

# 4. APTA PR-M-RP-003-98

## Recommended Practice for the Purchase and Acceptance of Type H-Tightlock Couplers

Approved January 22, 1998

**APTA PRESS Task Force**

Authorized March 17, 1999

**APTA Commuter Rail Executive Committee**

**Abstract:** This specification covers material, purchase, and acceptance requirements for APTA approved Type H Tightlock couplers and their parts, coupler yokes, draft gear followers, radial connection castings, shank pins, yoke pins, bushings and other parts.

**Keywords:** type H Tightlock couplers, radial connections, yokes, specification M-206-97

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# APTA PR-M-RP-003-98

## Recommended Practice for Purchase and Acceptance of Type H-Tightlock Couplers

### 1. Overview

#### 1.1 Scope and Purpose

This specification covers material, purchase, and acceptance requirements for APTA approved Type H Tightlock couplers and their parts, coupler yokes, draft gear followers, radial connection castings, shank pins, yoke pins, bushings and other parts.

The passenger rail industry phased this recommended practice into practice over the six-month period from July 1 to December 31, 1999. The recommended practice took effect January 1, 2000.

### 2. References

This standard shall be used in conjunction with the following publications. When the following standards are superseded by an approved revision, the revision shall apply.

AAR Specifications M-201 Steel Castings

AAR Specifications M-205 Coupler Yokes

AAR Specifications M-211 Purchase and Acceptance of AAR Approved Couplers and Coupler Yokes for Freight Service

AAR Specifications M-1003 Specification for Quality Assurance

49 CFR Part 238, Passenger Equipment Safety Standards

### 3. Basis of approval

#### 3.1 Manufacturers, foundries and materials

All manufacturers, foundries and materials must be AAR approved. The basis for such approval shall be satisfactory compliance with the provisions of this specification, and AAR Specifications M-201 Steel Castings, M-205 Coupler Yokes, M-211 Purchase and Acceptance of AAR Approved Couplers and Coupler Yokes for Freight Service, and M-1003 Specification for Quality Assurance.

#### 3.2 Standard designs

All standard designs must be approved by the Mechanical Committee of the Standard Coupler Manufacturers. All standard designs shall meet the 100,000 lbs. (445 kn) vertical sheer strength required by 49 CFR Part 238.

### **3.3 Non-standard designs**

All non-standard designs must be submitted for approval in accordance with Appendix A.

Any design submitted for approval may be approved by waiver of Official Design Tests, if applicable.

Approval of a design applies only to the manufacturer for whom it is approved. It does not cover an identical or similar design produced by another manufacturer. This Approval will also cover the same original Grade C steel design now produced in Grade E steel.

## **4. Basis of purchase and acceptance**

### **4.1 Cast steel**

Cast steel shall be furnished and marked in accordance with AAR Specification M-201 Grade C and marked C, and Grade E and marked E as part of the catalog number.

### **4.2 Cast steel knuckles and locks**

Knuckles and locks shall be heated to the proper temperature above the critical range for the required time and upon removal from the furnace shall be subjected to accelerated cooling by immersion in a suitable liquid medium. All C grade quenched castings shall be tempered immediately following the quenching operation to a Brinell hardness range of 223 minimum, 285 maximum. All E grade Knuckles and Locks will meet a Brinell range of 241 minimum, 291 maximum. From each 50 knuckles and/or locks, or less ordered, two knuckles and/or locks must be tested for hardness. The average of two or more determinations taken on the back of the knuckle hub, or on the lock body, shall be within the limits specified.

### **4.3 Certification**

At the purchaser's request, a certification will be made the basis of acceptance. The certification shall include a statement that the material has been manufactured, sampled, tested and inspected in accordance with, and meets the requirements of all applicable provisions of this specification. Each certification furnished shall be signed by an authorized agent of the supplier or manufacturer.

### **4.4 Records**

The manufacturer shall maintain records for 15 years of the mechanical, chemical and hardenability test reports, covering the heats representing the purchased castings. These records will be made available to the purchaser upon request.

## **5. Cast steel manufacture**

Cast steel shall be in accordance with AAR Specification M-201, as applicable, except as identified in 3.2 Knuckles and Locks.

## **6. Mechanical properties and tests**

Mechanical properties and tests shall be in accordance with AAR Specification M-201, as applicable.

## **7. Inspection**

### **7.1 Grouping**

The manufacturer shall have items grouped in inspection lots.

### **7.2 Visual inspection**

Coupler bodies, knuckles and yokes shall conform to the requirements of AAR M-211, Surface Acceptance Level Specifications. Critical inspection areas are shown shaded in Figure 1.

### **7.3 Casting integrity**

Manufacturer's internal process specifications and quality assurance program shall control casting integrity.

### **7.4 Proof tests**

#### **7.4.1 Strength**

Coupler bodies and knuckles must meet permanent and ultimate strength requirements shown in 7.4.4. The dimensions shown in Figure 2 shall be used for determining permanent set, and results recorded. Special test knuckles for testing coupler bodies shall have a load capacity in excess of 900,000 lbs (4005 kn).

#### **7.4.2 Maximum applied load**

When testing coupler bodies, if test knuckle breaks before required loading is attained, the test shall be terminated and the load recorded as "Maximum Applied Load".

#### **7.4.3 Minimum capacity**

Test machines shall have minimum capacity to meet specified loads and be calibrated to National Institute of Standards and Technology Standards.

**7.4.4 Static tension test requirements**

<b>Grade C Steel</b>			
<b>Max. Permanent Set – Inches</b>			
	<b>At</b>	<b>at</b>	
	<b>300,000 lbs.</b>	<b>450,000 lbs.</b>	<b>Min. Ultimate</b>
*Knuckle	.03	----	600,000 lbs.
Body	----	.03	725,000 lbs.
<b>Grade E Steel</b>			
<b>Max. Permanent Set-Inches</b>			
	<b>At</b>	<b>at</b>	
	<b>400,000 lbs.</b>	<b>700,000 lbs.</b>	<b>Min. Ultimate</b>
*Knuckle	.03	----	650,000 lbs.
Body	----	.03	900,000 lbs.

