



JUNE 10-12,
2025

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WRI2025HH

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Utilizing Machined Rail Inserts® to Facilitate Maintenance in CWR



HEAVY HAUL SEMINAR



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PROBLEM

The average detected defect in CWR requires multiple work groups and track time opportunities, along with approximately 21' of tested / matching plug rail to achieve a final welded repair

Individual Track Blocks for:

- Detection & Immediate Protection
- Rail Replacement
- Joint Elimination





SCOPE

In 2024, Norfolk Southern tested more than 100,000 track miles, detecting over 7,500 defects in mainlines and sidings.

This resulted in an approximate demand of:

- 157,000 LF of matching / UT tested plug rails
- 60,000 Bolt Holes & Bolts
- 30,000 Joint Bars
- 22,500 Saw Cuts
- 15,000 Welds





CURRENT PRACTICE

Identify Defect then:

Block 1 – 0.5 Hours

Section Truck – Protect

Block 2 – 1.5 Hours

Section Gang – Install Rail
Create Joints





CURRENT PRACTICE

Thermite Truck – 2 Welds

Block 3 – 2.5 Hours

**Thermite Practice –
3 Blocks – 4.5 Hours**



Or

Block 3 – 1.5 Hours

**EFB Practice –
3 Blocks – 3.5 Hours**

**(Can also install
seed rails if they
traverse a protected
defect)**





GOAL

Decrease Exposure & Improve Efficiency

Objectives:

- Remediate defects with a single crew replacing rail and welding the repair.
- Decrease the track time occupancy needed to repair a single defect.
- Improve quality and longevity of the welds and overall repair, creating fewer defective welds.





GOAL

**Maximize Process
Efficiency – F1 Pit Stop**





EVALUATION

Decrease Exposure & Improve Efficiency

How:

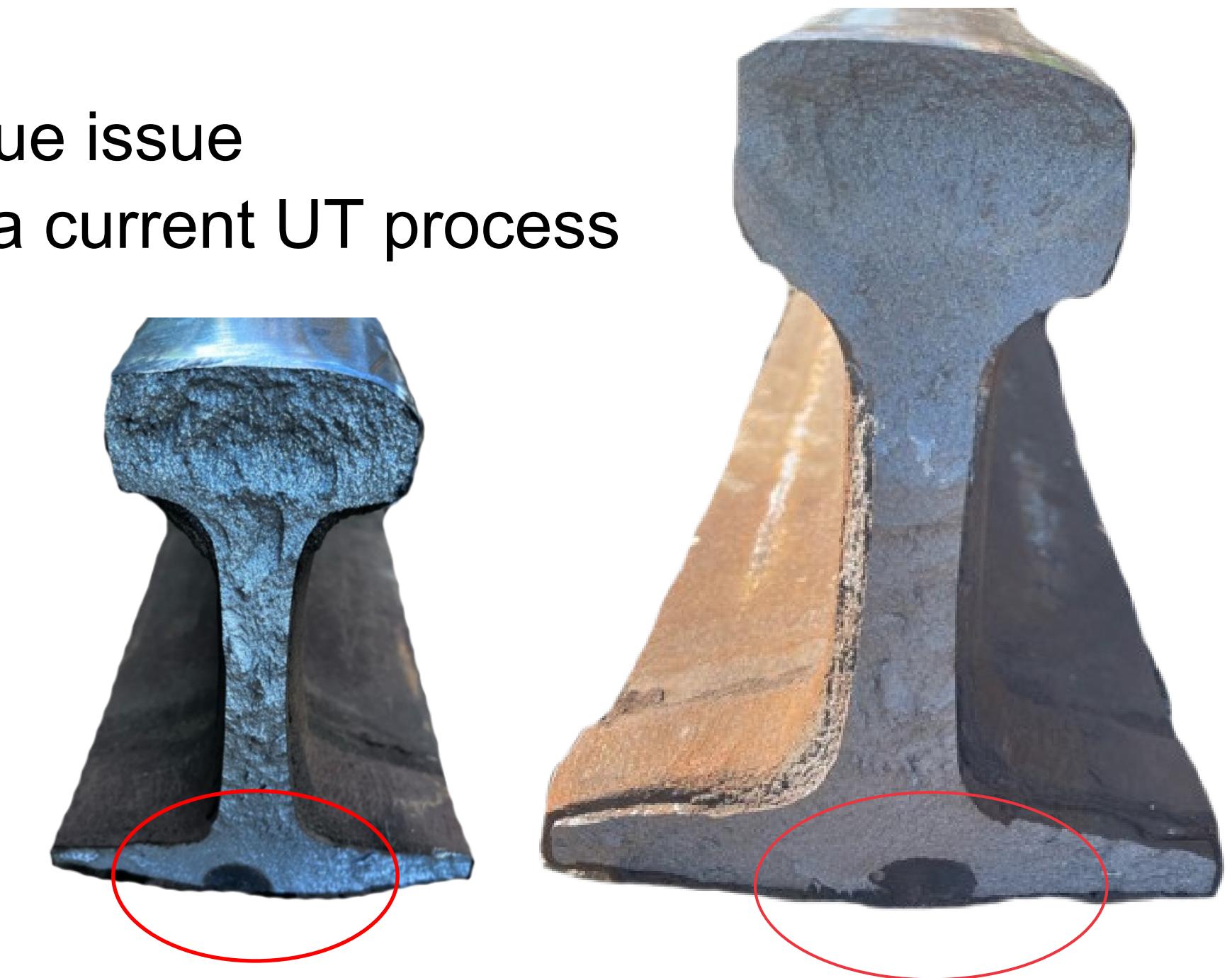
- Remediate defects with a single crew replacing rail and welding the repair.
 - Yes, a Turnkey EFB Crew can do this, but do we really need to remove 21' of rail?
- Decrease the track time occupancy needed to repair a single defect.
 - Can we reduce work volume and equipment required? Standardize the Work?
- Improve quality and longevity of the welds and overall repair.
 - Can we potentially improve EFB weld quality?





