



AN ISO 9001:2008 AND
18001:2007 CERTIFIED COMPANY



MARUTI
REFRACTORIES
CORROSION CONTROLLER ENGINEERS

PPG LINING DATASHEET

1. SCOPE

The Specification covers supply, furnishing, installation, finishing, curing, Protection, repairing, maintenance and handing over of all floor finishes and allied works covered under scope of this contract.

2. GENERAL

- 2.1 The contractor shall furnish materials, labour, plant equipment and tools to complete the work as specified and /or as shown in the drawings.
- 2.2 The individual elements shall fit perfectly together and be fixed to the underlying floor without the slightly unevenness at joints, they may be of different shapes and colours and be laid as directed.

3. MATERIAL

- 3.1 All materials shall be of best quality and shall conform to relevant IS codes where available. Materials for finishing items shall be procured from well reputed manufacturer and shall be approved by the Engineer. Materials of any type and kind shall be perfect in every respect. The Contractor shall submit samples of the materials used to the Engineer for approval if asked by the engineer.

4. Plastic Polypropylene Glass Acid / Alkali Resistant Lining

4.1 Scope

PPG Lining includes the supply and fixing of 2 mm. PPG sheet with 1.5 mm. approx. thickness of adhesive (Chemical-A and Chemical-B). Hardener and fiber. It includes complete supply of material required for the same along with the tools, tackles and skilled manpower for the installation and testing of the same as per the procedure recommended and approved as per Instruction of Engineers. The jointing of the sheet shall be carried out help of Fusion welding of two sheets by means of PP welding Rods.

4.2 Material

3.5 mm. PPG Lining on floor as well as wall shall be polypropylene based material backed with glass fiber cloth. It comes in the form of 2 mm. sheet of suitable size and it shall be fixed with suitable adhesive of 1.5 mm. approx. on the concrete or low carbon steel surfaces. The lining material shall be pasted on concrete/steel surface from glass cloth side whereas, the polypropylene side remains exposed.

These are the following properties of the PPG (Bare Sheet) :

Properties	Unit	Value of PPG
Physical		
Density	M/gm ³	0.9-0.91
Hardness	Shore	60
Heat Distortion Temp.	°C.	80
Softening Point	°C.	130
Oxygen Index		14
Flash Ignition Temp.	°C.	375
Mechanical		
Tensile Strength	Kg./Cm ²	250
Flexural Strength	Kg./Cm ²	30
Compressive Strength	Kg./Cm ²	525
Izod Impact Strength	Ft-Ib/in or J/cm	0.4
Thermal		
Thermal Conductivity	W/M°k	0.14
Thermal Expansion	m/mokx10 ⁸	112
Specific Heat	J/Kg°k	1925

4.3 Workmanship

4.3.1 Surface Preparation

The surface shall be sufficiently dry before installation of PPG lining. The floor surface shall have a mild roughness like sand finish plaster and from scales, loose material, oil, grease etc.

4.3.2 Laying and Fixing

Select the area where Thermoplastic-PPG lining shall be done. Check the dryness and roughness of the surface where PPG lining shall be fixing. It shall not be too smooth clear the all loose and sand particle from the selected area. With the help of wire brush.

Cut the Thermoplastic PPG sheet that shall be fixed in selected area from the roll (size of roll 10m. x 1.5m / 1.35m).

Mix Chemical 'A' to Chemical 'B' thoroughly to form mix of Chemical in the proportion of 100: 03 Now mix the hardener in mix Chemical in proportion of 103:02 (Hardener is fast setting compound where the mix chemical shall be set within a period of 1-2 hours, but its gel time starting shall be 25-30 minutes) and as per manufacturer's instructions. Apply mixed Chemical on the marked surface. After that lay the layer of fiber mat & apply mixed chemical on it till the fiber mat shall in wet.

Apply mixed chemical on reverse side of PPG sheet where fiber cloth is embossed. Place the sheet on marked surface and load on it. Load shall be applied in such a way the PPG sheet shall be in full contact with base surface.

Allow PPG lining to cure (curing time of mixed chemical) shall be 2-3 hours. Curing time shall be selected according to the size of the sheet and surface area. It shall be adjusted by the qty. of chemical added. Once the sheet lying and fixed work shall complete then check the adhesive at intermediate interval for curing. After confirmation of proper curing remove the applied loads. Clean the edges of sheet where any chemical are there so that proper welding shall be taken up.

Joints the Thermoplastic – PPG sheets shall be welded by Fusion welding through hot air gun. Below the strip a fine MS wire shall be placed to get the return earth for spark testing.

After the welding completed check the entire area with Spark testing for any leakage from the joints.

