



भारत सरकार - रेल विभाग
अनुसंधान अभिवृद्धि और मानक संगठन
लखनऊ - 226 011
EPBX (0522) 2451200
Fax (0522) 2456500

Government of India-Ministry of Railways
Research Designs & Standards Organisation
Lucknow - 226 011
DIO (0522) 2450115
DIO (0522) 2455310



No. CT/USFD

Dt: 18.12.2014

I. The General Manager (Engg./Works)

1. Central Railway, CST, Mumbai - 400 001.
2. Eastern Railway, Fairlie Place, Calcutta - 700 001.
3. East Central Railway, Hajipur - 844 101.
4. East Coast Railway, Chandrasekharpur, Bhubaneswar - 751 016.
5. Northern Railway, Baroda House, New Delhi - 110 001.
6. North Central Railway, Allahabad - 211 001.
7. N.E.Railway, Gorakhpur - 273 001.
8. N.F.Railway, Maligaon, Guwahati - 781 011.
9. North Western Railway, Jaipur - 302 001.
10. Southern Railway, Park Town, Chennai - 600 003.
11. S.C.Railway, Rail Nilayam, Secunderabad - 500 371.
12. S.E.Railway, Garden Reach, Calcutta - 700 043.
13. South East Central Railway, Bilaspur 495 004
14. South Western Railway, Hubli- 580 023.
15. Western Railway, Churchgate, Mumbai - 400 020
16. West Central Railway, Jabalpur - 482 001

Sub: Manual for Ultrasonic testing of Rails and Welds (Revised, 2012)-
A&C Slip No. 02 of December, 2014

Ref:(i) This office letter of even no.dt: 27.06.12/ 06.07.2012.

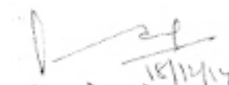
(ii) Railway Board's letter no. Track/21/2007/0903/7 dt: 03.12.2014.

1. The 'Manual for Ultrasonic testing of Rails and Welds, (Revised-2012)' was circulated to all Zonal Railways vide this office letter at reference (i) above. Please find enclosed herewith Correction Slip No. 02 of December, 2014 to the above Manual for information and further necessary action.

2. This Correction Slip to USFD Manual is being issued in view of inclusion of 'tunnel approaches (100m either side)' as sensitive locations and Railway Board's instructions issued separately regarding action to be taken on defective welds existing on major bridge approaches circulated vide letter no. Track I/ 21/ 99/0910/7 Pt. dt. 29.10.2002 & Track I/ 21/ 99/0910/7 Vol. II dt. 09.05.2003.

3. Please acknowledge receipt.

संलग्न- उपरोक्त ।


(एस.के.पाण्डेय)
कार्यकारी निदेशक/रेलपथ- I
कृते महांनिदेशक/रेलपथ

II Copy along with a copy of the correction slip No. 02 of December, 2014 for information and record to:

1. The General Manager(Cons.), N.F. Railway, Maligaon, Guwahati-781 011.
2. The Chief Commissioner of Railway Safety, Ministry of Tourism & Civil Aviation, NE Rly Compound, 16-A, Ashok Marg, Lucknow-260 001.
3. The CMD, Manging Director, KRCL, Belapur Bhawan, Plot No.6, CBD, Belapur, New Bombay-400 614.
4. The Director General, Railway Staff College, Vadodara-390 004.
5. The Director, IRICEN, Pune- 411 001.
6. The Executive Director, IRCAMTECH, Maharajpur Gwalior-474 020

III Copy along with a copy of correction slip to Executive Director/Track (Procurement), Railway Board, Rail Bhavan, New Delhi 110 001 for kind information in reference to Railway Board's letter no Track/21/2007/0903/7 dt: 03.12.2014.

