

Building Materials and Composites

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Lecture No. #38

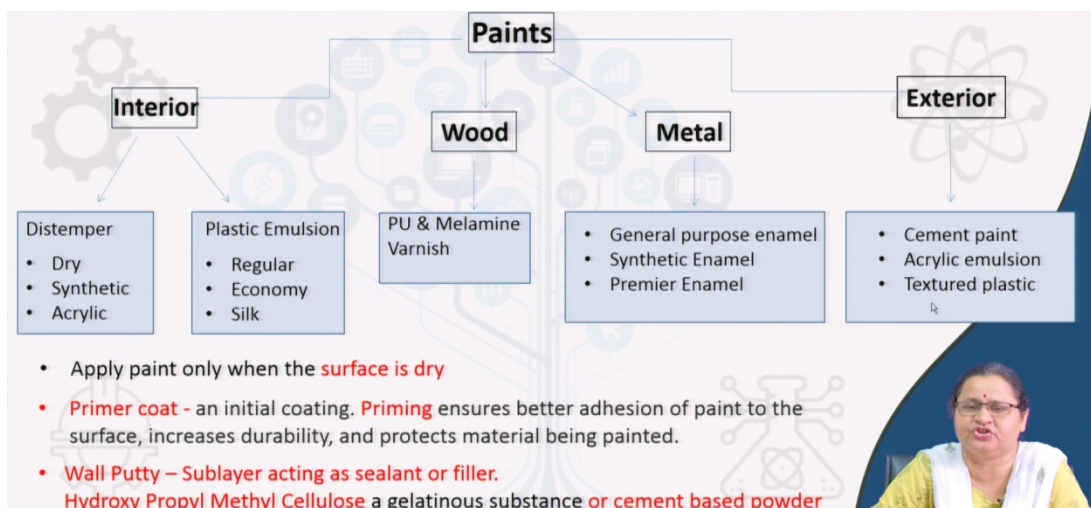
Paints (continued)

In the previous two lectures of this module we have actually discussed on paints and we as architects need to know, what are the different types of paints and what is to be recommended on what type of surface and how it is to be applied onto a surface. So we will try to concentrate or maybe finish off today in today's lecture, the paints chapter. (refer time: 00:59)

And we will try to cover the different types of paints, the application of paints, and we also need to know the special type of paints and again some nano applications. So we have discussed in my previous module, nano applications. Here it will be little different or particularly specific to that of paints. Now paints as I already told, it gives a protective covering. Now we had also discussed on the defects of paints.

There we had found that paints, there are three kinds of defects. And one is improper surface treatment. So surfaces are very important, when we are looking into the application of paints. But prior to that, we need to know what type of paint is applicable where. (refer time: 01:57)

So let us come to the different kinds of paint. We have interior applications that is the internal facades of the rooms, house, kitchen, toilet, chemical laboratory, all what we can imagine. So we are referring to the wall surfaces, which are mostly plastered surface or concrete surface. Similarly, we have such exterior walls. Beyond that, we have wood surfaces and metal surfaces.



So you can see all these that from paints, it has branched out. But what is important to know is whenever whatever be the surface, we have to apply the paint when the surface is dry. That is point number one to be remembered all through because on new surface even if it is new even you think it is okay we can apply paint just after finishing plastering, it would not help. We will come to why.

Other is if you put a primer coat an initial coat, what will happen? It will stick to the main surface or the substrate and a much amount will be absorbed by the material. Because other than metal we have concrete which can absorb, we have wood which is absorber. So they will absorb some amount of paint. So cheaper it is better it is. And at the same time this absorption will lead to the adherence of paint to the substrate.

So next coat on top of this primer coat will be less consumed. You can put a better quality of paint as the second coat. And obviously, depending on the hiding capacity of the paint, the primer coat will be getting invisible with coats. So this gives a durable protective coating. So primer coating is very important on any surface being painted.

Next point is for particularly walls. We have wall putty. That is a kind of sealant or a filler of all the kind of pores on the concrete surface or the plastered surface which is sand and cement. It is usually cement based powder or hydroxypropyl methylcellulose, HPMC which is a gelatinous substance, is glue like. So this glue like substance is coated as a primary coat on top of the wall surfaces be it interior or exterior.

