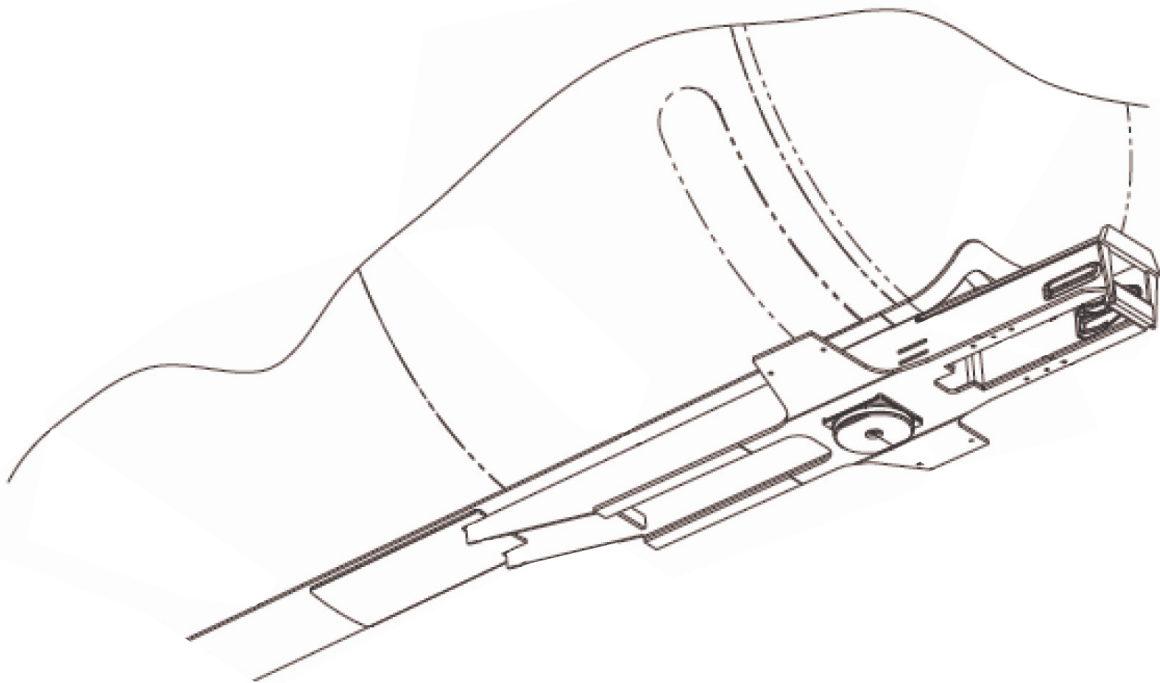


# ARI300 Tank Car and Underframe

## STRUCTURAL INSPECTION BULLETIN



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## Overview

The information contained in this inspection bulletin fundamentally explains the inspection, test and acceptance criteria for the structural integrity of the ARI300 design stub sill series of tank car underframes as specified in 49 CFR Part 180, Subpart F, Qualification and Maintenance of Tank Cars.

Tank car qualification programs require the inspection of many areas common to all tank cars. These areas are clearly outlined in 49 CFR Part 180.509. The requirements for a focused inspection, which may be considered specific to the ARI300 stub sill underframe, are outlined in the "Specific Inspections" section of this document. Additional references, including the AAR Manual of Standards and Recommended Practices, Specifications for Tank Cars, M-1002, the AAR Field Manual, and the AWS Railroad Welding Specification D15.1 must be consulted in the development of a comprehensive qualification plan. If any difference should exist between the aforementioned manuals and this bulletin, the manuals shall take precedence unless written instructions from The Greenbrier Companies or the car owner exists.

This document contains general inspection requirements for the ARI300 Series underframe. Specific inspections must be performed in accordance with the car owner's qualification and maintenance program.

### ARI300 Underframe Development

The ARI300 tank car underframe was developed specifically to meet the industry need for interchange service tank cars that comply with the AAR fatigue life requirements. The underframe consists of precisely designed fabricated steel components welded together to form a stub center sill and an underbelly cradle pad which is typically ½" thick x 22" wide. The production of this design began in 1997 and continues to be produced. This underframe has been updated several times since to assure that it continues to meet the AAR tank car environmental usage data. The 300 series underframe is currently in production.