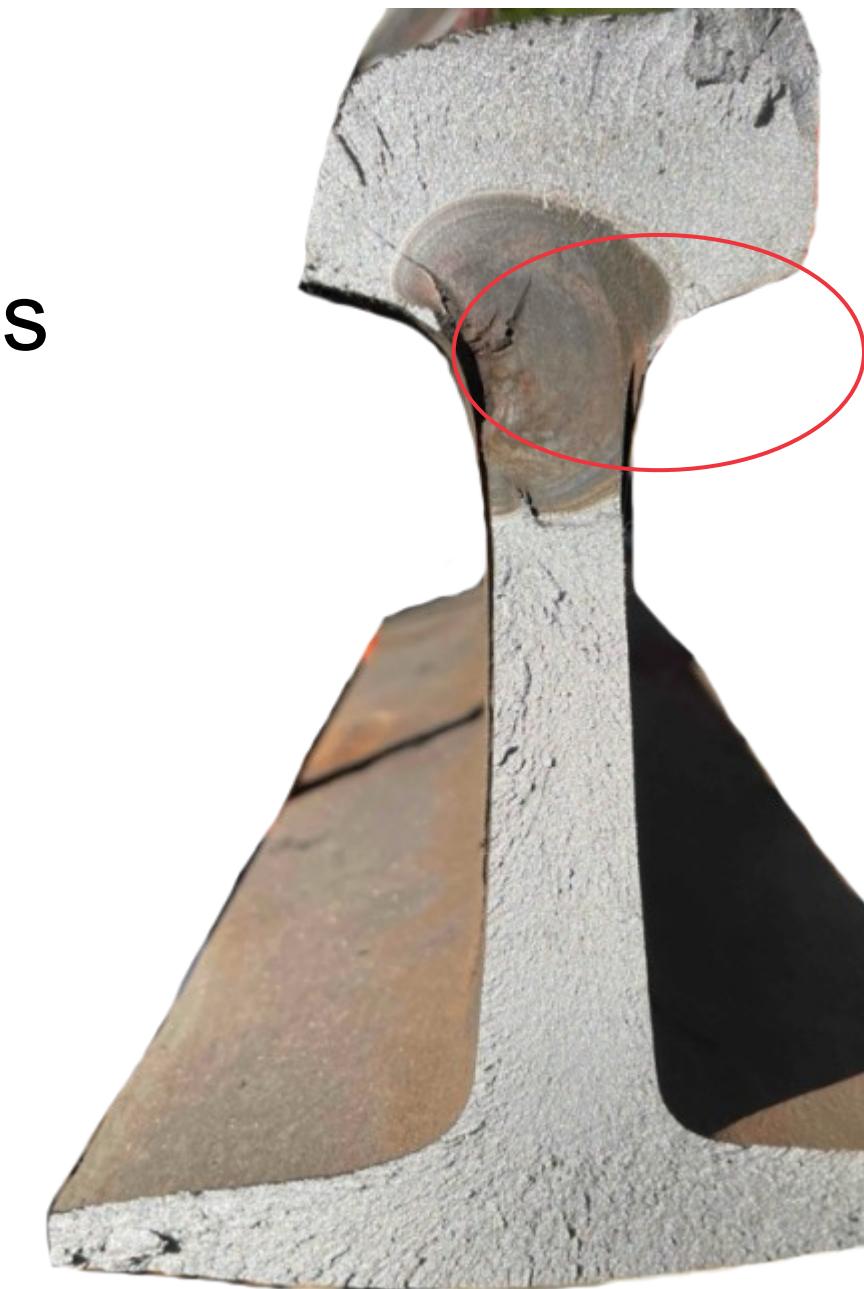
TYPICAL WELD FAILURES

- Thermite (Typical lifespan of 500 MGT)
 - Base Finning
 - Long-Term fatigue issue
 - Undetectable via current UT process



TYPICAL WELD FAILURES

- EFB (Typical lifespan of 1500 MGT)
 - Shear Lip (Head Web Fillet Radius)
 - Long-Term fatigue issue
 - Detectable via current UT Process