Obviously if it is exterior, you can have a very good damp protection from the rain water. Now coming to the interior paints. You see a list of interior paints, which are distempers and plastic emulsions. As I have told you in my previous lecture, base and vehicle, these are the two major components forming the paint.

So now base has its pigment component and the basic or the principal component and vehicle has the binder component and its solvent or the thinner component. And if I have missed out, the binder is carrier. The solvent or the thinner helps in carrying further, that gives the workability. And the binder actually oxidizes whereas the thinner evaporates.

So the binder forms an oxide coating carrying the pigments along with it. So distempers which are very basic coatings, very basic paints will be water based paint. Now here you see we have dry distemper, synthetic distemper, and acrylic distemper. We will come to that little later. Now for wood and metals, you see it is different. It is not the same paint as was being applied on interior wall surfaces.

It may be polyurethane and melamine on wood or it may be varnish. Now varnish is applied which is very much colourless or it may have a very light tint. But varnish is applied to make the wood grains visible. This I think I have told in my previous lecture sometimes. So sometimes we need a coating which should help in revealing the inside. At the same time for interior wall paints, we want to hide the imperfections or hide the main material or the substrate.

So that is what varnish helps to achieve. Other than that, we have the metal paints which are general purpose enamel paints, synthetic enamel paints, and the premier enamel paints. So maybe you have seen many a company containers, where it is written what it is. But now you need to train yourself that where it is applicable. So you may see synthetic enamel paint or you may see dry distemper.

Now whether it will be applied on top of a metal or it will be applied on top of a wall. Now I think you can segregate or identify. Coming to the exterior wall, exterior wall is the jacket. On top of it the paint is the jacket that is the protection. So we have to be very particular on the water proofing characteristics of the paint also into the fineness of the material.

We use cement paint, we use acrylic emulsion, we use textured plastic paints. So cement paint helps in better adherence with the substrate. Now if you have a wall putty on top of it, fine. Otherwise, you can start with cement paint, because wall putty sometimes is cement based powder applied as the initial coat or the primary coat. So we can start directly with cement paint as the first coat. So I think you can now segregate the material onto which, which kind of paint will be applied. (refer time: 10:13)

Let us move to the distempers. Distempers are the most commonly used paint which is water based, washable, durable, and smooth. Now you get dry distemper in the market. You add it with water and glue as the adhesive or the binder and you actually paint on the wall, simple interior paint. Acrylic distemper it has acrylic co-polymer formulation. It is also water based paint, provides smooth surface, you can clean it.

In case of dry distemper it may not be possible to clean every time because it will fade out. But acrylic distemper you can clean it. Same with synthetic distemper or oil bound distemper. It is having additionally oil in it which dries out. But it helps in carrying the distemper, in carrying the base easily. So it has higher coverage. The paint film gets hard with time and makes the surface easy to clean, which was again not possible for dry distempers. (refer time: 11:49)

Let us see, plastic emulsions. These are water based water based paint where tiny polymer particles are suspended or emulsified in water. It has higher coverage than ordinary paints. We had discussed 10 to 12 square meters per litre. Here it covers around 15 square meters per litre and the paint dries and the particles fuse together creating film of paint on the wall.

If we look into the advantages, it is easy to apply because it is having the polymers in it. It is pulled very easily. It moves very easily and it is drying quickly with no odour, washable, scratch resistant anti-fading. So you can wash it without any fading because it has oil in it and it is polymer based and it is being carried by the vehicle. (refer time: 13:14)

Coming to the exterior paints. The cement based paints. As I have told, it is also a water based paint, where cement is the base and it is weatherproof. Because of the presence of cement it prevents ultraviolet radiation. Best adheres when it is newly plastered wall. Obviously, because it is having cement as one of the components in the plastered wall. You see two pictures here, these are textured paint.

