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Research Designs & Standards Organisation
Lucknow - 226 011
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No. CT/U3FD/ACS

Dated: 10.08.2016

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) -
Revised A & C Slip No. 3 of August, 2016

Ref: (i) This office letter of even no.dt: 04/08.03.2016

(ii) Railway Board's letter no. Track/21/2007/0903/7 dt: 27.07.2016

1. The A & C Slip No. 3 of March, 2016 to 'Manual for Ultrasonic testing of Rails and Welds, (Revised-2012)' was circulated to all Zonal Railways vide this office letter referred at (i) above.
2. However, later on it was observed that due to typographical mistake, some matter was omitted during compilation of A & C Slip No. 3 of March, 2016
3. Accordingly, the revised A & C Slip No. 3 of August, 2016 to the 'Manual for Ultrasonic testing of Rails and Welds, (Revised-2012)' is being issued for information and further necessary action.
4. Please acknowledge the receipt.

संलग्न- उपरोक्त।

PEE
Look into and
circulate.

CTE
3/18

ABN/PM
Pr. SPK. A1
2/9/16

28/8/16

(रंजीत कुमार)
संयु. निदेशक/रेलपथ. 5
कृतेगहानिदेशक/रेलपथ:

II Copy along with a copy of the revised A & C Slip No. 3 of August, 2016 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, Managing 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
7. ED/M&C/RDSO/Lucknow.
8. ED/QA(Civil), RDSO, Lucknow.

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 dtd 27.07.2016.

संलग्न- उपरोक्त।

Ram
10/8/16
(रंजीत कुमार)
संयु.निदेशक/रेलपथ.5
कृतेमहानिदेशक/रेलपथ

IV Copy along with a copy of the revised A & C Slip No. 3 of August, 2016 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, Bhubaneshwar – 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.

संलग्न- उपरोक्त।

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10/8/16
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'Manual for Ultrasonic testing of rails & welds, (Revised-2012)'

Revised A & C Slip No. 3 of August, 2016

1. Para 4.1.1 (c) is modified as under :

"4.1.1c) Sensitivity setting of the equipment and probes– Check once every 3 days

The sensitivity of the USFD equipment shall be set up once every 3 days with the help of standard rail pieces as mentioned below:

Sensitivity (gain) setting: For the sensitivity setting of ultrasonic equipment and the probes, the following sequence is to be maintained:

- i) Place the testing trolley on the standard rail piece having artificial flaws as shown in **Fig. 3** for need based criteria. Check the alignment of probes to make sure that 70° Central probe & 0° probe travel centrally in line with the axis of the rail head & web. 70° GF & 70° NGF probes shall be aligned towards GF & NGF respectively at appropriate positions.
- ii) Set the acoustic barrier of the normal probe at right angle to the longitudinal direction of rail.
- iii) Open the water nozzle and regulate water flow on the probes at an optimum speed.
- iv) While testing on single line section and 'D' marked rails on double / multiple line section, additional gain of 10db is to be employed."

2. Para 5.1.2 is revised as follows :

"5.1.2 During testing

- (i) Conduct test as per procedure mentioned in Chapter 6.
- (ii) Maintain proper alignment of all probes during testing, otherwise false echoes may appear.
- (iii) Ensure adequate supply of water for coupling.
- (iv) Check proper functioning of 70° probes by touching the probe bottom with fingers. Noise pattern should appear on the screen.
- (v) Look out for back wall echo corresponding to normal probe throughout testing
- (vi) Lift the machine at crossings/change of rail table height at joints to protect the probes.
- (vii) Mark the locations found defective as per classification."

3. Para 8.6.4 is revised as under :

"8.6.4 Defect classification:

- i) A welded joint showing moving signal of 40% or more and up to 60% of FSH shall be classified as **DFWO**.
- ii) A welded joint showing moving signal of more than 60% of full screen height to be classified as **DFWR**.
A bunch of moving signals more than 10% shall also be considered as defective weld & to be declared as **DFWR** (Fig. 30)."