Welding procedure :

Both sheets shall be scrapped gently to ensure proper welding.

Thermoplastic sheet shall be welded using the fusion technique. In fusion welding technique set the temperature (350 c) setting of inbuilt compressor plastic blower. The basic objective is that the welding rod (3.5 mm. dia.) shall melt cleanly and should not be discolored.

Lay the tip of plastic blower on welding rod recommended by manufacturer and on the surface of the sheet simultaneously and slowly melt the rod on the joints by pulling you in such a way that welding rod should be clearly welding and have with surface.

4.4 Inspection & Testing Criteria

Visual Inspection

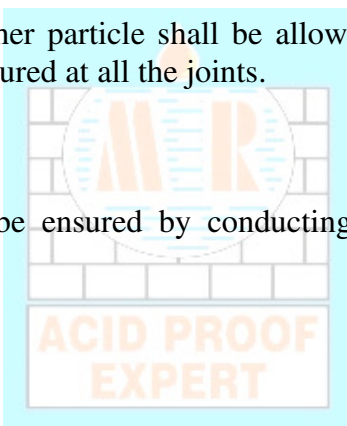
The entire surface where PPG lining shall be fixed shall free from dust, dirt, oil/grease etc. The PPG sheet also shall be cleaned all the foreign material.

Lining Welding Inspection.

No dust, sand or other particle shall be allowed at joints and also homogeneity shall be properly ensured at all the joints.

Bond Test

The bonding shall be ensured by conducting sound test using plastic/wooden mallet.



Test Report for Bonding of Sheet

Area	Sheet I	Sheet II	Sheet III	Sheet IV	Sheet V	Sheet VI	Sheet VII	Sheet VIII
Description								
North Wall								
South Wall								
East Wall								
West Wall								
Bottom Floor								

Inspected by

Client Engineer

Limit. : Not a single patch of size more than 150 mm. x 150 mm. in any sheet the total area of the air pocket shall not be more than 3% of the sheet size.

Spark Test

High frequency spark used to detect any pinhole or else we can also call pinhole detector. The intense electrostatic field produced discharge from a small metal rod inserted in the handle of the test coil. This metal rod when brought within 1 cm. of the lined surface of the structure produced a diffused spray discharge but if there is any minute crack or microscopic hole in the lining whether it be in glass, rubber or in any insulation this diffused discharge is concentrated into a bright spark passing through the hole or crack.

This phenomenon is attributed to the fact that high frequency currents possess a very high tendency of taking the nearest passage to earth. This method is therefore very useful in detecting faulty welding.

In testing the tip of the metal rod from the handle of spark tester shall be run along the welding joints and if porosity shall present then blue spark will readily appear. The voltage rating of tester may vary from 5000 to 30000 volts depending on the thickness of lining and magnitude of the porosity detected is 10000 to 15000 volts is a good general practice.

The machine parameters should be set as given below :

01.	Voltage	15 KV
02.	Frequency	Medium
03.	Current	10 Amps.
04.	Distance of Tip from Welding Joint	Up to 1 cm.

These parameters of the machine shall be fixed and once it will be decided, technicians/operator or any other person shall not authorize to disturb it without the permission of the concern Engineer. The same parameters shall be continuing till the testing.

All weld joints shall be tested preferably in the presence of the Engineer. Report on welding joint shall be prepared and submitted to the Engineer.

The welding joint test report shall be prepare in the following typical format.

Test Report for Welding Joints

Voltage :
Frequency :
Current :
Tip Distance :

Area	Sheet I	Sheet II	Sheet III	Sheet IV	Sheet V	Sheet VI	Sheet VII
Description							
North Wall							
South Wall							
East Wall							
West Wall							
Bottom Floor							

Welding joint test shall be conduct for 100 area of application

Inspected by

Client Engineer

To evaluate the properties of the PPG flooring following test shall be conducted. However, these are type test (i.e. of the test are already conducted in the reputed Lab., the same shall not need for each and every project.

Wear loss due to abrasive action on polypropylene side. High stress abrasive wear test shall be conducted on the two body SUGA abrasion tester model NUSI Japan. Wear rate shall be estimated from weight loss measurement.

Bonding strength of PPG lining material with RRC interface between PPG lining and RRC surface/MS surface shall not fail.

Backing pressure (Water leakage test) : A test shall be conducted on samples prepared to estimate tolerance of lining material to withstand against seepage water pressure. Lining material shall be fixed on a commercial grade concrete tile. A hold shall be made from concrete side in the tile up to the lining material, through which water pressure shall be applied. No damage to lining material shall be visibly seen up to applied water pressure of 25 kg./cm^2 and also adhesion between concrete tile and lining shall be ensured up to pressure of 20 kg./cm^2 .