\* Based on testing with dummy knuckle fixture.

**7.5 Yokes**

Test values for coupler yokes, *AAR Specification M-205*<sup>1</sup>, latest revision shall apply.

**7.5.1 Weld repair**

Weld repair must be in accordance with AAR Specification M-201.

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<sup>1</sup> For references in Italics see Section 2

### **7.5.2 Heat treatment after weld repair**

After castings have been weld repaired, they must be heat treated in accordance with requirements shown in Figure 3.

## **7.6 Wrought steel parts**

### **7.6.1 Knuckle pivotpin**

Refer to AAR Specification M-118

### **7.6.2 Draft gear follower**

Refer to AAR Standard S-119.

### **7.6.3 Shank and yoke pins**

The coupler shank and yoke pins shall be made of steel, grade A.I.S.I.-C-1137 or equivalent. The pins, after being cut to the required length, shall be heat treated to hardness within the range of Brinell numbers 260 to 300. The pins shall then be ground to the required diameter within the tolerances shown on Figure 4.

For each lot of 25 units, or less, ordered, one pin of each diameter shall be checked for hardness and the average of two or more impressions on each pin shall be within the hardness range of Brinell numbers 260-300.

If either or both pins representing the lot fail to meet the requirements for hardness, then all pins of that size in a lot shall be similarly checked and those failing to meet the requirements shall be rejected. Such rejection, however, does not prohibit the manufacturer from reoffering the rejected pins on the same order for inspection after adjustment.

### **7.6.4 Shank, yoke and radial connection bushing**

The bushings used in the coupler shank, radial connection and yoke head shall be made in accordance with AAR Standard S-100, Section B, Manual of Standards and Recommended Practices. These bushings, shown in Figure 4, shall be press-fit into the castings and the application checked by the standard gages listed in Table No 2.



## 7.7 Weights

### 7.7.1 Limiting weights

Table 1- Weight Limits

Name of Part	Weight (lbs.)		
	Min.	Norm.	Max.
Coupler (CH-80), fitted complete with single locklift (H15A), 6 ½ by 8 in. shank with bushings (without train line lugs)	609	629	654
Coupler (CH-81), fitted complete with single locklift (H15A), 6½ by 8 in. shank with bushings and trainline lugs	617	637	662
Coupler body (CH-80), without fittings, 6½ by 8 in. shank with bushings (without train line lugs)	493	509	530
Coupler body (CH-81), without fittings, 6½ by 8 in. shank with bushings and train line lugs	501	517	538
Yoke (CY-50), with bushings, Standard 24 <sup>5</sup> / <sub>8</sub> in. pocket. For use with conventional draft gear	236	243	253
Yoke (CY-65), with bushings, Standard 24 <sup>5</sup> / <sub>8</sub> in. pocket. For use with twin draft gear	315	325	338
Radial Connection (Y25A) with bushings	160	165	172
Radial Connection Seat (Y26)	36	37	39
Knuckle (H50B)	76	78	81
Lock (H40A)	17	18	19
Knuckle Thrower (H30A)	5.5	5.5	6.5
Rotary Locklift Assembly, single, (H15A)	9	9.5	9.5
Rotary Locklift Assembly, double, (H16A)	10.5	11	11
Knuckle pivot pin (C10), with cotter (C11)	8	8.5	8.5
Support pin (C2), with cotter (C3)	0.5	0.5	0.5
Shank pin (Y10), 2 <sup>31</sup> / <sub>32</sub> in. diameter	23	24	25
Yoke pin (Y13), 3 <sup>31</sup> / <sub>32</sub> in. diameter	32	33	34
Shank pin retaining key (Y11B), with cotter (Y5).	2.5	3	3

### 7.7.2 Maximum allowable weight

When castings are over the maximum weight shown in Table 1, and all other requirements are satisfactory, they may be accepted at the maximum allowable weight, the excess weight being at the expense of the manufacturer. Castings not meeting minimum weights shall be rejected.

### 7.8 Gauging

Couplers, parts and yokes shall meet the requirements of the gauges listed in Table No. 2. Class I. Inspectors' Gages should be used by inspectors for acceptance of couplers and parts conforming to same. The inspector may inspect and gauge each assembled coupler in a lot to determine if they conform to the contour gauge.

<b>Table 2--Gages to insure interchangeability of coupler parts</b>	
<b>Gages for Head and Parts</b>	
<b>Class 1 Inspectors' Gages</b>	
<b>Gage No.</b>	<b>Description</b>
31727	Inspector's contour
31701	Drawbar pulling lug and pin protector
31703	Drawbar front face checking pin used with gage 31701
31706	Drawbar aligning wing face ---- used with gage 31701
31707	Drawbar face and contour
31707-1	Pivot pin used with gages 31701, 31707, and 31715
31708	Drawbar lock chamber
31709	Drawbar lock hole
14513	Drawbar pivot lug
31713	Drawbar lock wall to knuckle side wall
31714	Drawbar rotary lug
28100-2	Drawbar and knuckle pivot pin hole---- Min. and Max.
14220	Knuckle hub
31711	Knuckle tail shelf
31715	Knuckle pulling lug and pin protector

31718	Knuckle tail height
32310	Knuckle contour and tail width
31719	Lock contour ---- Guard arm side
31720	Lock contour ---- Knuckle side
32091	Lock thickness
31721	Knuckle thrower
31721-1	Knuckle thrower- rear contour plate- used with gage 31721
31723	Rotary locklift lever
27896-3	Pin used with gage 31723
31725	Rotary locklift toggle contour and thickness
31725-1	Rotary locklift toggle - lock trunnion hole- used with gage 31725
31725-2	Rotary locklift toggle - rivet slot - used with gage 31725