संलग्न- उपरोक्त ।


(एस.के.पाण्डेय)
कार्यकारी निदेशक/रेलपथ-।
कृते महानिदेशक/रेलपथ

IV Copy along with a copy of the correction slip No. 02 of December, 2014 for information and record to:

The Chief Safety Officer:

1. Central Railway, CST, Mumbai – 400 001.
2. Eastern Railway, Fairlie Place, Calcutta – 700 001.
3. East Central Railway, Hajipur – 844 101.
4. East Coast Railway, Chandrasekharpur, Bhubaneswar – 751 016.
5. Northern Railway, Baroda House, New Delhi – 110 001.
6. North Central Railway, Allahabad - 211 001.
7. N.E. Railway, Gorakhpur - 273 001.
8. N.F. Railway, Maligaon, Guwahati – 781 011.
9. North Western Railway, Jaipur – 302 001.
10. Southern Railway, Park Town, Chennai – 600 003.
11. S.C. Railway, Rail Nilayam, Secunderabad – 500 371.
12. S.E. Railway, Garden Reach, Calcutta – 700 043.
13. South East Central Railway, Bilaspur 495 004
14. South Western Railway, Hubli– 580 023.
15. Western Railway, Churchgate, Mumbai – 400 020
16. West Central Railway, Jabalpur – 482 001.

Manual for Ultrasonic testing of rails & welds, (Revised-2012)

A&C Slip No. 02 of December, 2014

1. Para 8.14 is modified as follows:

“8.14 Action to be taken after detection of defects in AT welds: Action to be taken for defects in AT welds shall be same as at **Para 6.4** and in addition following shall also be applicable for welds classified as defective (DFWO/DFWR) in periodic testing of AT welds with 0° 2MHz , 70° 2 MHz , 45° 2 MHz , 70° 2 MHz SL probes, 45°/ 2 MHz Tandem Rig:

Classification	Painting on both faces of weld (In Head)	Action to be taken
Defective weld ‘DFWO/DFWR’ with 0° / 2MHz, 70° / 2MHz, 45°/ 2 MHz or 70° 2MHz SL probe, 45°/ 2 MHz Tandem Rig	In case of DFWO, one circle with red paint. In case of DFWR, two cross with red paint.	(i) In case of DFWO weld, following action will be taken: a) SSE/JE (P.Way)/USFD shall impose speed restriction of 30 kmph or stricter immediately and communicate to sectional SSE/JE about the flaw location, who shall ensure the following : b) Protection of defective weld by joggled fish plates using minimum two tight clamps immediately with a speed restriction of 30 kmph. Speed restriction can be relaxed to normal after protection of DFWO weld by joggled fish plates with 2 far end tight bolts (one on each side) with champhering of holes, within 3 days. The joint is to be kept under observation. ii) In case of DFWR weld, following action will be taken : a) SSE/JE (P.Way)/USFD shall impose speed restriction of 30kmph or stricter immediately and communicate to sectional SSE/JE about the flaw location who shall ensure the following:- b) Protection of DFWR weld by joggled fish plates using minimum two tight clamps immediately. SR of 30 Kmph can be relaxed to normal after providing joggled fish plates with two far end tight bolts one on each side with champhering of holes. The DFWR weld shall be replaced within three months of detection. Adequate traffic block should be granted for removal of DFWR welds. In case of non removal within three months, a speed restriction of 75 kmph for loaded goods train and 100 kmph for passenger train should be imposed. iii) In case of defective weld (DFWO/DFWR) on major bridges & bridge approaches (100m either side) and In tunnels & on tunnel approaches (100m either side), following action will be taken : a) SE/JE(P.Way)/USFD shall impose speed restriction of 30 Kmph or stricter immediately and to be continued till defective weld is replaced. He should communicate to sectional SE/JE (P.Way) about the flaw location who shall ensure the following : i) Protection of defective weld using clamped joggled fish plate within 24 hrs. ii) The defective weld shall be replaced within 3 days of detection.

2. Para 8.15.1 is modified as follows:

“8.15.1 Testing of AT welded joints shall comprise of testing by probes with sensitivity setting and calibration as per references indicated against them in the table below:

