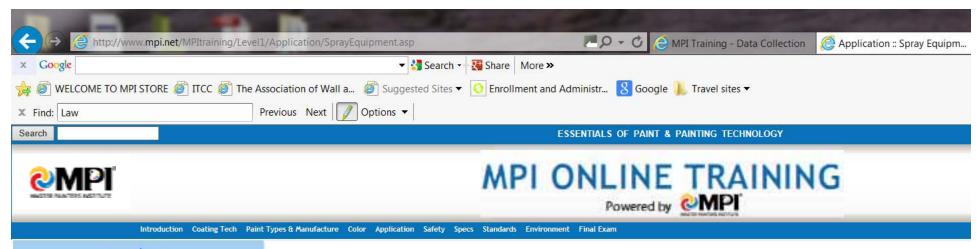
# Level 1

Essentials of Paint and Painting Technology





### Notes

- Because of environmental concerns, application devices with a transfer efficiency lower than 50% are being discouraged.
- Paint flows from a central supply through a high pressure pump (1000 psi to 3000 psi)
- The production rate of Airless is quite high as well as the Transfer Efficiency can be as high as 75%
- High flow rates coupled with large Airless tips dramatically allow the worker to make less passes to apply the required mit thickness
- Because of safety concerns, the guns on an Airless Spray must be manufactured with trigger guards



There are many types of spray finishing application equipment. A wide range of manufacturers provide and endless supply of pumps, guns, hoses and accessories. We classify spray equipment by atomizes the paint, and there are 4 basic types

- 1. airless spray;
- 2. conventional air spray;
- 3. HVLP: and
- 4. air-assist airless.

### **Airless**

Paint flows from a central supply through a high pressure pump (1000 psi to 3000 psi). This high pressure fluid goes through a fluid line to a spray gun. The high pressure fluid is expelled out the front of the gun through a small orifice or tip. As the fluid escapes into the atmosphere it expands and forms a spray pattern of small droplets (atomization). The production rate of airless is quite high as well as the transfer efficiency can be as high as 75%. This method of spray is good for large flat surfaces.

### The Advantages of Airless Spray

Reduced Overspray and Fog: This is the number one advantage of airless spray. As stated, more than 75% of the paint gets to and remains on the surface. This high transfer efficiency saves on paint costs and brings a significant reduction in emissions.

Increased Production: Uniform thickness and greater penetration increases the speed of application. High flow rates coupled with large airless tips dramatically allow the worker to make fewer passes to apply the required mil thickness.

Handles Viscous Materials: Paints and coatings that have a naturally high viscosity can be sprayed with no thinning or very little thinning. Solvent use is lowered, so emissions are too.

### Disadvantages of Airless Spray

Coarse Atomization: Compared to air spray, airless atomization is somewhat coarser. Coating should be able to flow out well to even out the atomized droplets once they hit the surface. Fine finishing tips and heated systems help to improve atomization.

Safety: Because of the extremely high pressure created (1000 psi to 3000 psi) with airless atomization, there is a danger of injection injuries. The pumps, lines, and guns must be manufactured to withstand these pressures. The guns themselves must be manufactured with trigger guards, trigger locks, and tip guards. The painter must also have complete safety training before using the equipment.

Expensive: The pumps, lines, guns and accessories are designed to handle and produce extremely high fluid pressures. For this reason the equipment has to be well made and strong. Typical airless systems are more expensive than air spray systems, and the maintenance costs are higher, too.



Typical Airless System

Gun Controls: An airless gun is full on/full off. When the trigger is pulled, the gun is wide open and the full amount of paint is being expelled. This characteristic can be a disadvantage when spraying intricate parts or shapes. "Feathering" of the trigger (see note below) is not possible. Speed of motion will dictate how much paint