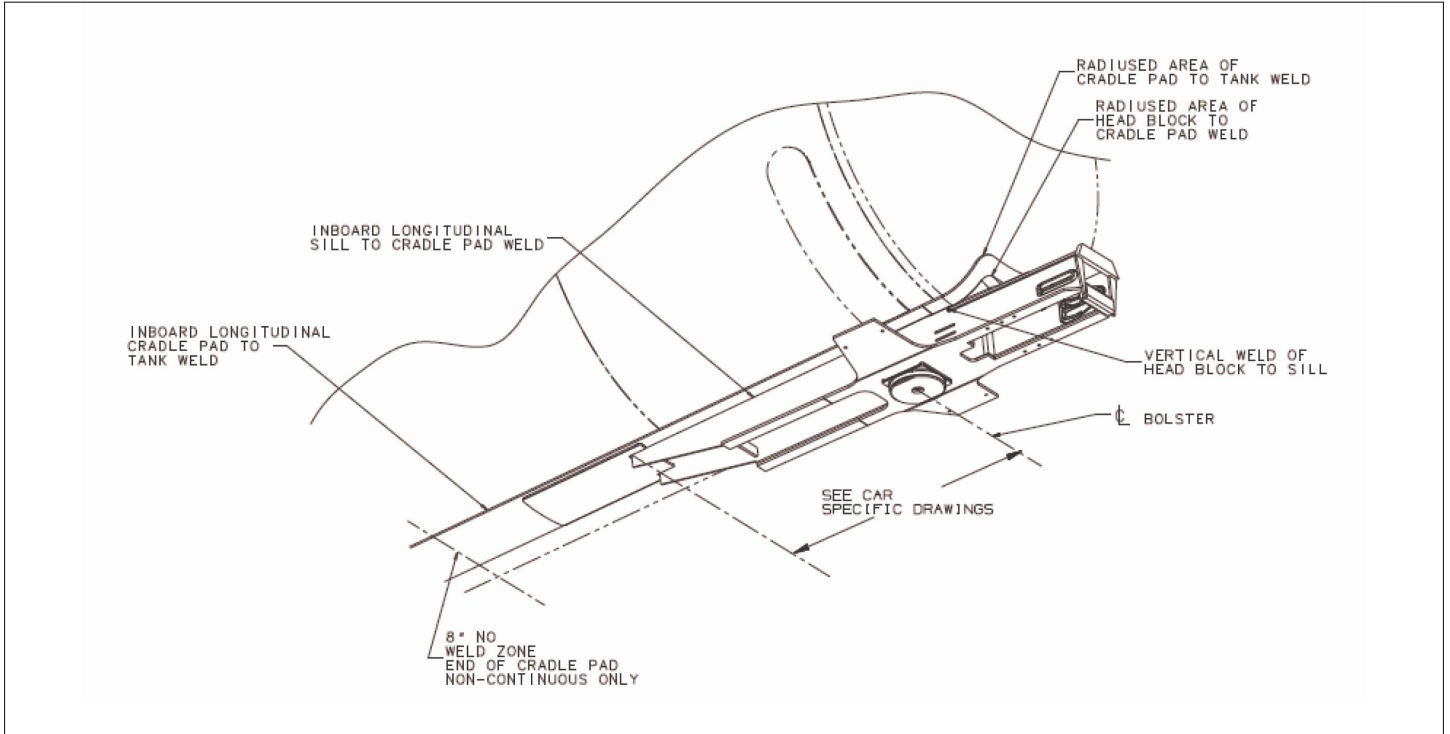
The most critical areas of the underframe are at the inboard and outboard ends of the stub sill where it attaches to the tank cradle pads. The attachment welds of the cradle pad to the tank at the inboard and outboard terminations are also critical inspection locations.