S. No	Probes	Calibration as per	Sensitivity Setting as per	Scanned area	Acceptance Criteria
1.	0 ⁰ 2 MHz	Para 8.5.1	Para 8.5.2, Fig 20(a)	Head, web	As per Para 8.5.4
2.	70 ⁰ 2MHz	Para 8.6.1, 8.9.1	Para 8.6.2, 8.9.2, Fig 20(a)	Head, weld foot	As per Para 8.6.4 & 8.9.4
3.	70 ⁰ 2MHz SL	Para 8.8.1	Para 8.8.2, Fig 22 (a)	Weld foot (Half Moon Defect)	As per Para 8.8.4
4.	45 ⁰ 2 MHz	Para 8.7.1	Para 8.7.1.2 , Fig 22 (a) & 23	Weld foot (Half Moon Defect/clustered defect & micro porosity)	As per Para 8.7.1.4
5.	45 ⁰ 2 MHz single crystal probe	As per Para 8.7.2.1	As per Para 8.7.2.2	Lack of fusion in the web and foot region below web	As per Para 8.7.2.4

The frequency of testing of AT welds with above listed probes shall be as under:

S No	Type of Welds	Type of Testing	Testing Schedule	
1	Conventional AT Weld	Periodic Tests	Every 40 GMT or 5 year, whichever is earlier	
2	SKV Weld	Acceptance Test	Immediately after welding	
3		First Periodic Test	1 year	
			Routes having GMT	Frequency
4		Further tests based on route GMT	> 45	2 years
5			>30 ≤ 45	3 years
6			> 15 ≤ 30	4 years
7			0-15	5 years

In case of welds on major bridges & bridge approaches (100m either side) and In tunnels & on tunnel approaches (100m either side), the minimum frequency of testing shall be once in a year.

Due to unusually high weld failure or other abnormal development in some sections, Chief Engineer may order testing of welds early, as per need.

The testing interval of USFD testing of defective AT welds should be reduced by 50% of normal testing interval of AT welds as provided in Para **8.15.1** to avoid fractures of defective welds.

