

INCH-POUND
MIL-DTL-82020C(YD)
14 March 1997
SUPERSEDING
MIL-S-82020B(YD)
12 February 1990

DETAIL SPECIFICATION

SWITCHES AND FROGS, TRACK, CAST MANGANESE STEEL, FOR PORTAL CRANES

This specification is approved for use by the Naval Facilities Engineering Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This document covers special cast manganese steel track fittings for portal crane tracks.

1.2 Classification. Portal crane track fittings will be of the following types, classes, and styles as specified (see 6.2):

Type I - Switches (double tongue).

Class A - Curve to right.

Class B - Curve to left.

Type II - Rigid frogs.

Class C - Double/double flangeway, for intersection of 135CR with 135CR.

Class D - Double/single flangeway.

Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data which may improve this document should be sent to: Commanding Officer (Code 1581), Naval Construction Battalion Center, 1000 23rd Avenue, Port Hueneme, CA 93043-4301, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 2250

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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Style 1 - for intersection of 135CR with 115RE (Nonramped).

Style 2 - for intersection of 135CR with 115RE (Ramped).

Type III - Half-crossing.

Class E - Combination of two class D, style 1 frogs.

Class F - Combination of two class D, style 2 frogs.

Class G - Combination of a class C frog with a class D, style 1 frog.

Class H - Combination of a class C frog with a class D, style 2 frog.

Type IV - Turntable frog.

2. APPLICABLE DOCUMENTS

2.1 Other Government documents, drawings, and publications. The following other Government drawings form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DRAWINGS

NAVAL FACILITIES ENGINEERING COMMAND (NAVFAC)

1294420 - Standard Portal Crane Turntable Frog, 135CR.

1294421 - Standard Portal Crane Turntable Frog, 135CR.

1294422 - Standard Portal Crane Turntable Frog, 135CR.

1403326 - Manganese Steel Casting, Portal Crane Track Switch Assembly.

1403327 - Manganese Steel Casting, Portal Crane Track Switch Details.

1403328 - Manganese Steel Casting, Portal Crane Track Rigid Frog, for Intersection of 135CR with 135CR.

1403329 - Manganese Steel Casting, Portal Crane Track Rigid Frog, for Intersection of 135CR with 115RE.

1403330 - Manganese Steel Casting, Portal Crane Track Rigid Frog.

(Copies of specifications, standards, handbooks, drawings, publications, and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are Department of Defense (DoD) adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents which is current on the date of the solicitation (see 6.2).

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AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

ANSI B46.1 - Surface Texture.
ANSI Y14.36 - Surface Texture Symbols.

(Application for copies should be addressed to the American National Standards Institute, Inc.,
11 West 42nd Street, New York, NY 10036.)

AMERICAN RAILWAY ENGINEERING ASSOCIATION (AREA)

AREA Manual for Railway Engineering.

(Application for copies should be addressed to the American Railway Engineering Association,
2000 L Street, N.W., Washington DC 20036.)

ASTM

ASTM A 36 - Structural Steel.
ASTM A 283 - Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes
and Bars.
ASTM E 10 - Standard Test Method for Brinell Hardness of Metallic Materials.
ASTM E 186 - Reference Radiographs for Heavy-Walled (2 to 4.5 inches (51 to
114 mm)) Steel Castings.
ASTM E 280 - Reference Radiographs for Heavy-Walled (4.5 inches to 12 inches
(114 to 305 mm)) Steel Castings.
ASTM E 446 - Reference Radiographs for Steel Castings up to 2 inches (51 mm) in
Thickness.

(Application for copies should be addressed to American Society for Testing and Materials,
100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

AMERICAN WELDING SOCIETY (AWS)

AWS Welding Handbook, Chapter 66.

(Application for copies should be addressed to the American Welding Society,
550 N.W. Le Jeune Road, Miami FL 33126.)

(Non-Government standards and other publications are normally available from the organizations
that prepare or distribute the documents. These documents also may be available in or through
libraries or other informational services.)

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2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Description. Track fittings shall be as specified herein and shown on NAVFAC drawings 1294420 through 1294422 and 1403326 through 1403330. The equipment specified herein are specially designed items intended for specific application to portal crane tracks. Unless otherwise specified (see 6.2), all stub rails shall be cast with holes in the web for joint bar installation. Examples of various applications of equipment covered by this document are shown in figure 1.

