DELEADING JOURNAL

TECHNOLOGY REVIEW

ENCASEMENT: AN INNOVATIVE SOLUTION FOR LBP MANAGEMENT

BY JOHN A. STAHL, PRESIDENT
PREFERRED SOLUTIONS, INC.,
CLEVELAND, OHIO

PSI
PREFERRED SOLUTIONS, INC.

Editor's note:

Much information has been published regarding the presence and removal of lead-based paint (LBP) in residential structures. LBP removal issues in industrial facilities have not been widely discussed since removal is not required and many facility owners are not aware of LBP regulations. However, it's estimated that 30-80 percent of structural steel and other surfaces in these facilities have been primed and/or painted with lead-based paints. In addition, industrial facilities often have corrosive or high humidity environments requiring periodic painting to avoid deterioration and eventual replacement.

While it is not expected that LBP removal will be mandated in industrial facilities, OSHA regulations apply when facilities undergo repainting projects due to the necessity of abrasive blasting or other surface preparation methods that disturb LBP. The stringent work practices required by OSHA for this type of work has significant impact on project cost (compared to non-LBP projects) resulting from passage of Title X - The Residential Lead-Based Paint Hazard Reduction Act of 1992.

This paper addresses the technical and cost aspects of spraying a polymer-based composite over LBP in a manner which eliminates surface preparation and disturbance. As a result, lead is not released and therefore the need and requirement to provide containment to control lead dust emissions and the disposal of LBP as hazardous waste are eliminated. This enables the project to proceed in a timely and cost effective manner.

Moreover, independent test data proves the superior long-term performance of encasement materials over traditional paints in corrosive environments. Because encasement materials have very low permeability, further corrosion of the encased steel is eliminated or significantly reduced, a benefit not possible with porous paint films.

Regulations Affecting Industrial LBP Projects

On October 28, 1992, Title X - Residential Lead-Based Paint Hazard Reduction Act of 1992 was passed as federal legislation. The title is somewhat misleading in that the Act is very comprehensive and includes private, public, commercial and industrial buildings, tanks, bridges and superstructures as well as demolition and dismantling projects.

One significant aspect of the law is that virtually every person dealing with LBP is required to receive special training and licensing by their respective state in order to perform LBP work. Individuals and contractors found not to be performing LBP work in accordance with all applicable regulations will be subject to having their licenses revoked, which could result in their inability to perform further work and termination of business operations.

Individuals and contractors must inform property owners if surfaces to be prepared and/or painted contain LBP so that appropriate work practices and resultant pricing are properly determined. This will have the effect of acquainting many facility owners of the appropriate regulations that must be followed and the resultant price increases compared to previous painting projects, raising the owner's interest in quicker, safer and lower cost solutions such as encasement.

On May 4, 1993, OSHA published the Interim Final Standard on Lead Exposure in Construction effective June 3, 1993 which reduced Permissible Exposure Limit of persons exposed to lead from 200 micrograms to 50 micrograms of lead per cubic meter of air. When such limits are exceeded, facility owners, individuals, consultants, contractors, material and equipment suppliers and others must assure all employees comply with the Standard, including proper training, medical monitoring, work practices, respiratory protection and suitable protective clothing.

Medical monitoring of employees, including blood sampling, is required when the Action Level of 30 micrograms of lead per cubic meter of air occurs or when any of the three OSHA defined high-risk "trigger" tasks are performed.

Cost Impact of Existing Regulation On Industrial LBP Projects

Industrial painting contractors can no longer perform open abrasive blasting and must contain or isolate the work area to assure existing OSHA air quality regulations are met in order to protect facility employees from being exposed to lead. Containment of lead dust increases the lead exposure to workers, therefore requiring more stringent training, protective clothing and respirators. Productivity is detrimentally affected and existing EPA regulations often require the lead debris to be transported, treated and disposed of as hazardous waste.

Because of these factors, facility owners are receiving paint bids that are often $8.00 to $12.00 per square foot of surface area compared to previous and current budgets of $3.00 to $4.00 per square foot. Additionally, plant production can be detrimentally affected since surface preparation work is much more involved and time consuming.

Lessons From the Asbestos Experience

Compared to asbestos, LBP is being recognized as being more pervasive, more hazardous from a health viewpoint and more difficult and expensive to remove.

Lessons learned as a result of spending billions of dollars to control asbestos fiber release are relevant to LBP. From a regulatory point of view, even though the EPA never required removal of asbestos from buildings, removal usually was done because it was erroneously perceived that removal was required or even preferred by the EPA.

Additionally, only a very limited number of technically-viable alternative solutions to manage asbestos in place were available and EPA had no authorization of funding to evaluate and approve such methods. More recently, however, EPA has issued new guidance documents that recommend facility owners consider managing asbestos in place before considering removal. These documents also describe the suitability or unsuitability of control options and describe the encasement approach as having the unique distinction of being "generally suitable for all forms and thicknesses of asbestos" compared to encapsulation which has numerous limitations.

