to exceed 25. The Contractor shall submit detailed engineering data on all materials used in the protection cover and fabrication details for the Engineer's approval.

6.8.8.1.3 Color

The color of the protection cover will be selected from a suitable range of samples requested and submitted to the Authority by the Contractor.

6.8.8.1.4 Voltage Classification

Material used for the protection cover shall be designed and tested to withstand a 10,000 Volt dc potential stress between any location on the inside and a ground placed on the outside of the cover. The dc test probe shall be a minimum of 1 square inch in area and applied for a minimum of 1 minute.

6.8.8.1.5 Mechanical Properties

The protective cover shall be designed to provide, in its installed position, protection from electrical hazard and shall meet the tests requirements specified herein.

6.8.8.2 Protection Cover Support Brackets

The protection cover support brackets shall be designed by the Contractor in accordance with the dimensions shown on the contract drawings and shall lie within the specified clearance envelope as shown on the contract drawings. # #

The support brackets will clamp directly to the contact rail.

6.8.8.2.1 Geometry

The protection cover support brackets shall have a contour compatible with the configuration of the protection cover. The support brackets shall maintain the dimensional clearances as shown on the contract drawings.

6.8.8.2.2 Material

The support brackets shall be manufactured in accordance with the requirements of Section 6.8.8.1.2 "Material", of these specifications.

Bare metallic brackets or metallic brackets coated with a non-conductive film will not be considered.

6.8.8.2.3 Mechanical Properties

The support brackets shall be designed to support a maximum 5 foot length of protective cover in installed positions. The brackets shall also be designed to meet the requirements of Section 6.8.8.1.5, "Mechanical Properties" of these specifications.

6.8.8.3 Physical Testing

The protective cover and support brackets shall meet the following minimum requirements as determined by the tests specified herein. Where the listed standards do not specify conditioning and sampling procedures, conditioning shall be at room temperature and a test set shall consist of 5 specimens from each lot of 500. Unless otherwise specified, failure of one test specimen from a test set shall constitute repeating of that test on five additional samples selected at random.

Should one of the additional test specimens fail, the entire lot represented by that sample shall be rejected. The tests shall be performed at the Contractor's expense by a qualified independent testing laboratory approved by the Engineer.

6.8.8.3.1 Mechanical Load Test

Five pieces of protective cover, 10 feet in length, of each 1000 pieces shall each be subjected to the following tests: #

The protective cover shall be mounted in a manner as proposed for installation on the system, and a 250 pound weight with a bottom surface not larger than one-half (1/2) square foot (6" x 12") shall be placed at any point on the coverboard assembly. The weight shall be left in place for thirty (30) seconds and then removed for sixty (60) seconds. This cycle shall be repeated fifty (50) times. # After this test, a drop test shall be performed by dropping a 250-pound weight from a height of 18 inches above the coverboard onto an area of the coverboard centered on the contact rail and directly over a coverboard bracket. The drop test shall then be repeated once by dropping a 250-pound weight from a height on 18 inches above the coverboard onto an area of the coverboard midway between two adjacent support brackets. The 250-pound weight used for the drop tests shall have a bottom surface not larger than 12 by 24 inches. During these tests, the maximum permissible deflection shall be 1-1/2 inches at the centerline of the contact rail. After the 50-cycle test and the drop tests, the protective cover assembly shall be inspected and shall show no splits, cracks, or breaks. The protective cover and protective cover assembly outlines shall still lie within the specified clearance envelope as shown on the contract drawings, without permanent deformation of more than 1/8 inch. The physical dimensions of the weights shall be submitted to the Engineer for approval prior to testing. #

The high potential test on the cover shall be repeated and shall show no change to the properties as specified herein under "Voltage Classification". Should one protective cover fail any of the tests, ten additional cover sections shall be chosen at random and tested. If any of the additional pieces fail, the entire lot shall be rejected.

6.8.8.3.2 Water Absorption Test

Material used in the manufacture of the protective cover and support bracket shall conform to the requirements of ASTM Designation D570, "Test for Water Absorption of Plastics". The maximum rate of water absorption shall not exceed 0.50 percent in 24 hours.

Testing samples shall be moulded from the cover and bracket mixes for each lot of 500 pieces. Sampling procedures and conditioning shall be as specified in the listed ASTM Standard Method.

6.8.8.3.3 Dielectric Strength Test

The dielectric strength test shall conform to the requirements of ASTM Designation D149, "Test for Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies". The test method shall be the short time test. The dielectric strength shall not be less than 250 volts per mil. #

6.8.8.3.4 Fire Resistance Test

The fire resistance test shall conform to the requirements of ASTM Designation D229, "Testing Rigid Sheet and Plate Material used for Electrical Resistance," Paragraph 48 through 50. The maximum burning time of the specimen shall be 10 seconds.

