

NEW YORK STATE DEPARTMENT OF HEALTH
Bureau of Community Sanitation and Food Protection
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Technical Fact Sheet

ASSESSMENT AND TESTING OF LEAD PAINT SURFACES
FOR ENCAPSULANT APPLICATION

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Encapsulation is a method of abatement in which lead paint is covered and completely sealed by a durable, long-lasting material which will not readily tear, chip or peel. Encapsulants are coatings applied in liquid form, with or without a fiber mat for reinforcement which cures to a solid. Conventional paint is NOT an encapsulant.

Encapsulants will not protect occupants from ingesting lead paint or lead dust if the encapsulants become damaged, delaminated, broken or worn away. They must be monitored visually on a regular basis, by the homeowner, to look for damage such as can occur from water or structural/substrate failure, which may expose the underlying lead paint.

For additional definitions refer to glossary in appendix.

Utilization:

When deciding if encapsulation is a viable method of abatement the following criteria should be considered:

1. Encapsulants are categorized as permanent abatement of lead-based paint, but must be repaired, if damaged, and periodically inspected to maintain effectiveness. The only permanent solutions which do not require periodic maintenance and inspection include: replacement of architectural elements (door and windows), or complete removal of lead paint.
2. Each component must be evaluated individually for the suitability of the application of encapsulants. Proper assessment of the condition of the surface and substrate is essential before the application of the encapsulation product. Patch testing (described later in this document) verifies that the substrate condition, surface condition, and surface preparation methods are adequate. The ideal surface and substrate conditions require that the surface is sound and intact, with no deteriorated paint and generally a limited number of coats of paint; and if the surface is dirty, it can be easily cleaned.
3. Encapsulant coatings can only be used on reasonably sound surfaces. They are not appropriate for surfaces which are routinely impacted, scraped or abraded by passing objects or those surfaces subject to constant friction.

Conditions Considered Unacceptable for Encapsulation:

1. Movable parts of windows - window wells, jambs, sashes, parting beads, and back stops/blind stops
2. Floors, stair treads, and thresholds
3. Surfaces coated with calcimine paint unless they are properly prepared with a surface conditioning product specifically formulated to bind chalk (Or any other powdery material).
4. Surfaces that fail the visual assessment, tape tests, or patch tests.

Manufacturers guidelines and specifications should be referred to for additional surfaces.

Conditions Not Recommended for Encapsulation:

Note: Each manufacturer's recommendations may differ slightly from this list and each manufacturer should be consulted for specific conditions.

1. Surfaces that receive repeated impacts such as window headers, door jambs and the risers of stairs.
2. Surfaces that rub against each other such as window stops, inside door jambs and headers, drawers and cabinet doors.
3. Surfaces with moisture damage which remains uncorrected.
4. Surfaces with evidence of heavy chalking, which is the formation of a friable powder on a pigmented coating evolved from the film itself at or just beneath the surface. In practical terms, chalking is the formation of a fine dust, like that commonly found on a blackboard.
5. Surfaces that have been painted with a calcimine or milk paint.
6. Working steam radiators
7. Any other surfaces not recommended by the encapsulant manufacturer.

Surface Assessment Procedures:

1. Visual Assessment - the ideal surface and substrate are sound and intact with no deteriorated paint; a limited number of coats of paint in place; and surfaces, which if dirty, can be easily cleaned. All surfaces must be prepared properly prior to testing. Painted surfaces rated as a "0" or "1" may be eligible for encapsulation. If a surface or substrate is rated a "2" it is not eligible for encapsulation. (See appendix for description of what constitutes a 0, 1, or 2 rating).
2. Initial Tape Test on Existing Paint -(This test is not required by all manufacturers and must only be performed when recommended by the manufacturer of the specific encapsulant) The initial tape test is a simple, non-invasive test that provides evidence of the adhesion of the visible layers of paint. Surfaces rated a "0" or "1" on the initial tape test are potentially eligible for encapsulation and may be tested further. Surfaces rated "2" are not eligible for encapsulation. See appendix for description of tape test.
3. X-Cut Tape Test on Existing Paint - this test provides evidence of the adhesion of the visible layers of paint.