3. Annexure IIA and IIB are modified as follows:

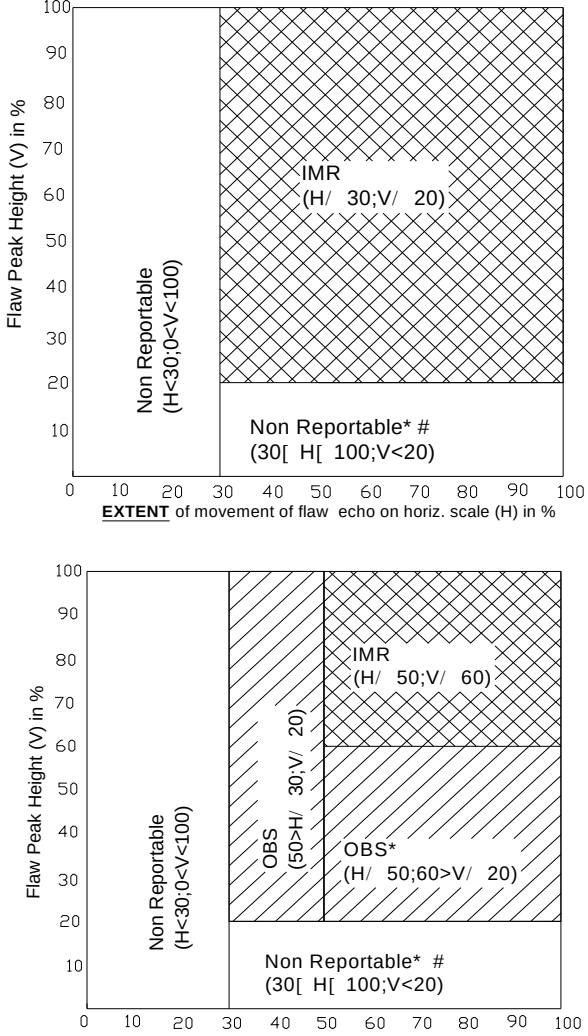
**Annexure-IIA
(Para 6.3)**

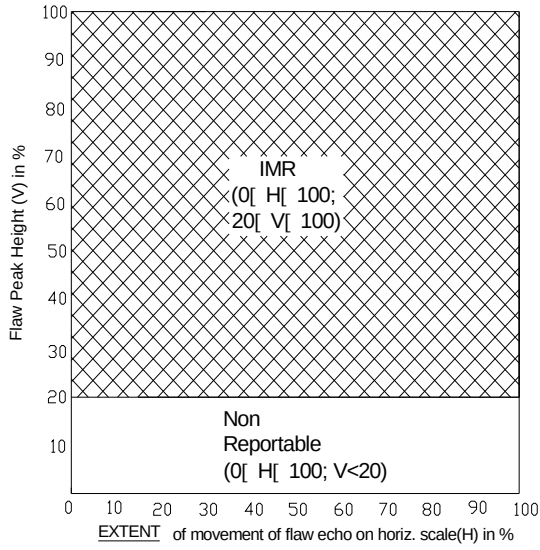
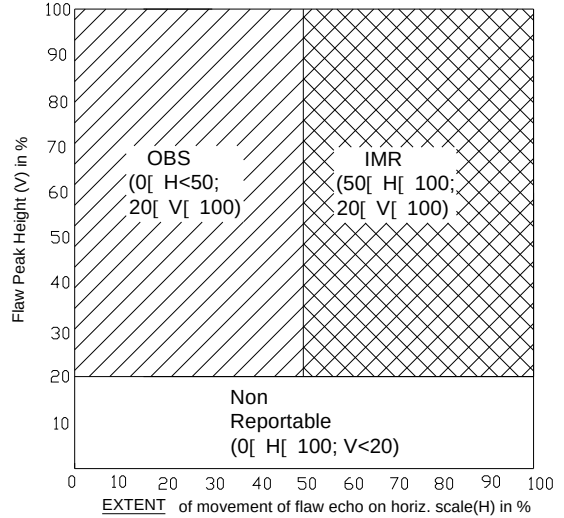
**CLASSIFICATION OF RAIL/WELD DEFECTS FOR
NEED BASED CONCEPT OF USFD**

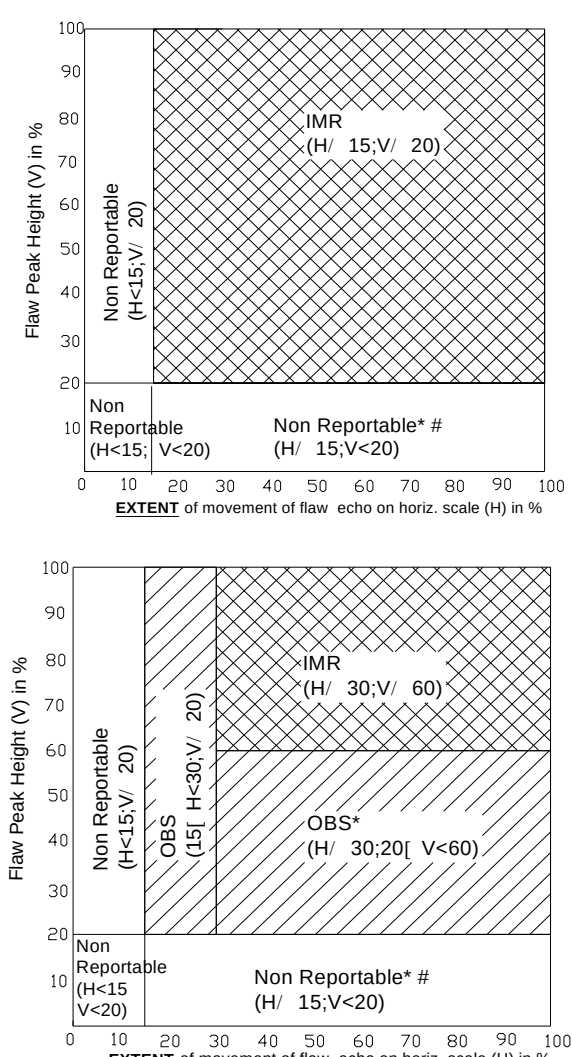
Note : “Any sweeping signal on horizontal baseline that does not extend beyond 2.5 divisions from the left edge of the screen or vice versa shall be recorded as Gauge Corner Cracking (GCC) and not as OBS”.