At national conventions dealing with LBP issues, EPA personnel have repeatedly stated their asbestos experiences have been very beneficial in their determination that management in place of LBP is their recommended solution where technically and economically feasible. Hopefully, the billions of dollars needlessly spent on asbestos removal will not be repeated with LBP.

Overcoating, Encapsulants and Encasement

Overcoating is a term sometimes used to describe materials applied over existing LBP instead of removal. In some cases surface preparation might be necessary.

Encapsulants are paint-type coatings that are usually water based and are generally spray applied in thickness ranging from .003" to .020".

Encasement materials are usually 100% reactive polymers containing no water or solvents and are generally spray applied in thicknesses ranging from .250" to 1.00" which is up to fifty times the thickness of encapsulants or traditional paints. The photo on page two shows a typical one inch thick, two-layer encasement system over LBP on structural steel.

Table 1 (page seven) is a comparison of three LBP treatment options. **Table II** (page seven) compares the long-term performance while **Table III** (page eight) compares the cost of each of the three treatment options.

Encasement as a Generic Approach to LBP Control

Industrial facility owners are not currently faced with any existing or proposed regulations that require in-place LBP to be addressed in their facility as long as air quality levels are acceptable. On the other hand, issues dealing with LBP regulatory and safety issues must be properly addressed when LBP is delaminating (requiring hazardous disposal) and when steel surface preparation is necessary prior to maintenance painting.

The encasement approach deals with spray applying one or more materials over LBP without surface preparation in such a manner that no lead disturbance occurs, eliminating the need and expense of having full isolation of the work area (commonly called containment area). Such containment is required by OSHA since lead-laden dust is usually created during most surface preparation methods.

Encasement procedures have been used for asbestos and lead paint control for 25 years. Independent laboratory results have documented the ability of encasement materials to be sprayed as a fine mist over fluffy asbestos without fiber disturbance due to contact pressures of the encasement materials being less than .03 psi. Since LBP is usually a harder and better adhered material compared to asbestos, chance of disturbance is further reduced.

The ability of the encasement materials to stay in place during the life of the building is function of the longevity of the materials and the structural strength of the completed encasement system. A comparison can be made to encasing an I-beam in concrete since the encasement system locks itself mechanically in place. Unlike traditional coatings, it's not dependent on surface adhesion for long term ability to stay in place.

Fortunately, available polymeric encasement materials can be easily sprayed in retrofit situations with immediate cure at virtually any temperature and has proven performance as shown in this report's case history examples.

The encasement system shown on page 2 is a two part system as follows: Spray polyurethane foam insulation was first applied 1" thick. It has an R-value of 6.5, almost twice that of fiberglass & cellulose. Polyurethane foam insulation has been used for decades to insulate buildings, where its' superior insulation efficiency/value, seamless application, high strength, moisture resistance and durability are required. The energy efficient insulation provides payback through energy savings (see **Table IV** page eight).

The finished surface is a vinyl-ester resin coating (commonly described as "fiberglass") applied at 1/16" or greater thickness to provide a durable, washable, seamless and fire retardant finish required by building codes. It has low permeability (.09 perms @ 1/16") and excellent chemical resistance to keep chemical vapors, moisture and air from affecting the foam and steel substrates.

The encasement system weighs approximately ½ pound per square foot and can withstand pull-off or resistance-to-delamination tests exceeding 200 pounds per square foot for an engineering safety factor of over 400. Since buildings are usually designed with an engineering safety factor of 3, structural engineers can easily determine, and have confidence in, the long-term ability of the encasement system to stay in place.

Monitoring Strength of Encased Steel

Steel that is covered by concrete, fireproofing, insulation or other thick materials including encasement should be periodically monitored to determine the presence of corrosion, fatigue, cracking, metal loss or other factors that could affect the steel's strength. Analysis of steel encased with the polymeric encasement system described in this paper has confirmed no apparent further steel corrosion after twenty five years in a hydrochloric and nitric acid environment.

Suggested Steps for Facility Owners

Because of the significant amount of LBP in industrial facilities and the complicated, hazardous, time consuming, and very expensive procedures required for LBP removal and replacement, it's a prudent business decision to evaluate encasement solutions in order to obtain first-hand information about their technical and economic features and benefits.

If numerous encasement solutions were available, facility owners would need a research program to evaluate the many options. However, since only a limited number are available with documented proven performance, investing in an initial encasement installation (to verify features, benefits and cost), will confirm that the encasement approach can save facility owners hundreds of thousands (if not millions) of dollars during the life of their buildings. This type of return on investment analysis is needed in order to maximize cost effectiveness in dealing with environmental, maintenance and energy issues.

