

TECHNICAL SPECIFICATION FOR FRP FENCING

1 Scope

This specification covers the basic requirement for the complete design, manufacture, fabrication, testing and inspection at manufacturer's works, packing, supply and Installation of Insulating type FRP Fencing for safety with necessary hardware, accessories, fittings, etc. for Distribution Transformer Stations/RMU/Package Substations.

2 Service Conditions

The equipment to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

- a) Maximum ambient temperature of air: 50°C
- b) Maximum temperature of air in shade: 4°C
- c) Minimum ambient temperature of air: 3.5°C
- d) Maximum daily average ambient temperature: 40°C
- e) Maximum yearly average ambient temperature: 30°C
- f) Relative Humidity: up to 95%
- g) Average number of thunder storm days per annum: 15
- h) Maximum annual Rainfall: 150cm
- i) Maximum Altitude above mean sea level: 100Meter
- j) Maximum Wind Pressure: 150 Kg/cm² (As per IS 802 latest code)
- k) Maximum soil temperature at cable depth: 30°C
- l) Maximum soil thermal resistivity: 150°C cm/watt
- m) Iso-ceramic level (days/year) 50
- n) Climate Moderately hot and humid tropical climate, conducive to rust and Fungus growth.

3 Applicable Standards

All components used in the manufacture of the FRP Fencing shall conform to the Relevant Indian standard specification and IS-6746 i.e. Unsaturated Polyester Resin System and IS 13410 Glass reinforced Sheet Moulding Compounds (SMC)

4 General Technical Requirements

(I) General: -

- a. The Fencing shall be antistatic and ultra violet resistant. Fencing shall be manufactured using components made in accordance with IS-6746 and IS 13410.
- b. FRP Fencing shall be made utilizing FRP Pultruded sections & SMC Pickets. FRP sections shall be made from an advanced formulation of Thermosetting Polyester Resin with Glass Fiber Reinforcement on state of art electronically controlled pultrusion technology. Manufacturing process shall be pultrusion using automated pultrusion machines. SMC Pickets from hot press compression moulded SMC conforming to IS 13410
- c. FRP Fencing shall be made of FRP and shall be corrosion resistant and fire retardant (Low flammability) in accordance with the latest IS-6746. An additive material shall be mixed

with the FRP to make them resistant to ultraviolet light. FRP/SMC Flats may be used as preferred by bidder. Colour shade shall be as approved by MGVCCL.

- d. The oxygen index shall be minimum 24 as per IS 6746.
- e. The minimum glass content in the FRP and SMC material shall be 45% and 20% respectively
- f. The FRP Fencing shall be free from sharp edges and corners, burns and unevenness.
- g. FRP fencing shall be supplied in completely knocked down condition and shall be of ready to use type. The fencing system shall be suitable for onsite fabrication using standard hardware and tools. The fencing shall be supplied as per BOQ agreed between supplier and purchaser.
- h. The fencing is constructed utilizing vertical post duly grouted / fitted in ground/on floor. Horizontal rails fitted to sub frame to suite onsite mounting the vertical posts, pickets fitted to rails and gate to facilitate entry and exit restriction within the covered area.
- i. FRP Pultruded Sections and SMC pickets shall have following mechanical properties

Sr. No.	Parameter	Value for Pultruded Section	Value for SMC Pickets
a)	Ultimate tensile strength:	2000-4000Kg/cm ²	50 MPa
b)	Flexural strength	2000-10000 Kg/ cm ²	155 MPa
c)	Flexural modulus:	1.5-5x100000 Kg/ cm ²	N.A.
d)	Izod impact:	130Kg/cm/cm of notch	45 KJ/m2
e)	Compressive strength:	1500-5000 kg/ cm ²	N.A.
f)	Compressive modulus:	2.5-4.5 kg/ cm ²	N. A.
g)	Bar col thickness:	50- 65	50- 65
h)	Water absorption:	<=0.6%	<=0.25%
i)	Glass Content	Min. 45%	Min. 20%
j)	Flammability	Low flammability as per IS 6746	
k)	Flame Spread (Fire propagation Index)	Less Than 15 as per BS 476 (Part 5, 6 & 7)	

- j. FRP Pultruded Sections and SMC pickets shall have following Electrical Properties.

