

TECHNICAL SPECIFICATIONS (T.S.)

- 1.0** Mild Steel Welding Electrodes of coding **ERR4221X** having high radiographic quality conforming to IS: 814-2004 and/or latest amendments if any for welding of general structural purposes mild steel.
- 2.0** **CORE WIRE FOR ELECTRODES:** - The core wire used for the manufacture of electrodes shall conform to IS: 2879: 1998 and manufactured by M/s Steel Authority of India Ltd. or M/s Tata Steel Limited shall only be accepted.
- 2.1** **FLUX COVERING:** - ERR-RUTILE HEAVY COATED as per IS: 814:2004. The electrodes shall have a covering containing a large quantity of rutile or components derived from Titanium Oxide. The coating ratio of covering shall be above 1.5 i.e. the ratio of the standard outer diameter of the covering & the nominal diameter of the core wire both expressed in mm shall be above 1.5. The electrodes should have smooth arc characteristics & shall normally produce very little spatter. The slag detachability shall be easy & good. The covering shall be free from any organic materials & hydrogen bearing compounds. There shall be no moisture present in the coating. The flux covering on the electrodes shall be uniform & concentric with the core wire. The tolerance for concentricity of the covering shall be such that the maximum core plus covering dimensions shall not exceed the minimum core plus one covering dimension by more than 4 % as per IS :814 :2004.
- 2.2** A through & even fusion of the coating in the arc must be there during welding.
- 3.0** **SIZE:** - The size of electrodes shall be **3.15X 450 mm, 4.00X 450 mm, 5.00X 450 mm**, as per IS: 814-2004.
- 3.1** The manufacturer is required to state the current conditions for each type & size of electrodes quoted.
- 3.2** Core wire & covering shall be free from defects which would interfere with the uniform welding performance of the electrodes.
- 3.3** The arc striking end of the electrode shall be bare & permit easy striking of arc. The distance from the arc end to the first point where the full cross section of the covering prevails shall not exceed 2/3 core wire diameter or 2.5 mm whichever is less.
- 3.4** The contact end of the electrodes shall be clean & free from the covering for enabling it to be gripped by the electrode holder as mentioned below:-

<u>Electrode size</u>	<u>Bare length of electrode</u>
3.15 mm	15 to 30 mm
4 to 5.0 mm	20 to 40 mm

3.5 The tolerance on the specified diameter of the core wire shall be (\pm) 0.05 mm.

3.6 The tolerance on the specified length shall be (\pm) 3 mm

3.7 **The coding ERR 4221X represents:-**

- E- Electrode
- RR- Rutile, Heavy coating
- 4- Strength characteristics:
 - Ultimate Tensile strength : 410 to 510 Newton/ mm²
 - Yield Strength : 330 Newton/mm²
- 2- Elongation & Impact properties (weld metal deposited)
 - Elongation : 22% (minimum)
 - Impact strength : 47 Joules at +0° C (minimum)
- 2- Welding position: For all positions except vertical down.
- 1- Welding current & voltage conditions
 - Direct current recommended electrode polarity : (+) or (-)
 - A.C. Open current voltage (minimum) : 50 volts.
- X- Radiographic quality electrodes

4.0 **MARKING:** - Manufacturer's brand name/ classification should be printed on all the electrodes.

4.1 Each bundle or carton of electrode should be clearly marked with the following information:-

- (i) Classification- ERR4221X
- (ii) Indicating the Source of manufacture
- (iii) Trade name & brief description of electrode
- (iv) Size & quantity of electrode
- (v) Batch number
- (vi) Recommended current range, polarity & open circuit voltage
- (vii) Date of manufacture
- (viii) Recommendation for special storage conditions & redrying temperature
- (ix) A cautionary note on safety during welding should be printed.
- (x) The bundle or carton of electrodes must also be marked with the standard mark.

5.0 **PACKING AND STORAGE:-**

5.1 The net mass of an individual bundle or carton of electrodes for manual operation shall not exceed 7

Kg.

- 5.2** Electrodes should be suitably packed to guard against the damage during transportation. The packing shall be suitable to ensure that under normal store room condition the electrodes shall be safe, for a period of 6 months after dispatch from the manufacturer's stores, be capable of giving result in accordance with the provision of IS: 814-2004 and that of the flux covering is of a type requiring special protection during storage, the detail of such special protection shall be furnished by the manufacturer and reference to this should be included in the marking of the bundle or carton of electrode.
- 5.3** The batch of electrodes represented by electrodes tested shall not be certified as complying with the specification unless the test results obtained satisfy the requirements specified in the Quality Control Tests and the manufacturer has performed tests at intervals in accordance with the requirement as specified in IS: 814-2004.

6.0 TESTS FOR ELECTRODE PROPERTIES:-

The electrodes shall be subjected to the following tests for assessing the mechanical properties of the deposited weld metal and the usability of an electrode for a particular welding position:-

- (a) Initial Tests
- (b) Periodic Check Test,
- (c) Quality Control tests.

6.1 Initial Tests:-

(I) The manufacturer/ Tenderer is required to submit test reports of a reputed standard test laboratory approved by government for the following tests along with this offer. The test reports as per IS: 814-2004 must be for the electrodes being offered and manufactured during last one year (Batch Number to be mentioned)

- (a) All weld metals mechanical tests for Tensile and Impact
- (b) Butt weld bend test

(II) **Radiographic Quality Test:-** The tenderer/ manufacturer are required to submit Radiographic Quality Test Report for each size of electrode tendered. These test reports are to be obtained from a standard Test Agency designated for this purpose for the electrodes manufactured during last one year (Batch Number to be mentioned).

- 6.2 Periodic Check Tests: -** The periodic check test reports for "All Weld Metal Mechanical test for tensile and impact" as per IS: 814-1991 conducted once in a year for last three years are required to be submitted along with the offer. The periodic Check Test Report for the last batch/lot manufactured for each size of the electrode offered is also required to be submitted along with the offer.
- 6.3 Quality Control Tests: -** Quality Control Tests Reports for the composition and quality of all the electrodes offered being produced currently are also required to be submitted along with the offer.
- 6.4** The manufacturer shall make available to the approving/certifying/ authorities / Department the records maintained for quality control for ensuring that the composition and quality of all the electrodes currently produced are similar to those electrodes subjected to the initial and periodic check tests.

7.0 INSPECTION & TESTING:-

M. S. Welding Electrodes being supplied shall be inspected/ tested by IIIrd Party Inspection Agency at the works of the manufacturer prior to dispatch and the following tests are to be required to be carried out during inspection as per IS: 814-2004.

- (a) All Weld Metal Mechanical Test For Tensile And Impact as per Clause 9.1 of IS: 814-2004
- (b) Butt Weld Bend Test as per Clause 9.20 of IS:814 - 2004
- (c) Visual Check
- (d) Dimensional Check

The visual and dimensional check shall be carried out for one in thousand pieces for each size of electrode and for each consignee.

- 7.1** The parent metal for test pieces for All Weld Assembly and Butt Weld Assembly shall conform to ANNEX-"F" (Clause 8.03) of IS: 814-2004.
- 7.2** Test pieces prepared for All Weld Metal Assembly and Butt Weld Assembly shall be welded and tested with each type & size of electrode (offered) separately.
- 7.3** The manufacturer shall produce evidence/certificate before the inspection agency that the core wire of the **M. S. Welding Electrodes** are manufactured only for the steel procured for M/S Steel Authority India Limited or Tata Steel Limited and also submit test certificates verifying chemical composition of core wire. The Radiographic Quality Test Report shall be submitted before the above inspection agency for verification.

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