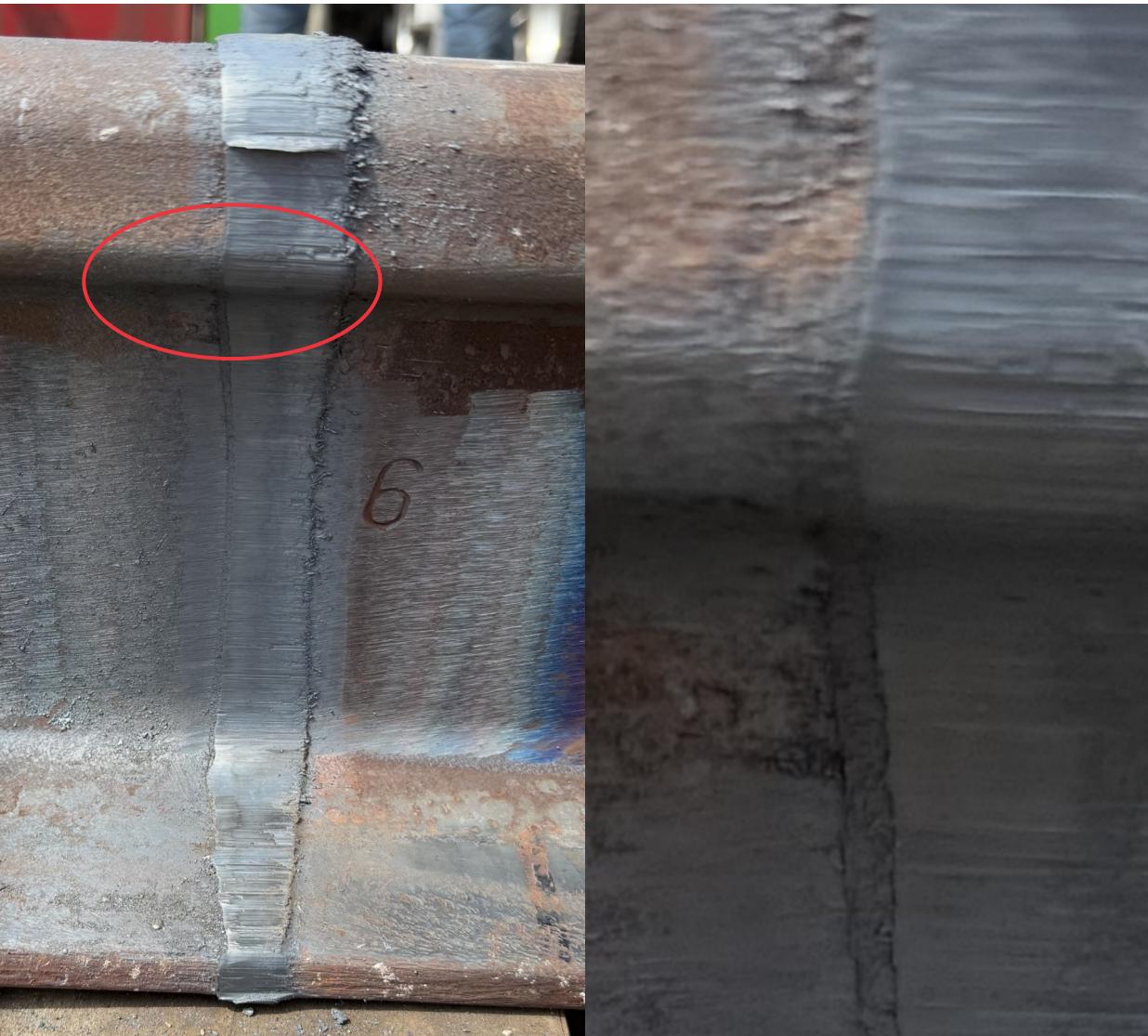




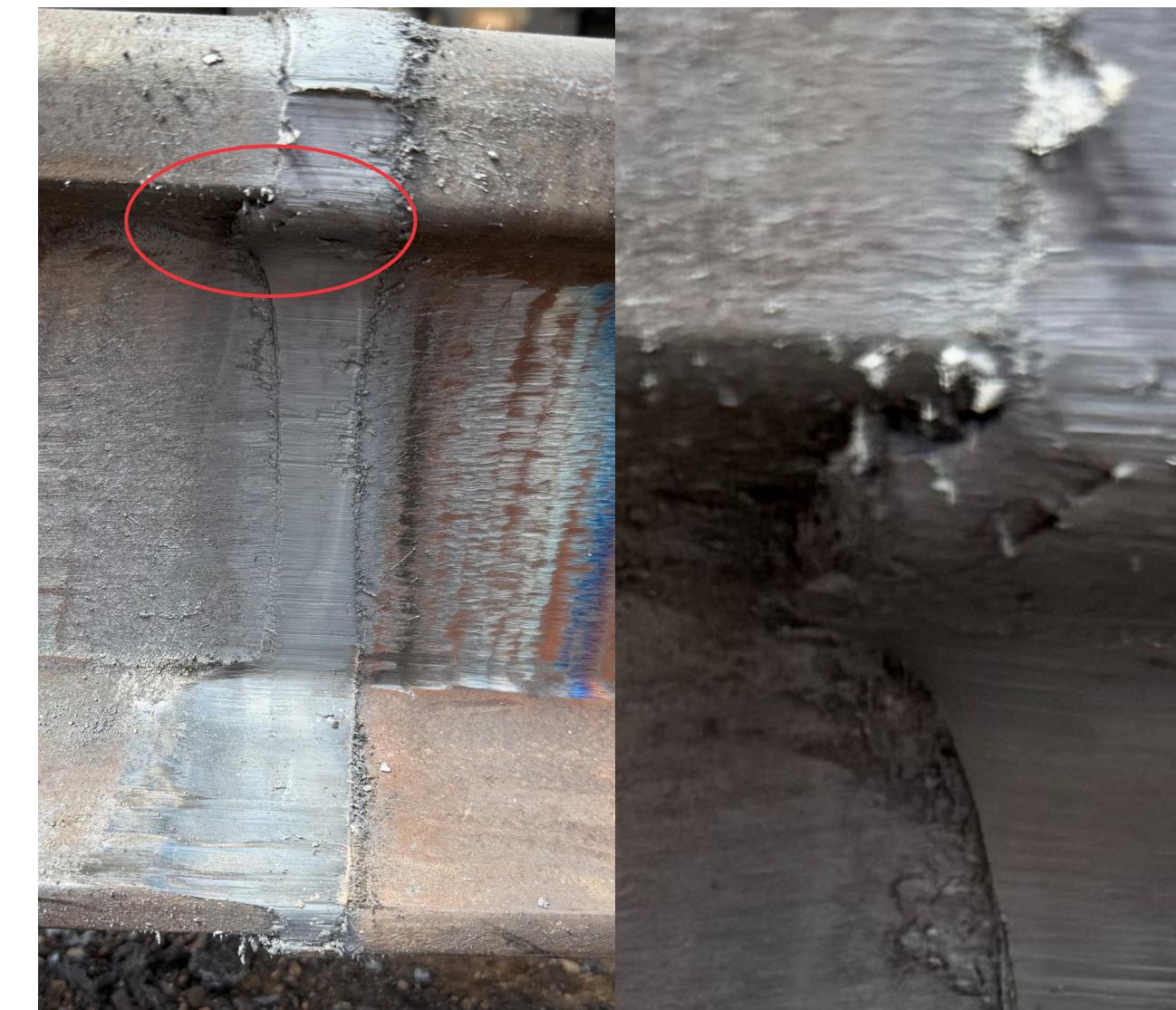
WELD FAILURE CONTRIBUTING FACTOR – EFB Welds