### ARI300 Underframe, General Inspection Information

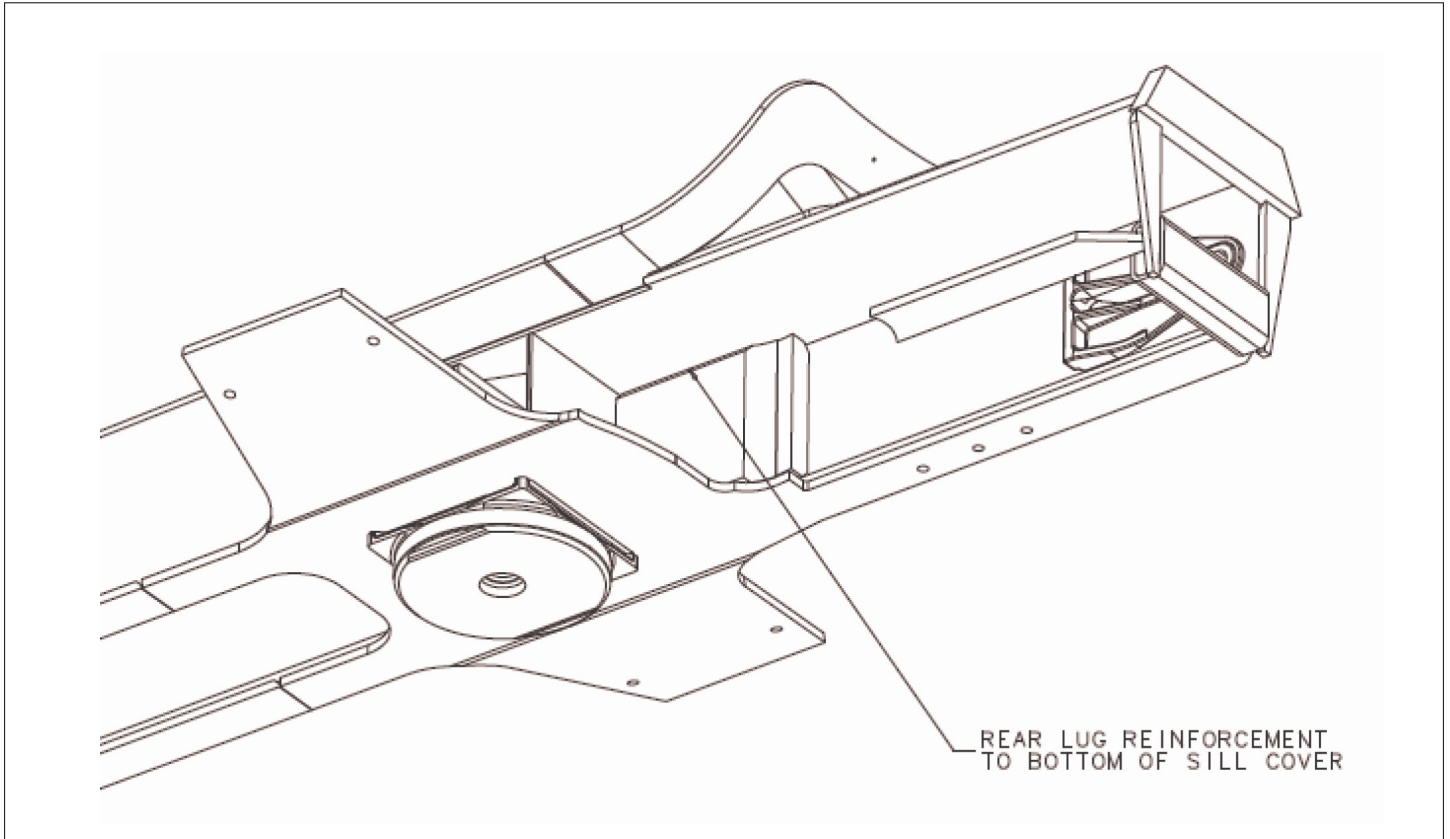
All work must be performed in an AAR approved facility, and must be in accordance with the car owner's specific instructions, following all industry and shop safety procedures. Inspection personnel must be qualified in accordance with all FRA and AAR regulations including AAR MSRP CIII Appendix T. Note: Methods indicated in the following paragraphs are recommended methods and must not be interpreted as the only acceptable method.

The defect acceptance criteria for the tank shell welding is to be in accordance with AAR Appendix W. All other non-tank welding is to be in accordance with AWS D15.1 Class 2. If questions arise concerning the integrity of any weld or the parent metal, then a more extensive test or inspection may be required to obtain an accurate conclusion about the integrity of the area in question. If defects are present contact the maintenance responsible party for repair procedures.

**Figure 1: ARI300 Underframe Inspection Locations and Codes**



**Figure 2: ARI300 Underframe – View of Backstop to Sill Weld**



# Specific Inspections

## 1. Underframe – General Inspection

Inspect the sill and bolster for signs of abrasion, corrosion, cracks, dents, distortion, weld defects or any other condition that would make the tank car unsafe for transportation using one of the following inspection and test procedures that the shop and inspector is certified to utilize:

- a. Dye penetrant test
- b. Radiography test
- c. Magnetic particle test
- d. Ultrasonic test
- e. Direct or remote visual inspection
- f. Other applicable techniques which are authorized

The inspection locations are to be reported using the TCID Data Collection Template ACF300 and ARI300. This template applies to the ACF300, ACF301, ACF310, ACF330, ARI300, ARI301, ARI310, ARI330 underframes.