For Rail Defects

S. No	Probe used	Nature of defect	Oscillogram pattern	Classification
1.	Normal probe 4MHz (sensitivity set with respect to 100% back wall signal height from rail bottom)	A) Within fishplated area -		
		(i) Any horizontal defect in head web or foot of length equal to distance between rail end and first bolt hole and connected with the rail head.	No back echo before or after appearance of bolt hole echo with Flaw echo with or without multiples OR Drop in back echo before or after appearance of bolt hole echo with flaw echo with or without multiple	IMR
		(ii) Any horizontal defect connecting both bolt holes	No back echo between bolt hole echo. Flaw echo with or without multiples.	IMR
		(iii) Any defect originating from bolt holes and progressing at an angle towards head-web junction or web-foot junction.	No back echo before or after appearance of bolt hole echo with or without flaw echo	IMR
		B) Outside fish plated area -		
		a) Any horizontal defect progressing at an angle in vertical plane in the rail at the following locations in the track: i) In tunnel & on tunnel approaches (100m either side) ii) On major bridges & bridge approaches (100m either side) iii) In the vicinity of holes near the weld (50 mm for old AT weld and 75mm for new AT weld from the centre of weld on either side of weld)	No back echo with flaw echo (shifting/without shifting) for any horizontal length OR No back echo and no flaw echo	IMR
		b) Any horizontal defect progressing at an angle in vertical plane in the rail at track locations other than (a) above.	No back echo with flaw echo (shifting/without shifting) for horizontal length $\geq 20\text{mm}$ No back echo with or without shifting flaw echo for horizontal length $< 20\text{ mm}$	IMR OBS

S. No	Probe used	Nature of defect	Oscillogram pattern	Classification
		C) Vertical longitudinal split (piping)	In case of partial/complete loss of back echo, side probing shall be carried out with 0° probe, if any flaw echo with/ without multiples is observed (in any length)	IMR
2.	70° 2MHz Centre Probe (Sensitivity set with 12mm dia. Standard hole in rail head 25mm from rail top) <u>For non 'D' marked rails on double/multi line sections</u>	A) Any transverse defect in the rail head at the following locations in the track i) In tunnel & on tunnel approaches (100m either side) ii) On major bridges & bridge approaches (100m either side) iii) In the vicinity of holes near the weld (50 mm for old AT weld and 75mm for new AT weld from the centre of weld on either side of weld) B) Any transverse defect in the rail head at track locations other than A) above	 * Details to be forwarded to RDSO quarterly in format at para 5.1.3 # To be marked as 'O' on web of rail	

S. No	Probe used	Nature of defect	Oscillogram pattern	Classification
3.	70° 2MHz (Centre) Probe (sensitivity set with 12mm dia. Standard hole at rail head 25mm from rail top and with additional gain of 10dB thereon). <u>For all single line sections and 'D' marked rails on double/multiple line sections</u>	A) Any transverse defect in the rail head at the following locations in the track i) In tunnel & on tunnel approaches (100m either side) ii) On major bridges & bridge approaches (100m either side) iii) In the vicinity of holes near the weld (50 mm for old AT weld and 75mm for new AT weld from the centre of weld on either side of weld) B) Any transverse defect in the rail head at track locations other than A) above	 	

4.	70⁰ probes Gauge Face & Non-gauge Face side (Sensitivity set on 5mm FBH)	A) Any transverse defect in the rail head on gauge face side/ Non-gauge Face at the following locations in the track i) In tunnel & on tunnel approaches (100m either side) ii) On major bridges & bridge approaches (100m either side) iii) In the vicinity of holes near the weld (50 mm for old AT weld and 75mm for new AT weld from the centre of weld on either side of weld) B) Any transverse defect in the rail head on gauge face/ Non-gauge Face side at track locations other than A) above	 The figure consists of two graphs, one for gauge face side (A) and one for non-gauge face side (B). Both graphs plot Flaw Peak Height (V) in % on the y-axis (0 to 100) against the Extent of movement of flaw echo on horizontal scale (H) in % on the x-axis (0 to 100). Graph A (Gauge Face Side): Non Reportable (H < 15; V < 20): A rectangular region in the bottom-left corner. IMR (H/ 15; V/ 20): A cross-hatched region in the top-right corner. Non Reportable* # (H/ 15; V < 20): A rectangular region in the bottom-right corner. Graph B (Non-gauge Face Side): Non Reportable (H < 15; V < 20): A rectangular region in the bottom-left corner. OBS (15[H < 30; V/ 20): A region with diagonal hatching, bounded by H = 15, H = 30, and V = 20. IMR (H/ 30; V/ 60): A cross-hatched region in the top-right corner. OBS* (H/ 30; 20[V < 60): A region with diagonal hatching, bounded by H = 30, H = 60, and V = 20. Non Reportable* # (H/ 15; V < 20): A rectangular region in the bottom-right corner. * Details to be forwarded to RDSO quarterly in format at para 5.1.3 # To be marked as 'O' on web of rail
----	--	--	--