Sr. No.	Parameter	Value for Pultruded Section	Value for SMC Pickets
a)	Dielectric Strength Axial	30 – 45 kV / 25 mm	9 kV
b)	Dielectric Strength Radial	10-15 kV / 25mm	N. A.
c)	Arc Resistance	> 120 sec	> 120 sec

- k. FRP Pultruded Sections fencing – Routine & Acceptance Testing Parameter shall include but not be limited to following:

Test for FRP sections

Sr. No.	Parameter	Value specified
---------	-----------	-----------------

1	Visual	As per approved drawing
2	Dimensions	As per approved drawing
3	Glass Content	Min. 45%
4	Flammability	Low flammability as per IS 6746

Test for SMC Pickets

Sr. No.	Parameter	Value specified
1	Visual	As per approved drawing
2	Dimensions	As per approved drawing
3	Glass Content	Min. 20%
4	Flammability	Low flammability as per IS 6746

Construction of FRP

- **Vertical Posts:**

The vertical post shall be made out of FRP Pultruded square hollow section of size 50x50x5 mm. Such posts shall be kept at a distance not exceeding 1000mm c/c except gate opening and shall be grouted in the ground with c.c. of ratio 1:2:4 in the pit of size 300x300x450 mm. The work must be done under Supervision of concerned SDO OR Authorized staff appointed by SDO. The vertical posts shall be supplied with pre-drilled holes so as to accept Sub frame provided using hollow FRP box sections 50x25x5 mm and other accessories for fixing of gates etc. The length of vertical post shall be sufficient to take care of grouting, depth i.e. underground and height of fencing above the ground. Post should be buried in foundation at least 450mm from ground level. Posts at corners and gate openings may be of different size/shape so as to take care of the fencing requirements.

- **Rails**

Rails shall be made out of FRP notch bars of 12 mm dia. provided at equal spacing not exceeding 200 mm Centre to Centre as shown in drawing. The rails are placed horizontally and height of the 1st rail from the ground as well as gap between the rails shall be maintained as detailed in the approved drawing.

- **Pickets:**

Pickets shall be made of flats of size 35x5 mm SMC or FRP provided at equal spacing not exceeding 100 mm Centre to Centre mechanically locked between vertical post as well as top and bottom member of sub frame as shown in the drawing. Pickets shall be pre-drilled to facilitate fixing on the rails. Dimensions of the sections utilized (vertical post, rail, picket), length of those sections (height of fencing), gate openings, corner posts and the perimeter as well as shape of area to be covered by fence shall be as per the drawing and shall be as mutually agreed between the supplier and purchaser by way of issue of approved drawing. The fencing Material of Construction (MOC) shall conform to the IS: 6746 and/ IS 13410 as applicable and the fabricated, installed fencing shall confirm to the approved drawing.

- **Fencing Gate:**

Fencing gate should have door with two shutters with one Heavy duty S.S. aldrap of size not less than 16 mm Dia and 350 mm length. Gate is to be provided as per site conditions. General arrangement and layout of fencing is shown in schematic drawing.

- **Danger Board:**

Danger Board of size 300X300 mm (1.6 mm thick M.S. Plate) is to be provided on left hand side of fencing with standard drawing as attached herewith. Danger Board should have letter writing pattern and size as per drawing.