## 2. Cradle Pad to Tank Welds – General Inspection

Inspect the structural tank attachment welds for cold-rolled terminations, cracks, undercuts and all other defects. Figure 1 shows the general construction, car specific dimensions should be used when cutting inspection ports on jacketed cars.

## 3. Tank Girth Seam Butt Welds

Ultrasonically inspect from the tank interior, the tank shell butt welds within 2 feet of the bottom longitudinal center line of the tank. The tank butt weld under the cradle pad is not a highly stressed weld, and by analysis has a low likelihood of failure. The weld must be inspected unless the owner has submitted reliability data to the FRA to exempt this weld from inspection.

## 4. Rear Lug to Sill Welds

Visually inspect from the tank exterior the fillet weld of the longitudinal rear lug reinforcement to the bottom of the sill top cover. Inspect the adjacent rear lug reinforcement and sill top cover parent metal (4 places per car). See figure 2.

## 5. Sill Web to Cradle Pad Welds – Inboard Termination

For underframes not equipped with a reinforcement pad, visually inspect from the tank exterior, the last 6” of the inboard longitudinal fillet weld of the sill web to cradle pad, (B4, B44). Inspect the adjacent sill web and cradle pad parent metals (4 places per car). See figure 3.

Cars not equipped with reinforcing pads (ACF 300 and ARI300 are recommended to have them applied per the latest version of the Inspection Bulletin, tank car inboard stub sill inspection and modification.

## 6. Reinforcement Pad to the Sill Web Welds

For underframes equipped with a reinforcement pad, visually inspect from the tank exterior, the reinforcing pad at the inboard termination of the weld joining the sill web to the reinforcement pad. (B4, B44). Inspect the adjacent reinforcing pad parent metal (2 places per car). See figure 3.

## 7. Reinforcement Pad to the Cradle Pad Welds

For underframes equipped with a reinforcement pad, visually inspect from the tank exterior, the weld of the reinforcing pad to the cradle pad, (B301, B302). Also inspect the adjacent reinforcing pad parent metal (2 places per car). See figure 3.

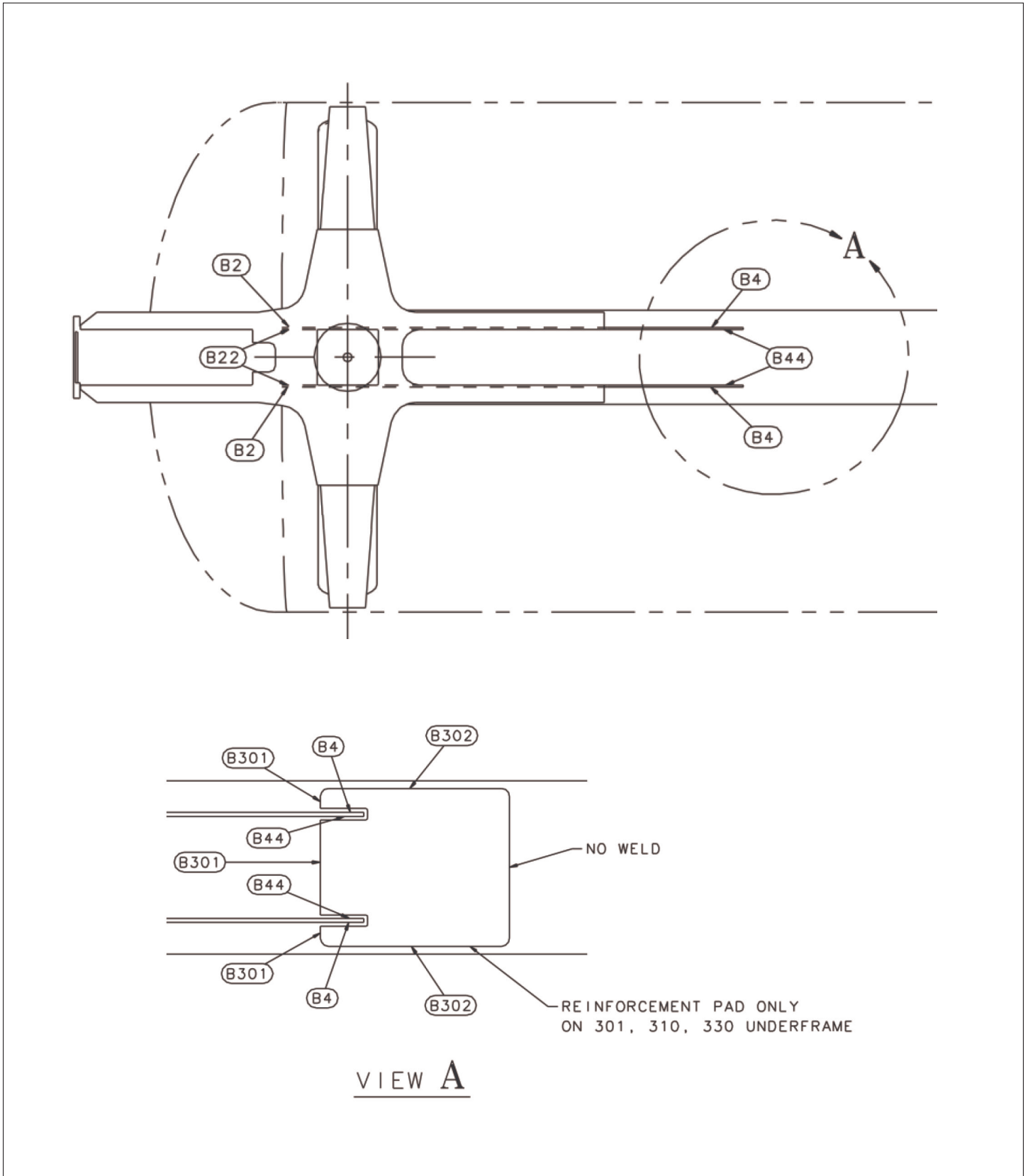
## 8. Cradle Pad to Tank Welds – Adjacent to Reinforcement Pad