3.1.1 Double tongue track switch. The double tongue switch consists of a cast manganese steel switch bed supporting a cast manganese steel switch tongue with two rails. These provide a flangeway on both the gage side and the field side of the running rails, in either operating position. The switch tongue shall be curved for turnout to the right for class A, or to the left for class B (see 1.2). The double tongue switch shall be constructed to provide adequate drainage to prevent ponding of rainwater. Additional options for track switches are listed in table I and depicted on NAVFAC drawings 1403326 and 1403327.

TABLE I. Options for double tongue track switch (see 6.2).

Option Number	Choose one	Description
1	A	One piece casting
	B	Two piece casting
	C	Three piece casting
2	A	With cover piece
	B	Without cover piece
3	A	With bronze pivot bearing
	B	Without bronze pivot bearing
4	A	With manually operated throw mechanism
	B	With power operated throw mechanism (manual override capability required)

3.1.2 Rigid frogs. The rigid frogs consist of a one-piece casting of manganese steel. Class C is designed with two double flangeways for the intersection of two rails. Class D is designed with a double flangeway for one rail and a single flangeway for the other. This accommodates the intersection of a crane rail with a standard gage railroad rail. Additional options for rigid frogs are listed in table II and depicted on NAVFAC drawings 1403328 and 1403330.

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TABLE II. Options for rigid frogs (see 6.2).

Option Number	Choose one	Choose one	Description
1	A	a	With stub rails. Attached to base plate using integrally cast bolt holes (see figure 2).
		b	Attached to base plate using rail clips (see figure 3).
	B	a	Without stub rails. Field rails connected to fitting using integrally cast bolted rail attachment bracket (see figure 4).
		b	Field rails connected to fitting with rail clips (see figure 5).
2			Specify angle of track intersection.
3			If application requires a radius frog, specify the radius and geometry.
4	A		No double flangeway extension for half-crossing.
	B		With double flangeway extension for half-crossing.
		a	Double flangeway extension attached to base plate using integrally cast bolt holes (see figure 6).
		b	Double flangeway extension attached to base plate using rail clips (see figure 7).

3.1.3 Half-crossing. The half-crossing shall be class E, F, G, or H as specified (see 1.2 and 6.1.2). Examples of these configurations are shown in figure 1. Track connection points shall be provided with bolt holes for bolted connection to tracks or with the ends beveled for arc welding connection, as specified (see 6.2).

3.1.4 Turntable frogs. The turntable frog shall consist of a cast manganese steel turntable base supporting a cast manganese steel turntable and rail. The angle of track intersection is the rotation angle for the turntable frog and shall be as specified (see 6.2). Field rail connection points shall be provided with bolt holes for bolted connection to field rails. The turntable frogs shall be constructed to provide adequate drainage to prevent ponding of rainwater.

3.2 First production frog. When specified (see 6.2), the contractor shall furnish one track fitting for first article inspection and approval (see 4.2.1 and 6.3).

3.3 Materials. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and articles incorporated in the work covered by this specification are to be new and fabricated using materials produced from recovered materials to the maximum extent possible without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials.

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Unless otherwise specified, none of the above shall be interpreted to mean that the use of used or rebuilt products are allowed under this specification.

3.3.1 Manganese steel castings. All components of the track fittings shall be manganese steel castings having a chemical composition specified herein, unless otherwise specified in the applicable drawings.

3.3.1.1 Chemical composition. Manganese steel castings shall conform to the following requirements as to chemical composition:

Carbon, percent	1.00 to 1.40
Manganese, percent, minimum	12.00
Phosphorus, percent, maximum	0.10
Sulfur, percent, maximum	0.05

3.3.1.2 Heat treatment. Castings shall be heat treated at not less than 1,850 degrees Fahrenheit (°F) (1 010 degrees Celsius (° C)) and preferably at 1,900 °F (1 038 °C) for not less than 2 hours or for 1 hour per inch of casting section thickness, whichever is greater. Casting shall be cooled by water quenching.

3.3.2 Steel. Steel for base plates, cover plates, and hold downs and stops, shall conform to ASTM A 36 or ASTM A 283 as required by applicable drawings.

3.4 Drawings. The switches and frogs shall be constructed in accordance with NAVFAC drawings listed in 2.1. Drawings forming a part of this specification are engineering design drawings. The contractor shall be responsible for preparing shop drawings. Where tolerances provided could cumulatively result in incorrect fits, the contractor shall provide tolerances within those prescribed on the drawings to ensure correct fit, assembly, and operation of the items. Proposed changes by the contractor to the government furnished design drawings shall be approved by the contracting officer. No deviation from the prescribed dimensions or tolerances shall be permissible without prior approval of the contracting officer.