**Table 2 (Continued)--Shank Gages**

<b>Gage No.</b>	<b>Description</b>
29222-3	Shank pin diameter
29224	Shank butt loop
29224-1	Pivot pin used with gage 29224

**Gages to Insure Interchangeability of Yokes, Shank Butt, Radial Connection and Radial Connection Seat**

**Class I Inspectors' Gages**

<b>Gage No.</b>	<b>Description</b>
29218	Yoke ---- 24 5/8 in. pocket
29218-2	Yoke inside width
29218-3	Yoke pin diameter
29219	Yoke head opening
29219-1	Yoke head outside width
29219-2	Yoke head outside height

29220-1	Pin for use with gages 29219 and 29220
33158	Twin gear yoke rear end thickness
33158-1	Twin gear yoke rear end width
33158-2	Twin gear yoke strap thickness
33159	Twin gear yoke pocket length
33159-1	Twin gear yokes outside height
33168	Twin gear yoke head opening
33168-1	Twin gear yoke head radial seat location
33168-2	Twin gear yoke length ---- pin hole to rear end
33169	Twin gear yoke end squaring in horizontal plane used with gage 33168-2.
33169-1	Twin gear yoke end squaring in vertical plane.
29220	Radial connection loop ---- yoke end
29221	Radial connection loop ---- shank end
29224-1	Pin used with gage 29221
29222-1	Radial connection loop thickness ---- yoke end
29222-2	Radial connection width
29222-4	Radial connection loop contour ---- yoke end
32430	Shank pin retaining key
32430-1	Shank pin retaining key hole and hole location
32430-2	Shank pin retaining key hole location ---- used with gage 32430-1
29223-1	Radial connection seat thickness
29223-2	Radial connection seat width
29223-3	Radial connection seat ---- loop seat contour
29223-4	Radial connection seat contour

<b>Class II. Checking Gages Gages for Head and Parts Class 1 Inspectors' Gages</b>	
<b>Gage No</b>	<b>Description</b>
31708-1	Drawbar lock chamber and lock hole ---- maximum
27895	Drawbar knuckle thrower hole location
31707-1	Pin for use with gage 27895
33159-2	Twin gear yoke head radial seat radius
31727-1	Inspector's Contour Gage ---- No Go
<b>Gages Used for Maintenance of Couplers In Service</b>	
<b>Gage No</b>	<b>Description</b>
31000	Contour maintenance
32600	Aligning wing limit
34101-4	Guard arm
44250-5	Vertical height condemn limit alignment pocket and guard arm
34100-1	Contour slack
34100-2A	Knuckle nose wear and strength

## 7.9 Coupler operation

All completely assembled couplers must be carefully checked for operation. The knuckles and other operating parts must perform their functions in an entirely satisfactory manner.

### 7.9.1 Opening

Coupler knuckle must throw to the open position by a continuous rotary force applied by hand through the operating rod from rod handle. See Figure 5.

### 7.9.2 Closing

Coupler knuckle must rotate to the fully closed position to permit drop of the lock to the locked position by a continuous steady force applied by hand on the knuckle nose.

### 7.9.3 Lock shut

Coupler lock must automatically drop to the locked position when the knuckle is closed as described in Section 7.9.2. Coupler knuckle is locked shut when the lock drops to seat on, or to within 1/8 inch (.32 cm) of seating on the knuckle tail lock shelf.

#### **7.9.4 Lock set**

Coupler is put on lock set when the knuckle is restrained from opening while force is applied through the operating rod to raise the lock above the knuckle tail. When the rod is eased back and released, the lock must rest on the forward top edge of the knuckle thrower lock leg. The knuckle then must be free to rotate open by hand force applied on inside face of the knuckle nose. Coupler then must perform the functions of knuckle closure and lock drop as described in Sections 7.9.2 and 7.9.3.

#### **7.10 Finish**

##### **7.10.1 Riser pads and gate stubs**

Riser pads and gate stubs shall not project more than 1/4 inch (.63 cm) above the surrounding surface at any location. Where interference would exist in the operation or application or where serviceability would be affected, the riser pads and gate stubs shall be contoured to surrounding areas.

##### **7.10.2 Blasting**

Castings shall be blasted sufficiently clean to permit thorough, visual inspection. Prior to shipment, castings shall be free of dirt, rust, or loose material that would affect operation. Couplers must not be sand or shot blasted when completely assembled.

##### **7.10.3 Painting castings**

The castings shall not be painted or covered with any substance that will hide defects. If castings are to be painted, it shall be so specified on the order, but this shall be done only after complete inspection and acceptance of the parts by the purchaser. Paint must not be applied to the inside of the coupler head or internal fittings.

#### **7.11 Lubrication**

Only dry lubricant shall be applied to the coupler head or the coupler head fittings. This lubricant may be applied using a water, alcohol, or other non-petroleum based carrier.

#### **7.12 Storage**

Couplers, yokes and attachments must be stored in a dry place under cover to prevent rusting.

Any rust or dirt resulting from prolonged storage must be removed prior to placing coupler or parts in service.

#### **7.13 Markings**

All yokes, couplers and parts shall have legible markings, as specified in Figures 6 and 7.