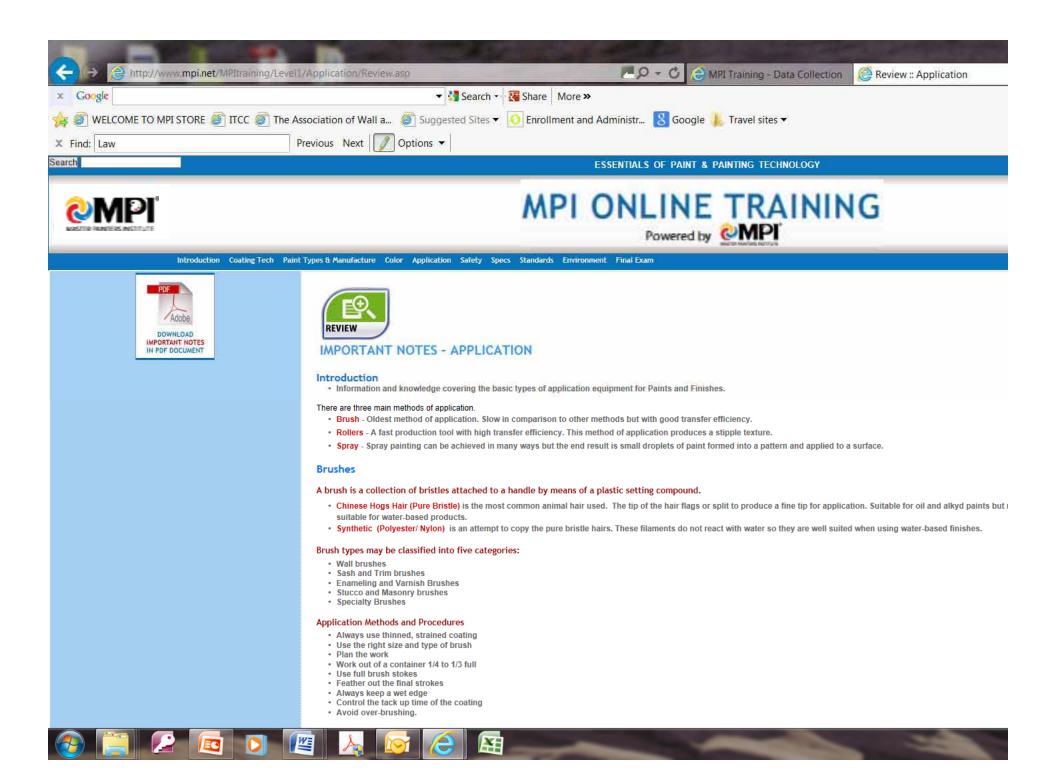


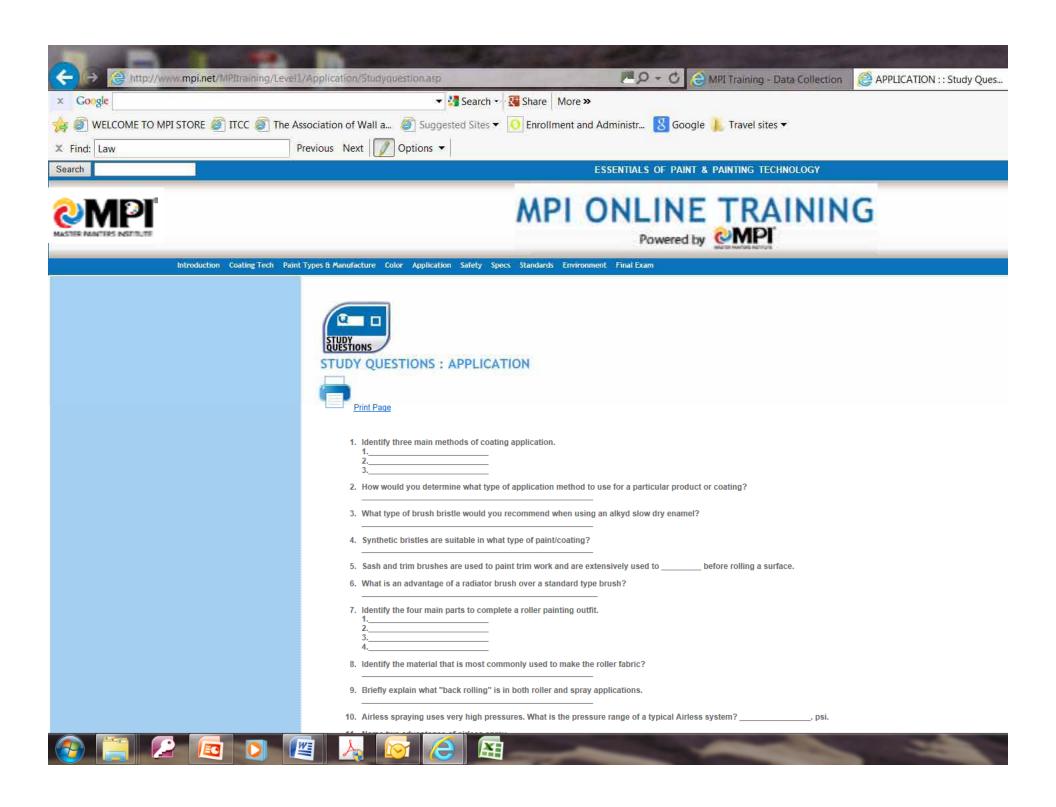




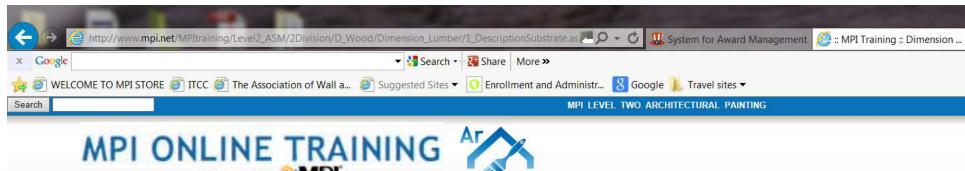








# Level 2 - ASM



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# DESCRIPTION OF THE SUBSTRATE

Dimensional lumber is a term used for lumber that is finished/planed and cut to standardized width and depth specified in inches. Examples of common sizes are 2"x4" 2"x6", and 4"x4". specified separately from the width and depth. It is thus possible to find 2"×4"s that are four, eight, or twelve feet in length. In the United States the standard lengths of lumber range from 6 92 % inches, 104 % inches, and 116 % inches.

Dimension lumber is what's used to make glue-lam beams, decks, and some of the other wood constructions we'll discuss in subsequent sections; it's used for siding, columns, beams, jois

Softwoods such as cedar, pine, spruce and fir are commonly used as dimension lumber. These woods can be delivered to the job site unfinished or factory primed. The types of wood used predominantly softwoods, such as cedar, pine, fir and spruce. Wood used for siding and fence boards is available in smooth to rough surfaces of various widths, thicknesses and types.

### What to look for

Unfinished lumber should be stored in a dry area. The wood will easily pick up moisture and subsequently swell. Wood that has been stored outside without protection should have a moisti finishing work is attempted.

Most paint failures on new wood construction can be attributed to the use of "green" or uncured wood that releases sap, partially solidified resin, or water after being painted. Pine and fir sp. or pitch trapped in knots and deep pockets within the wood board. These can sometimes appear after painting and cause the paint film to lift: when sap or pitch moisture is excreted, pressu film and cause failure through blistering, splitting, cracking and staining. This is more frequently a problem if a coating with low permeability is used, such as a gloss alkyd.