6.8.8.4 Longevity Testing

The contact rail protection cover shall be designed for exterior use with a life expectancy of 30 years. This design requirement is intended only to illustrate the standard of design, workmanship and materials. It is not intended, thereby, that the Contractor extend the guarantee beyond the period contained in Section 2, Special Conditions, nor is it to be construed as imposing a warranty on the supplier.

Immediately after award of the contract, the supplier shall mould ten samples of the protection cover material to perform the tests specified herein. Conditioning, unless otherwise specified in the appropriate standard, shall be at room temperature. Certified test results shall be submitted to the Engineer for approval.

6.8.8.4.1 Weatherometer Test

Test specimens shall be subjected to a weatherometer test in accordance with the requirements of ASTM Designation G23, "Recommended Practice for Operating Light and Water Exposure Apparatus (carbon arc type) for Exposure of Non-Metallic Materials". The elapsed exposure shall be 150 consecutive days.

6.8.8.4.2 Dielectric Strength Test

At the completion of the weatherometer test, the test specimens shall be subjected to, and shall satisfactorily withstand the "Dielectric Strength Test", as specified in Section 6.8.8.3.3.

6.8.8.4.3 Izod Impact Strength Test

Following completion of the dielectric strength test, each specimen shall be subjected to an izod impact strength

test in accordance with the requirements of ASTM Designation D256, "Test for Impact Resistance of Plastics and Electrical Insulating Materials". The average izod impact strength shall be 4 foot-pound inch notch.

6.8.8.5 Fasteners

Polycarbonate plastic fasteners shall meet the requirements of Section 6.8.6, "Nuts, Bolts, and Miscellaneous Hardware," of these specifications.

6.8.8.6 Cable Access Through Protection Cover

At the expansion joint locations, the protection cover shall be cut to provide for jumper cable connections to the contact rail as shown on the contract drawings. The cut shall not exceed 6-5/8" in height, measured from the base of the protection cover.

Cable access through the protection cover for other cable connections may be permitted by the Engineer in the interest of cable installation and connection. No cable access opening in the protection cover shall exceed 12 inches wide by 5 inches high, the height being measured from the base of the cover, for each cable access. Cable access opening shall be made with a router and template. Inside corners shall have a minimum radius of one and one half (1 1/2) inches.

6.8.9 ELECTRICAL CABLE AND CONNECTIONS

The following electrical cables and connections shall be included in this contract:

All expansion joint jumper cables and connections as shown on the contract drawings.

All connections to contact rail from feeder cables, transition, crossover and other special trackwork jumper cables, including copper splice bars with hardware, insulating splice cover with accessories, and extra flexible 1000 MCM cable as shown on the contract drawings.

Feeder cables from substations and tie breaker stations to the locations indicated on the contract drawings will be furnished and installed by others. All conduit will be furnished and installed by others.

6.8.9.1 Extra Flexible Cable

Extra-flexible cable shall be single conductor - 1000 MCM Class G (427 Strand) annealed coated copper, with 0.125 inch ethylene propylene rubber insulation, rated 90°C, and 0.065 inch heavy duty black neoprene jacket, for 1000 Volt dc service. Cable shall be manufactured and tested in accordance with the requirements of the Insulated Power Cable

Engineers Association Standard S-19-81, "Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy", and in particular, Section 3.16 "90C Synthetic Rubber". Two (2) certified copies of all test reports shall be submitted to the Engineer within seven (7) days after completion of the tests.

6.8.9.2 Standard Duty Cable

Standard duty cable shall be single conductor, 1000 MCM Class D (127 Strand) annealed copper, with 0.130 inch non-carbon filled cross-linked polyethylene insulation, rated 90°C, for 1000 volts dc service.

The use of ethylene propylene insulation, as a substitute for cross-linked polyethylene, will be considered, provided the material meets or surpasses the requirements of this section.

6.8.9.3 Standards and Tests

Except as otherwise noted herein, standard duty cable shall be manufactured and tested in accordance with the requirements of IPCEA Standard S-66-524, "Cross linked Thermosetting Polyethylene Insulated Wire and Cable." Standard duty cable consisting of insulation made of ethylene propylene shall be manufactured and tested in accordance with the requirements of IPCEA Standard S-19-81, "Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy", and in particular, Section 3.16, "90C Synthetic Rubber". Two certified copies of all tests reports shall be submitted to the Engineer within seven (7) days after completion of the tests.

6.8.9.4 Connector Materials and Accessories

6.8.9.4.1 Copper Bus and Hardware

Copper bus used for connections shall be hard drawn copper with a conductivity of at least 98% of the International Annealed Copper Standard at 20°C. Bus connections shall be in accordance with the requirements of National Electrical Manufacturers Association Standard SG-1, "Electrical Power Connectors", for the cables connected. Hardware used for joining copper bus shall be high strength silicon bronze, corrosion resistant, non-magnetic, and free from electrolytic action when in contact with the copper bus.