Cement based paint - water based exterior paint with cement as base
 Weather proof
 Blocks Ultra Violet Radiation
 Best adheres on newly plastered wall

Textured paint - Water reducible paint
 Cement is the base and also consist of coarse grains like gypsum, sand and metal with binder used for creating a rough pattern effect on a wall.
 Popular trend in external painting as different types of styles can be created on the wall surface.
 Provides better protection of exterior wall

Acrylic paint - is a fast-drying paint made of pigment suspended in acrylic polymer emulsion.
 Acrylic paints are water-soluble, but become water-resistant when dry.




So these are water reducing paints. These are thick paints. Sometimes or at times, asbestos fibres were added but presently those are not used. Coarse grains of sand, gypsum, metals are added with the binder. It is not necessarily very fine paint, it is a rough paint. You get this feel when you are touching it. So you may have seen this. Try to observe buildings, public buildings where regular painting is not possible.

Where people regularly come, enter go but no one takes the maintenance as a responsibility. They are applied with textured paints. They have become very popular because you can create a rough wall surface. The colour is remaining. It provides better protection to the external wall. You can create a lot of pattern with brush mark as the other picture shows.

The other paint that can go is the acrylic paint. It is a fast drying paint made of pigment suspended in acrylic polymer emulsion. So acrylic paints are again water soluble, but becomes water resistant when dry. So they are washable. Washable means the nature washes it. Because of rain it can get washed without water entering into the building. (refer time: 16:14)

Now coming to the wood and the metal paints. As I was discussing on varnish it is a solution of resin or any resinous substance like amber, copal, shellac and it is dissolved in alcohol, turpentine or spirit and is applied. When it is applied, it does not create any colour. It is colourless or transparent and the natural fibres or the grains are visible. We have polyurethane or melamine coating, PU and melamine coating.

This is again a synthetic hydrocarbon polymer which forms a film over the wood surface. It can protect the base material from any kind of corrosion, weathering, and abrasion to some extent. But it laminates the wood and does not allow the wood to breathe. So what happens? Wood being organic, it may have some internal defects. If you remember, wet rots, dry rots. Some dry rots can happen from inside the wood.

And if it was breathable, maybe it could not have happened. But now because it is having an impervious coating this polyurethane and melamine coating is restricting the wood to breathe and hence internally decay may happen. Metal surfaces mostly it is enamel paints. Enamel

paints are oil based paints, cheap, durable and waterproof. It is anti-termite and hence **can be applied on wooden surface**. So when you apply enamel paint on wooden surface, you cannot see the wood surface. You can see the colour of the enamel paint. So the wood, whether it is wood or any other material you cannot make out. Yes, from the profile you can make out maybe. So the oil content allows the paint to be very smooth. And it adheres to the surface much longer.

Metals do not have any roughness, if it is not having any kind of corrosion in it. So enamel paint actually creates a coating, very smooth coating and it adheres or sticks to the metal surface quite for a long time. (refer time: 19:31)

Now coming to the major point, which is application of paint. So we could see there are many types of paints by name. Commercially they are available in many other names as I told emulsion paint, silky emulsion, velvet, royal emulsion. So that those are all how find the paint is, how easily it is moving, how much of coverage it is providing. And other point is how durable they are.

But when we are applying paint on plastered surfaces as I told you, we have to the wall surface has to be dry and we have to put a layer of putty. But why do we need to have the surface dry? because till it is wet the hydrated cement is on the wet surface, is active on the wet surface. So the hydration of cement is still taking place and it may lead to flaking off the paint layer.

Hence paint is to be applied on dry surface. If it is a wet weather condition then you have to add zinc sulphate prior to applying paints. Zinc sulphate will actually eat away the alkalis and then allow the paint to adhere to the surface. Sometimes a layer of glue, if you cannot do a primer coat, you can apply a layer of glue mixed with water on the entire surface.

That will reduce the consumption of the paint to achieve economy. So if you directly apply, if you do not have primer, and if you plan to directly apply paint, you will end up in much of absorption of the good quality paint. So you can put a layer of glue. And if it is damp surface, continuously damp surface say some water outlets or areas which is underwater.