On knots and areas where sap has been removed from the surface, vinyl-based knot sealers can be used to seal surfaces and minimize or prevent further sap release.

### **Factory Primed Surfaces**

Factory primed wood can present a problem because often, the primer chosen by the factory cannot be relied upon to properly seal the wood surface. The wood supplier must provide certi using the specified surface preparation and primer. If this cannot be confirmed, the primer may have to be removed and an appropriate primer re-applied, especially for exterior applications extremely susceptible to expansion and contraction from temperature/moisture intrusion, making proper adhesion of the primer too critical to compromise

### Avoiding Problems with Moisture

Exterior wood must be well protected from water intrusion, as this often leads to swelling, cracking and cupping in the wood and blistering, peeling and cracking in the coating. End sealing used to reduce water intrusion in horizontally and vertically placed wood. "Back Priming" refers to the practice of priming the entire wood component including the back and edges. All exter "back primed" prior to installation; for interior applications, all wood surfaces that may come in contact with moist areas must be back primed before installation.

To seal areas often left unpainted (such as the contact point at the rail), fence boards are best coated on all sides, edges, and ends, before attaching to the fence. Cedar siding applied below must be sealed by back priming. Water contacting the masonry or stucco surface can pick up alkali salts, accelerating the extraction of soluble tannins from the wood, and leading to yellow

It is not possible to guarantee long term coating protection if the backs of the wood surfaces cannot be primed.