Experience with encasement systems can also provide benefits in using these technologies for non-LBP applications such as corrosion control, thermal insulation and asbestos encasement.

TABLE I

Comparison of LBP Treatment Options*

	Encasement	Encapsulation	Removal & Replacement
Surface preparation required	NO	YES	YES
Lead disturbed and made airborne during surface preparation	NO	YES	YES
Workers and building occupants must be protected from airborne lead	NO	YES	YES
Work area must be isolated using physical barriers, negative air pressure and air filtration equipment	NO	YES	YES
Disposal of lead required	NO	YES	YES
Cold weather prevents abatement method from being used	NO	YES	YES
*Assumes LBP is partially delaminating or peeling			

TABLE II

Long Term Performance Comparison of LBP Treatment Options

Expected Longevity	Encasement	Encapsulation	Removal & Replacement
Corrosive Environments	25+ years 25 Year Documented Performance History	5-10 years	5-10 years
Materials are thick and highly resistant to delamination and peeling	YES	NO	NO
Materials are vapor barriers that prevent further steel corrosion	YES	NO	NO
Materials minimize maintenance costs	YES	NO	NO
Materials can provide thermal insulation to provide energy savings	YES	NO	NO

TABLE III

Long Term Cost Comparison of LBP Treatment Options
(Costs per square foot of surface)

	Encasement	Encapsulation	Removal & Replacement
Initial Costs	$5.00 - $6.00 per square foot	$5.00 - $6.00 per square foot	$6.00 - $15.00 per square foot
Expected longevity	25+ years	5 - 10 years	5 - 10 years
Cost per square foot per year	$.18 - $.22 (60% - 85% less cost than encapsulation) (70% - 95% less than removal and replacement) Energy savings provided by encasement can further reduce overall costs	$.45 - $1.10	$.60 - $3.00

TABLE IV

Cost Comparison and Expected Longevity

Encasement of LBP on Roof Deck vs. Removal and Replacement of Roof Deck
Precious metal refining plant
Environment of hydrochloric and nitric acid vapors - 11,000 square feet of roof deck

	Total	Per Square Foot
Low bid for roof deck replacement and reinsulation	$115,000	$10.46
Encasement contract	$58,080	$5.28
Savings provided by encasement	$56,920 (49%)	$5.18

Energy savings provided by encasement/insulation system: > $8,000.00 per year = 7.3 year payback
100% savings on lead control since energy savings paid for complete encasement system

Case History

Twenty-Five Year Performance: Structural Steel and Roof Deck Encasement

Problem

In 1984, engineers at an 11,000 square foot New England metals refining plant needed to find a chemical resistant insulation and corrosion control system that would eliminate further corrosion and deterioration of their structural steel and roof deck.

Plant operations generated strong hydrochloric and nitric acid vapors that condensed on the steel and caused sufficient corrosion requiring some steel to be removed and replaced. Attempts to protect the steel by abrasive blasting and application of epoxy-based coatings had repeatedly failed.

Their needs were defined as follows:

- A system that could be applied without abrasive blasting the painted steel surfaces since lead paint primers and paints had been used.
- A chemical resistant insulation and corrosion control system capable of withstanding exposure to a variety of acid fumes.
- A high R-value (6.5 per inch) insulation that would insulate the underside of the roof sufficiently so that winter temperatures would not chill the metal roof and allow destructive condensation to form.
- A spray-applied system having no water or solvents that would fill all contours and provide a seamless vapor barrier to prevent water, air and chemical vapors from deteriorating the protected substrate.
- A tough surface that could be scrubbed with brushes, soap and water and cleaned by high pressure washing.
- A system that could be installed during two weekends without the lengthy time and disruption involved with abrasive blasting and applying three coats of paints.

Solution

After several candidate solutions were evaluated by subjecting them to liquid acids, the client chose the three-layer, encasement system manufactured by Preferred Solutions, Inc. The STAYFLEX™ Corrosion Control and Thermal Insulation System consists of 2" thick STAYCELL™ 245-2.0 Spray Polyurethane Foam Insulation covered by 1/16" thick STAYFLEX™ 2505 Thermal Barrier Coating and top-coated with .005" thick (5 mils) STAYCOAT™ 200 Topcoat for enhanced chemical and abrasion resistance. The entire project was completed in the necessary two weekends.

Result

As shown in **Photo 1**, the encasement system is performing in an excellent manner with no deterioration. Since the roof deck surface temperature has been kept above the dew point of the acid-bearing vapors and by the system being a barrier to air, moisture and chemicals, further corrosion of the steel has been prevented and maintenance costs have been virtually eliminated. The expected service life of the structural steel and roof deck has been greatly extended.