For underframes equipped with a reinforcement pad, visually inspect from the tank exterior, the cradle pad to tank weld along the length of the reinforcement pad. See figure 3.

## 9. Sill Web to Cradle Pad Webs – Outboard

Visually inspect, from the tank exterior, the last 6” of the outboard longitudinal fillet weld of the sill web to cradle pad, (B2, B22). Inspect adjacent sill web and cradle pad parent metals (4 places per car). See figure 3.

Figure 3: ARI300 Underframe – View of Sill Web to Cradle Pad



### **10. Cradle Pad to Tank Welds – Inboard Termination**

Visually inspect from the tank exterior, the last 6” of the inboard longitudinal fillet weld of the cradle pad to tank, (A6). Inspect the adjacent cradle pad and tank parent metal (4 places per car). See figure 4. Note: This inspection area only applies to cars not equipped with a continuous cradle pad.

Cars equipped with a slot weld from the cradle pad to the tank between the draft sill webs, (A8). Inspect the adjacent cradle pad and tank parent metal (4 places per car). See figure 4. Welds are longitudinal only and should not be welded around the radius on either end.

### **11. Head Pad to Tank Welds**

Visually inspect from the tank exterior, the radius area of the outboard cradle pad (head pad) to the tank head fillet weld (A1, A2). Inspect the adjacent cradle pad and tank parent metal (2 places per car). See figure 4.

### **12. Head Pad to Tank Welds – Inside the Head Block**

Ultrasonically inspect, from the tank interior, or through remote visual inspection through the hole in the head block, the cradle pad (head pad) window to tank head fillet weld (A3). The cradle pad (head pad) window size is approximately 8.0” transversely by 14.6” longitudinally. The start of the window is located outboard of the tank head weld seam approximately 4 ¼” and is centered on the bottom center line of the tank (2 places per car).