Other Conditions

- a. At top the whole fencing shall be tied with FRP Angle section 50x50x5 to provide suitable stiffness. Angle section should be openable across gate.
- b. Hardware for fixing / assembling shall be of stainless steel.
- c. Gate should be suitably stiffened to prevent sagging. 3nos. of Hinges of 100 mm size on each door and shall be of heavy duty S.S. and facilitate of outward 180 degree movement of the gate flaps.
- d. Left door of gate should be provided with stopper of 300 mm and Dia. of 10 mm at upper and lower part of fencing with proper locking arrangement.
- e. Transformer fencing erection should be done according to site situation and as per instruction of engineer in charge of sub division office.
- f. Supporting bracing flat size SMC molded / FRP Flat 35 x 5mm and length 300 mm are to be provided in each corner on top and bottom frames of fencing and on each shutter of door.
- g. Grouting Rods of M. S. With Dia. of 12mm and 250 mm long at each Vertical Post are to be provided as shown in Drawing.
- h. Payment of bill will be based on running meter measured during joint measurement with engineer in charge.

DRAWINGS AND DOCUMENTATION

- a) The successful bidder shall submit sketches for each location of the FRP Fencing and get the same approved at concerned Division office before commencement of supply. The indicative schematic drawing is enclosed herewith.
- b) The tenderer shall furnish all details and clarifications required if any for scrutiny and evaluation of the offer.
- c) Manufacturing of material to be supplied shall be done strictly as per approved drawing.
- d) Approval of drawing shall not absolve the supplier of his liability for ensuring correctness according to applicable standards & regulations.

5 Tests

All the Type Tests shall be carried out from reputed Laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India or accepted by MGVL. Test Reports submitted by Labs such as CPRI, ERDA, ERTL, CIPET, Fire Research Laboratory (FRL) of CBRI Roorkee shall be accepted to prove that the FRP Pultruded Sections meet the requirements of specification. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable. The FRP Pultruded Sections used in FRP Fencing shall be fully type tested for Mechanical and Electrical Properties. Attested copies of Type Test Reports are to be submitted.

6 Testing & Manufacturing Facilities

- a) The Bidder/manufacturer shall have necessary machinery for production of FRP Pultruded Sections using Automated Pultrusion Machines as well as SMC material and SMC hot press compression molding Machines if SMC is intended to be used for FRP Fencing.
- b) Manufacturer should have in house testing facilities for carrying out the routine and acceptance tests. Each Lot dispatched should be tested in house and test report should be submitted to MGVL.
- c) Supplier shall be responsible for packing, transporting and delivery to the consignee.

7 GTP

Sr. No.	Description	Requirement	Supplier Remark
1	Vertical Post (Pultruded FRP)	Box section of 50 x 50 x 5mm @ max 1000 mm c/c & corners	YES/NO
2	Sub frame section	FRP Box section of 50 x 25 x 5mm	YES/NO
3	Rail	FRP Rod Dia. 12mm @ 200mm c/c with notch and keys to lock pickets.	YES/NO
4	Pickets	SMC molded / FRP Flat 35 x 5mm Thick @ 100 mm c/c	YES/NO
5	Bracing Flat	SMC molded / FRP Flat 35 x 5mm and length 300 mm	YES/NO
6	Heavy Duty S.S. Aldrop	Not less than 16 mm Dia. And 350 mm Long	YES/NO
7	Grade of Material for Fencing	Pultruded FRP - UV and Fire Resistant conforming to IS 6746	YES/NO
8	Type Test Certificate For Material	Refer Respective Clause of Technical Specifications	YES/NO
9	Size of the fencing	HEIGHT: 1600 MM (1500+100 mm) above ground and 450 mm in ground; minimum Width and Length as per site conditions and as decided by EIC (Engineer In-charge).	YES/NO

MGVCL will take random samples from the material supplied and subject them to tests in Government approved laboratories. The material should stand these tests and if the materials do not stand these tests, they will summarily be rejected and the supplier should make immediate arrangement to replace them with standard material only after getting them duly inspected.

MGVCL also reserves the right to accept the whole or part of such supplies or of the utilized material and recommend reduced prices taking into account the defects noticed. Such reduction for the whole lot will be maximum up to 30% (Thirty) of the end cost price, provided MGVCL accepts the material. In this respect, the decision of the MGVCL will be final and will be binding on the supplier.