PHOTO #1

Case History

Encasement of LBP on Structural Steel in a Galvanizing Plant

Problem

Owners of an east coast steel galvanizing plant were faced with severely corroding structural steel caused by hydrochloric and nitric acids emitted during the galvanizing process. **Photo 2** shows the condition of the steel before encasement.

As shown in **Table V** (page twelve), $266,500 had been budgeted for sandblasting and painting 65,000 square feet of this steel. Due to the presence of lead-based paint, cost projections for removal and repainting greatly increased to $590,000 not including the costs associated with any production losses that could occur since full containment was required to contain the lead during sandblasting.

The building was unheated and the work needed to be performed during nights in winter months with temperatures in the building often below freezing precluding water or solvent-based paints unless the contractor heated the high, open building, which was not economically feasible. In addition, several industrial painting contractors had told the building owner that even with complete sandblasting and painting with the best paints available, long-term performance was questionable due to the strong chemical environment.

Solution

Preferred Solutions, Inc. (PSI) was asked to visit the jobsite to review the owner's needs and discuss the feasibility of encasing the lead paint without surface preparation and disturbance. After concurring that encasement would meet the job requirements, PSI personnel flew the owner to a previously installed project where production practices also utilized hydrochloric and nitric acids.

Based on seeing the long-term proven performance, the STAYFLEX™ Corrosion Control and Thermal Insulation System was selected for application to all structural steel in the building. The system consisted of 1" thick STAYCELL™ 245-2.0 Spray Polyurethane Foam Insulation covered by 1/16" thick STAYFLEX™ 2505 Thermal Barrier Coating.

Results

The STAYFLEX™ System was spray-applied at night by a two-man crew in cold temperatures with no surface preparation or disturbance. **Table V** shows the 41% cost savings based on $5.41 per square foot of steel surface area. The expected longevity is greater than 25 years based on other similar encasement installations. See results **Photo 3**.

PHOTO #2

PHOTO #3

TABLE V

Cost Comparison and Expected Longevity

LBP Encasement vs. Removal and Replacement
Steel galvanizing plant
Environment of hydrochloric and nitric acid vapors - 65,000 square feet of structural steel

	Total	Per Square Foot
Original budget for sandblasting and painting: non-lead paint	$266,500	$4.10
Low bid for sandblasting and painting; paint containing lead	$590,000	$9.05
Encasement contract	$351,000	$5.41
Savings provided by encasement	$239,000 (41%)	$3.64

Expected longevity of sandblasting and Epoxy Paints: Unknown since no painting contractor would provide warranty.
Expected longevity of encasement: 25+ Years, backed by independent test data.

PSI
PREFERRED SOLUTIONS, INC.
7819 Broadview Road
Cleveland, Ohio 44131
(216) 642-1200
FAX (216) 642-1166

LEAD PAINT ENCASEMENT

Stayflex™ Lead Paint Encasement Systems

SYSTEM DESCRIPTION

Stayflex™ Lead Paint Encasement Systems have been successfully used for over 15 years to provide highly cost-effective solutions to encase lead-based paint (LBP) on building components and equipment.

The systems have unique installation methods and high chemical resistance along with other performance features enabling them to be an economically viable solution to difficult LBP control problems. The system also provides thermal insulation which often provides energy savings that achieve payback periods as soon as one year.

Stayflex™ systems are spray-applied in a two layer composite. *Staycell*™ closed-cell, polyurethane foam insulation is first applied as a fine mist with surface contact pressure less than .03 psi. Thicknesses typically range from .250" to 1.00". Air monitoring by independent laboratories during installation confirm the ability of the encasement system to be sprayed with negligible lead disturbance which eliminates the need for complex and expensive isolation of the work area, stringent personal safety precautions and lead dust disposal procedures.

Polyurethane foam has been the predominant insulation used in cooler and freezer buildings during the past twenty years. Its high thermal efficiency rating of R-8 per inch is approximately twice that of most insulation materials. The spray-applied *Staycell*™ foam achieves outstanding adhesion to most substrates including surfaces where LBP is in varying stages of deterioration, delamination and peeling. Additionally, the foam performs as a thick, strong and tenacious primer and base for final encasement with the *Stayflex*™ chemical resistant finish.

One of the most important limitations of paints and thin overcoats for LBP is their inability to stay in place since the LBP is often not well-adhered to the substrate. Like concrete encasement, the thickness and high strength of the *Stayflex*™ system negates the importance of the LBP adhesion. Where necessary, mechanical fasteners such as stud welded pins with three inch diameter metal disks are attached to the substrate. The *Staycell*™ materials are then sprayed to encase the disk thus mechanically fastening the *Staycell*™ material to the substrate.

Stayflex™ is an unsaturated polyester resin material, commonly referred to as "fiberglass", used to manufacture gasoline and chemical tanks, chemical resistant process piping, fume hoods and other products that must withstand highly corrosive environments. *Stayflex*™ is spray-applied at a 1/16 inch or greater thickness over the *Staycell*™ foam to add substantial strength and a highly durable surface. *Stayflex*™ is also a Class A, fireproofing material that enables the system to comply with insurance and building code requirements for buildings of all types.