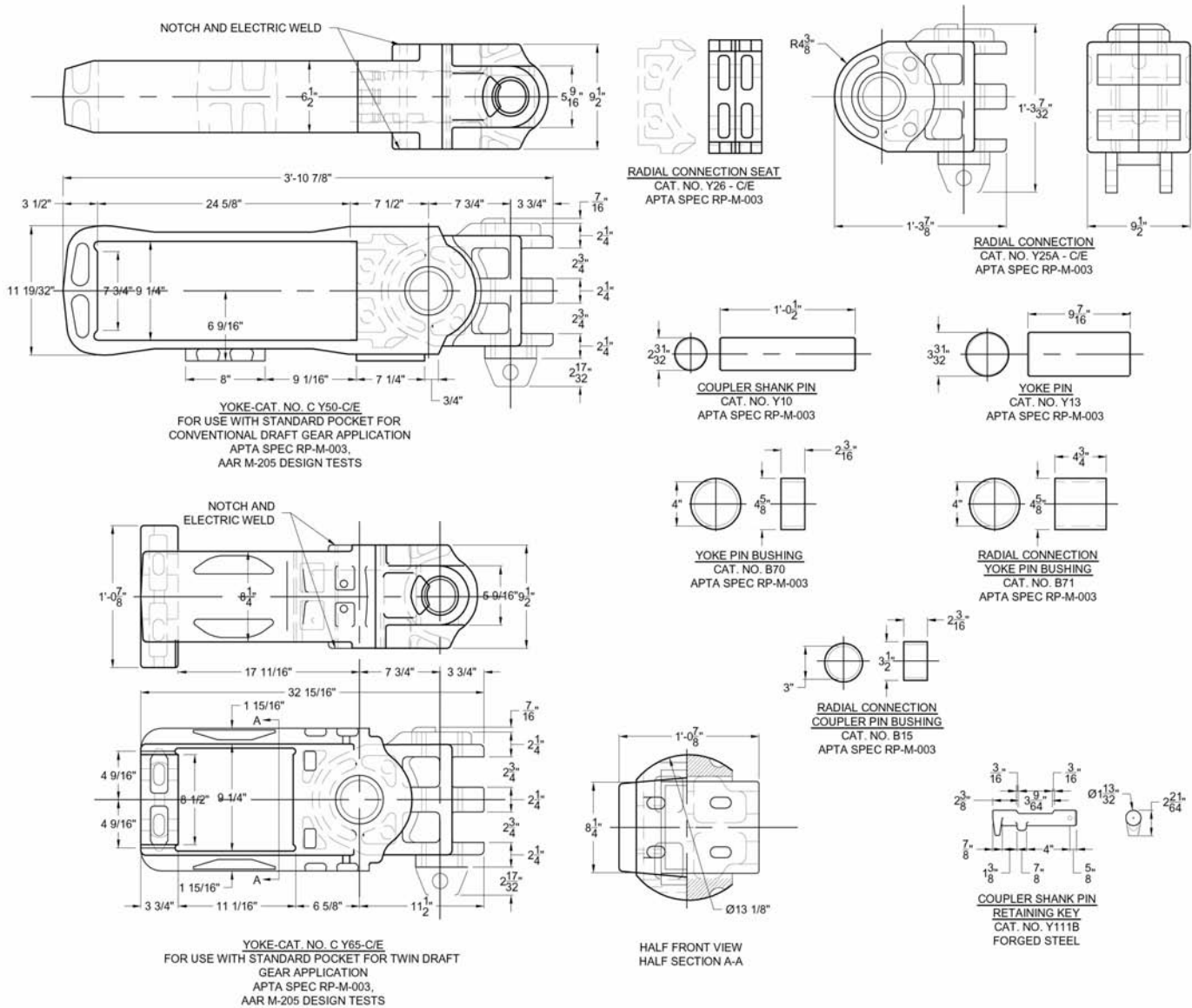
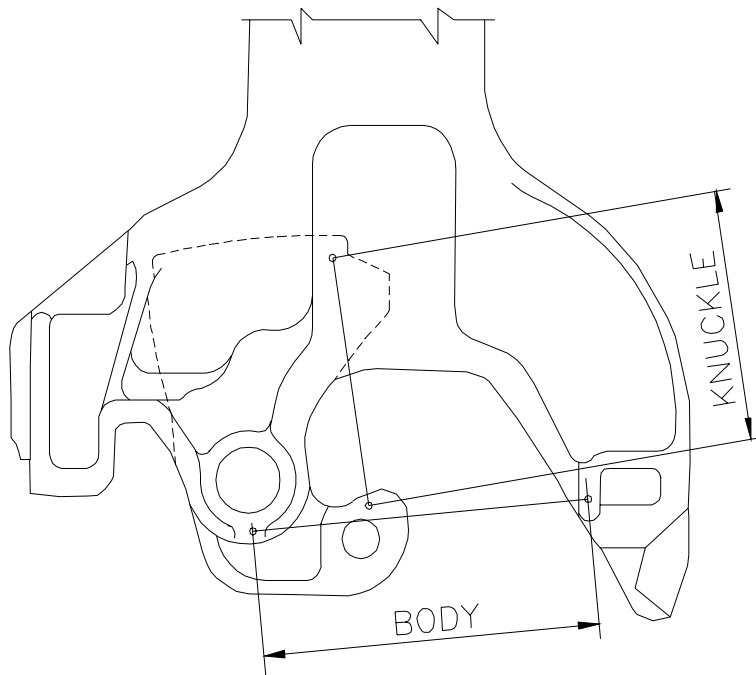