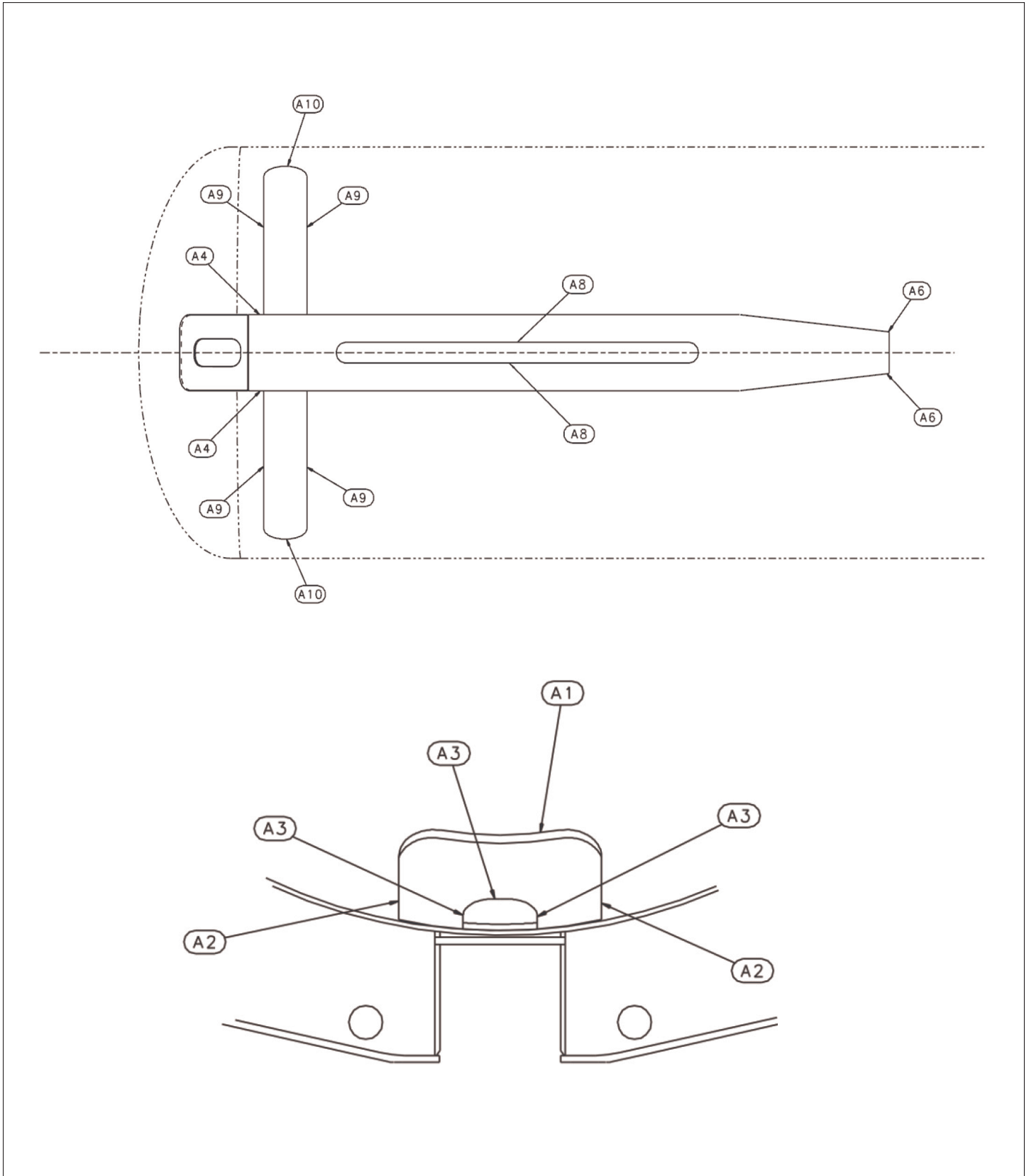
This weld is not a highly stressed weld and by stress analysis been determined to have a low likelihood of failure. The weld must be inspected unless the owner has submitted reliability data to the FRA to exempt this weld from inspection. See figure 4.

### **13. Bolster Pad to Tank Welds**

This weld is included in the TCID template. Owners must base the need to inspect this area on reliability data.

Visually inspect from the tank exterior, the weld around the radius portion of the bolster pad and one foot down from the tangent (A9, A10). Inspect the adjacent cradle pad and tank parent metal (2 places per car). See figure 4.