### Coating Failures on Dimension Lumber











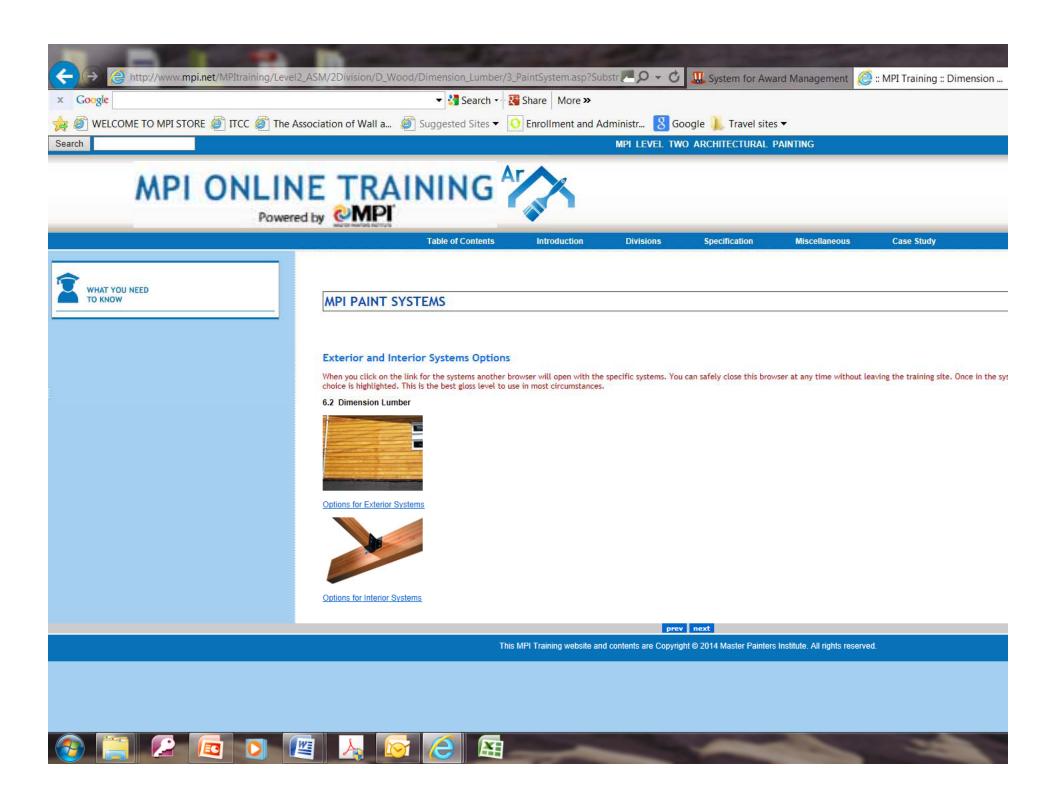


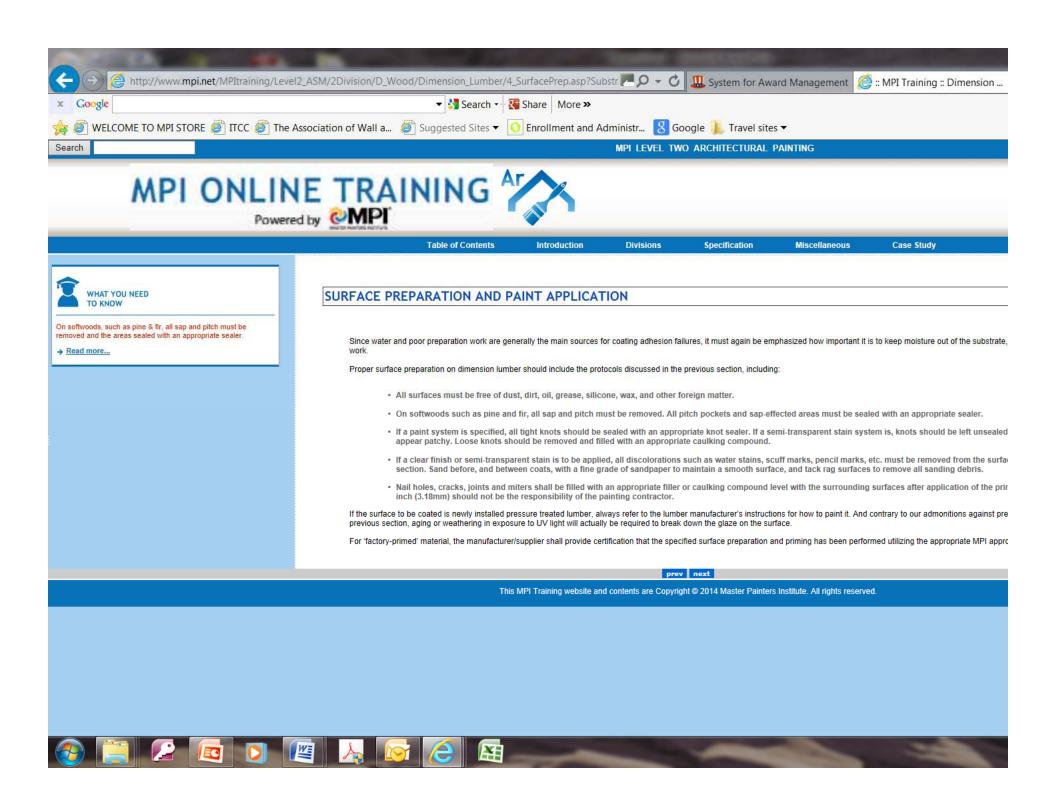


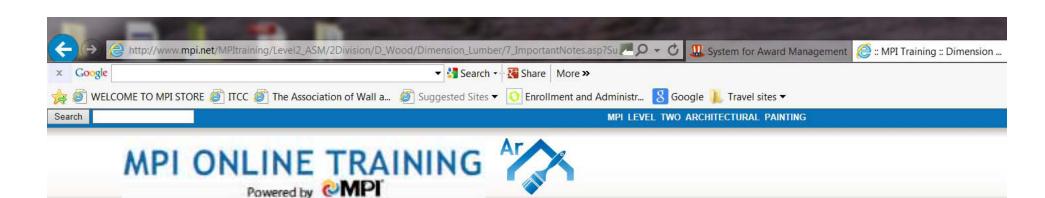














# IMPORTANT NOTES

### DESCRIPTION OF THE SUBSTRATE

Dimensional lumber is a term used for lumber that is finished/planed and cut to standardized width and depth specified in inches.

Introduction

Softwoods such as cedar, pine, spruce and fir are commonly used as dimension lumber.

Unfinished lumber should be stored in a dry area.

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Most paint failures on new wood construction can be attributed to the use of "green" or uncured wood that releases sap, partially solidified resin, or water after being painted.

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Factory primed wood can present a problem because often, the primer chosen by the factory cannot be relied upon to properly seal the wood surface

End sealing and back priming are two methods used to reduce water intrusion in horizontally and vertically placed wood.

Cedar siding applied below masonry or stucco wall surfaces must be sealed by back priming

## **CHOOSING A PAINT SYSTEMS**

For exterior applications, using a primer can also facilitate recoating with minimal surface preparation after the surface has weathered.

Alkyd and oil based stain-resistant primers, are also recommended to block water contact and reduce stain bleeding on wood species prone to extractive and tanning bleeding, such as cec boards

Rough surfaced wood is often coated with flatter finishes; a flat finish assists in improving the uniformity of slightly rough surfaces.

Fire-retardant coatings are available as both pigmented or clear penetrating finishes that show moderate exterior or interior durability.

The coating type should be selected based on the particular fire rating required for the application.

Systems for exterior service: The alkyd/oil primer and creates a uniform surface for the latex finish coat and reduces the probability of extractive staining from colored wood.

Two component aliphatic polyurethane clears such as MPI #78 are durable clear finishes with excellent resistance to chemicals, solvents, abrasion, and UV light.

caution: all stains tend to lap do not stain in the direct sun or on a hot surface, and use two coats on badly weathered or new wood.

### SURFACE PREPARATION AND PAINT APPLICATION

On softwoods, such as pine & fir, all sap and pitch must be removed and the areas sealed with an appropriate sealer.