Figure 1

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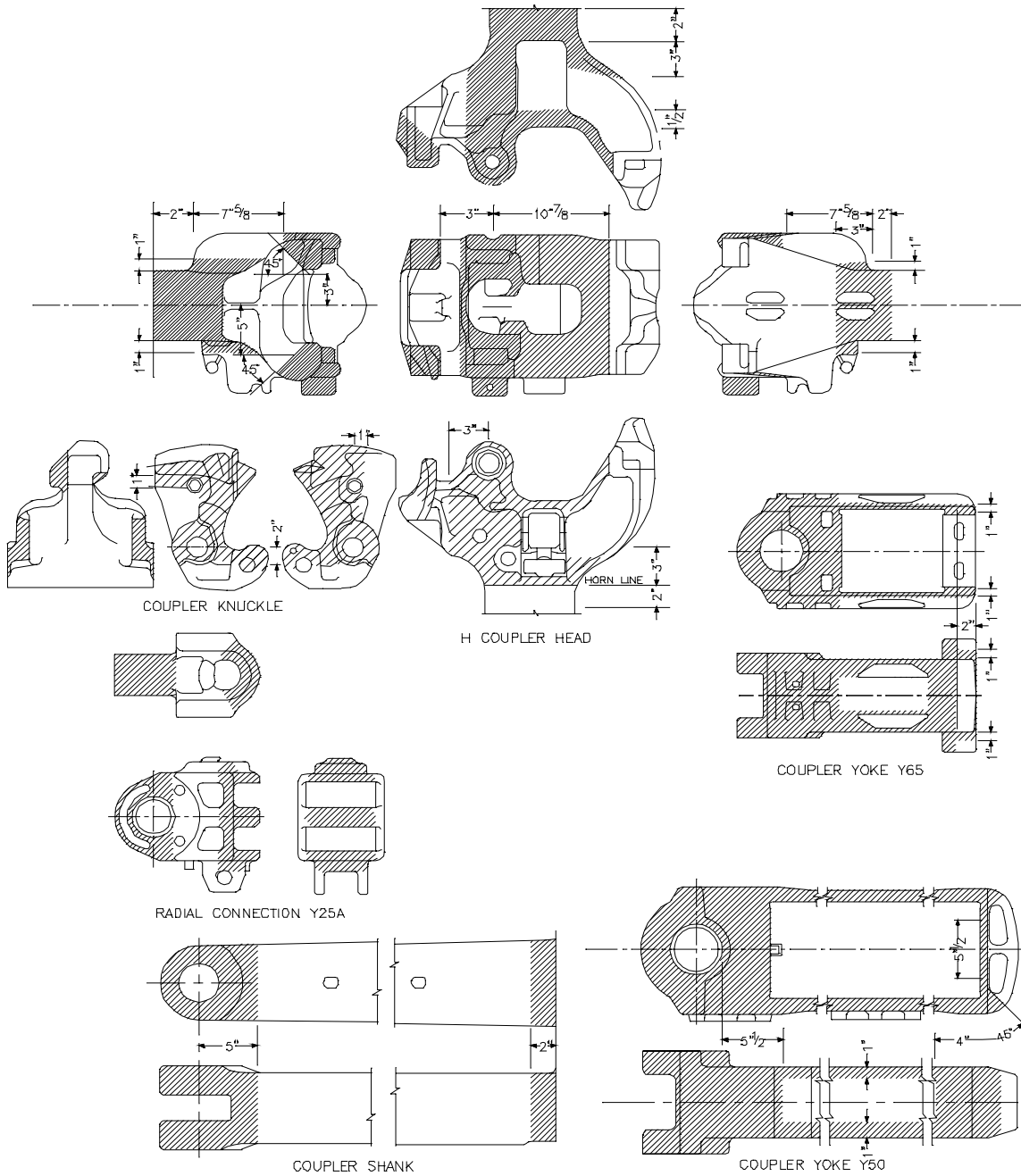


H TIGHTLOCK COUPLER HEAD

FIG. 2



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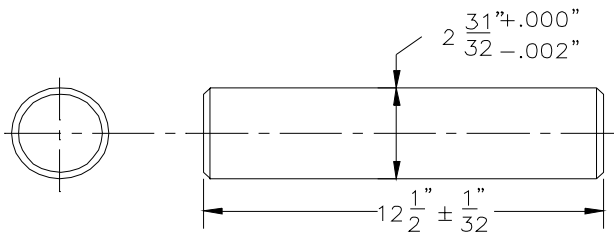


	NORMALIZED AND TEMPERED	QUENCHED AND TEMPERED
WELDS IN SHADED AREA	TEMPER	QUENCH AND TEMPER
WELDS IN NON-SHADED AREA	NONE	TEMPER

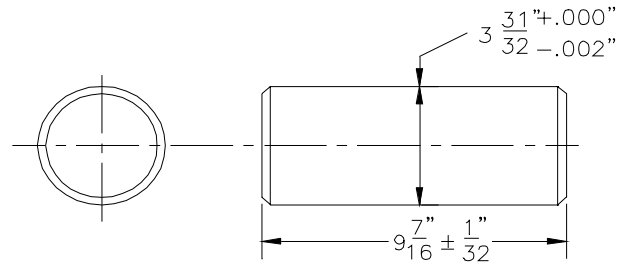
HEAT TREATMENT REQUIREMENTS AFTER WELD REPAIR

FIG. 3

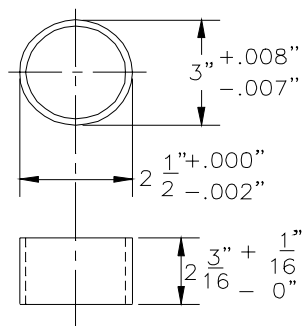
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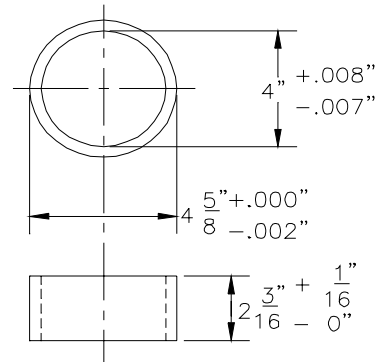
Coupler Shank Pin  
Catalog No, Y10



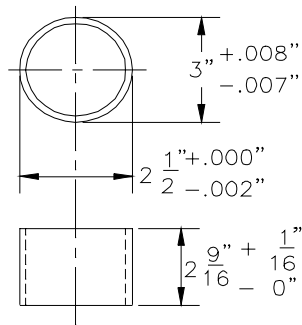
Yoke Pin  
Catalog No. Y13



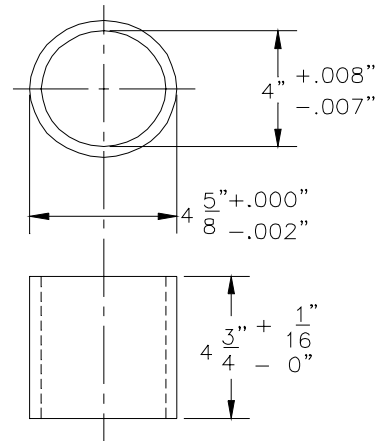
Radial Connection  
Coupler Pin Bushing  
Catalog No. B15