Surfaces rated a “0” or a “1” on this test are potentially eligible for encapsulation and may be tested further. Surfaces rated a “2” are not eligible for encapsulation. See appendix for description of X-Cut Tape Test.

4. X-Cut Tape Test on Encapsulant Patch - (This test is not required by all manufacturers and must only be performed when recommended by the manufacturer of the specific encapsulant). If the surface/substrate passes the visual assessment and the initial tape tests, X-Cut tape tests are then performed on a patch test of the proposed encapsulant. A minimum of at least two X-Cut tape tests for each potentially eligible architectural system in the housing unit must be done.

Surfaces Where Encapsulation is Planned:

Some manufacturers require patch tests (see Appendix for description) to be performed on representative surfaces where encapsulation is planned. Since the cure times of the various encapsulants vary, consult the manufacturers’ literature to determine the suitable cure time for patch testing procedures. Some of the factors that affect cure time are temperature, relative humidity, ventilation, and film thickness. If a component passes this test it is considered satisfactory for application of an encapsulant.

Application of Encapsulant:

1. Other phases of lead hazard control should be completed to ensure that dust generating activities do not stir up dust during the encapsulation application and cure time.
2. After encapsulants have been applied, restrict any renovations in the general vicinity of the applied encapsulants to ensure that dust and other contaminants do not accidentally disturb the encapsulant before sufficient curing time has passed.
3. People applying the encapsulant should obtain a Material Safety Data Sheet from the manufacturer and institute any necessary precautions to ensure worker protection.
4. Occupants should not be in the immediate work area during patch tests and encapsulation application.
5. All surfaces to be encapsulated should be washed with a solution that is designed to lift, remove or solubilize lead dust on the surface. Surfaces on which such solutions are used may need to be rinsed with water and allowed to dry. Dry surfaces should be cleaned with a clean cloth to remove any residue. Some cleaning agents such as trisodium phosphate may leave a residue which will adversely affect the adhesion of encapsulants and paint.
6. For proper encapsulant adhesion, some deglossing (removing the shiny, glossy surface typical of high or semi-gloss paint) is usually recommended by the manufacturer. If wet sanding or scouring is required it should be kept in mind that this process could generate lead dust and chips and create additional exposure to the occupants and workers. Necessary precautions should be taken to minimize exposure to lead dust and chips.
7. Repairs or surface preparation activities that generate dust may require work area containment, occupancy restriction, recleaning of surfaces and use of a HEPA vacuum.
8. Before beginning the application of the encapsulant, all seams, joints, cracks and junctures around fixtures must be properly caulked. The encapsulant products must not be diluted, thinned, tinted, or mixed with other products.
9. The manufacturers recommendations and directions should be consulted for coverage per gallon and the appropriate application method of their product.

APPENDIX A

I. Materials Required for the X-Cut Tape Test

The materials required to perform the X-Cut Tape Test include:

- Cleaner, water and paper towels
- Cutting tool - sharp utility knife
- Tape - one to two inch wide, semi-transparent pressure-sensitive tape. Such as 3M600 or Permacel 99 tape
- Rubber eraser on end of pencil
- Flashlight or other light source

II. Procedure for Initial X-Cut Tape Test on Existing Paint

A. Preparation and Performance of Initial X-Cut Tape Test on Existing Paint

1. The paint or surface to be tested must be cleaned with a cleaner, rinsed with clean water and thoroughly dried.
2. Holding the knife with the blade perpendicular to the surface, make 2 cuts in the paint film down to the substrate, about 2 inches long, that intersect near the middle, forming an "X".
3. Inspect the incisions with a flashlight to establish that the paint film incision has been penetrated to the substrate. If the incision has not penetrated to the substrate, make the X in a different location. DO NOT attempt to deepen a previous cut.
4. Place the center of a 3 inch piece of tape at the intersection of the cuts.
5. Smooth the tape into place with a finger and rub the tape firmly with an eraser on the end of the pencil.
6. After 90 seconds, remove the tape rapidly and smoothly, in a straight downwards direction.
7. Inspect the X-Cut area for removal of the coating from the substrate, then rate the adhesion in accordance with the scale described below.