- Shear Lap / Smear

Matching Rails



4.7mm Mismatch (3mm in Base)





SOLUTION – MACHINED RAIL INSERTS®

- Improve repair / weld quality by improving rail match to within 2mm vs current 5mm
 - Eliminate Shear Lap / Smear
- Reduce track occupancy (Time and # of Occurrences)
 - Install and weld at the same time
 - Less Equipment to set on/off
 - Smaller / more nimble equipment
- Expedite repair process
 - Reduce trackwork & grinding demand
 - Less material handling
- Reduce costs (short-term and long-term)
 - Reduce to 5' Rail Inserts to save on crew, material, logistics costs
 - Productive and quality repairs
- Improve safety of employees
 - Less heavy & long material handling



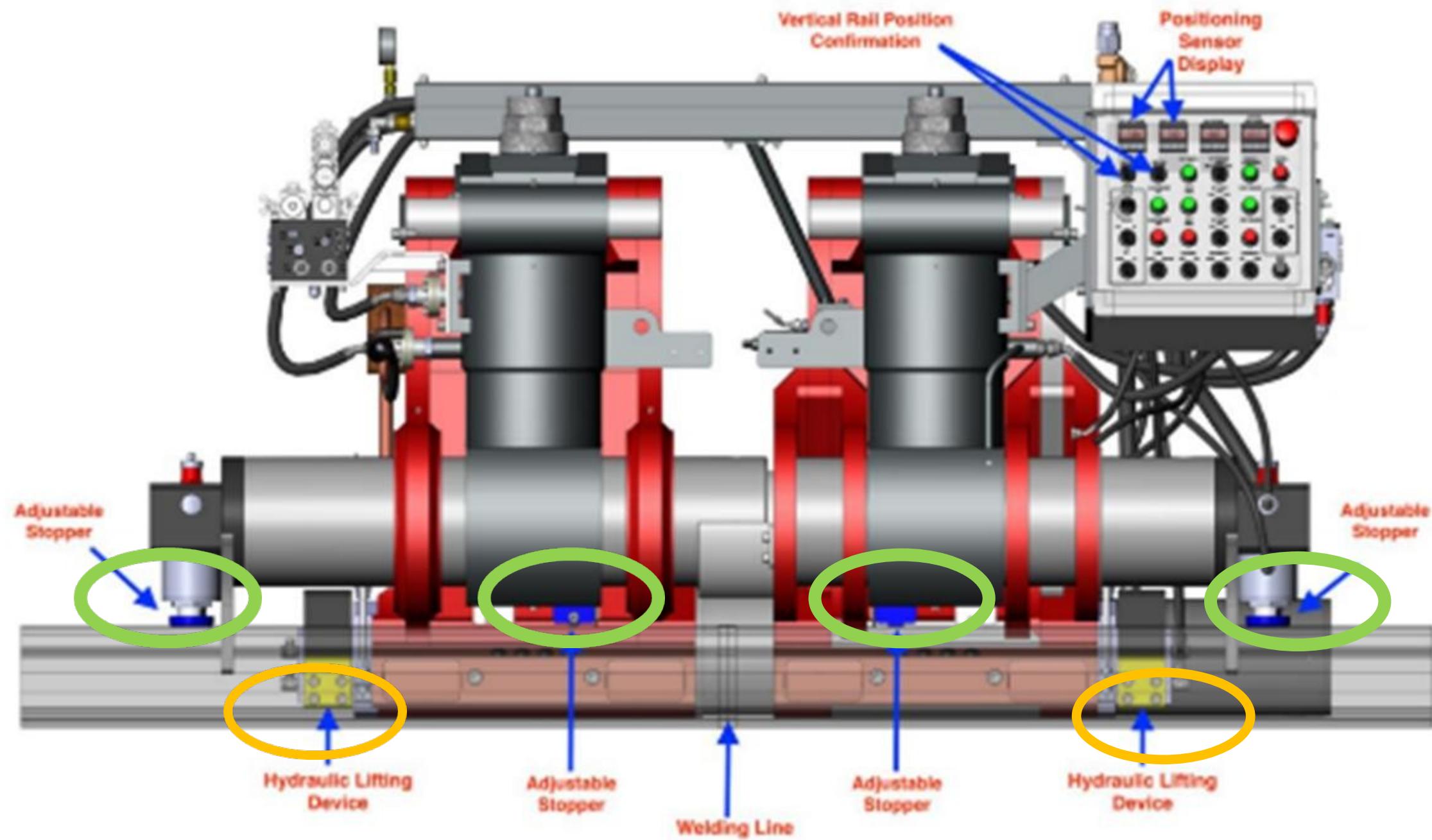


SOLUTION – MACHINED RAIL INSERTS® (Product)





SOLUTION - INSERT WELDING® (Process)





SOLUTION - INSERT WELDING® CREW (Process)