Yoke Pin Bushing  
Catalog No. B70



Coupler Shank Bushing  
Catalog No. B16

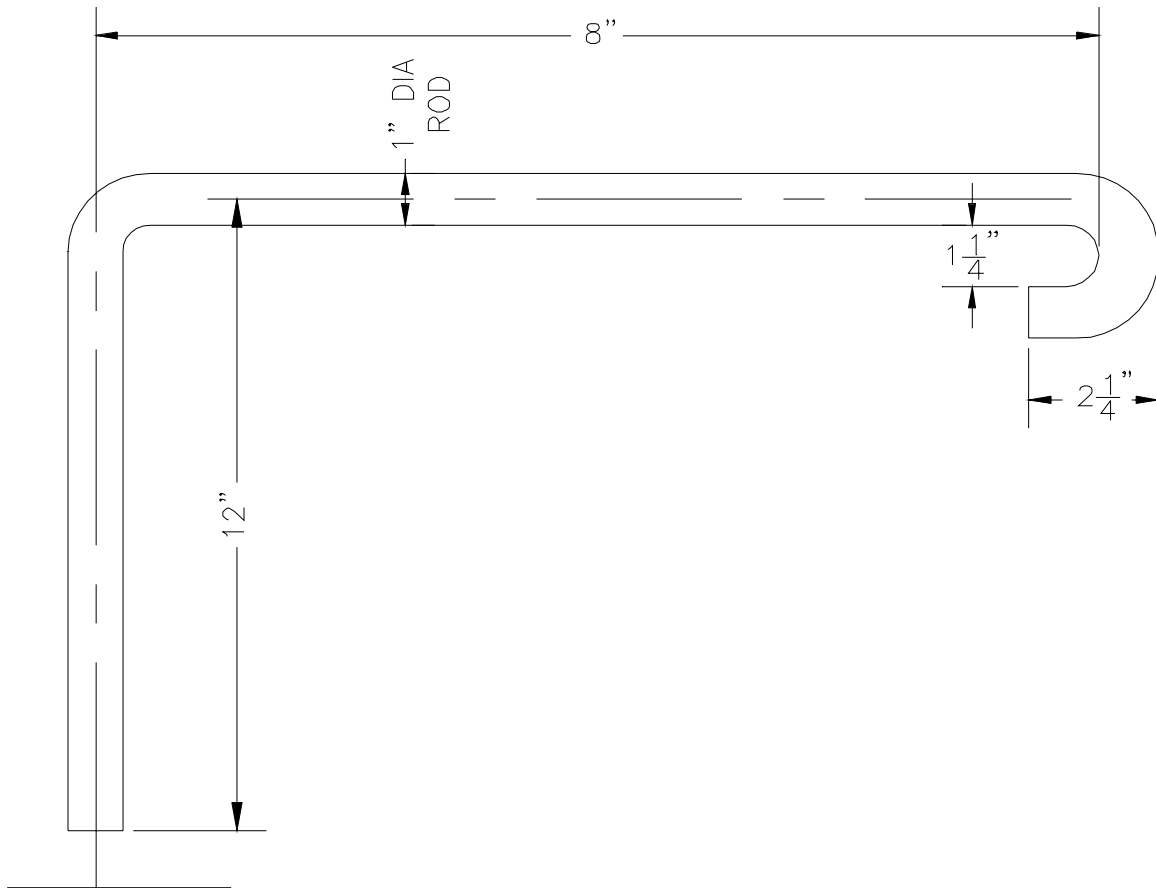


Radial Connection  
Yoke Pin Bushing  
Catalog No. B71

"H" TIGHTLOCK COUPLER  
COUPLER SHANK AND YOKE PINS AND BUSHINGS - TOLERANCES

FIG. 4