Figure 4: ARI300 Underframe – View of Reinforcement Pad to the Cradle Pad



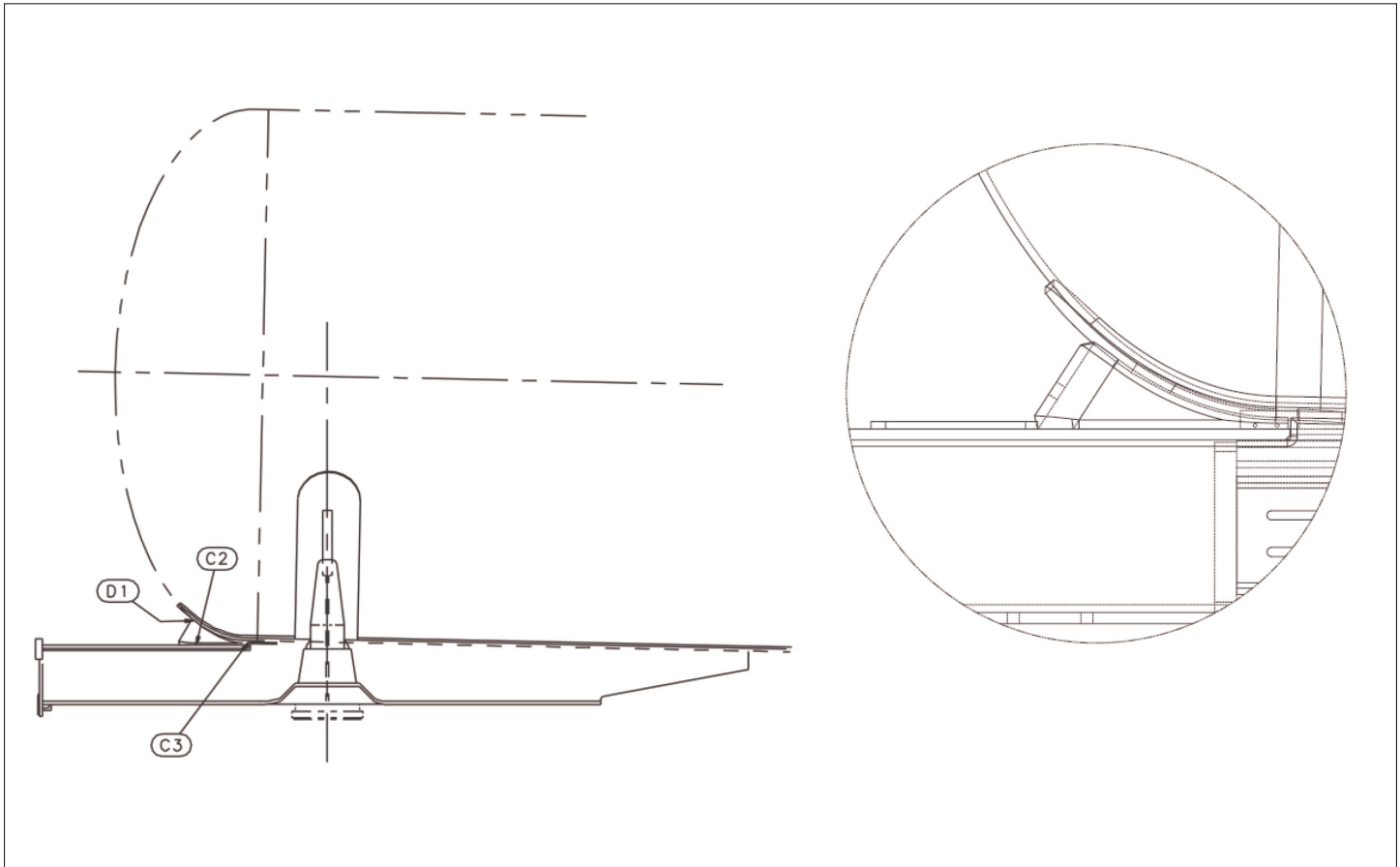
**14. Head Block to Head Pad Welds**

Visually inspect from the tank exterior, the radius area of the outboard head block to cradle pad (head pad) fillet weld (D1). Inspect adjacent head block and cradle pad parent metal (4 places per car). See figure 5.

**15. Head Block to Sill Web Welds**

Visually inspect from the tank exterior, the welds which attach the head block to the sill web including that portion of the weld that extends across the sill top cover (C2, C3). Note that the vertical groove weld is approximately 1” long (C3). Inspect the adjacent head block and sill web parent metal (4 places per car). See figure 5.