**Block 1 – 0.5 Hours
(Not Shown)**

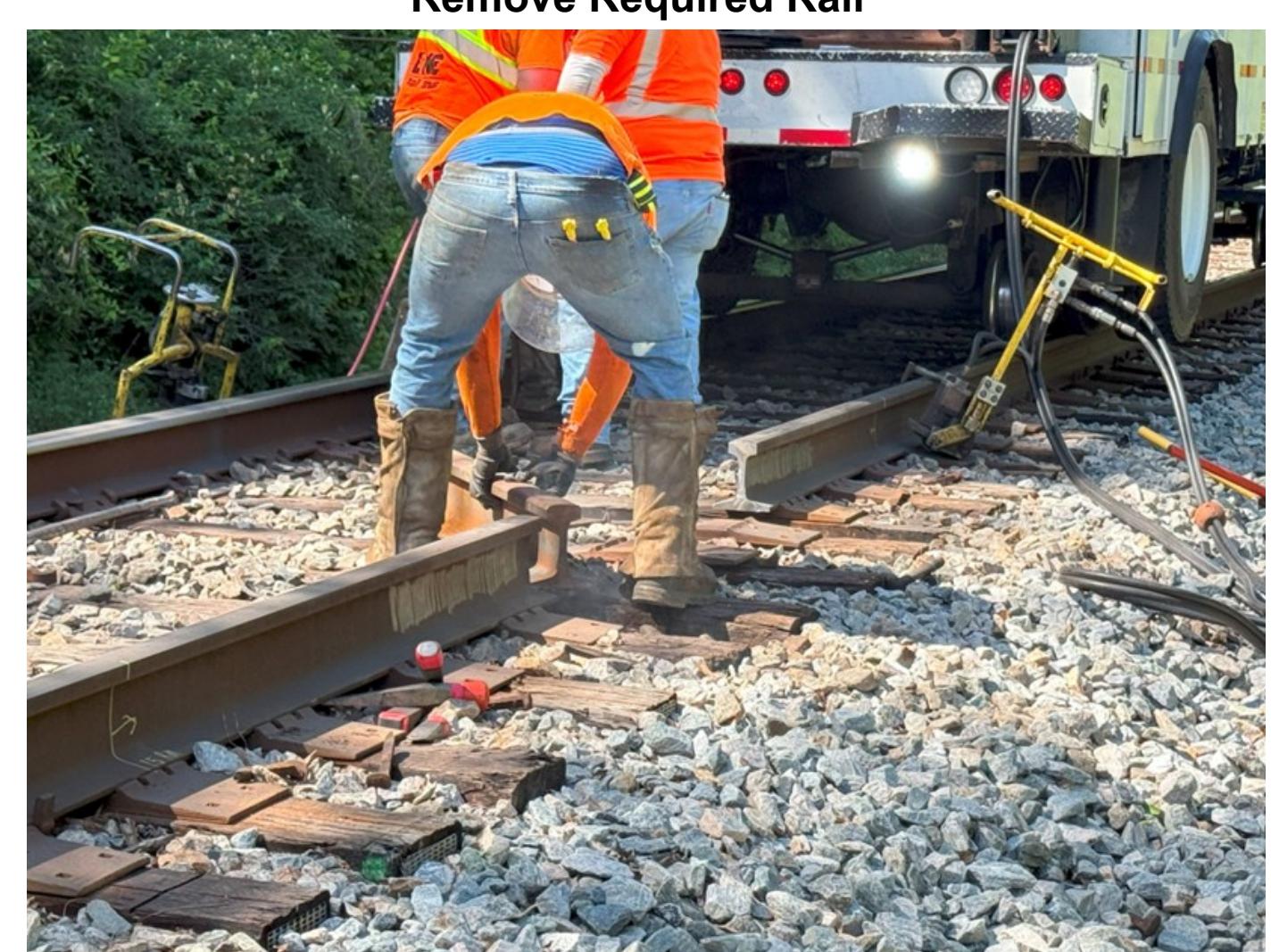
Block 2 – 1.0 Hours

**2 Block Total –
1.5 Hours**





SOLUTION - INSERT WELDING® (Process)





SOLUTION - INSERT WELDING® (Process)