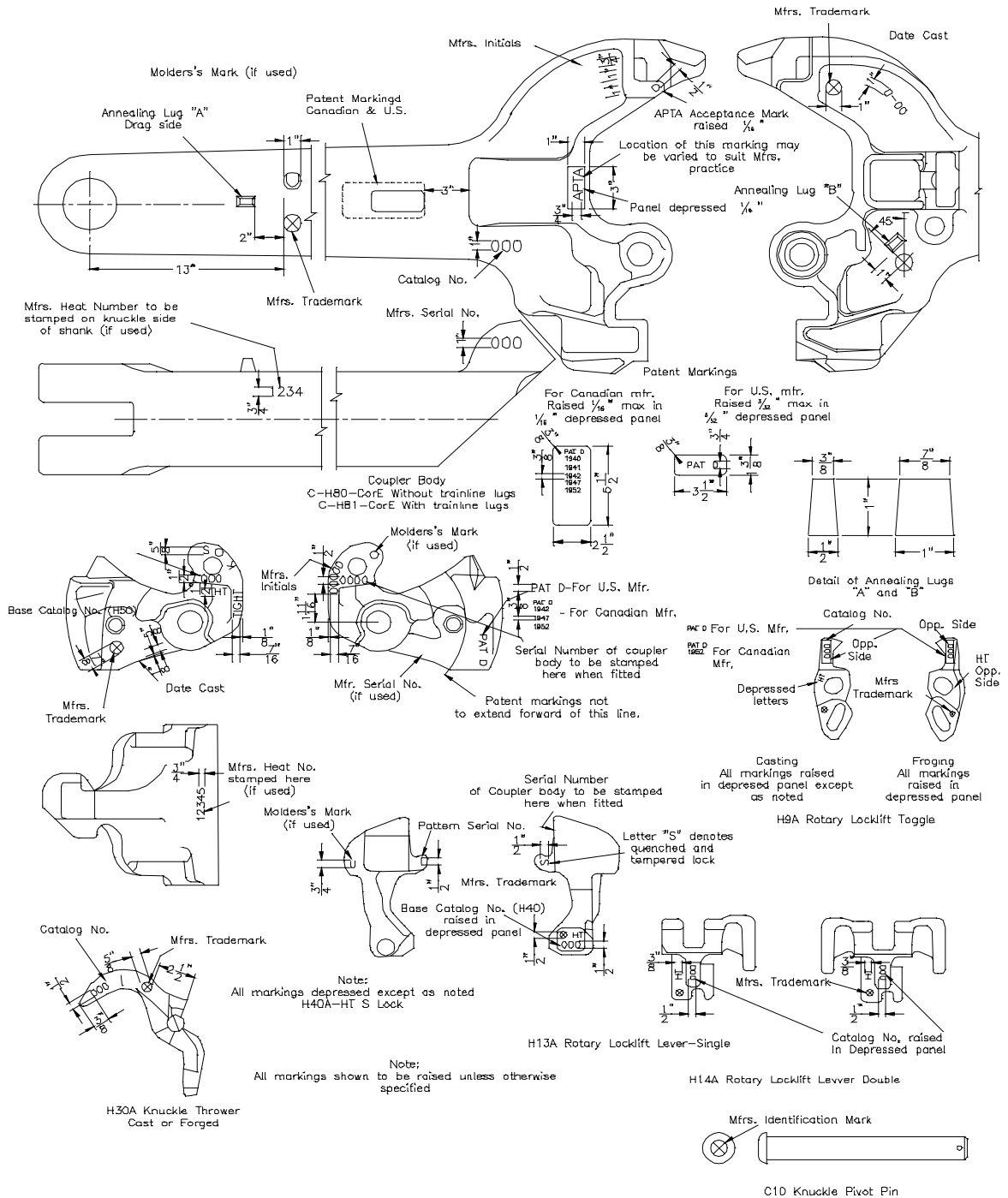
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COUPLER INSPECTION OPERATING ROD

FIG. 5

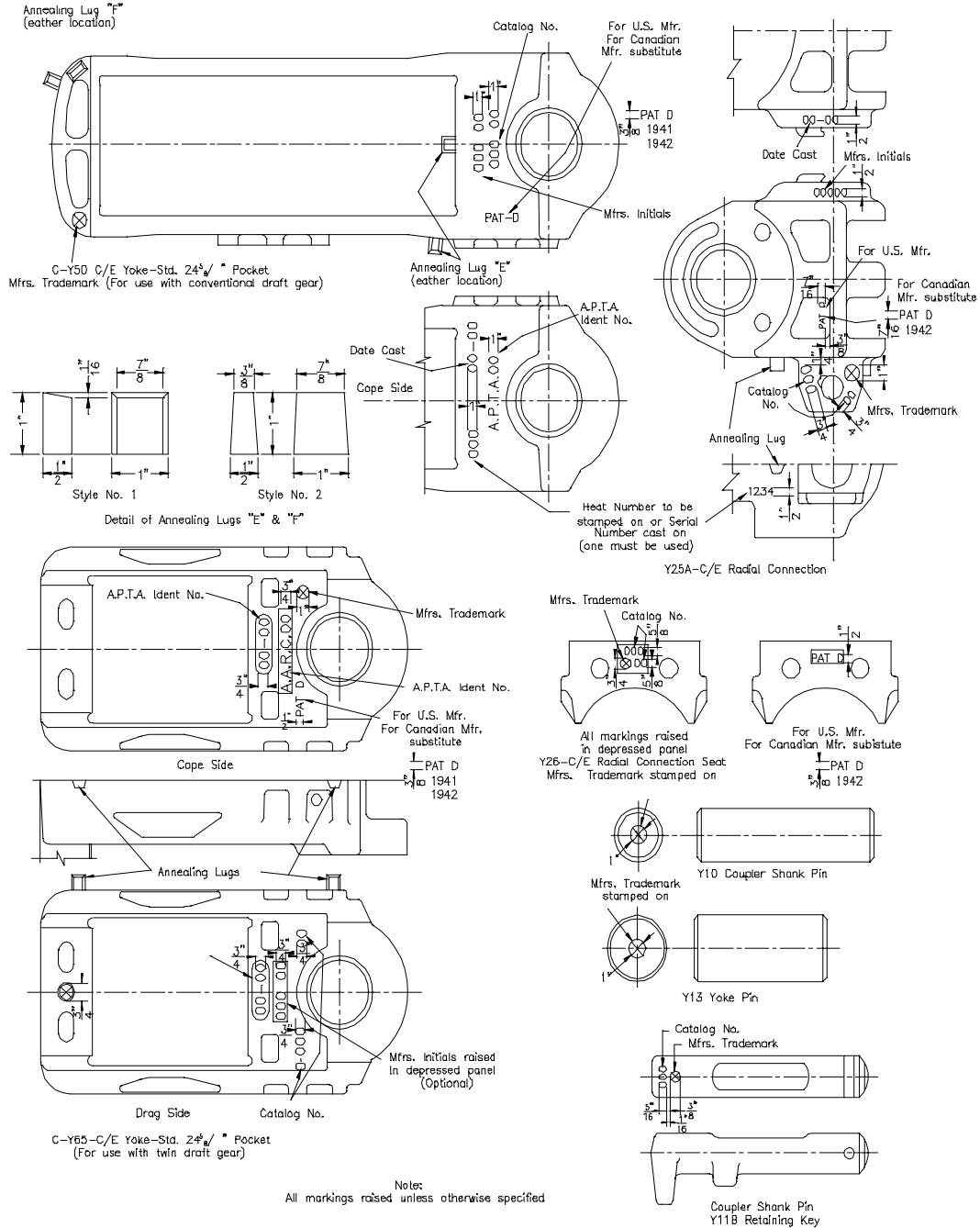
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"H" TIGHTLOCK COUPLER  
MARKINGS FOR YOKES AND ATTACHMENT PARTS