6.8.9.4.2 Cable Connectors

All cable connectors except those used for connection of cables to the contact rail shall be compression connectors.

The compression connectors shall be 98% pure copper with four (4) hole tongues and necessary silicon bronze flat washers, lock washers, nuts and bolts. Tongues shall be not less than 9/16 inch thick and drilled for 1/2 bolts on one and three quarter (1-3/4) inch centers, Thomas and Betts No. 266-30490-117 or approved equal.

Cable connections to the contact rail shall be made by an exothermic welding system as specified in Section 6.14 "Exothermic Connections".

6.8.9.4.3 Insulating Covers and Accessories

Insulating covers shall be moulded glass-reinforced high impact epoxy, orange colored, not less than 0.215 inches thick, two piece, with neoprene gaskets, and self-locking fasteners. Cable sleeves shall be foam rubber. Complete assembly shall be water-tight. Entire assembly with exception of cable sleeves shall be capable of being readily disassembled.

6.8.10 MEASUREMENT AND PAYMENT

6.8.10.1 The contact rail furnished for the Huntington and New Carrollton Routes will be measured by the linear foot, for tangent and curved track constructed in place. The measurement will be taken on the centerline of the contact rail excluding gaps and end approaches to the nearest one half (1/2) foot.

Payment will be made for the quantities as above determined at the unit price per linear foot listed in the Unit Price Schedule for:

CONTACT RAIL, FURNISH

Initial payment will be 100 percent of the invoice cost of the rail when delivered and stockpiled at locations approved by the Engineer. Initial payment may be made with the approval of the Engineer for rail delivered and stockpiled at an off-site storage area. Final payment will be at the contract unit price less the amount of the initial payment.

Measurement and payment for the installation of the contact rail for the Huntington and New Carrollton Routes will be as specified in Section 6.14. There will be no separate measurement or payment for the itemized contact rail appurtenances specified in this section. All costs for design, fabrication, testing, furnishing, and delivering contact rail appurtenances will be included in the price for installation of contact rail appurtenances as specified in Section 6.14.

IZ4082
Revised Am: 2
Reissued Am:5

##

(Not Used)

##

6.8.10.2 End Approach

There will be no separate measurement and payment for end approaches for the Huntington and New Carrollton Routes in this section.

All costs for design fabrication, testing, furnishing, and delivering end approaches will be included in the price for installation of contact rail appurtenances as specified in Section 6.14.

##

(Not Used)

##

6.8.10.3 Expansion Joints

There will be no separate measurement and payment for the itemized expansion joints designated for Huntington and New Carrollton Routes.

All costs involved in the design, fabrication, testing, furnishing and delivering of expansion joints designated for the Huntington and New Carrollton Routes will be considered as included in the Contract Unit Prices for installation of expansion joints.

##

(Not Used)

##

(Not Used)

##

6.8.10.4 Anchors

There will be no separate measurement and payment for anchors designated for Huntington and New Carrollton Routes.

All costs involved in the design, fabrication, testing, furnishing and delivering of anchors designated for the Huntington and New Carrollton Routes will be considered as included in the Contract Unit Prices for installation of anchors.

##

(Not Used)

##

6.14.7.5 Insulators

There will be no separate measurement and payment for the insulators designated for Huntington and New Carrollton Routes.

All costs involved in the design, fabrication, testing, furnishing and delivering of insulators designated for the Huntington and New Carrollton Routes will be considered as included in the Contract Unit Prices for installation of insulators.

##

(Not Used)

##

##

##

6.8.10.6 Electric Cable - Standard Duty

There will be no separate measurement and payment for standard duty electric cable designated for Huntington and New Carrollton Routes.

All costs involved in furnishing and delivering standard duty electric cable designated for the Huntington and New Carrollton Routes will be considered as included in the Contract Unit Prices for installation of electric cable-standard duty.

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6.8.10.7 Cable Connections

There will no separate measurement and payment for cable connections designated for Huntington and New Carrollton Routes.

All costs involved in furnishing and delivering cable connections designated for the Huntington and New Carrollton Routes will be considered as included in the Contract Unit Prices for installation of cable connections.