3.5 Identification marking. Identification marking shall be cast into each unit in a location easily visible after installation. Required information shall include as a minimum:

- a. Manufacturer and location of foundry.
- b. Type, class, and style or pattern number.
- c. Date of manufacture.
- d. Radius (for switches).
- e. Angle (for rigid frogs).
- f. Radius of curvature (for radius type frog).
- g. Applicable rail section.

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3.6 Workmanship.

3.6.1 Castings. Casting shall be smooth and true to patterns. Where dimensions do not conform to those indicated, excess material shall be removed by grinding or other approved methods. Chaplets shall be used only where unavoidable and shall be prepared from manganese steel as specified in 3.3.1.1. Internal chills shall not be used. Casting shall be free of surface or internal defects which would impair the strength or service life of the castings. Tread surfaces and flangeway walls 1-inch (25 mm) down from treads shall be free from defects, such as shrinkage, porosity, cracks, sand holes, gas pockets, cold shuts, or other defects unless such defects are so small that they will be removed by the finishing grinding. Castings shall be free of twist, shall be true to alignment, and shall not be subjected to undue straining or denting produced in straightening. Bearing surfaces of castings shall be straight and true and free from any imperfections which would prevent a good bearing.

3.6.1.1 Depth hardening. Rail heads of the fittings shall be hardened by flexible sheet explosive or by hammering or pressing integrally pressed pads of suitable thickness and area to not less than a surface Brinell hardness number of 350.

3.6.2 Welding. Surfaces of parts to be welded (see 3.7) shall be free from rust, scale paint, grease, or other foreign matter. Welding of cast manganese steel shall be performed in accordance with Chapter 66 of the AWS Welding Handbook and section 5 of the AREA Manual for Railway Engineering.

3.6.2.1 Electrodes. Only austenitic, high manganese (nominal 11-14 percent Mn) or stainless steel (nominal 14 percent Cr - 14 Mn) electrodes or semi-automatic wires shall be used. Low phosphorus grades of manganese are recommended.

3.6.3 Cleaning. Castings shall have heads and gates removed, shall be thoroughly cleaned, and all sand, scale, fins, and excessive rough spots removed by mechanical means before final inspection. Heads and gates may be removed by gas or arc cutting or scarfing. Sufficient metal for subsequent removal by grinding or machining to eliminate any detrimental effect of the heat of cutting shall be left on the casting. Gas or arc cutting or scarfing shall be followed by mechanical cutting or grinding operations as necessary to provide the specific contour.

3.6.4 Finish. Surface of castings shall be as shown on the applicable drawings. Faces of sliding surfaces shall have an average roughness of 63 microinches (0.001 6 mm) as defined in ANSI B46.1 and ANSI Y14.36.

3.7 Repair of defects. Defects may be repaired by welding in a manner similar to that described in 3.6.2 and 3.6.2.1. Defects shall be classed and defined as in 3.7.1 and 3.7.2. Minor defects may be repaired without permission. Repair of major defects shall not be made without permission of the contracting officer. Manganese castings shall be welded before final heat treatment. For major defects, manganese castings shall be re-heat treated after welding. For minor defects, re-heat treatment of manganese casting shall be required where the location and

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extent of welding is such as to impair the strength of the casting or as directed by the contracting officer.

3.7.1 Minor defects. Minor defects shall include areas resulting from oxygen cutting, chipping, surface sand, or slag defects, or slight surface defects. The depth of the defect, when prepared for repair welding, shall not exceed 20 percent of the wall thickness at that point, or 1-inch (25 mm), whichever is less. No other dimension shall be greater than four times the wall thickness, or greater than 6 inches (152 mm), whichever is less.

3.7.2 Major defects. Major defects include all defects not falling within the limits specified in 3.7.1 and those classed as “unacceptable” in ASTM E 186, ASTM E 280, or ASTM E 446.

4. VERIFICATION

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification, where such inspections are deemed necessary to ensure that supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this document shall become a part of the contractor’s overall inspection system or quality program. The absence of any inspection requirements in this document shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Material inspection. The contractor is responsible for ensuring that supplies and materials are inspected for compliance with all the requirements specified herein and in applicable referenced documents.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2.1).
- b. Quality conformance inspection (see 4.2.2).

4.2.1 First article inspection. The first article inspection shall be performed on one of each type of fitting when a first article is required (see 3.2 and 6.3). This inspection shall include the examinations of 4.3 and the test of 4.4. The first article may be either a first production item or a

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standard production item from the supplier's current inventory provided the item meets the requirements of the specification and is representative of the design, construction, and manufacturing technique applicable to the remaining items to be furnished under the contract.