Can Overlap if Needed



Insert Weld



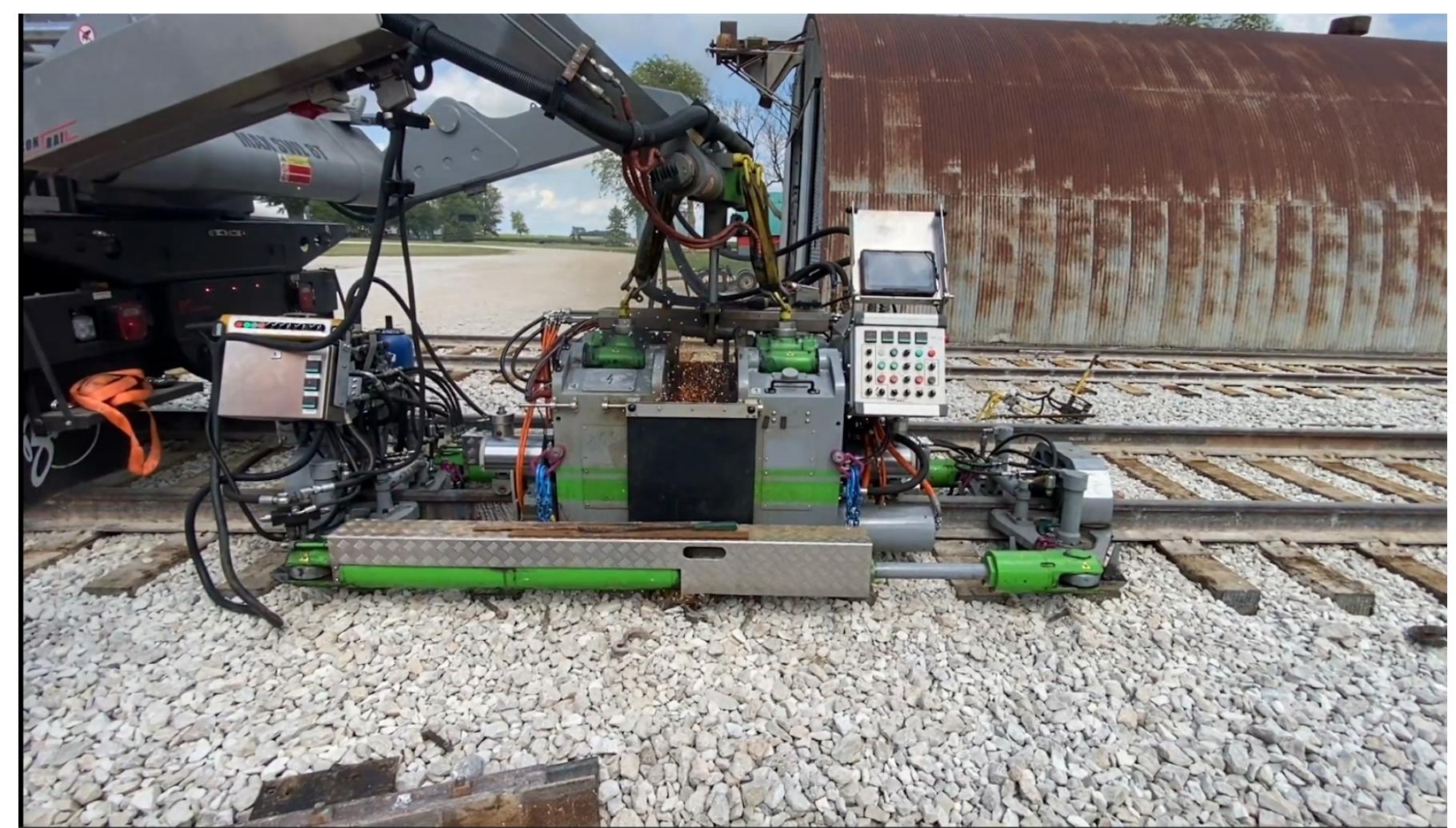
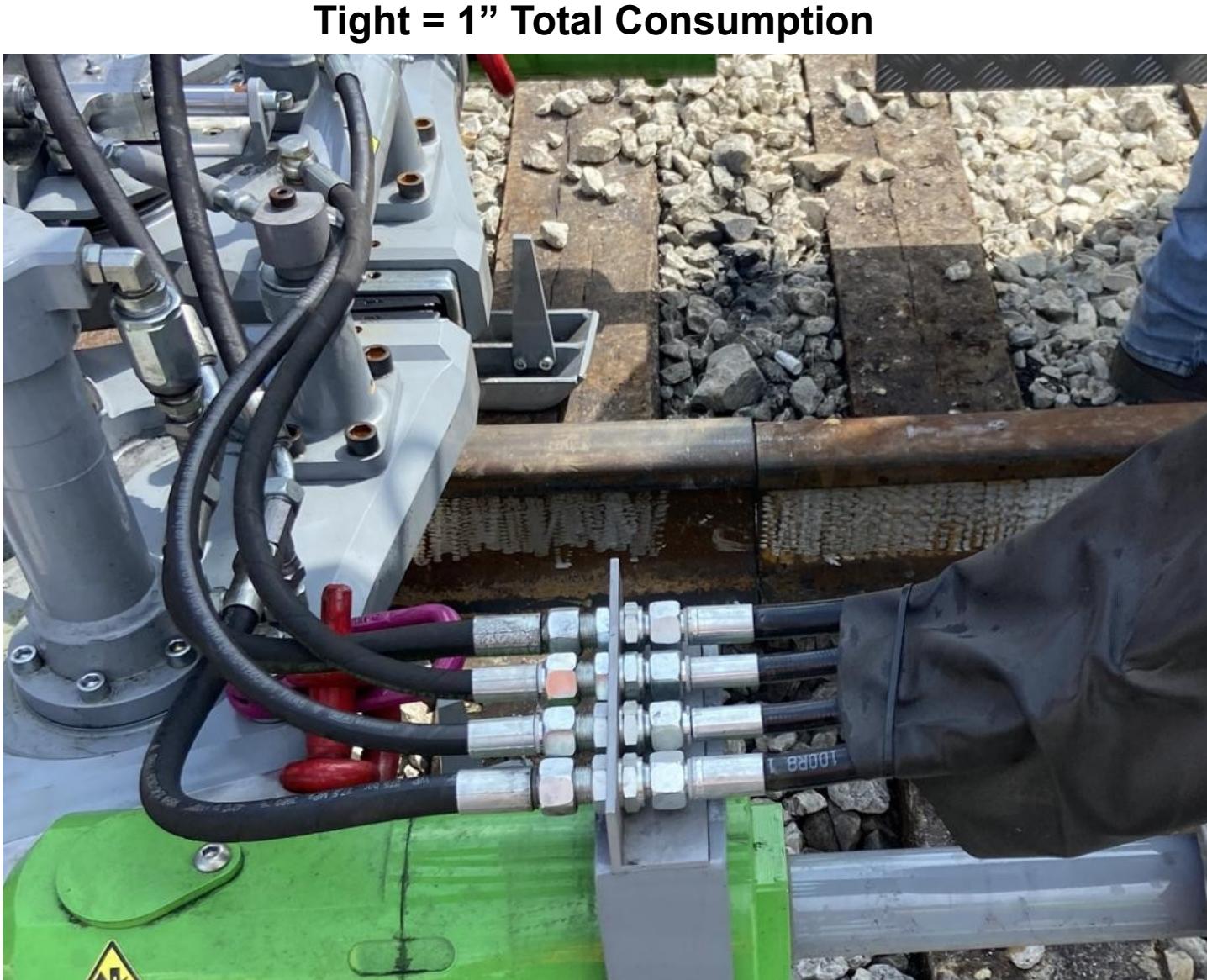