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6.8.10.8 Protection Cover and Support Brackets

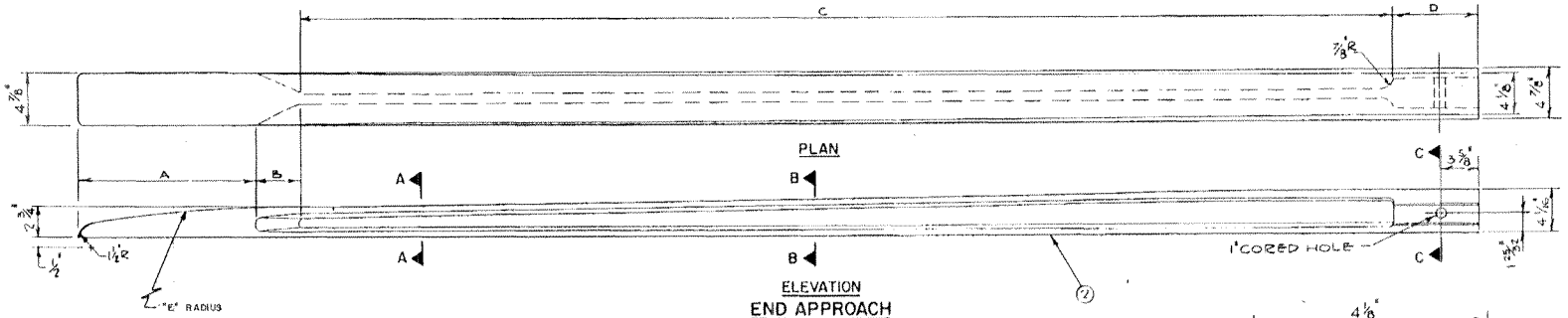
There will be no separate measurement and payment for protection covers and support brackets designated for the Huntington and New Carrollton Routes.

All costs involved in furnishing and delivering protection covers and support brackets designated for the Huntington and New Carrollton Routes will be considered as included in the Contract Unit Prices for installation of protection cover and support bracket.

##

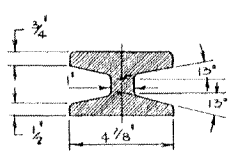
(Not Used)

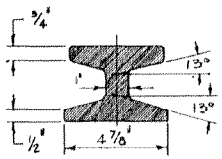
##

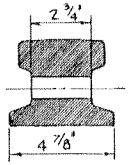


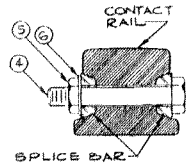
BILL OF MATERIAL
DESCRIPTION-FURNISHED BY OTHERS

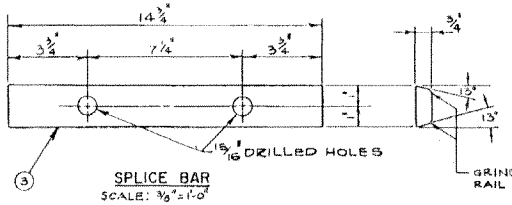
ITEM NO.	FOR 1 END APPROACH	MATERIAL	QTY
1	CONTACT RAIL	STEEL	AR
2	END APPROACH	GRAY IRON CASTING	1
3	SPLICE BAR	STEEL	2
4	BOLT, MACHINE, 7/8" X 6 1/2" LG	GALVANIZED STEEL	2
5	NUT, HEX, 7/8"	GALVANIZED STEEL	2
6	WASHER, LOCK, 7/8"	GALVANIZED STEEL	2

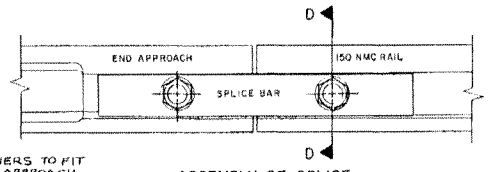


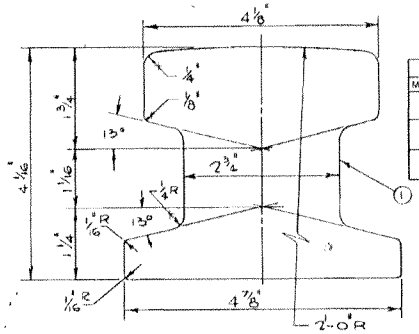












CONTACT RAIL DIMENSIONS

MEASUREMENT	MAXIMUM	NOMINAL	MINIMUM
HEIGHT	4 9/32"	4 1/16"	4 3/64"
WIDTH OF BASE	4 15/16"	4 7/8"	4 13/16"
WIDTH OF HEAD	4 3/16"	4 1/8"	4 1/16"

END APPROACH DIMENSIONS

TYPE	A	B	C	D	E
11'-0" END APPROACH	1'-6"	4"	7'-10"	1'-4"	10'-0"
5'-6" END APPROACH	8"	4"	3'-10"	8"	3'-4"
3'-0" END APPROACH	1'-4"	3 1/2"	9 1/4"	r1/4"	*

*NO RADIUS, SLOPE IS FLAT & TANGENT TO 1 1/2" RADIUS.