COST EFFECTIVENESS

The excellent cost effectiveness of *Stayflex*™ Lead Paint Encasement Systems is achieved in three ways:

1. Initial costs are usually less than chemical and mechanical methods of stripping LBP and repainting. Where substrates such as steel have severe corrosion that precludes repainting, *Stayflex* systems are often the only technical and economically viable solution. The ability to apply the *Stayflex*™ system with no surface preparation or disturbance has provided initial cost savings up to 50% compared to abrasive blasting and repainting. This is a result of OSHA regulations requiring strict and expensive work practices when removing or disturbing LBP.

2. *Stayflex*™ systems are installed in a quick and clean manner. No water or solvents are in the materials which enables them to harden in minutes. Dollars are saved since normal building operations and production schedules can be maintained with minimal disruption. 15,000 to 20,000 square foot projects have been completed in a single weekend.

3. The superior performance features provide three important benefits unavailable with the more costly removal and repainting approaches. The 1/16 inch thick *Stayflex*™ material is thicker than 25 coats of high quality paint and also provides greater durability and chemical resistance. Paints contain water or solvents which must evaporate to cure and result in thin, porous coatings. Since *Stayflex*™ has no water or solvents, a barrier to vapors and oxygen is thus provided which reduces or eliminates further steel corrosion. Reinspections of 15 year old projects have confirmed these significant performance features. Since the *Stayflex*™ system also provides thermal insulation, encasing LBP on uninsulated steel siding, for example, can pay for itself through energy savings. For these reasons, long-term operating and maintenance costs are superior to traditional solutions.

The combination of attractive initial costs, quick and simple installation and low long-term operating costs provides a very cost-effective solution to the presence of LBP.

PERFORMANCE FEATURES OF *STAYFLEX*™ SURFACE

Vapor Barrier Performance
The seamless *Stayflex*™ surface has a water vapor barrier permeability rating of .012 perm-inches when tested at 100% relative humidity and 100 degrees Farenheit. This is important since vapors and oxygen necessary for corrosion to occur are prevented from entering the insulation and reaching the substrate.

Impact Resistance
Stayflex™ is similar to the glass-reinforced polymers used for over thirty years to manufacture "fiberglass" boats, car bodies, and chemical tanks and consequently has similar properties; one of the most important being excellent impact resistance. This high impact resistance provides several benefits:

1. Long-term maintenance costs are minimized since repairs are virtually eliminated.

2. Long-term lead paint control is maintained since the monolithic barrier is not compromised.

Chemical Resistance
Stayflex™ has excellent resistance to most chemicals and is easily power washed. This performance is one of the reasons why *Stayflex*™ is the only spray-applied, single coat, fireproofing material approved by the U.S. Department of Agriculture (U.S.D.A.) for use over polyurethane foam in food processing applications.

Other applications such as chemical process tanks and roof decks in acid environments are just two examples where *Stayflex*™ systems are providing unique solutions to difficult problems.

A chemical resistance data sheet is available upon request.

Abrasion Resistance
Although in-place weight at 1/16 inch thickness is only .57 pounds per square foot, *Stayflex*™ has a density of 110 pounds per cubic foot which makes it very abrasion resistant, durable and tough. Examination of *Stayflex*™ will convincingly confirm this unique property. This is particularly important when scrubbing or power washing is utilized.

Puncture Resistance
Stayflex™ is very resistant to punctures and other penetrations normally caused by sharp objects such as tools and movement of equipment.

Washability
Stayflex™ is washable with ordinary soap and water. If necessary, bristle brushes can be used. Excellent washability is another reason why *Stayflex*™ has been accepted by the U.S. Department of Agriculture. This feature coupled with chemical, impact and abrasion resistance provides long-term, low maintenance costs not achievable with other lead paint control systems.

Integral Colors
Color in *Stayflex*™ is throughout the material, not just on the surface. Consequently, painting should never be necessary resulting in additional maintenance cost savings.

If a color change is ever desired, *Stayflex*™ can be brush or spray painted with chemical resistant polyester gel coats and a variety of latex and oil-based paints.

Stayflex™ is available in numerous matte finish colors with white most frequently used for excellent light reflectance. Custom colors and high gloss topcoats are also available.

AVAILABILITY

Stayflex™ Lead Paint Encasement Systems are installed throughout the United States by Authorized *Stayflex*™ Applicators. Phone us at our toll-free number to determine how *Stayflex*™ systems can be your most cost-effective and preferred solution for lead paint encasement.

ADDITIONAL DATA

Technical data, material safety data sheets, application instructions, case histories, approvals, payback calculations and other information is available upon request.