SNo	Probe Used	Nature of Defect	Oscillogram Pattern	Classification
5.	45 ⁰ probes mounted in test rig (sensitivity set to 100% with respect to reflection signal received from opposite face of rail head)	A) Any transverse defect in the rail head, with scabs/wheel burn on top surface, at the following locations in the track i) In tunnel & on tunnel approaches (100m either side) ii) On major bridges & bridge approaches (100m either side) iii) In the vicinity of holes near the weld (50 mm for old AT weld and 75mm for new AT weld from the centre of weld on either side of weld)	Loss of signal height equal to or more than 20% of full scale height.	IMR
		B) Any transverse defect in the rail head with scabs/wheel burn on top surface at track locations other than A) above.	Loss of signal height equal to or more than 80% of full scale height.	IMR
			Loss of signal height equal to or more than 20% but less than 80% of full scale height	OBS

Annexure II B
(Para 6.5.1)

Weld defects(AT+FBW)

S.No.	Probe used	Nature of defect	Oscillogram pattern	Classification
1.	Normal probe 4MHz (sensitivity set with respect to 100% back wall signal height from rail bottom)	A) Any horizontal defect progressing at an angle in vertical plane in the rail at the following locations in the track : i). In tunnel & on tunnel approaches (100m either side) ii). On major bridges & bridge approaches (100m either side) iii) In the vicinity of holes near the weld (50 mm for old AT weld and 75mm for new AT weld from the centre of weld on either side of weld) B) Any horizontal defect progressing transversely in the rail at track locations other than A) above	No back echo with flaw echo (shifting or without shifting) No back echo with flaw echo (shifting or without shifting)	IMRW OBSW

S.No.	Probe used	Nature of defect	Oscillogram pattern	Classification
2.	70° 2MHz Centre probe (Sensitivity set with 12mm dia. Standard hole at rail head 25mm from rail top)	A) Any transverse defect in the rail head at the following locations in the track i) In tunnel & on tunnel approaches (100m either side) ii) On major bridges & bridge approaches (100m either side) iii) In the vicinity of holes near the weld (50 mm for old AT weld and 75mm for new AT weld from the centre of weld on either side of weld) B) Any transverse defect in the rail at track locations other than A) above	Flaw Peak Height (V) in % Non Reportable (H<30;0<V<100) IMRW (H/ 30;V/ 20) Non Reportable* # (30<= H< 100;V<20) EXTENT of movement of flaw echo on horiz. scale (H) in %	
			Flaw Peak Height (V) in % Non Reportable (H<30;0<V<100) OBSW (50>H/ 30;V/ 20) IMRW (H/ 50;V/ 60) OBSW* (H/ 50;60>V/ 20) Non Reportable* # (30<= H< 100;V<20) EXTENT of movement of flaw echo on horiz. scale (H) in % * Details to be forwarded to RDSO quarterly in format at para 5.1.3 # To be marked as 'O' on web of rail	

3.	70⁰ probes Gauge Face & Non-gauge Face side Probe (Sensitivity set on 5mm FBH)	A) Any transverse defect in the rail head on gauge face/ Non-gauge Face side at the following locations in the track i) In tunnel & on tunnel approaches (100m either side) ii) On major bridges & bridge approaches (100m either side) iii) In the vicinity of holes near the weld (50 mm for old AT weld and 75mm for new AT weld from the centre of weld on either side of weld) B) Any transverse defect in the rail head on gauge face/ Non-gauge Face side at track locations other than A) above	* Details to be forwarded to RDSO quarterly in format at para 5.1.3 # To be marked as 'O' on web of rail
-----------	--	--	--