DESIGNED	TINKHAM	11-9-70 DATE
DRAWN	TINKHAM	11-10-70 DATE
CHECKED		11-23-70 DATE
APPROVED		11/23/70 DATE

REFERENCE DRAWINGS

NUMBER	DESCRIPTION
TW6-CR-12	MISCELLANEOUS INSTALLATION DETAILS

REVISIONS

DATE	BY	DESCRIPTION

STATE OF MARYLAND — DONALD F. KLEPPINGER — PROFESSIONAL ENGINEER

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

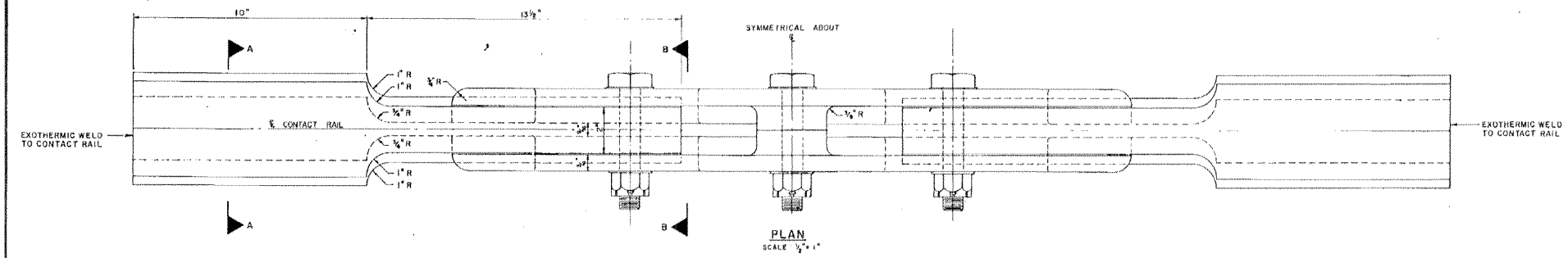
DE LEUW CATHER & COMPANY
SECTION DESIGNER
SUBMITTED Donald F. Kleppinger

DE LEUW, CATHER & COMPANY
GENERAL ENGINEERING CONSULTANT ■
HARRY WEESE & ASSOCIATES
GENERAL ARCHITECTURAL CONSULTANT □
APPROVED Donald F. Kleppinger

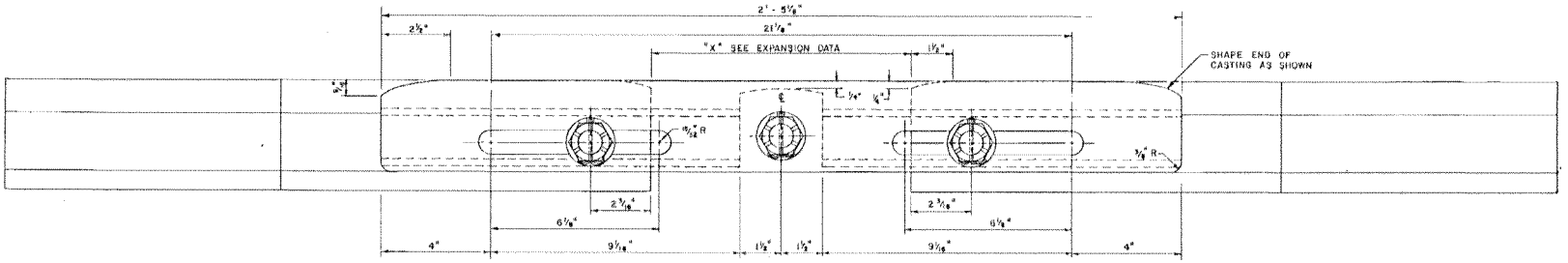
CONTACT RAIL
END APPROACH & SPLICE BAR FOR 150 NMC STEEL RAIL

SCALE: AS NOTED
DRAWING NO.: TW6 - CR - 6
M392-118

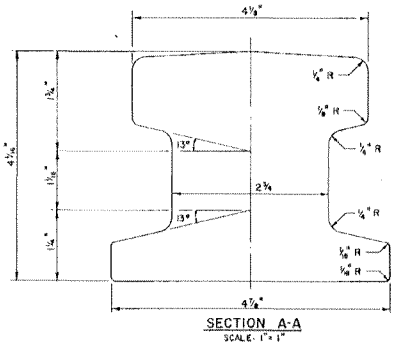
"WMAT098869"



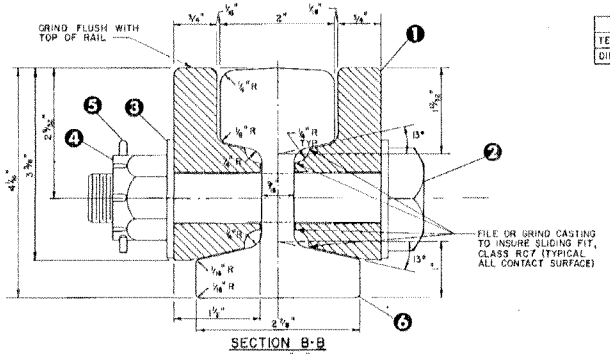
PLAN
SCALE ½" = 1"