4. Para 8.7.2 is modified as under :

"8.7.2 45° / 2MHz single crystal probe (Tandem probe scanning) :

The tandem probe rig scan on the rail table by 45° probe is used to detect any vertically oriented defect such as lack of fusion located at head–web junction, complete web & up to web-foot junction area."

5. Para 8.10 is modified as follows :

“8.10 Initial USFD testing of AT welds and subsequent testing within the guarantee period of contract

A thermit welding done in-situ shall be joggled fish-plated with two clamps and supported on wooden blocks of 300-450 mm length untill tested as good by USFD.”

6. Para 8.14 is modified as under :

“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. In addition, following shall also be applicable for welds classified as defective (DFWO/DFWR) in Initial acceptance test & periodic testing of AT welds using hand probing :

Classification	Painting on both faces of weld (In Head)	Action to be taken
Defective weld ‘DFWO/DFWR’ with 0 ⁰ / 2MHz, 70 ⁰ / 2MHz, 45 ⁰ / 2 MHz or 70 ⁰ 2MHz SL probe, 45 ⁰ /2 MHz Tandem Rig	In case of DFWO, one circle with red paint. In case of DFWR, two cross with red paint.	<p>(i) In case of DFWO weld, following action will be taken:</p> <p>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 :</p> <p>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.</p> <p>(ii) In case of DFWR following action will be taken:</p> <p>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:</p> <p>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.</p> <p>(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 :</p> <p>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 :</p> <p>b) Protection of defective weld using clamped joggled fish plate within 24 hrs.</p> <p>c) The defective weld shall be replaced within 3 days of detection.</p>

7. Para 8.15.1 is modified as under :

“8.15.1 Testing of AT welded joints using hand probing 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° 2 MHz	Para 8.5.1	Para 8.5.2, Fig 20(a)	Head, web	As per Para 8.5.4
2.	70° 2MHz (Head & AT weld Flange scanning)	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° 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° 2 MHz (AT weld foot scanning)	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° 2 MHz single crystal probe (Tandem probe scanning)	As per Para 8.7.2.1	As per Para 8.7.2.2 (Fig. 22(b) & 22(c)	lack of fusion located at head-web junction, complete web & up to web-foot junction area.	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 years which ever is earlier		
2	SKV Weld	Acceptance Test	Immediately after welding		
3		First Periodic Test	1 year		
		Further tests based on route GMT	Routes having GMT	Frequency	
4			> 80	1 year	
5			> 60 ≤ 80	1 ½ years	
6			> 45 ≤ 60	2 years	
7			>30 ≤ 45	3 years	
8			> 15 ≤ 30	4 years	
9	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.

8. Below Para 8.16, New clause b) (iii) under note 'Guidelines for the operators', is added as given below :

“ b) (iii) The defect signal observed at the collar from one end of testing shall be confirmed from other end also. If defect is confirmed from both the ends the welds must be marked as defective.”

9. Fig.3 and Fig.22 (c) are revised and are enclosed at Annexure-1-A and Annexure-1-B.

10. New para 6.3.1 and 6.3.2 are added as given below :

“6.3.1: Defect at any location which is detected by two or more probes and are considered to be classified as OBS/OBSW based on peak pattern of individual probe, should be classified as IMR/IMRW and action shall be taken accordingly as per Para 6.4.

6.3.2: In case two or more OBS/OBSW defects are located within a distance of 4.0 metre from each other, such OBS/OBSW defects shall be classified as IMR/IMRW and action shall be taken accordingly as per Para 6.4.”

11. A new Para 10.6 is added at the end of chapter 10 as follows:

10.6 Guidelines for USFD testing of tongue rail of point & crossing in service.

10.6.1 For purpose of USFD testing of tongue rails of points and crossings, the tongue rail can be demarcated in three zones as under:

- a. Zone-1: Where full width of rail head is available. This zone shall be covered in normal rail testing.
- b. Zone-2: Region where scanning by 70° probe is easily feasible i.e. up to width of rail head of points and crossings, where 70° probe of 20 mm crystal size can be suitably placed over it.
- c. Zone-3: Rest portion of tongue rail of points and crossing.