4.2.2 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.3 and the tests of 4.4. This inspection shall be performed on all units submitted under the contract.

4.3 Examination. Each switch shall be examined for compliance with the requirements specified in section 3 of this document. Any redesign or modification of the contractor's standard product to comply with specified requirements, or any necessary redesign or modification following failure to meet specified requirements shall receive particular attention for adequacy and suitability. This element of inspection shall encompass all visual examinations and dimensional measurements. Noncompliance with any specified requirements or presence of one or more defects preventing or lessening maximum efficiency shall constitute cause for rejection.

4.4 Tests.

4.4.1 Hardness. Depth hardened areas of fittings shall be tested for conformance to the requirements of 3.6.1.1 in accordance with ASTM E 10. The readings shall be taken at the intersection of lines 1-inch (25 mm) from, and parallel to, the gage or guard lines.

4.4.2 Operation of switches and turntable frogs. After assembly, the switches and turntable frogs shall be operated to assure smooth operation and correct alignment. Both manual and power operating mechanisms shall be tested.

5. **PACKAGING**

5.1 Packaging. For acquisition purposes, the packaging materials shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. **NOTES**

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. These crane track fittings are the standard design of the NAVFAC for two-rail, double flange wheel, portal crane trackage and conform to NAVFAC criteria for portal crane track alignment. They are intended for use in new construction and in rehabilitation of existing

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trackage, where conditions will permit. While a similar commercial product may be available in railway practice for single flange wheels, equivalent designs for double flange wheels are not commercially available.

6.1.1 Rigid frogs. Class D, styles 1 and 2, rigid frogs are two alternative designs which differ in the cross section of the flangeway for use by standard gage railroad wheels.

6.1.1.1 Style 1. The style 1 rigid frog provides a standard AREA flangeway (1.875 inches (48 mm) deep) through the entire railway intersection. Railroad wheel loads are carried in normal fashion, bearing only on the treads of the wheels. No ramps for railroad wheel flange bearing across the area of railway intersection are provided. This results in a notch through the crane wheel flangeways (0.875 inch (22 mm) deep) due to the difference in depth of railroad and crane wheel flanges.

6.1.1.2 Style 2. The style 2 rigid frog utilizes a non-standard railroad wheel flangeway ramps are employed in the railroad wheel flangeways providing depths varying from not greater than 1.375 inches (35 mm) to not less than 0.875 inches (22 mm); and railroad wheel flanges bearing is required across the area of the railway intersection.

6.1.2 Half-crossing. Where a standard gage track intersects a crane rail, two rigid frogs are located in close proximity and are usually designed as an integral unit called a half-crossing.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Type, class, and style required (see 1.2).
- c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2).
- d. When stub rails shall not be cast with holes in the web for joint bar installation (see 3.1).
- e. Number of pieces switch is to be cast (see table I, option 1).
- f. If switch shall be provided with cover plates (see table I, option 2).
- g. If the switch pivot pin shall be provided with bronze pivot bushing (see table I, option 3).
- h. Whether switch throw mechanisms shall be power or manually operated (see table I, option 4).
- i. If stub rails are required on frogs and intended method of connection of stub rails or field rails to base plate (see table II, option 1).
- j. Frog angle (angle of track intersection) (see table II, option 2).
- k. Whether straight frog or radius frog is required and radius of curvature of radius type frog (see table II, option 3).
- l. If half-crossings are to be provided with double flangeway extension and method of attachment of extension of each base plate (see 3.1.3 and table II, option 4).
- m. When track connection points are provided with bolt holes for bolted connection to tracks or with ends beveled for arc welding (see 3.1.3).

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- n. Rotation angle for turntable frogs (see 3.1.4).
- o. When first article is required (see 3.2 and 4.2.1).
- p. Packaging requirements (see 5.1).

6.3 First article. When a first article inspection is required, the item will be tested and should be a first article sample or it may be a standard production item from the contractor's current inventory as specified in 4.2.1. The first article should consist of one unit. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examination, test, and approval of the first article.