ELEVATION
SCALE ½" = 1"



SECTION A-A
SCALE 1" = 1"



SECTION B-B
SCALE 1" = 1"

EXPANSION DATA (SEE NOTE 1)

TEMP. OF RAILS - F°	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
DIMENSION "X"	16 3/16"	15 5/16"	15 5/16"	14 1/4"	13 3/8"	12 5/8"	11 15/16"	11"	10 3/16"	9 3/8"	8 7/16"	7 3/4"	6 15/16"	6 1/8"	5 5/16"	4 1/2"

EXPANSION JOINT

BILL OF MATERIAL
DESCRIPTION-FURNISHED BY OTHERS

ITEM NO.	QTY.	DESCRIPTION
1	2	EXPANSION JOINT BAR (STEEL OR MALLEABLE IRON)
2	3	BOLT 7/8" X 5 1/4" LG.
3	6	FLAT WASHER FOR 7/8" Ø BOLT
4	3	CASTLE HEX NUT FOR 7/8" Ø BOLT
5	3	COTTER PIN 1/8" X 1-3/4" LG.
6	2	COMPROMISE RAIL (STEEL, GRADE 70 40)

NOTE:
1. TOLERANCES ± 1/4" F, ± 1/8"

DESIGNED UBALDI 2/22/77 DATE
DRAWN DERR 4/18/77 DATE
CHECKED [signature] 11-23-77 DATE
APPROVED [signature] 11/22/77 DATE

REFERENCE DRAWINGS

NUMBER	DESCRIPTION

REVISIONS

DATE	BY	DESCRIPTION

STATE OF MARYLAND — DONALD F. KLEPPINGER — REGISTERED PROFESSIONAL ENGINEER

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

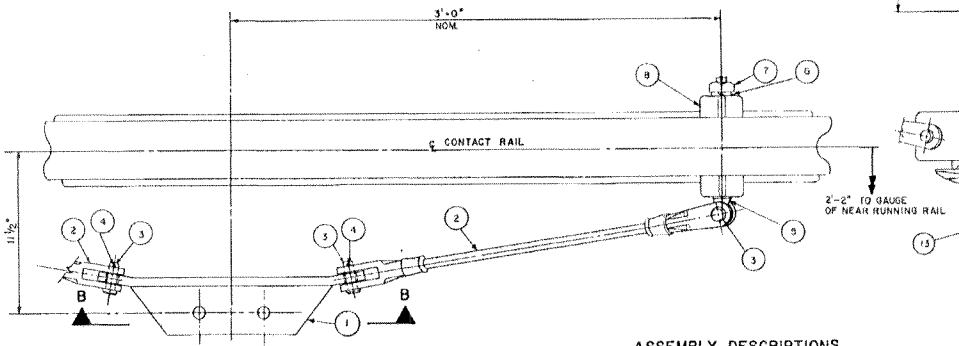
DE LEUW, CATHER & COMPANY
SECTION DESIGNER
Donald F. Kleppinger
SUBMITTED

DE LEUW, CATHER & COMPANY
GENERAL ENGINEERING CONSULTANT ■
HARRY WEESE & ASSOCIATES
GENERAL ARCHITECTURAL CONSULTANT □
APPROVED Donald F. Kleppinger

CONTACT RAIL
EXPANSION JOINT
FOR 150 NMC STEEL RAIL

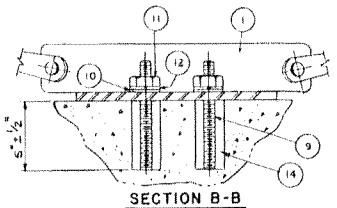
SCALE: AS NOTED
DRAWING NO.: TW6-CR-7
M392-119

"WMAT098990"

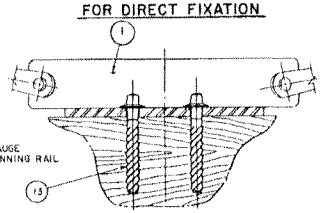


(MOUNTING TO TIMBER TIE & DIRECT FIXATION)

PLAN OF ASSEMBLY ARRANGEMENT



SECTION B-B
FOR DIRECT FIXATION



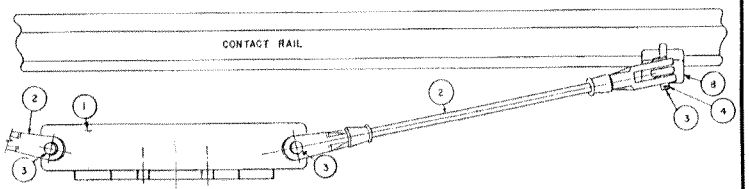
SECTION B-B
(FOR TIMBER TIE)