FIG. 6

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"H" TIGHTLOCK COUPLER  
MARKINGS FOR YOKES AND ATTACHMENT PARTS

FIG. 7

"H" TIGHTLOCK COUPLER ROTARY OPERATING FOR PASSENGER CARS AND LOCOMOTIVES

ALTERNATE STANDARD ADOPTED, 1937; REVISED 1939  
 TENTATIVE STANDARD ADOPTED, 1944  
 ADVANCED TO STANDARD, 1946; REVISED 1949, 1960, 1966

STANDARD S-166-80  
 ADOPTED, 1980

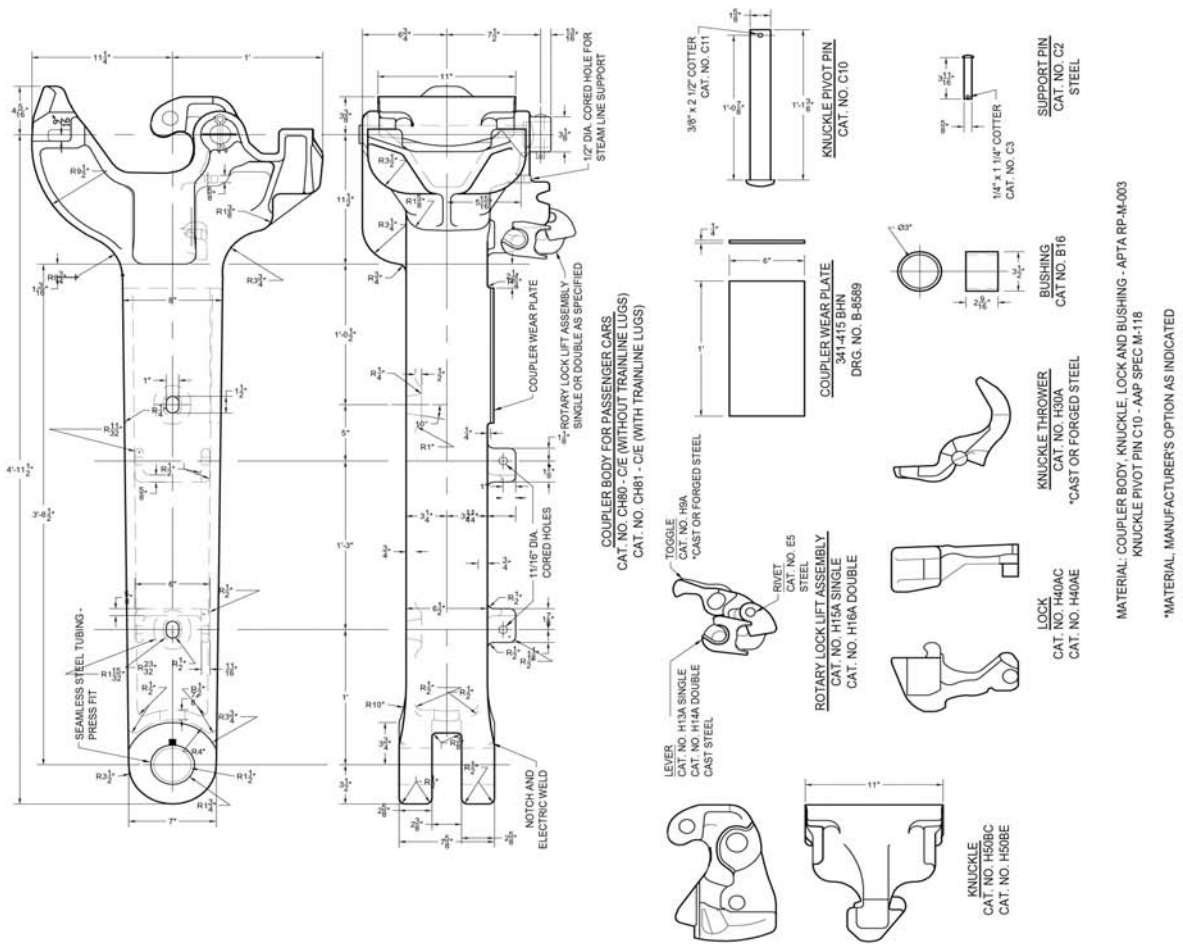


Figure 8

## Annex A (informative)

### Approval Requirements for Special Design Couplers, Coupler Parts, Yokes and Draft Gear Followers

Special and proprietary designs which deviate from APTA catalog numbered items which are to be used in interchange or common carrier service by arrangement will require separate approval by the APTA Coupler and Draft Gear Committee if they are to be identified with the initials APTA either stamped or cast in raised letters.

#### Approval Application Content

##### Description of the Special Feature

- a. Function
- b. Component design type to which feature is applicable.
- c. Owner, builder or designer who developed.

Railroad(s), car owner(s), or manufactures requesting special design.

Car type for which special design is to be furnished on original application.

Replacement(s) (What can be applied). If not interchangeable with an APTA standard, design deviations are to be listed.

Include statement that the item will be manufactured, sampled, tested and inspected in accordance with, and will be equal to or better than, the requirements of applicable specifications. In the event that material deviated from APTA specifications, mechanical, chemical and harden ability, test reports must accompany the application and a certification must be included which contains a statement that the component is compatible with APTA requirements in addition, a certification that the design complies with APTA operational and DOT safety requirements.

Specifications for reconditioning the Special Design, if different from applicable APTA Specifications, must be provided to each purchaser on request.

#### DOCUMENTATION REQUIREMENTS

Twelve drawings listing material, heat treatment, and complete dimensioning and the name of the foundry or foundries that produce the item must accompany the application.