Chemical resistance against HCL, H_2SO_4 and NaOH : The sample shall be tested as per IS : 159 and it shall be ensured that no crack shall be observed in surface, no colour change can appear and no weight loss shall be observed. Falling draft impact test : PPG lining shall be fixed on concrete tile of approx. 25 mm. thick using available. Two different heights from the PPG lining material. The average thickness of PPG lining, glass fiber matrix shall be 2 mm. The depth of indentation shall be measured.

4.5 Method of Measurement

4.5.1 Floors

Floors of any kind shall be estimated on the basis of the surface area appearing between the plastered walls of the room. Dado shall be paid for the surface area up to floor level. Measurement of lining work on floor and dado shall be as per actual work done in square meters to decimal places and be measured by their actual surface, whatever shape or position the walls may have. Skirting shall be measured in linear meters. The cost of laying shall include providing of adequate cleaning of surface, application of adhesive, laying of PPG sheet curing required testing, equipment and all special transition pieces, groove moulds, corners all as per specification and drawing.

IS : 1200-1992 Method of measurement of building and civil
Engineering Works (Part-II)

Definitions

Area Which are prone to chemical attack and required to be protected (Area has to be decided by the user / client / consultant).

Surface Req. For PPG Lining we required smooth and dry surface.

Smooth surface stand for the surface's should have one plan, undulation or unevenness should not be observed on prime of face, and further to that if we put a plan wooden plank, or M.S. Plate, ups and down should not be of more than 10 MM. Edges in the surface is not at all permissible. Surface should be free from any foreign particles dust etc.

Dry surface stand for the surface free from any traces of the moisture. To check the same we can put a piece of plastic sheet with load on the floor for one day, if moisture deposited below the sheet that shows still moisture content is there in the surface.

Bonding In PPG consist of two surfaces, top is of PP which will be exposed to the chemicals and back side is Fiber Glass lined which is bonded with the parent surface.

The Purpose of bonding the PPG Sheet with Principal surface is "PPG Sheet remains intact with the Principal Surface without any external support by any means". The bonding strength of PPG with RCC and M.S. is 38.65 Kg./CM² and 28.00 Kg./CM²^{#1} respectively.

For details please refer procedure of fixing the PPG Sheet.

Sealing of the joints Although the numbers of joints are very negligible, all the joints will be welded by Homogenous welding process to ensure that by any means principle surfaced should not be exposed to the chemical. For details please refer Welding Procedure.

Testing There are two type of test is conducted to ensure that it should achieve the objective of Chemical Resistance Lining remain in tact for the life expected^{#2} for details please refer testing of PPG Lining.

Definitions and elaboration of the phrase.

#1 : Bonding Strength This is a distractive type of test carried out by us time to time when ever we made any change in the procedure or raw material. This test till date has been conducted by council of Scientific and Industrial Research at there laboratory. If any individual client would like to carry out the test we can organize the same, while all the commercial implications will lies with the client. For details please referee the Performance Evaluation report of PPG Flooring and Lining Report No. RRL/PG/CRESCENT/2002-01, December 2002

#2 : Expected Life As such PP will not be deteriorated against the chemicals if it has been

checked before the application against the chemicals for any given time. Now the life of the PPG has been decided by the list of the bonding material. Theoretically the life of the adhesive in the open environment is 12-15. Since in PPG the bonding material is at the back of the sheet and not at all exposed to the open environment we can expect a life much more than that. On above subject Life Cycle test are under process with the Council of Scientific and Industrial research, results are awaited. Further to that we have executed first order in October 1995, till date we have not observed any de-bonding of the sheet on above account.

#3 : Vertical and Horizontal Surface and application of load to get full contact. We have two different procedures for the dead load separately for vertical wall and floor.

Vertical Surface For vertical wall dead load will be provided by the jigs and fixture developed specifically for the PPG Lining.

Floor the best way to provide the dead load on the floor is sand. Here we will use empty cement bags half filled with the sand.

For our all application sand bags will be used even in the vertical surfaces also where we consider as it is possible to provide the deal load on the wall by mean of sand bag better then mechanicals jigs and fixture. We can here assume that height up to 500 mm. can be managed with the sand bags.

Contact Surface ideally PPG should have 100% contact area with Principal surface. Since all the actions of above will take place behind the sheet which is not visible, there is a possibility that some minor areas of the principal surface may not come is contact with the PPG and that will result in to the minor lose bonding. For details please refer visual inspection enclosed.

#4 :Ratio of Ratio given is for the ideal working conditions of the controlled atmosphere. The ratio varies as per the atmospheric conditions and size of the sheet to be fixed as we used to adjust the ratio to set the required time we need to fix the sheet.