ASSEMBLY DESCRIPTIONS

ASSEMBLY NO 1-CONTACT RAIL ANCHOR FOR TIMBER TIE
ASSEMBLY NO. 2-CONTACT RAIL ANCHOR FOR DIRECT FIXATION

ANCHOR ASSEMBLY
BILL OF MATERIAL

QUANTITY ASS'Y-1	QUANTITY ASS'Y-2	ITEM NO.	DESCRIPTION-FURNISHED BY OTHERS
1	1	1	BRACKET
2	2	2	CLEVIS ASSEMBLY
4	4	3	CLEVIS PIN .750" DIA. X 2-1 8" LONG
4	4	4	COTTER PIN .125" DIA. X 1.0" LONG
2	2	5	EYE BOLT
2	2	6	LOCKWASHER
2	2	7	HEX NUT
4	4	8	CLAMP
			DESCRIPTION-FURNISHED THIS CONTRACT
-	2	9	ANCHOR BOLT GALVANIZED STEEL
-	2	10	FLAT WASHER, 3/16" THICK
-	2	11	HEX NUT
-	2	12	LOCKWASHER
2	-	13	WASHERHEAD DRIVE SPIKE GALVANIZED STEEL
	AR	14	EPOXY MORTAR



(MOUNTING TO TIMBER TIE & DIRECT FIXATION)

ELEVATION OF ASSEMBLY ARRANGEMENT

DESIGNED	TINKHAM, BISE	12-1-70 DATE
DRAWN	BISE	12-16-70 DATE
CHECKED		DATE
APPROVED		DATE

REFERENCE DRAWINGS		
NUMBER	DESCRIPTION	
TWG-CR-9	ANCHOR ASSEMBLY DETAILS & SECTIONS, SHEET 2	
TWG. CR-12	MISCELLANEOUS INSTALLATION DETAILS	

REVISIONS		
DATE	BY	DESCRIPTION

STATE OF MARYLAND — CHARLES F. KEPPINGER — PROFESSIONAL ENGINEER

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

DE LEUW, CATHER & COMPANY
SECTION DESIGNER
SUBMITTED Ronald F. Keppinger

DE LEUW, CATHER & COMPANY
GENERAL ENGINEERING CONSULTANT ■

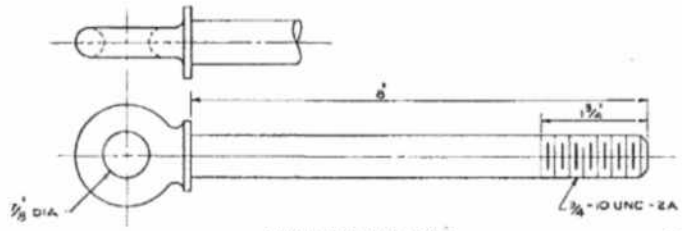
HARRY WEESE & ASSOCIATES
GENERAL ARCHITECTURAL CONSULTANT ☐
APPROVED Ronald F. Keppinger

CONTACT RAIL
ANCHOR ASSEMBLY
DETAILS & SECTIONS (SHEET 1)

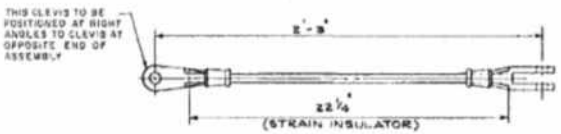
SCALE 1/4"=1" 0 1 2 3 4 5

DRAWING NO. TW6-CR-8 | M392-120

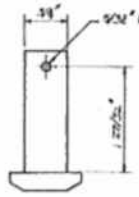
"WMAT098991"



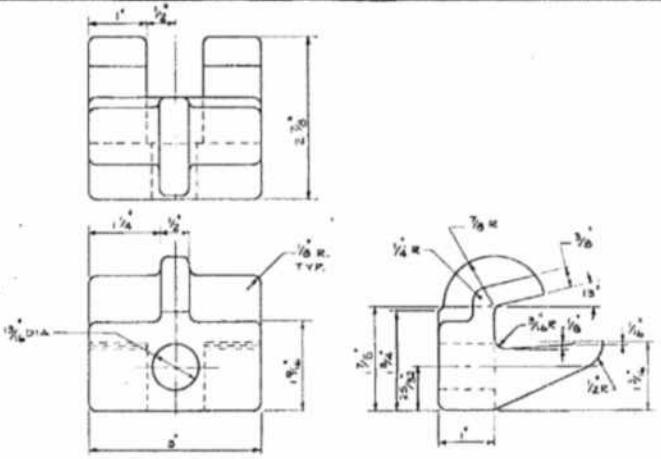
SHOULDER EYE BOLT
MATERIAL: FORGED STEEL, GALVANIZED
SCALE: 1"=0'-1"