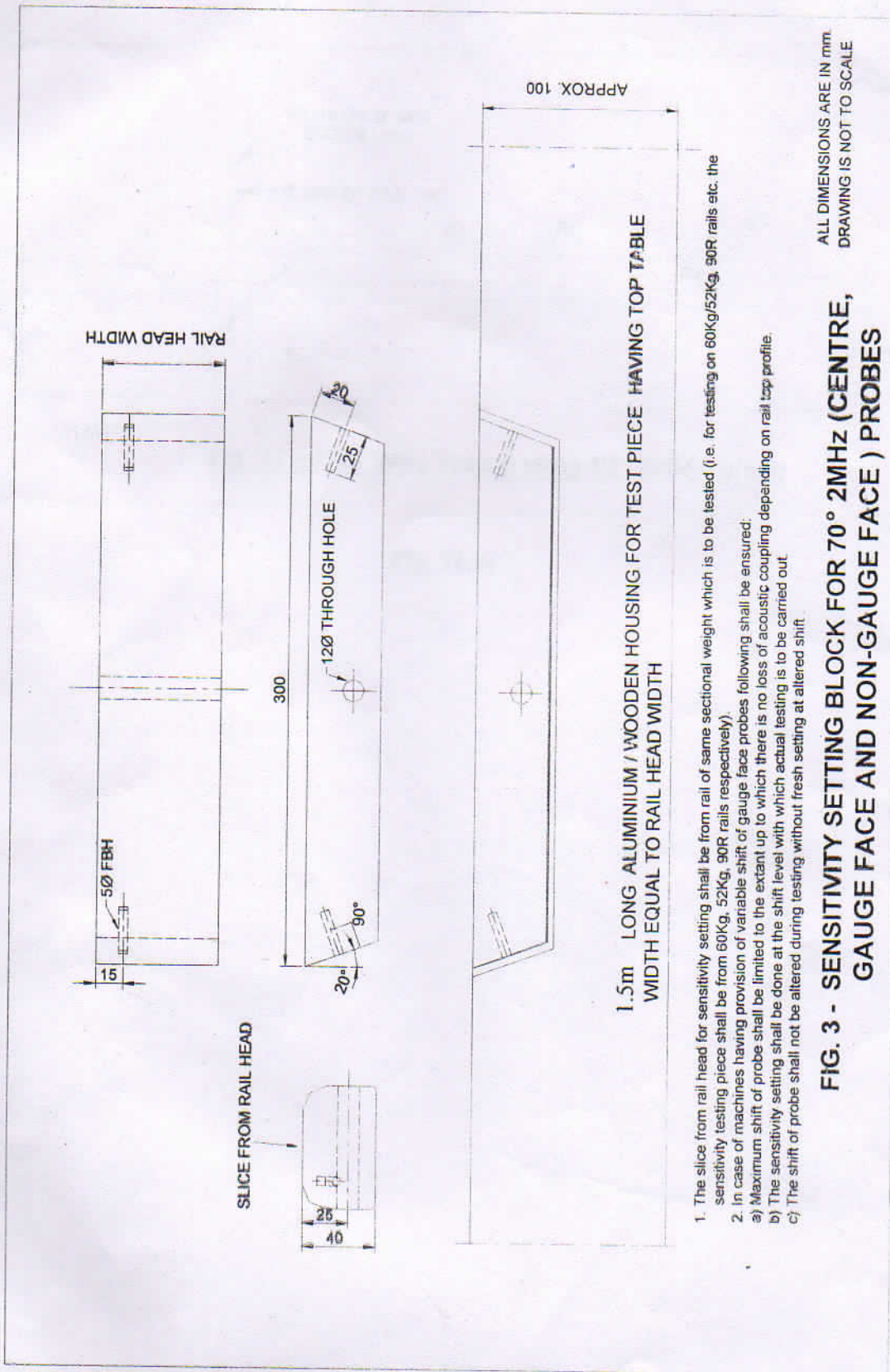
10.6.2 The USFD testing of tongue rails of points and crossings, shall be done as given below. The sensitivity setting for the probes shall remain same as used for through periodic rail testing.