If a clear finish is or semi-transparent stain is to be applied, all discolorations must be removed from the surface.

Nile holes, cracks, etc. must be filled with an appropriate filler or caulking compound.

If the lumber is pressure treated always refer to the lumber manufacturer's instructions













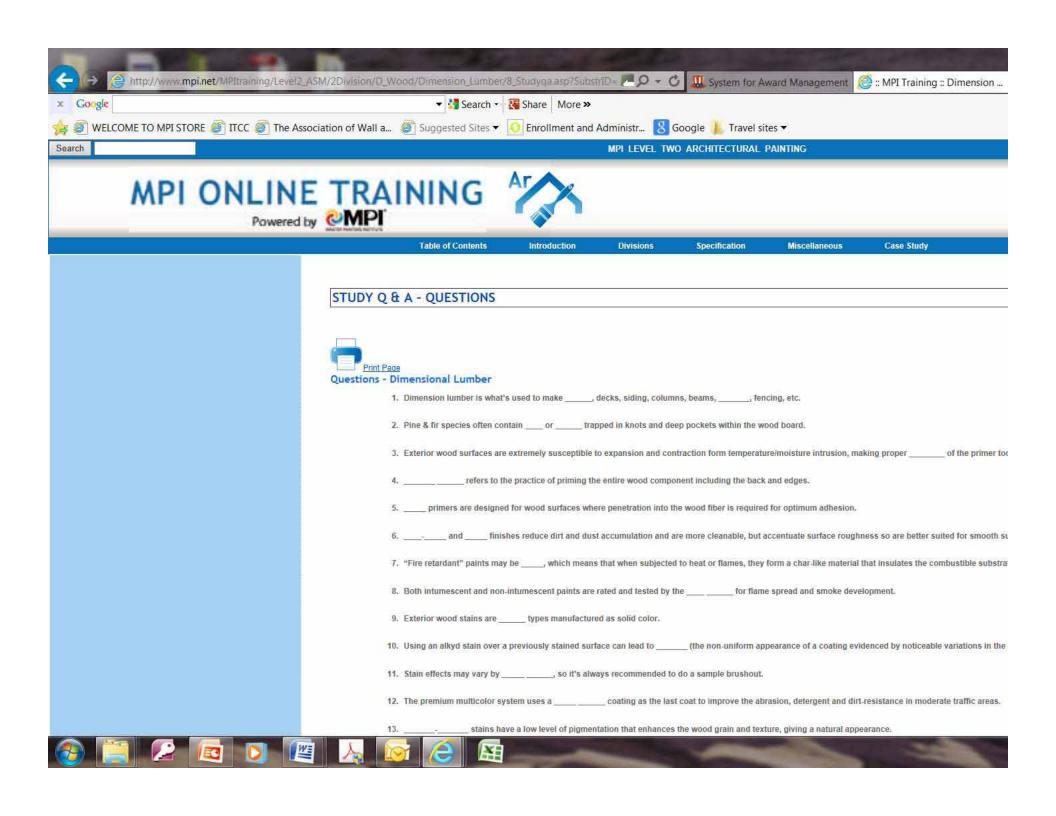












# Level 2 - RSM

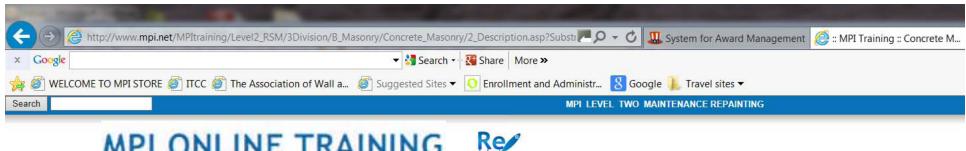




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# DESCRIPTION OF THE SUBSTRATE

### Block Manufacture and Design

Concrete blocks, or Concrete Masonry Units (CMU's) have been used more in recent years for exterior walls on large, low-rise warehouse and commercial construction. The process of ma mixing cement, gravel, sand and water into a paste and pouring it into molds that uses vibration and pressure to form a rectangular block, typically measuring 8" x 8" x 16." After it's remove undergoes an accelerated curing process at an elevated temperature that evaporates the water and binds the cement, sand, and gravel together into a hardened block. The block is then s' out over a 14-30 day period before being shipped to the distributor or construction site.