SOLUTION - INSERT WELDING® (Process)



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US Patent No. – 11,919,108



SOLUTION - INSERT WELDING® (Process)

Both welds fit inside PullerMax





INSTALLATION EXAMPLES

132# Rail Insert® (-6mm)



132# Rail Insert® (-8mm)





INSTALLATION AUDITING

Electronic Straight Edge



Rail Alignment Evaluation



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US Patent No. – 11,919,108



WELD FAILURE CONTRIBUTING FACTOR IMPROVEMENT – MACHINED RAIL INSERTS®

- Shear Lap / Smear Improvement

132# (-6mm w/ Rail Insert)



132# (-8mm w/ Rail Insert)





IN SERVICE - MACHINED RAIL INSERTS® (30 DAYS)



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US Patent No. – 11,919,108



IN SERVICE - MACHINED RAIL INSERTS® (60 DAYS)





TRACABILITY

72 Machined Rail Inserts® Installed (Through 6/5/2025)

**Crew has 27 working days
Making 242 welds
Averaging 8.96 welds / day**

Rail Group, LLC Rail Insert® Tracking											2025 - Norfolk Southern Railway 400 Insert Trial, WO #25504	
Date Installed	Subline	MP	Insert	Tangent	High/Low	Parent Rail	Insert Size	Install	Weld No.	Weld ID	Comments	
1	W-Line	38.58	070801	TAM	H/R	132RE	68-697-MH	EE	WT3548 : WT3561	1		
2	W-Line	38.58	070802		2.5	Lew	132RE	68-697-MH	EE	WT3548 : WT3562	1	
3	W-Line	34.38	070803	TAM	H/R	132RE	68-697-MH	EE	WT3578 : WT3579	5	Replaced compromised weld, shown to split the difference in parent rail sizes	
4	S-Line	246.40	070804	TAM	H/R	132RE	68-694-MH	EE	WT3512 : WT3513	4	4.5-Hr train delay, 2.8-Hr welder delay	
5	S-Line	247.58	070805	TAM	H/R	132RE	68-694-MH	EE	WT3514 : WT3515			
6	S-Line	248.78	070806	TAM	H/R	132RE	68-697-MH	EE	WT3516 : WT3587	3		
7	S-Line	249.48	070807	TAM	H/R	132RE	68-697-MH	EE	WT3518 : WT3598			
8	S-Line	252.84	070808	TAM	H/R	132RE	68-694-MH	EE	WT3521 : WT3532			
9	S-Line	284.18	070809	TAM	H/R	132RE	68-697-MH	EE	WT3537 : WT3538	6		
10	S-Line	284.19	070810	TAM	H/R	132RE	68-697-MH	EE	WT3535 : WT3536			
11	S-Line	245.32	070811	TAM	H/R	132RE	68-697-MH	EE	WT3514 : WT3585	7		
12	S-Line	246.02	070812	TAM	H/R	132RE	68-694-MH	EE	WT3512 : WT3583			
13	S-Line	246.75	070813	TAM	H/R	132RE	68-697-MH	EE	WT3518 : WT3583	4	5.8-Hr train delay, 3.8-Hr welder delay	
14	S-Line	247.25	070814	TAM	H/R	132RE	68-697-MH	EE	WT3518 : WT3511	2	5.5-Hr train delay, 2.8-Hr RWIC delay	
15	S-Line	247.55	070815	TAM	H/R	132RE	68-694-MH	EE	WT3512 : WT3513	1		
16	S-Line	247.58	070816		2.5	Higb	132RE	68-697-MH	EE	WT3514 : WT3515		Installed in conjunction with 247.58, spaced apart 7'8"
17	S-Line	247.58	070817		2.5	Higb	132RE	68-697-MH	EE	WT3516 : WT3547		Spaced interval at 247.58
18	S-Line	247.59	070818		2.5	Higb	132RE	68-697-MH	EE	WT3518 : WT3519		Installed in conjunction with 247.58, spaced apart 7'8"
19	S-Line	248.58	070819	TAM	H/R	132RE	68-697-MH	EE	WT3526 : WT3521	4	2.8-Hr train delay, 3-Hr welding baseline.	
20	S-Line	249.28	070820	TAM	H/R	132RE	68-697-MH	EE	WT3522 : WT3523			
21	S-Line	..	H/R	TAM	H/R	132RE	68-694-MH	H/R	WT3524 : WT3525	5	Installed HS plug rails, no lasers installed.	
24	H-Line	253.95	070821	TAM	H/R	132RE	68-693-MH	EE	WT3535 : WT3536	3		
22	H-Line	254.85	070822	TAM	H/R	132RE	68-693-MH	EE	WT3533 : WT3540	7	Installed back-to-back (seamless)	
23	H-Line	254.85	070823	TAM	H/R	132RE	68-693-MH	EE	WT3534 : WT3542		Installed back-to-back (seamless)	
24	H-Line	249.25	070824	TAM	H/R	132RE	68-693-MH	EE	WT3546 : WT3547	4	4.5-Hr train delay, 3-Hr welding baseline	
25	H-Line	254.85	070825	TAM	H/R	132RE	68-693-MH	EE	WT3538 : WT3551	11		
26	H-Line	254.24	070826	TAM	H/R	132RE	68-693-MH	EE	WT3532 : WT3552			
27	H-Line	245.18	070827	TAM	H/R	132RE	68-697-CH	EE	WT3553 : WT3568			