6.4 Part or Identifying Numbers (PINs). The specification number, type, class, and style are combined to form PINs for cast frogs and switches covered by this document (see 1.2). PINs for cast frogs and switches are established as follows:

		PIN: M82020 X X X		
Military Detail Specification Number	_____			
PIN Codes	_____			
1 = Type I				
2 = Type II				
3 = Type III				
4 = Type IV				
A = Class A	_____			
B = Class B				
C = Class C				
D = Class D				
E = Class E				
F = Class F				
G = Class G				
H = Class H				
1 = Style 1	_____			
2 = Style 2				

6.5 Subject term (key word) listing.

Double flangeway
Rigid frogs
Single flangeway
Turntable frogs

6.6 Changes from previous issue. Marginal notations are not used to identify changes with respect to the superseded document.

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Custodian:
Navy - YD1

Preparing Activity:
Navy - YD1

(Project 2250-N101)

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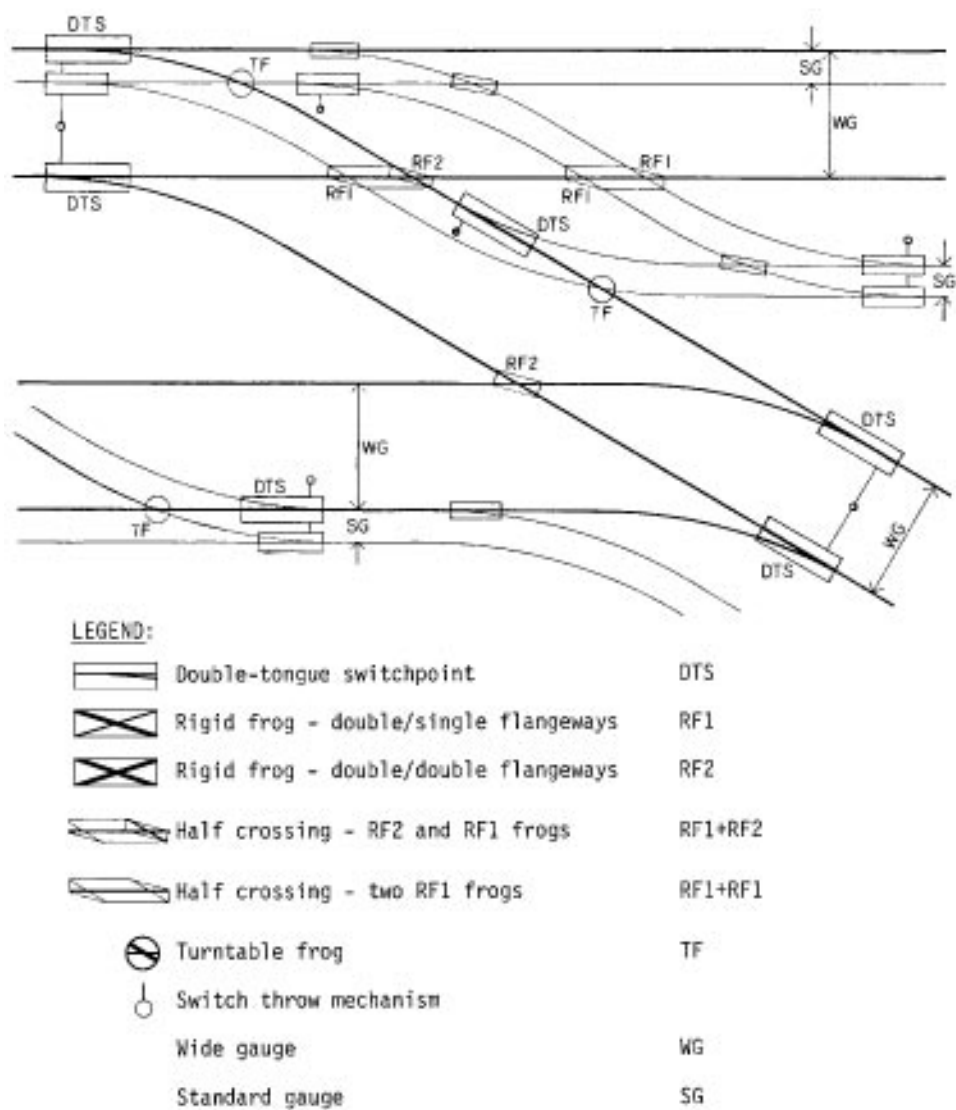
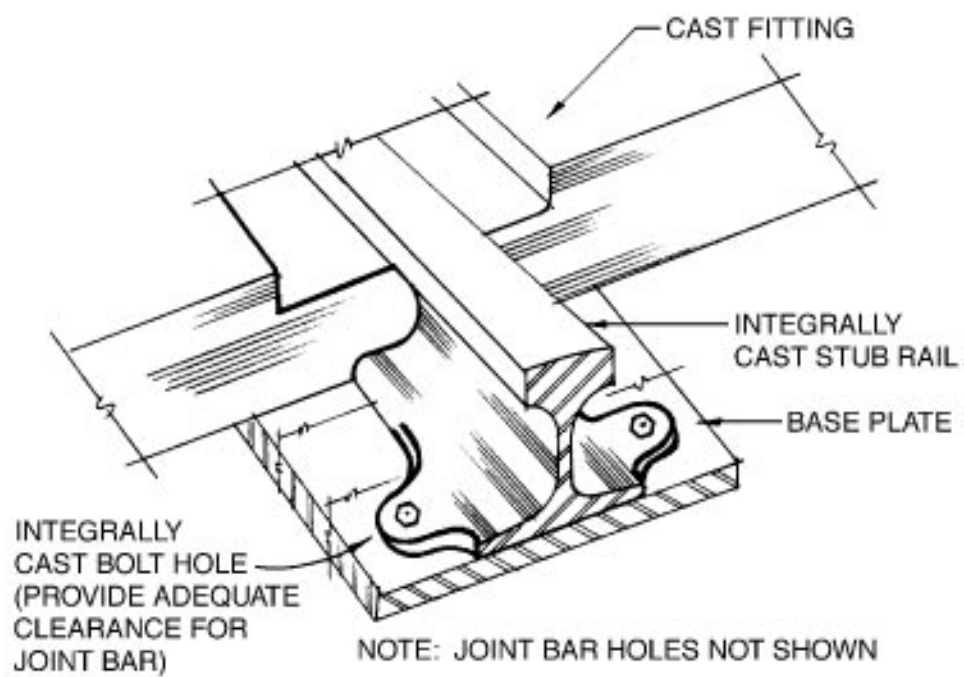
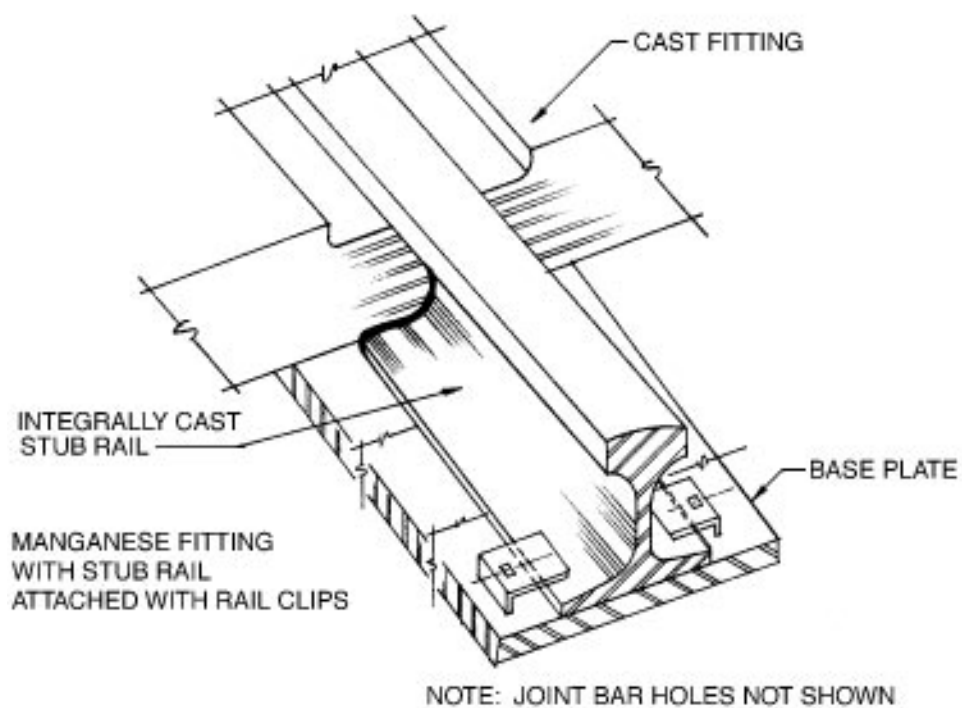


Figure 1. Typical Crane Rail Fittings.

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Figure 2. Fitting with Stub Rail and Integrally Cast Bolt Holes.Figure 3. Fitting with Stub Rail Attached by Clips.