Figure 5: ARI300 Underframe – View of Head Block to Head Pad





**16. Sump to Tank Welds**

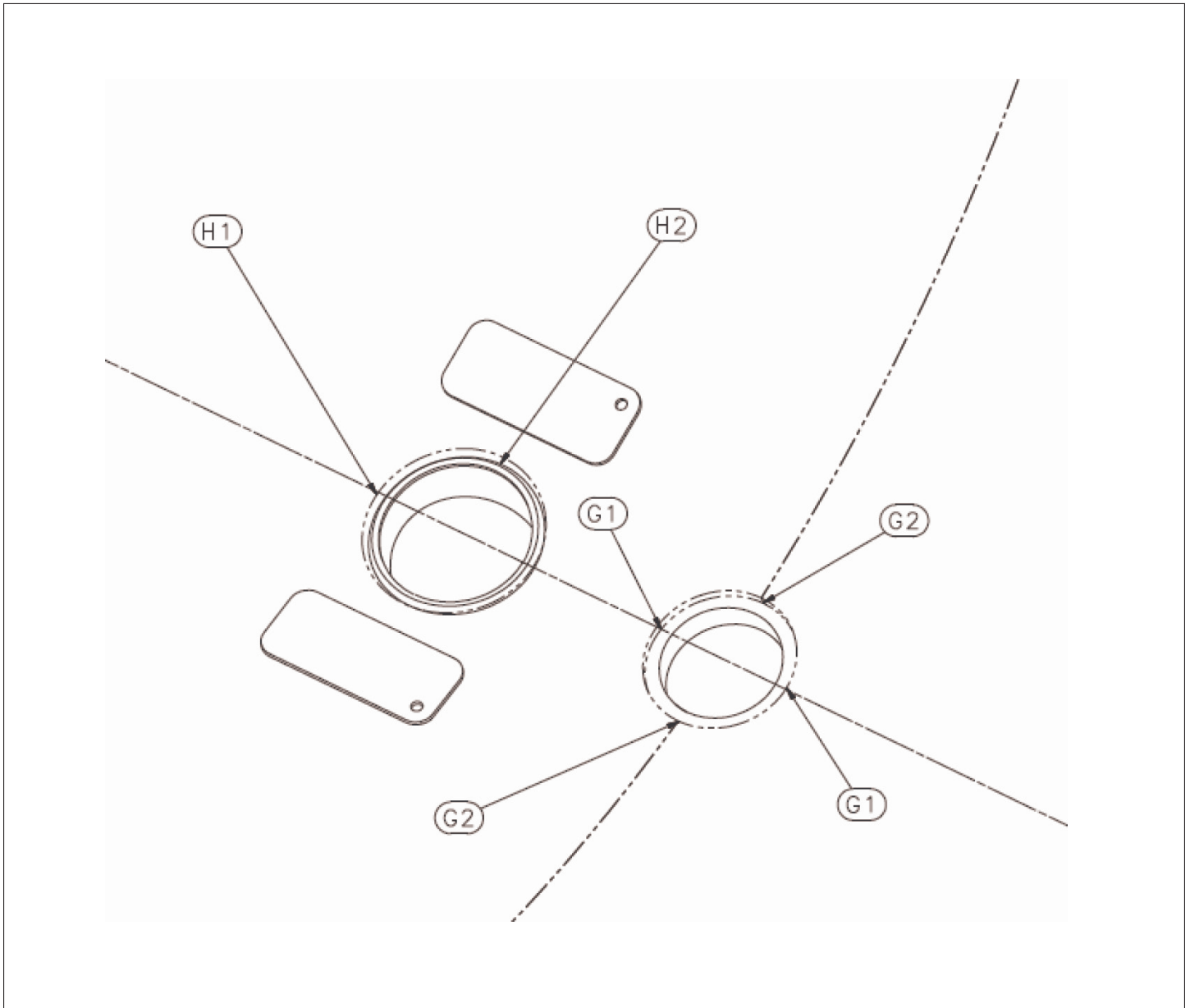
The sump to tank weld is not a highly stressed weld, and by analysis has a low likelihood of failure. The weld must be inspected unless the owner has submitted reliability data to the FRA to exempt this weld from inspection.

If the car is equipped with a sump and its tank attachment weld is a fillet weld, from the tank interior visually inspect the sump to tank weld (H1, H2). Inspect the adjacent sump and tank parent metal. See figure 6.

If the car is equipped with a sump and its tank attachment weld is a groove weld, from the tank interior ultrasonically inspect the groove weld (H1, H2). Visually inspect the sump and tank parent metal.

From the tank exterior, visually inspect the welds of the sump protective skid to the tank and/or cradle pad. See figure 7.

Figure 6: ARI300 Underframe – View of Sump welds



### 17. Bottom Outlet Valve (BOV) Flange to Tank Welds

The bottom outlet valve flange to tank weld is not a highly stressed weld, and by analysis has a low likelihood of failure. The weld must be inspected unless the owner has submitted reliability data to the FRA to exempt this weld from inspection.

If the car is equipped with a BOV flange and its tank attachment weld is a groove weld, from the tank interior, ultrasonically inspect the groove weld of the BOV flange to the tank (G1, G2). Inspect the adjacent BOV flange and tank parent metal. See Figure 6.

If the car is equipped with a BOV flange and its tank attachment weld is a fillet weld, from the tank interior visually inspect the BOV flange to tank weld (G1, G2). Inspect the adjacent BOV flange and tank parent metal. See Figure 6.

From the tank exterior, visually inspect the BOV flange weld (G1, G2). Inspect the adjacent BOV flange and tank parent metal. See Figure 7.

Figure 7: ARI300 Underframe – View of BOV welds