B. Interpreting Results of the Initial X-Cut Tape Test on Existing Paint

A judgement must be made when rating test results. If the existing paint is rated as a "0" or "1" proceed to the (X-Cut test on Encapsulant patch or the manufacturer recommended test.

- 0 = No paint removed or a trace amount of paint removed along the incisions
- 1 = Jagged removal of paint along incisions up to 1 inch on either side
- 2 = Removal of paint from a large area of the X (greater than 1 inch under the tape) or removal of paint beyond the area of the X.

III. Patch Tests - Various Tests Performed on a Patch of Encapsulant

Patch tests the selected encapsulant must be performed on representative surfaces where encapsulation is planned. Manufacturers may require some or all of the patch tests described. The manufacturer must be consulted to determine which tests they require.

A. Purpose of Patch Testing:

When the Initial tests show that the existing paint is reasonably sound, a Patch Test using encapsulants must be performed on representative surfaces to show that the product is compatible with the existing paint and performs adequately. After the patch of encapsulant has cured, various tests are performed depending on the nature of the encapsulant system. Since the cure time of encapsulants vary, the manufacturers' literature should be consulted to determine the suitable cure time for patch testing procedures. Some of the factors that affect cure time are temperature, relative humidity, ventilation, and film thickness.

B. Surface Preparation for the Patch Tests:

Surface preparation for the patch test is a critical factor in the success or failure of the encapsulant. The surface must be clean, deglossed and free of deteriorating paint. The manufacturers' product literature provides encapsulant specific instructions for preparation for patch testing.

C. Location of the Patch Tests:

Location for patch tests should be selected to represent appropriate building component types that have a surface and/or substrate rating "0" or "1". At least one patch test must be made on each **type** of architectural system in the housing unit where encapsulation is being considered. It may be appropriate to evaluate each room separately since painting histories can vary widely or may be unreliable. Patch test locations should be selected in inconspicuous areas since the patch test area may appear to be raised once full encapsulation is completed. It is recommended that Patch Tests be performed using several different encapsulant products in order to determine which particular product gives the best performance on a particular architectural system.

D. Size of the Patch Test

The size of the patch test depends on the surface being evaluated. For liquid encapsulants without reinforcement and cementitious encapsulants, a 6 x 6" patch is recommended. When using a product reinforced with a fiber mat, a 2"x 4" or 3"x 3" patch is sufficient. For narrow surfaces, such as door frames and window casings, approximately the same area should be used, changing the shape of the patch to accommodate the dimensions of the building component.

E. Interpreting the Results of the Patch Test of an Encapsulant

After the patch has cured and the required tests performed, the encapsulant may be used if all the appropriate test have been rated as a "0" or as "1". If any test is rated "2" then the surface is unsuitable for encapsulation.

F. Re-Testing

Failure of a Patch Test may be due to several factors. If possible reasons for failure can be identified, correct the suspected causes, and perform another patch test nearby. Some common failures are:

1. Failure often occurs if the encapsulant product has not cured sufficiently (usually at least 7 days). Consider retesting on a fresh patch that has been allowed to cure longer. Temperature and humidity can affect curing time.
2. If the encapsulant comes off the paint, it may be due to inadequate surface preparation. Make sure

that the cleaning solution did not leave a film behind (preparation may require clean water rinsing). Glossy paint may require deglossing, either with a chemical deglosser or light wet-sanding (which must be done in a way that does not spread the lead-contaminated dust).

3. Measure the thickness of the cured encapsulant. If it is less than the manufacturer's recommendation, it may not be strong enough. If it is greater than the recommended thickness, it may also fail because of internal stress.

G. Types of Patch Tests

1. Visual Examination of Patch Test (required on all systems)

Visually examine the patch for bubbling, cracking, cratering, and any other apparent defects not attributable to improper application.

Rate the Patch test:

0 = no defects

1 = less than 10% of the patch areas has small defects

2 = more than 10% of the area has small defects

2. Tape Test on Patch

Follow directions and rating procedure for Tape test on existing paint (Appendix AII)

3. X-Cut Tape Test on Patch (required by some manufacturers)

Using a sharp utility knife and a straight-edge as a cutting guide, inscribe an "X" (1.5 to 2 inches long) in the center of the patch down to the substrate. Apply and remove tape over the X-cut, exactly as described for the X-cut tape test. Score the X-Cut Patch Test :

0 = tape comes off cleanly, no damage to the surface.