So it is expected that the facade will be wet, wall will be wet, you can put **an** initial coat of paraffin, benzolene, and resin in the proportion given and that will actually save your paint layer. So paint is not only protecting, it is also adding aesthetic value. So even if it is a damp surface and you want to cover up the damp, you have to take proper measures.

Otherwise the paint layer you put it, it will come out because of the damp. And then it will become an ugly picture. Similarly, for old surfaces, we have to be very careful. Why? because old surface is already painted and now you are repainting it. So first point is you have to remove the old paint, how? By means of brush. You can by means of emery paper, by means of brush you have to take out the patches which are still present.

Maybe it is in a very poor, dull condition. You have to take it out or scratch it out from the substrate. So that will be the first step of painting any old surface which was painted. Other than that you have to take care if there is any efflorescence, if there are any patches, chalky

substances, organic growths, you have to clear off them. And then you have to wash the entire wall surface and wait till dry.

Any kind of defects, cracks in plasters etc., should be corrected before applying paints. Otherwise those will become the vulnerable points. So before painting, it takes a few days to actually do these dressings. (refer time: 24:41)

Coming to metal surfaces, we are much concerned when it is ferrous metal. As we had discussed, aluminium does not need **paint**. Why? Because of the oxide layer formed on top of it, which is self-protective. Unless you need to give a **colour** you do not need to paint aluminium. But ferrous metal we have to paint it. Even if it is new the oxidation process starts.

So it is always better to clear off with emery paper and free it from any kind of oxide formed in which is a very gradual process. If not done, the paint will start flaking off be it old surface or a new surface. Next is particularly if it is catching some oil or greasy items, it has to be cleaned with petroleum or alkaline solutions like sodium bicarbonate, sodium hydroxide and immediately after removing these you have to apply primer on top of it. Once primer is added, it is ready to take any enamel paint over it. (refer time: 26:17)

For new wood surfaces, again I reiterate it has to be dry, clean, seasoned wood. And because it is organic, any kind of knots, any kind of rotten areas are to be taken off. If it is possible, you can take it off or you have to treat it with hot lime. If you are not treating it the internal sap or the resin from the inside will come out and will damage the finish from these knots.

So it is very important that before applying the primers such kind of pores, knots are to be filled. And usually varnish or melamine coats are applied in three coats only after each layer drying. In case of old wood surfaces, the earlier coat has to be removed. Sandpaper **which is** emery paper, you must have seen or have heard is the best way to take off the earlier layer.

Oil greasy surfaces are to be washed by soap solution and then after drying the new coats are to be applied. Now another important point in case of all the paints, paints may look that they are very thick. It may always tempt a workman to add some water into it or some solvent or thinner into it. But this is a time dependent property which is called thixotropy, which makes you feel that the paint is solid, solidified.

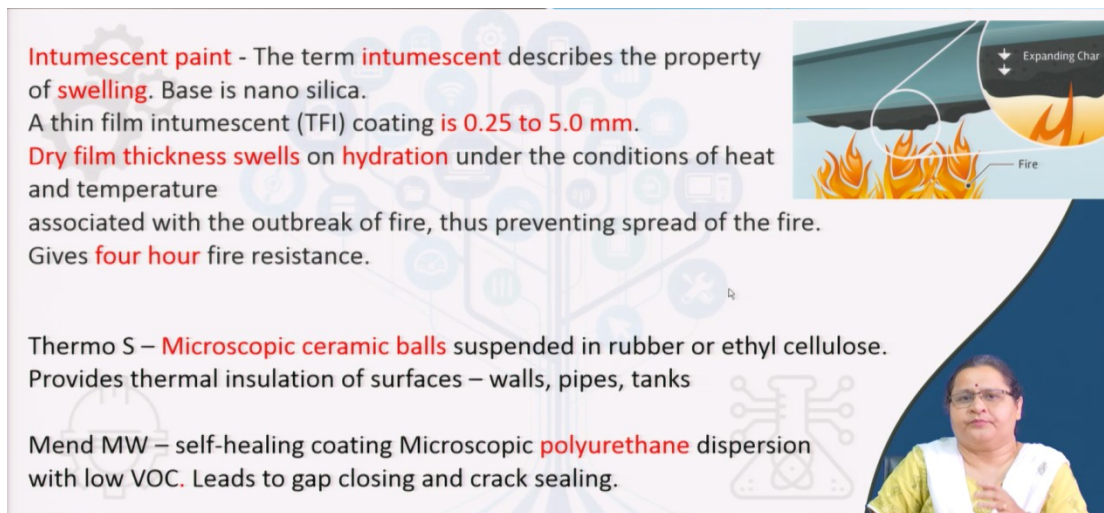
But once you churn it you give dynamism into it. It becomes viscous. The thick fluid becomes much workable. This property is called thixotropy, which a workman is supposed to know and hence paint should be applied with right consistency so that you get maximum coverage with maximum hiding power etc. (refer time: 29:26)