TOLL-FREE PHONE NUMBER
1-800-522-4522

REPRESENTATIVE COMPLETED PROJECTS

Chicago Bridge and Iron
Dow Chemical Company
Dupont
Ford Motor Company
General Motors Corporation
LTV Steel
William G. Mather Ore Boat
Midland Steel
Merck Drug
Olin Chemical Company
Rohm and Haas
Stouffers Foods
Sweetheart Cup
USX Corporation
White Consolidated Industries
Uniroyal

Form No. 93LBP

Printed in USA

PSI
PREFERRED SOLUTIONS, INC.
7819 Broadview Road
Cleveland, Ohio 44131
(216) 642-1200
FAX (216) 642-1166

ASBESTOS ENCASEMENT

Stayflex™ and *Staywrap*™ Asbestos Encasement Systems

ENVIRONMENTAL PROTECTION AGENCY (EPA) POSITION ON ASBESTOS CONTROL

Much confusion has existed over the years regarding the EPA position on asbestos control. Billions of dollars have been needlessly spent on asbestos removal. To our knowledge, there are no regulations at any federal, state or local level that require asbestos removal if other control options can prevent asbestos fiber release. Because the stripping of asbestos-containing materials (ACM) creates large quantities of airborne asbestos which can contaminate other parts of the building, EPA published dozens of documents describing how to perform removal safely. This concentrated effort was misconstrued to believe that EPA required or preferred removal. EPA's position on asbestos in buildings has always been the same. If the material is in good, undamaged condition, leave it alone and monitor its condition. If ACM is deteriorating or will be disturbed during renovation or demolition activities, address the ACM in a manner that will prevent asbestos fiber release.

In July, 1990, EPA issued their current guidance document Managing Asbestos in Place which provides the statement . . . "Building owners should thoroughly consider any decision to remove asbestos. In-place management techniques should be assessed carefully before deciding to remove asbestos". The document also references another EPA publication Evaluation and Selection of Control Options which describes the suitability and unsuitability of the four generic approaches to asbestos control; encasement, encapsulation, enclosure and removal. All persons involved with making decisions on ACM control alternatives should obtain these documents. Preferred Solutions, Inc. has published a free booklet Facts About Asbestos Management and Control Alternatives - A Building Owner's Guide to Information Sources which reprints key pages from these and other EPA publications and lists EPA phone numbers to obtain them.

EPA states that both encapsulation, the application of relatively thin coatings such as paints; and enclosure, installing sheets or boards over ACM, have limited uses or benefits. On the other hand, EPA states that encasement, installing materials such as concrete or PSI's products, is "Generally suitable for all forms and thicknesses of asbestos-containing materials". This EPA guidance acknowledges the unique performance of our *Stayflex*™ and *Staywrap*™ Asbestos Encasement Systems which are herein described.

SYSTEMS DESCRIPTION

The *Staywrap*™ Asbestos Encasement System has been successfully used over the past 7 years and consists of fabric rolls impregnated with a proprietary, water-activated cementitious/polymer that are dipped in water and hand-applied over damaged ACM on piping, ductwork, boilers and other locations where the projects are too small or not suitable for PSI's sprayed *Stayflex*™ encasement systems. Rolls ranging from 6" to 48" widths are available. The materials cure quickly, are extremely durable and withstand temperatures up to 900 degrees Farenheit. By repairing only damaged locations, *Staywrap*™ is enabling building owners to save up to 90% compared to ACM removal and replacement.

Stayflex™ Asbestos Encasement Systems have been successfully used for over 15 years to provide highly cost-effective solutions to encase ACM on building components and equipment.

These systems have unique installation methods, significant strength and other performance features enabling them to be an economically viable alternative to stripping and replacement of ACM. These systems also add thermal insulation which often provides energy savings that achieve payback periods as soon as one year.

Stayflex™ systems are spray-applied in a two layer composite. *Staycell*™ closed-cell, polyurethane foam insulation is first applied as a fine mist with surface contact pressure less than .03 psi. Thicknesses typically range from 1.0" to 2.0". Air monitoring by independent laboratories during installation confirm the ability of the encasement system to be sprayed with negligible asbestos disturbance

which eliminates the need for complex and expensive isolation of the work area, stringent personal safety precautions and asbestos disposal procedures.

Polyurethane foam has been the predominant insulation used in cooler and freezer buildings during the past twenty years. Its high thermal efficiency rating of R-8 per inch is approximately twice that of most insulation materials. The spray-applied *Staycell*™ foam achieves outstanding adhesion to ACM including situations where the ACM is in varying stages of deterioration and delamination. Additionally, the foam fills in cracks and crevices and smooths out rough and uneven ACM prior to final encasement with the *Stayflex*™ durable finish.