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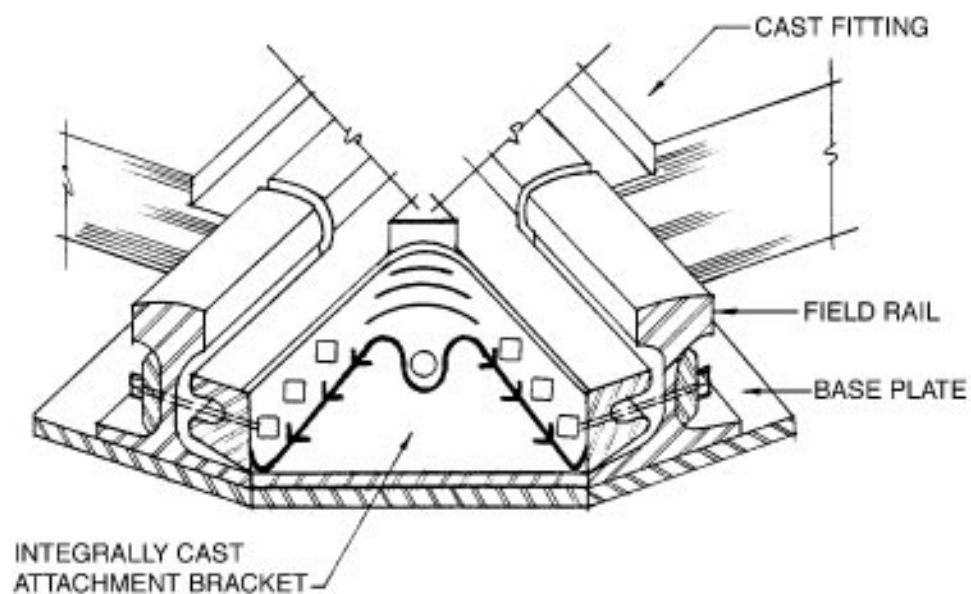


Figure 4. Fitting with Integrally Cast Attachment Bracket.

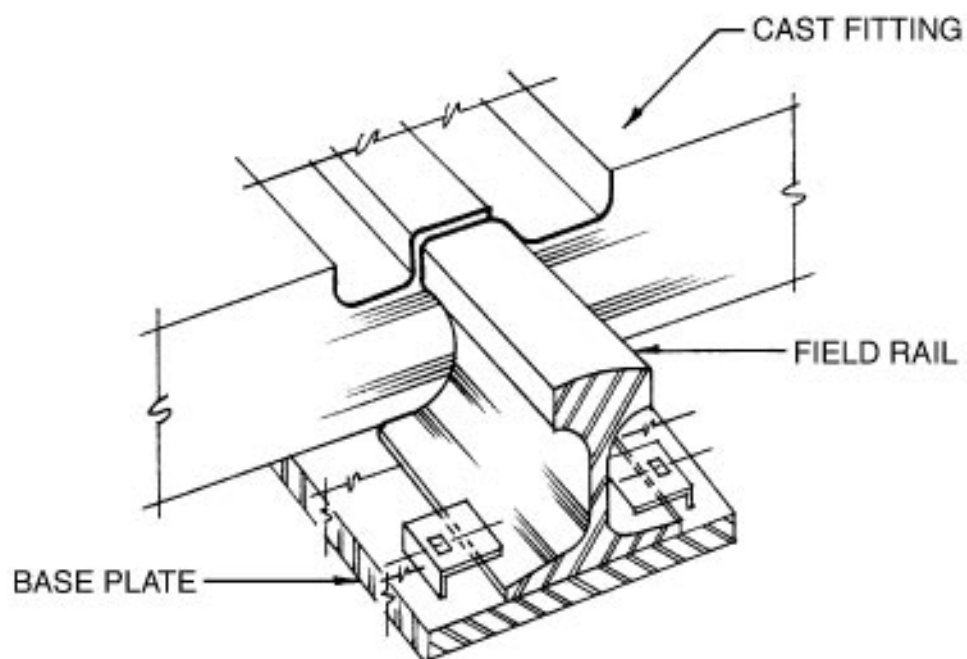


Figure 5. Fitting without Stub Rail, Field Rail Attached by Clips.