Specifications describing concrete block compressive strength and water absorption are described in ASTM standards C55, C145, C90, and C129, and CSA A165.1.

There are a large variety of block types and shapes manufactured. Smooth sided blocks are generally known as "standard" and scored, split face, fluted, etc. are referred to as "profiled." D colored pigments can be added to the mixture to achieve custom colors.

The concrete mixture and proportions of ingredients dictate the density, strength, and porosity of the surface. Semi lightweight and lightweight blocks substitute lightweight aggregates such and these have much lower density than the standard types. While the lighter weight block may offer advantages from a general construction perspective, the lower density and high porosi for easier ingress of water and the problems/issues that come with it. Also, the density of block will also have a significant effect on coating consumption: the more porous lightweight block the amount of block filler to produce a "filled" surface. All these factors can ultimately affect which coating system we choose.

Regardless of the type or shape, concrete block has a very porous surface and usually requires a block filler as the primer to create a surface suitable for the application of most coatings.

### **CMU Construction**

CMU offers advantages over other types of concrete construction. Tilt-up, for example, creates a wall that's 4" thick. Concrete Masonry Unit (block) constructed buildings are typically const rectangular blocks stacked on top of one another with a mortar mix made up of cement, sand, additives, and water acting as the glue that holds them in place — a method also referred to a Rows of blocks are added to achieve the desired height of the building. Concrete block walls are typically 8" thick and more energy efficient than tilt-up. If desired, insulation material may b blocks, and some kind of finishing system and insulation may be added on the inside wall that may or may not incorporate an air barrier membrane.

## Likely Causes for Coating Failure

#### MOISTURE ISSUES

If the right coating products are specified and applied properly, coatings on concrete block can provide a long lasting finish. However, both liquid water and water vapor within the block must controlled, or premature failure can occur.

Issues with moisture will evidence themselves in the form of efflorescence; blistering and/or peeling of the paint film; or stains to both the exterior and interior surfaces. Moisture can infiltrat including vapor drive; defects in construction; or from the outside.

### Vapor Drive

Moisture vapor naturally travels through walls to achieve balance, and there are a number of conditions that increase vapor drive from one side to the other. One is the porosity of the wall, For example, under the right conditions and especially if the wall is not insulated, a difference in relative humidity (usually higher humidity inside and lower humidity outside) can cause air c fall beneath the dew point while circling inside the block, causing water vapor to condense and wet the interior of the block.

Temperature differences will also drive moisture vanor from inside to outside and vice versa: moisture vanor naturally moves from the warm side of a wall to the cold side. Which side is wa













