

**Manual for Flash Butt Welding of Rails (1996)
Addendum & Corrigendum Slip No. 7 of 2007**

1. Para 1.1 may be replaced as under.

“1.1 The manual gives details of the types and suitability of rails to be welded by stationary Flash Butt Welding Plant, **Mobile Flash Butt Welding Plant**, pre-welding inspection, preparation of rail ends before welding, the general procedure of execution of welding and finishing of welded joints. It also defines geometrical tolerances for the finished joints and acceptance tests to ensure quality control.”

2. Para 5.5 may be replaced as under.

“5.5 WELD PARAMETERS: Welding parameters will depend on section and metallurgy of rail to be welded. These are, normally, specified by the manufacturer of the plant. Before adoption the welding parameters shall be got approved from RDSO. RDSO shall consider parameters suggested by the Manufacturer while fixing the parameters. **Zonal Railways/ Owner of Mobile Flash Butt Welding Plant are required to get the welding parameters standardized for their Flash Butt Welding Plant for different rail chemistry and rail section in consultation with RDSO, Lucknow before regular operation of the plant. RDSO will standardize welding parameters for a particular machine, make and model. These standardised parameters shall be circulated to Zonal Railways and shall be applicable for same type of machine working on other Zonal Railways also. For Mobile Flash Butt Welding Plant of a particular make for which standardized parameters exist, sample testing will be carried out either at RDSO or at the nearest Flash Butt Welding Plant (having the testing facilities) in presence of RDSO official to check the compliance of machine.**

For all Mobile Flash Butt Welding Plants, QAP will be approved by RDSO before plant is put to regular operation. The welding parameters should be available with welder of the plant and displayed at appropriate point on the plant.”

3. Para 10.2.1 may be replaced as under.

“10.2.1 Hardness Test: Brinell hardness test shall be conducted on the test weld sample before conducting transverse load test. The hardness value in HAZ shall not vary from the hardness of the parent rail by more than ± 20 HB. Results shall be maintained as per proforma given in Annexure – VI ‘C’.”

4. The existing para 10.2.2.1 may be replaced as under.

“10.2.2.1 The test joint shall be supported on cylindrical or semi-cylindrical supports having a diameter of 30 to 50mm and distance of one metre between them. In case of 60kg 110 UTS/head hardened rail joints the test span shall be 1.25 metre. The mandrel diameter shall be between 30 to 50mm. The mandrel axis should be perpendicular to the horizontal axis of the rail section and it should be positioned at the centre of the weld. The weld shall be in the centre of the span and loaded in such a manner that the foot of the rail is in tension. The load shall be uniformly and gradually increased. The rate of application of the load should not exceed 2.5 tons/sec. The test joints shall withstand the minimum load and shall show minimum deflection as given in Table 1 without showing any signs of cracking or failure. The minimum deflection values are corresponding to stipulated minimum **breaking** loads. Results shall be maintained as per proforma given in Annexure-VI ‘D.’

VALUES OF MINIMUM BREAKING LOAD AND DEFLECTION IN TRANSVERSE LOAD TEST

S N	Rail Section	Span	Min. breaking load (tonnes)	Min. deflecti on at centre (mm)	Frequency of testing	
					Stationa ry FBW Plant	Mobile FBW Plant
1	60 kg (UIC) NHH	1.25 m	115	30	1in500	1in 100*
2	60 kg (UIC) Cr. Mn. alloy steel	1.25 m	110	12	1in500	1in 100*
3	60 kg (UIC) 90 UTS	1m	150	20	1in1000	1in 100*
4	52 kg 90 UTS	1m	100	15	1in1000	1in 100*
5	60 kg UIC MM (72 UTS)	1m	135	30	1in1000	1in 100*
6	52 kg MM(72 UTS)	1m	100	30	1in1000	1in 100*
7	90R MM(72 UTS)	1m	80	30	1in1000	1in 100*
8	75R MM(72 UTS)	1m	70	30	1in1000	1in 100*
9	60 R MM (72UTS)	1m	60	25	1in1000	1in 100*

***Sample joints for first 1000 joints welded by a Mobile Flash Butt Welding Plant will be tested at a frequency of 1 in 100 joints and subsequently at a frequency of 1 in 500 joints. ”**

5. The existing para 10.2.3 may be replaced as under.

“10.2.3 Macro examination: One test joint for every 5000 joints welded in case of stationary Flash Butt Welding Plant and One test joint for every 1000 joints welded in case of Mobile Flash Butt Welding Plant, shall be subjected to macro examination. 150mm length of rail with weld at centre shall be cut and the sample shall be sectioned in vertical longitudinal direction through the weld. One of the sections shall be etched with 5-10% Nitric acid and also subjected to magna flux test to ensure freedom from cracks, lack of fusion or oxide inclusion. Extent of heat affected zone shall be measured for head, foot and web of the rail. **These values should not be more than the values achieved during standardization of welding parameters of the particular rail section and chemistry of particular make of FBW Plant.** Results shall be maintained as per proforma at Annexure – VI ‘E’.

6. A new Para no. 13 may be added as given below.

“13. Welding Team for Mobile Flash Butt Welding Plant

13.1 Welding team may consist of one supervisor and two welders. The educational qualification of supervisor should be min. Diploma in Mechanical/Electrical Engineering or BSc and that of welder should be minimum Class X or equivalent, passed. Welders and supervisor already working in Mobile FBW Plant plants may continue if Chief Engineer is satisfied about the quality of welds by these operators. Zonal Railway shall also ensure periodic training of welders of Mobile Flash Butt Welding Plants.

13.2 Test for competency certificate of welder of Mobile Flash Butt Welding Plant will be conducted by Zonal Railways as per this Manual and after satisfactory result the competency certificate will also be issued by Zonal Railways. For the guidance of Zonal Railways, test scheme as well as syllabus for written test and interview is given as under: -

13.2.1 Part-I (Written Test and Interview)

13.2.1.1 Written Test

- (i) Welding parameters and its influence on quality of welding and Heat Affected Zone**
- (ii) Suitability of rails for welding**
- (iii) Preparation of rails to be welded including pre-straightening of rails.**
- (iv) Procedure of welding of rails**

- (v) Record of welds**
- (vi) Post weld straightening of Joints**
- (vii) Finishing of Joints**
- (viii) Marking of joints**
- (ix) Testing of welds**
- (x) Precautions to avoid defects in Flash Butt Welding rail joints**