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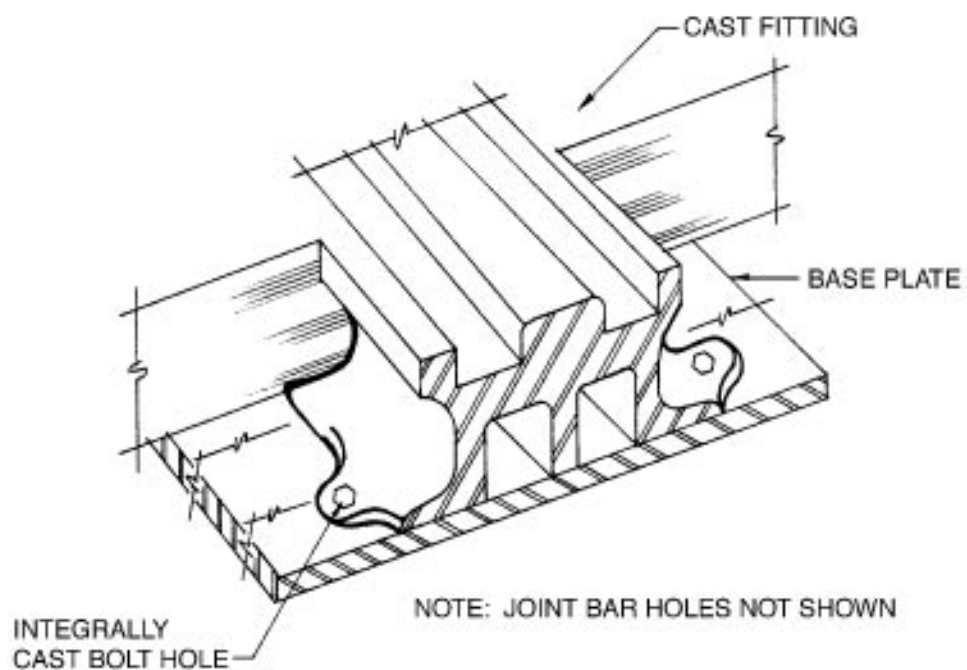


Figure 6. Fitting with Double Flangeway Extension and Integrally Cast Bolt Holes.

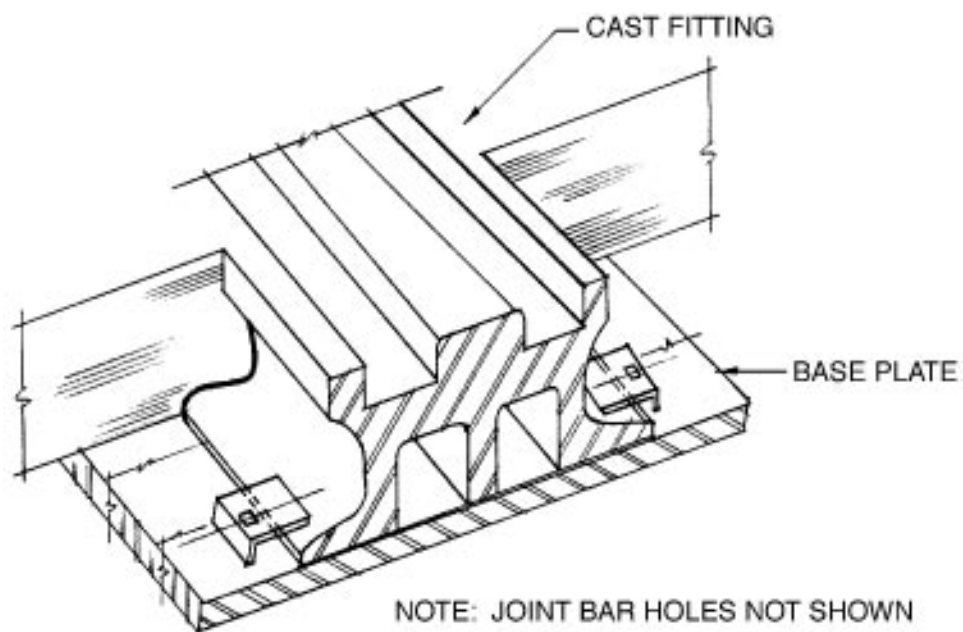


Figure 7. Fitting with Double Flangeway Extension Attached by Rail Clips.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

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I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER
MIL-DTL-82020C (YD)

2. DOCUMENT DATE (YYMMDD)
970314

3. DOCUMENT TITLE SWITCHES AND FROGS, TRACK, CAST MANGANESE STEEL, FOR PORTAL CRANE

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)
(1) Commercial
(2) AUTOVON
(if applicable)

7. DATE SUBMITTED
(YYMMDD)

8. PREPARING ACTIVITY

a. NAME
RUDY PAMPLONA

b. TELEPHONE Include Area Code)
(1) Commercial (805) 982-5843
(2) AUTOVON 551-5843

c. ADDRESS (Include Zip Code)
COMMANDING OFFICER, NCBC CODE 15E2D
1000 23RD AVENUE
PORT HUENEME, CA 93043-4301

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