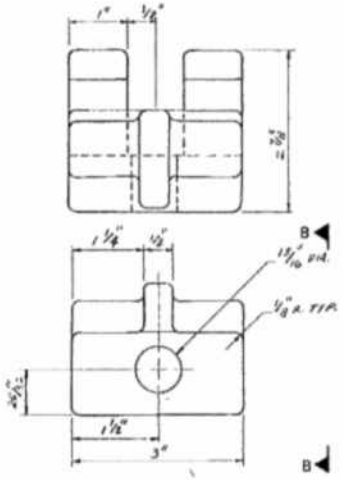
CLEVIS ASSEMBLY



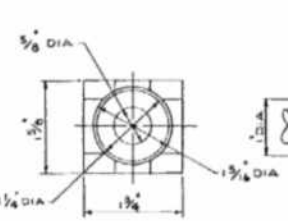
CLEVIS PIN
MATERIAL: STEEL, GALVANIZED
SCALE: NONE

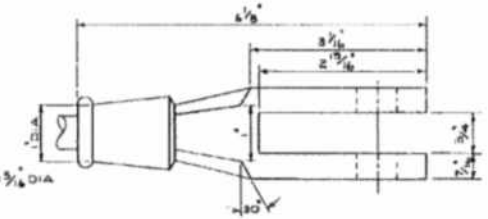


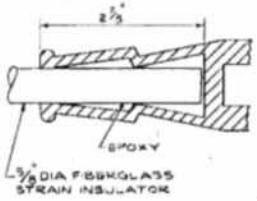
CLAMP-CASTING FOR STEEL RAIL
MATERIAL: MALLEABLE IRON, GALVANIZED



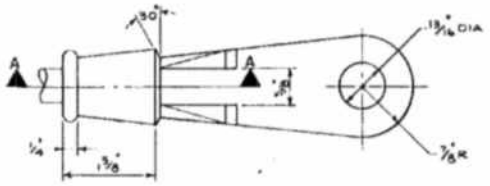
CLAMP-CASTING FOR COMPOSITE RAIL
MATERIAL: MALLEABLE IRON, GALVANIZED
SCALE: 1"=0'-1"



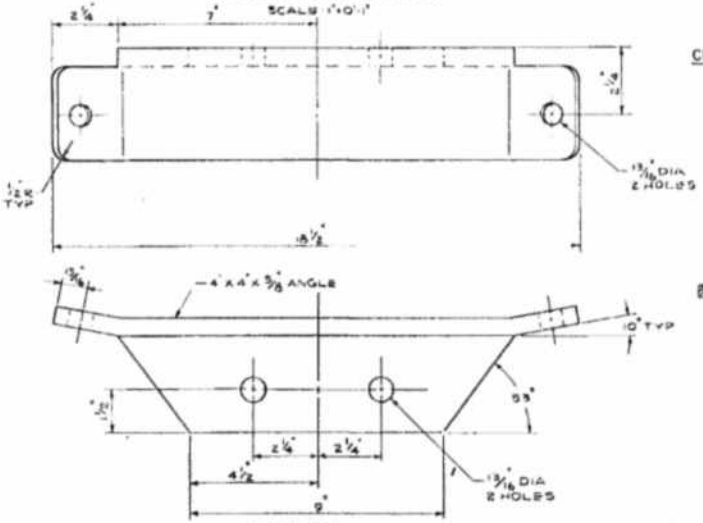




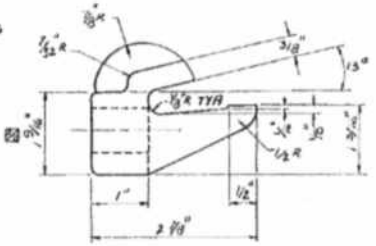
SECTION A-A.



CLEVIS
MATERIAL: MALLEABLE IRON, GALVANIZED
SCALE: 1"=0'-1"



BRACKET
MATERIAL: STEEL, GALVANIZED
SCALE: 1/2"=0'-1"



VIEW B-B
SCALE: 1"=0'-1"

DESIGNED		DATE
DRAWN		
CHECKED		
APPROVED		

REFERENCE DRAWINGS

NUMBER	DESCRIPTION
TW6-CR-8	ANCHOR ASSEMBLY DETAILS & SECT'S SHT 1

REVISIONS

DATE	BY	DESCRIPTION
2-15-80	M.T.	REVISED DRAWINGS PER AMENDMENT #3

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

DE LEUW, CATHER & COMPANY
SECTION DESIGNER
SUBMITTED Ronald F. Kloppinger

DE LEUW, CATHER & COMPANY
GENERAL ENGINEERING CONSULTANT ■

HARRY WEESE & ASSOCIATES
GENERAL ARCHITECTURAL CONSULTANT □
APPROVED Ronald F. Kloppinger

CONTACT RAIL
ANCHOR ASSEMBLY
DETAILS & SECTIONS (SHEET 2)

SCALE 1"=1'-0" 1/2"=1'-0" AS NOTED
DRAWING NO. TW6-CR-9
M392-121