One of the most important limitations of painting ACM (commonly called encapsulation) is the tendency of paints to enhance the delamination of the ACM due to the additional weight without any increase in strength. This delamination can create greater problems than those solved since dry, hazardous asbestos fiber will be released into the air. Like concrete encasement, the thickness and high strength of the *Stayflex*™ system negates the importance of the ACM condition and adhesion. Where necessary, mechanical fasteners such as stud welded pins with three inch diameter metal disks are attached to the substrate. The *Staycell*™ materials are then sprayed to encase the disk thus mechanically fastening the *Staycell*™ material to the substrate.

Stayflex™ is an unsaturated polyester resin material, commonly referred to as "fiberglass", used to manufacture gasoline and chemical tanks, chemical resistant process piping, fume hoods and other products that must withstand highly corrosive environments. *Stayflex*™ is spray-applied at a 1/16 inch or greater thickness over the *Staycell*™ foam to add substantial strength and a highly durable surface. *Stayflex*™ is also a Class A, fireproofing material that enables the system to comply with insurance and building code requirements for buildings of all types.

COST EFFECTIVENESS

The excellent cost effectiveness of *Stayflex*™ Asbestos Encasement Systems is achieved in three ways:

1. Initial costs are generally much less than stripping ACM and replacing with non-ACM materials. Where ACM is not readily accessible, *Stayflex*™ systems are often the selected solution. The ability to apply the *Stayflex*™ system with no or minimal ACM disturbance is a key feature of this technology. When ACM is disturbed and made airborne during stripping procedures, OSHA regulations require strict and expensive work practices to minimize the possibility of contaminating other building areas.

2. *Stayflex*™ systems are installed in a quick and clean manner. No water or solvents are in the materials which enables them to harden in minutes. Dollars are saved since normal building operations and production schedules can be maintained with minimal disruption. 15,000 to 20,000 square foot projects have been completed in a single weekend.

3. The superior performance features provide three important benefits unavailable with the more costly stripping and replacement approaches. The excellent functional properties of the ACM are maintained and upgraded while eliminating the only problem with asbestos, namely fiber release. The *Stayflex*™ system provides greater durability than typical replacement materials which protects the ACM from future damage. Reinspections of 7 year old projects have confirmed these significant performance features. Since the *Stayflex*™ system also provides thermal insulation, encasing ACM can pay for itself through energy savings. For these reasons, long-term operating and maintenance costs are superior to ACM stripping and replacement.

The combination of attractive initial costs, quick and simple installation and low long-term operating costs provides a very cost-effective solution to preventing asbestos fiber release.

AVAILABILITY

Staywrap™ and *Stayflex*™ Asbestos Encasement Systems are installed throughout the United States by Authorized *Stayflex*™ Applicators. Phone us at our toll-free number to determine how *Staywrap*™ and *Stayflex*™ systems can be your most cost-effective and preferred solution for asbestos control.

ADDITIONAL DATA

Technical data, material safety data sheets, application instructions, case histories, approvals, payback calculations and other information available upon request.

TOLL-FREE PHONE NUMBER

1-800-522-4522

REPRESENTATIVE COMPLETED PROJECTS

Chicago Bridge and Iron
Dow Chemical Company
Dupont
Ford Motor Company
General Motors Corporation
LTV Steel
William G. Mather Ore Boat
Midland Steel
Merck Drug