- a. Zone-1 : This part of tongue rail of point & crossings where full width of rail head is available, shall be covered in normal rail testing using double rail tester. In some of the switches in which guide roller of double rail tester hinder the movement of trolley up to full width of rail head part, lower dia of guide roller shall be used.
- b. Zone-2 : This part of tongue rail shall be tested manually using $70^{\circ}/2$ MHz , Single crystal probe having crystal size 20 dia. or 20x20 mm square crystal.
- c. Zone-3 : This part of the tongue rail shall be examined visually:

10.6.3 **Classification of defects** : The defect classification shall be made as per provisions given in item 1(A), 2(A) , 3 (A) and 4(A) of Annexure-II-A of 'Manual for Ultrasonic testing of rails & welds, (Revised-2012)'

However, in zone-2 provisions given in item 2(A) and 3 (A) of Annexure-II-A of 'Manual for Ultrasonic testing of rails & welds, (Revised-2012)' shall be applicable.

10.6.4 **Action to be taken after detection of defects**: SE/JE (P.Way)/USFD shall impose speed restriction of 30 Kmph or stricter immediately and to be continued till flawed tongue rail is replaced which should be done within 3 days of detection.



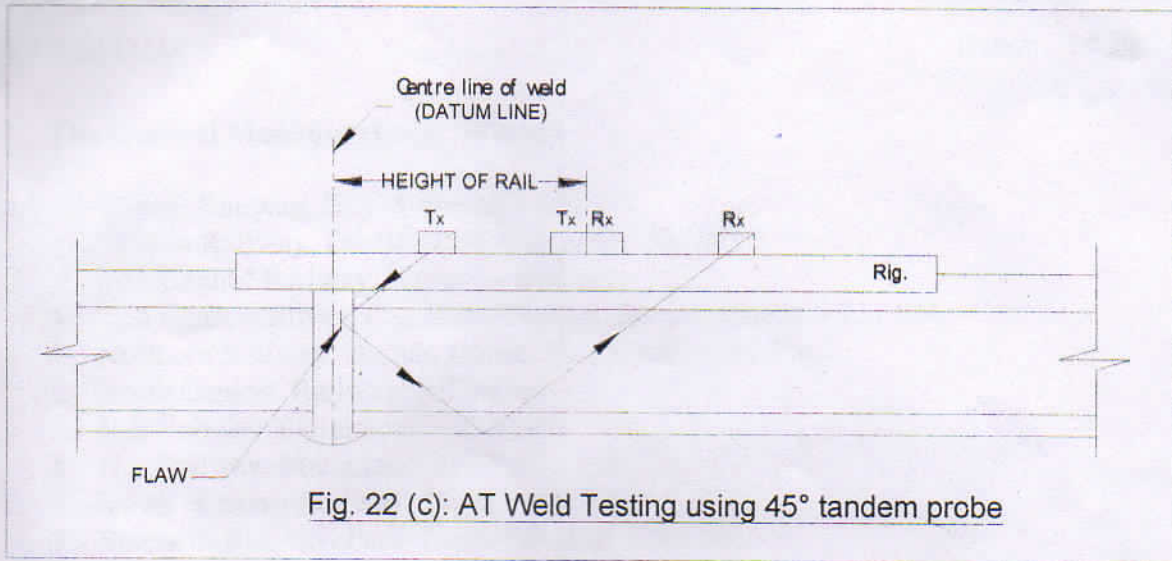


Fig. 22(c)