Coming to some special paints. We have already discussed aluminium paint, ground aluminium or metal aluminium mixed into the solvent, mixed into spirit and applied onto metal surfaces. Anti-corrosive paint, Chromium oxide, red lead oxide, zinc chrome, lead is not used nowadays, are used to form the anti-corrosive paint. These are also applied on to metal surfaces. We have asbestos paint.

Also this is unhealthy and getting obsolete day by day. They have asbestos fibre, which was initially once I mentioned for textured paint, here I mention for fire resistance, but nowadays this paint is getting obsolete. Bituminous paint, if you remember when we covered bitumen in damp proofing, there we discussed it. It is bituminous material suspended in oil or petroleum which is used for sub structures or underwater structures.

We have cellulose paints where cellulose forms the base. It is obtained from plant and it hardens by evaporation and not by forming oxide. So this is a different kind of paint, very limited application in buildings. But yes cellulose paint is also one such. (refer time: 31:37)

Now let us come to few nano applications of paint. You can see the word intumescent paint. Intumescent means it swells. What happens when the fire, if you see this picture, when the fire is touching the metal surface this black intumescent paint, the colour black here, is expanding and not allowing the fire to touch. It is nano silica in the paint. A thin film of 0.25 millimetre maximum 5 millimetre on metals on steel structures actually these are painted to keep it off from fire.



Intumescent paint - The term **intumescent** describes the property of **swelling**. Base is nano silica.
A thin film intumescent (TFI) coating is **0.25 to 5.0 mm**.
Dry film thickness swells on **hydration** under the conditions of heat and temperature associated with the outbreak of fire, thus preventing spread of the fire.
Gives **four hour** fire resistance.

Thermo S – **Microscopic ceramic balls** suspended in rubber or ethyl cellulose.
Provides thermal insulation of surfaces – walls, pipes, tanks

Mend MW – self-healing coating Microscopic **polyurethane** dispersion with low VOC. Leads to gap closing and crack sealing.

It can prevent or give support to the steel structure for 4 hours. The dry film thickness swells on hydration under the condition of heat and temperature. And hence the fire spread or the damage to the main structure can be restricted and by that time the fire protection can be done. Other two nano applications are applications of microscopic ceramic balls in rubber or ethyl cellulose as the suspended binder.

These can be used for thermal insulation. Mend W. It is self-healing paint. Say some portion has got damaged or there is a scratch, some balls will come out or come rolling, rubber balls, polyurethane dispersion, the rubber balls will come and hide or cover that scratch or correct that scratch. It will seal that area. That is also called gap closing or crack sealing paint.

The commercial name is Mend W or Mend MW. So it is mending itself, self-healing. Thermo S. It is ceramic balls which is preventing it from fire insulation, thermal insulation. Walls, pipes, tanks, which are exposed to high temperature differences. So you are applying such

kind of things there. So everything are explored in building industry. So these applications are very limited.

As we had seen nano applications on self-cleaning glass, it is self-healing paint. Strength gains etc., we had discussed in the last module. So lot of research is being done in each of the material domain. So you as architects, you have to keep yourself updated with the new materials coming in, what kind of building it is applied? Yes, these are not applied every day, not applied in all buildings every time.

But you must have the knowledge or the base that what is to be recommended where, for which particular context, and what are you going to gain out of it. Thank you.