Printed in USA

United States
Environmental Protection
Agency

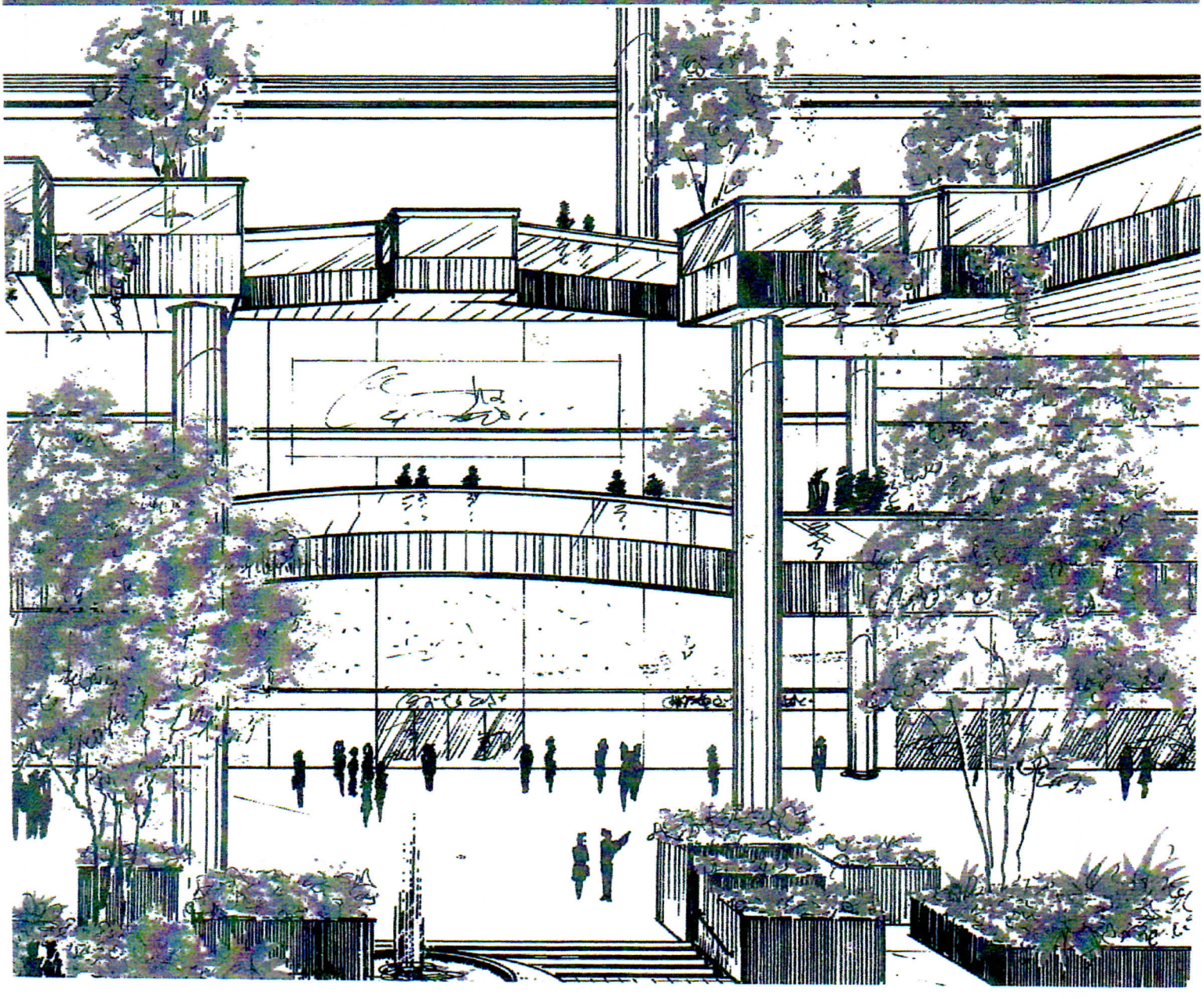
Pesticides and Toxic Substances
(TS-799)

20T-2003
July 1990

EPA

Managing Asbestos In Place

A Building Owner's Guide to Operations and Maintenance Programs for Asbestos-Containing Materials



- Generally not suitable when demolition is planned in the near future since enclosure materials will need to be removed first in most cases.

- Generally suitable over ACM fireproofing if gypsum wallboard is used since additional fire resistance is added.

Spray-Applied Enclosures

Spray-applied enclosures are often called encasement systems since the ACM is encased behind a hard surface. The material is applied by airless spray equipment and cures rapidly. The sealant can be applied in a range of thicknesses, usually one-eighth to four inches. At present, there are at least two encasement systems on the market. These enclosures consist of a structural shell which is sprayed over the ACM in one or two layers. The systems are mechanically fastened in a manner similar to mechanical enclosures to assure they stay in place. Structural strength of the encasement system is high, although it must be applied by trained applicators and according to the manufacturer's specifications. A field test should be conducted to assure suitability and proper application. Following is a list of suitable and unsuitable applications:

- Generally suitable for all forms and thicknesses of ACM.

- May be suitable for ACM with some damage since materials are mechanically fastened into the building structure or substrate and do not place weight on the ACM.

- Not suitable over ACM in locations expected to receive significant water damage since water could collect behind the enclosure unless suitable venting is provided.

- Generally suitable where enclosure ACM is subject to impact and abrasion, depending on thickness and durability of enclosure materials.

- May be suitable for some situations where future renovation is planned since system designs can include mechanical fasteners and hangers to accommodate installation of items such as piping, electrical conduit and partition headers.

- Generally suitable over ACM fireproofing since one of the present spray-applied enclosure systems has fire resistance comparable to gypsum wallboard and, therefore, is not detrimental to the fire rating of the fireproofing.

Repair

Repair of ACBM is discussed in the AHERA Rule, both as a separate response action, and as part of an ongoing O&M program. Repair can be accomplished with a variety of materials and procedures. Small areas of surfacing ACM could be patched with asbestos-free spackling compound, caulk, or plaster. However, any loose material must be dislodged prior to patching. In addition, the cause of the damage must be identified and eliminated. Thermal system insulation can be repaired with caulk, asbestos substitutes such as fibrous glass, styrofoam, rubber, or new jackets. (New jackets may be considered a form of enclosure.)