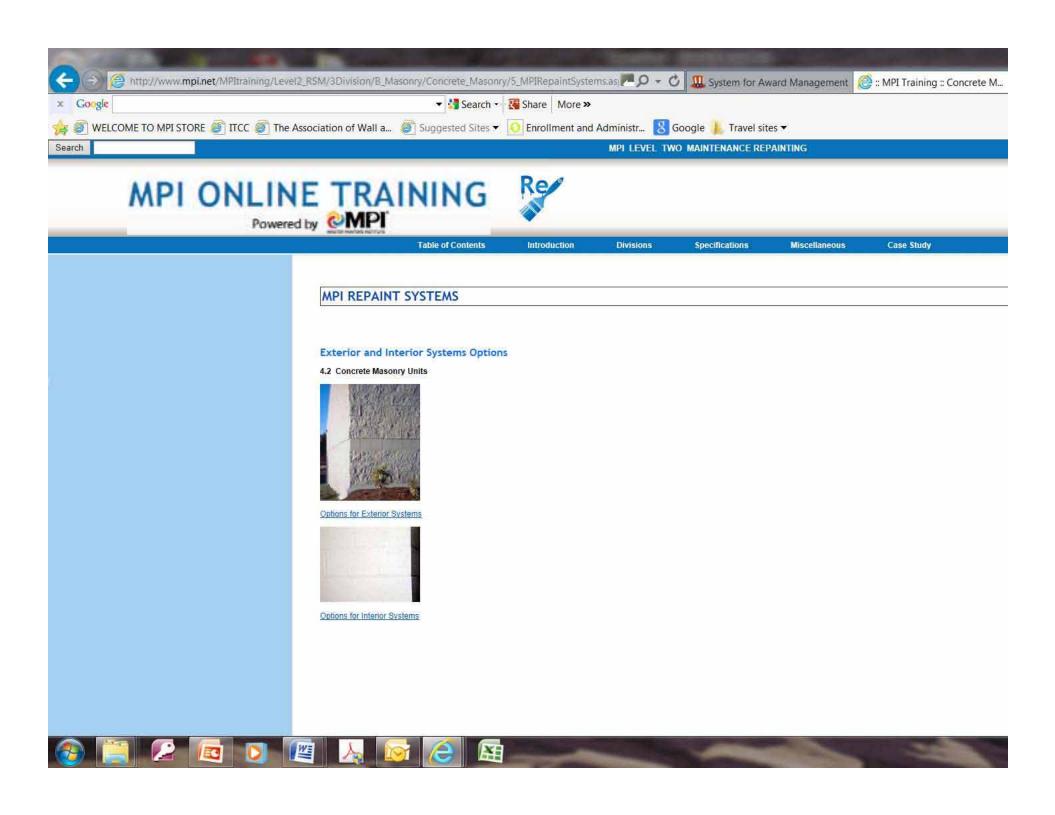














# SURFACE PREPARATION FOR CMU AND BRICK

If the current coatings are intact overall and an overcoat is all that's necessary, preparation protocols for CMU are similar to those used for concrete. Preparation of the different types of CN fluted) differ as follows: if grooves in scored block are bridged or filled in, they must be cleaned out by grinding with hand or power loos or whatever mechanical means are required, and the primer, if needed. With split face, scored, and fluted CMU, hand tooling during preparation may be necessary due to the unevenness of the blocks.

However, with buildings constructed from brick or CMU, there is a limit to how many times a wall can be refurbished simply by power washing and/or roughening the surface and applying a the concerns discussed in the opening section (incompatibility of the existing coating with the desired repaint material, or the existing coating being too poorly adhered to support the weigh coat), CMU and masonry surfaces pose the additional consideration that adding another coat to what's already there may reduce the permeability of the system to the point that moisture v.

In these cases, some or all of the existing coating needs to be removed with proper surface preparation practices. And full removal of failing coatings on CMU or brick surfaces can add sign maintenance painting.

## **Shortcomings of Surface Prep Standards**

As we discussed in the section on Concrete, there are industry standards describing methods of surface preparation for concrete and masonry surfaces — however, most of the standards rather than painted CMU or brick.

Also, the standards do not describe definitively the degree of cleanliness beyond stating that a sound concrete surface free of laitance, glaze, efflorescence, and incompatible curing compreprivate specific acceptance criteria when removing existing paint from these substrates.

Standards that may be referenced (along with their potential shortcomings for use with CMU and clay masonry surfaces) include:

### SSPC-SP13/NACE No. 6, Surface Preparation of Concrete

Many of the methods described within (abrasive blasting, shotblasting, wet blasting) can remove existing coatings but may significantly roughen or damage block or brick and mortar joints.

### SSPC-SP12/NACE No. 5 Surface Preparation and Cleaning of Metals by Water Jetting Prior to Recoating

Wet methods will remove poorly adhered coating, allow intact coating to remain, or completely remove existing coating if higher pressures and dwell times are used. While these are less d surfaces, some roughening will occur. And while the methods described in the standard are suitable for use on concrete and masonry surfaces, the acceptance criteria described for each c metallic substrates.

### ASTM D4259, Standard Practice for Abrading Concrete.

This practice addresses methods for removing coatings and roughening the surface but many of the methods described can damage the substrate.

### ICRI Guideline No. 310.2-1997 (formerly No. 03732), Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays

We described this in detail in the preceding "Concrete" section. Some of the methods described are suitable for removing coatings from CMU and brick (abrasive blasting, scarifying, needle drawback of being extremely aggressive to the substrate. More suitable methods such as high and ultra-high-pressure water jetting are also covered, as well as low pressure water cleaning loose coating. Methods described that will not remove coatings or are not suitable for CMU or brick include detergent scrubbing, acid etching, grinding, shotblasting, scabbling, flame blasting.





