1 = less than 1 square inch of encapsulant removed

2 = greater than 1 square inch of encapsulant removed

4. X-Cut Patch Test Without Tape (Probe of X-Cut) -(Required by some manufacturers)

Make sure that the cut is made all the way through the reinforcing material and underlying coatings, all the way to the substrate. Use the sharp tip of the knife to get underneath the reinforcing mat at the top of the triangle where the legs of the "X" meet. Lift about 1/4" to 1/2" of material at the apex, grab hold of it, and pull downwards.

Rate the test:

0 = no more peels away when using a reasonable amount of force to pull

1 = if the sheet of encapsulant/reinforcement comes away with paint stuck to the back of it, note which layers of paint have come away from the substrate and compare with the Initial Tape Test:

- a. If the same layers are coming away, it indicates that the encapsulant system is adhered down to this layer, which the Initial Test showed to be the weakest layer.
- b. If the layers coming away are closer to the substrate than the layers in the Initial Test the encapsulant has strengthened the adhesion of the top layers of paint, and now the next weakest layer is being pulled up.
- c. If the layers of paint coming away are above those which came away in the Initial Test, the encapsulant has weakened the adhesion,
 - 2 = the sheet of encapsulant/reinforcement comes cleanly off of the top layer of paint. This indicates inadequate adhesion of the encapsulant to the paint.

5. Patch Edge Test (required by some manufacturers)

Using a heavy blade, attempt to force the edge of the blade under the encapsulant along one side of the patch area and attempt to pry the encapsulant off the substrate.

- 0 = encapsulant is undamaged when using moderate to heavy force, cause the point of the tool to gouge into the substrate
- 1 = encapsulant cracks or crumbles near the edge while being levered, using moderate to heavy force
- 2 = encapsulant pops off, either directly from the top layer of paint or with large pieces of paint stuck to it.

6. Impact Test (required by some manufacturers)

Using a 16 oz. hammer with a handle at least 13" long, strike the center of the patch ten times using moderate force as follows. If testing a vertical component, place the hammer horizontally with the end of the handle against the component. Hold the end of the handle in your fingertips and allow the head to fall like a pendulum and strike the component. If testing a flat surface, hold the handle against the surface in a similar manner and allow the head to fall and strike the patch.

Score the test:

- 0 = no visible damage to the surface
- 1 = some denting of the surface and/or hairline cracks appearing after the 5th blow
- 2 = any of the following,
 - a) hairline cracking appearing before the 6th blow,
 - b) any wide cracks,
 - c) hairline cracking longer than 3",
 - d) chipping away of the surface.

GLOSSARY

Architectural System - a group of architectural elements related in function and/or proximity.

Chalking - the formation on a pigmented coating of a friable powder evolved from the film itself (ASTM D4214-89). In practical terms, chalking is the formation of a fine dust, like that commonly found on a blackboard.

Coverage per gallon - the encapsulant manufacturer specifies how much area (square footage) one gallon of a particular product will cover to achieve the recommended thickness, regardless of the number of coats required. This figure will vary depending on the nature, and smoothness of the surface or substrate.

Cracking - the phenomenon manifested on paint films by a break extending through to the surface painted. Where this is difficult to determine, the breach should be called a crack only if the underlying (sub)surface is visible (ASTM D661-86).

Cure -(PARTIAL CURE) When the coating changes from a liquid to a solid film by a chemical reaction such as the two-part epoxy reaction by oxidation, whereby the chemical in the liquid reacts with the oxygen in the air. This may also be called polymerization. (FULL CURE) At full cure, the encapsulant offers it maximum benefit, is not tacky, and meets the manufacturer's specifications.

Degloss - to remove the shine, or gloss, from a high or semi-gloss paint.

Delamination - the separation of paint layers from each other, or from the substrate which may occur with, or without, an encapsulant having been applied.

Film thickness - manufacturers specify wet and dry film thickness and they often provide a reference to the expected square feet per gallon at a particular wet film thickness. Wet film thickness is measured with a wet film gauge and compliance with this specification is the responsibility of the applicator.