28	H-Line	247.45	070828	2.5	Higb	132RE	68-693-MH	EE	WT3535 : WT3562	4	5.8-Hr train delay, first location mis-labeled - skipped; oral location is clear in crossing - skipped; didn't make production until afternoon.	
29	H-Line	255.57	070829	TAM	H/R	132RE	68-693-CH	EE	WT3565 : WT3566	4	4.5-Hr train delay, during lead delay, drove 2-hr RTT lead inertia (screws needed and unsecured)	
30	H-Line	255.73	070830	TAM	H/R	132RE	68-693-CH	EE	WT3568 : WT3569	5		
31	H-Line	252.18	070831	TAM	H/R	132RE	68-693-CH	EE	WT3571 : WT3572	10	HP 258.78 - HS PW plug rail installed, not included in this list	
32	H-Line	255.18	070832	TAM	H/R	132RE	68-693-CH	EE	WT3573 : WT3574			
33	H-Line	256.35	070833	TAM	H/R	132RE	68-693-CH	EE	WT3577 : WT3578			
34	H-Line	251.83	070834	TAM	H/R	132RE	68-693-CH	EE	WT3573 : WT3588	8	HP 251.48 - HS PW plug rail installed, not included in this list	
35	H-Line	253.84	070835	TAM	H/R	132RE	68-693-CH	EE	WT3581 : WT3582			
36	H-Line	257.58	070836	TAM	H/R	132RE	68-697-CH	EE	WT3585 : WT3586			
37	H-Line	248.28	070837	TAM	H/R	132RE	68-693-CH	EE	WT3587 : WT3588	1		
38	H-Line	247.55	070838	TAM	H/R	132RE	68-697-CH	EE	WT3589 : WT3590			
39	H-Line	258.25	070839	TAM	H/R	132RE	68-693-CH	EE	WT3587 : WT3591	11		
40	H-Line	254.28	070840	TAM	H/R	132RE	68-693-CH	EE	WT3574 : WT3581	7		
41	P-Line	305.28	070841	TAM	H/R	132RE	68-694-MH	EE	WT3706 : WT3707	4		
42	P-Line	..	H/R	TAM	H/R	132RE	68-694-MH	H/R	WT3708 : WT3709	4	Installed HS plug rails, no lasers installed.	
43	P-Line	365.58	070842	TAM	H/R	132RE	68-693-MH	EE	WT3795 : WT3796	4	Welds performed with GW-1003, which is unqualified for over-sag.	
44	P-Line	378.58	070843	TAM	H/R	132RE	68-693-MH	EE	WT3797 : WT3798	4		
45	P-Line	388.38	070844	TAM	H/R	132RE	68-693-MH	EE	WT3724 : WT3725	10		
46	P-Line	392.78	070845	TAM	H/R	132RE	68-693-MH	EE	WT3723 : WT3724			
47	P-Line	355.38	070846	TAM	H/R	132RE	68-697-MH	EE	WT3725 : WT3726			
48	P-Line	355.58	070847	TAM	H/R	132RE	68-697-MH	EE	WT3727 : WT3728			
49	P-Line	352.38	070848	TAM	H/R	132RE	68-693-MH	EE	WT3729 : WT3730			
50	P-Line	344.64	070849	TAM	H/R	132RE	68-693-MH	EE	WT3733 : WT3740	7		
51	P-Line	344.64	070850	TAM	H/R	132RE	68-693-MH	EE	WT3735 : WT3744			
52	P-Line	344.62	070851	TAM	H/R	132RE	68-693-MH	EE	WT3745 : WT3747			
53	P-Line	57.25	070852	TAM	H/R	132RE	68-693-MH	EE	WT3752 : WT3754	6	HS plug installed at MP 57.51 and MP 58.87, 4 welds	
54	P-Line	57.68	070853	TAM	H/R	132RE	68-697-MH	EE	WT3756 : WT3757			
55	P-Line	64.67	070854	TAM	H/R	132RE	68-694-MH	EE	WT3758 : WT3759			
56	P-Line	65.67	070855	TAM	H/R	132RE	68-695-MH	EE	WT3760 : WT3761			
57	P-Line	78.87	070856	TAM	H/R	132RE	68-697-MH	EE	WT3762 : WT3763			
58	P-Line	78.91	070857	TAM	H/R	132RE	68-697-MH	EE	WT3764 : WT3765			
59	P-Line	36.28	070858	TAM	H/R	132RE	68-697-MH	EE	WT3766 : WT3767	6		
60	P-Line	341.37	070859	TAM	H/R	132RE	68-697-MH	EE	WT3768 : WT3769			
61	P-Line	401.00	070860	TAM	H/R	132RE	68-693-MH	EE	WT3770 : WT3771			
62	P-Line	402.44	070861	TAM	H/R	132RE	68-694-MH	EE	WT3772 : WT3773	8	HS plug installed at MP 404.44, 2 welds</td	



PROGRAM POTENTIAL EXPANSION

- Expand program to multiple crews / divisions
- Maintain tracking of all installations
- Maintain Rail Insert® match tolerance within +/- 2mm
- Evaluating RR Defect Remediation Requirements
- Utilize distribution Storage Containers
- Add inventory tracking to each distribution point
- Add Inventory App for phone access / convenience
- Evaluate UT Tested Relay Rails for Machining Heavy Worn Rail Insert® Patterns





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THANK YOU - Q&A



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