research report

Galvanized Steel Framing for Residential Buildings

RESEARCH REPORT RP06-1

2006

American Iron and Steel Institute

Steel Framing Alliance™

Steel. The Better Builder.

DISCLAIMER

The material contained herein has been developed by researchers based on their research findings and is for general information only. The information in it should not be used without first securing competent advice with respect to its suitability for any given application. The publication of the information is not intended as a representation or warranty on the part of the American Iron and Steel Institute, Steel Framing Alliance, or of any other person named herein, that the information is suitable for any general or particular use or of freedom from infringement of any patent or patents. Anyone making use of the information assumes all liability arising from such use.

PREFACE

This report was developed by the NAHB Research Center for the Steel Framing Alliance and other shareholders in ILZRO's research program SC-4, *Galvanized Steel Framing for Residential Buildings*. This report replaces the previous report issued in September 2003.

The initial objective of this project was to investigate the corrosion performance of galvanized steel framing components in residential construction by measuring actual corrosion rates of steel framing members over a 3-year period and correlating these to environmental conditions. After completion of the initial phase of work, the monitoring period was extended to 5 years and later to 7 years. The findings of this study validate the adequacy of current industry corrosion protection requirements and provide additional basis for promoting the long-term durability of cold-formed steel framing.

Research Team
Steel Framing Alliance

ILZRO RESEARCH PROGRAM ZC-4

Galvanized Steel Framing for Residential Buildings

7-Year Report
March 2006

Prepared by

NAHB Research Center, Inc.
400 Prince George's Blvd.
Upper Marlboro, MD, 20774
USA

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

This report was prepared by Nader Elhajj, P.E., of the NAHB Research Center, Inc., under sponsorship of the International Lead Zinc Research Organization, Inc. (ILZRO). Special appreciation is extended to Dr. Frank Goodwin of ILZRO for his guidance and assistance throughout the project.

Appreciation is also extended to the following homeowners of the homes that were used as test sites for this project:

Steve and Debby Capinos
Anthony Delancy
John Wheeler
Joseph Finio

The following companies are recognized for contributing the materials used for this research project:

Defasco
House Factory
Wierton
Dale Incor
Bethlehem Steel

EXECUTIVE SUMMARY

ILZRO's research program ZC-4, *Galvanized Steel Framing for Residential Buildings*, is a study designed to measure actual corrosion rates of steel framing samples and correlate these to environmental conditions. The NAHB Research Center is performing this work at four residential buildings in North America over a seven-year exposure period.

The NAHB Research Center commenced work on the project in February 1997 and established test sites in Miami, Florida; Leonardtown, Maryland; Hamilton, Ontario; and Long Beach Island, New Jersey. At each site numerous test samples were installed in building cavities where steel framing would typically be used (e.g., attics, floor systems, walls). The corrosion test samples consist of galvanized, galvalume, and galfan-coated flat plates and 1-inch (nominal) segments of C-section stud. Two sites were also equipped with electronic monitoring systems that measured and recorded surface temperatures, relative humidity, and time of wetness for a one-year period. This data has been analyzed to determine if thermal and moisture conditions existed that would allow condensation to form on building components.

The program was divided into two phases: Phase I of the program, included all sample and site preparation and installation. Phase II, involved processing the environmental data, retrieving and analyzing samples, and maintaining the sites. Phase I was completed in 1998. Phase II was initially completed in 2003 for a 5-year exposure (1-, 3-, and 5-year exposures) but was further extended to the end of 2005 to obtain data for 7-year exposure.

All one-, three-, five-, and seven-year exposure samples have been retrieved from the test sites. Coating loss measurements from the four sites have indicated minor mass loss rates for all sample types (e.g., studs, plates), all sample coatings (e.g., galvanized, galvalume, and galfan), and all sample colonies (e.g., crawlspaces, walls, attics, joists). All retrieved samples had a measured mass loss of less than 0.05 grams and an estimated average life expectancy of 377 years. The fastest coating corrosion rate observed for any of the four sites for any colony was 0.548 microns/year for a galvalume plate installed in the crawl space of the Leonardtown, Maryland site after seven years of exposure.

The one-year environmental data from the Hamilton and New Jersey sites demonstrated that the surface temperatures of metal samples and actual building components remained above the local dew point with little exception. At one exterior wall location in Hamilton there were numerous instances of wall component surface temperatures falling below dew point. However, sample plates retrieved from this wall cavity after seven years of exposure showed an average mass loss of 0.02 grams.

INTRODUCTION

The International Lead Zinc Research Organization (ILZRO) is sponsoring a research initiative entitled Galvanized Steel Framing for Residential Buildings. The chief objective of the study is to investigate the corrosion performance of galvanized steel framing components in residential construction. The NAHB Research Center, Inc. is performing the study in North America, while similar efforts within the industry are being conducted in Europe.

This report is a 7-year report that summarizes the previous interim reports submitted to ILZRO (1-, 3-, and 5-year retrievals) as well as the results of the 7-year sample retrievals.

The NAHB Research Center commenced work on the project in February 1997 where four test sites have been established and test samples installed. Two of these sites contained electronic monitoring systems for a one-year cycle. During this time environmental conditions like surface temperature and relative humidity were measured and recorded to determine whether condensation occurred.

Test samples were scheduled to be retrieved from each test site at intervals of one, three, five, and seven years after installation. All batches of one-, three-, five-, and seven-year exposure samples have been retrieved. The results of the coating loss analysis on the samples are presented in this report. Additionally, analyses of the environmental data for the Hamilton and New Jersey sites are presented.

CORROSION SAMPLES

The corrosion samples consist of galvanized, galvalume, and galfan coatings in the form of 10 cm x 10 cm (3.94 in x 3.94 in) flat plates and 1-inch (25.4 mm) (nominal) segments of C-section stud. The flat plates allow for a more definitive determination of the specimen's area, and thus a better measure of coating thickness and mass reduction after exposure (Figure 1). The C-section samples have been installed to investigate corrosion performance at the edges and bends of a stud. Both the plate and stud samples have both sides and all edges exposed, which is consistent with the approach used in parallel research efforts in France. The coating thickness specifications for the samples are listed in Table 1.

Figure 1 – Plate Samples

TABLE 1 - COATING THICKNESS OF SAMPLE MATERIALS

MATERIAL	COATING SPECIFICATION (metric)	COATING SPECIFICATION (English)	NOMINAL COATING THICKNESS (microns)	MEASURED COATING THICKNESS (microns)	DENSITY OF COATING (g/cm^3)	COATING WEIGHT OF SOURCE MATERIAL (g/m^2)
Galvanized 1	Z180	G60	25	38	7.14	273
Galvanized 2	Z180	G60	25	29	7.14	206
Galfan	ZGF275	AZ90	41	47	6.7	315
Galvalume 1	AZ180	AZ60	49	60	3.75	227
Galvalume 2	AZ180	AZ50	41	45	3.75	168

For SI: 1 lb/in^3 = 27.7 g/cm^3, 1 lb/m^2 = 4882 g/m^2.

Separate supplies of the galvanized and galvalume material were acquired because it was decided after the program's inception to include flat samples (with area of 100 cm^2, 15.5 in^2) in addition to stud-type samples. Thus, the galvanized 2 and galvalume 2 materials were acquired to fabricate the plates. Galvalume 1 samples were later discarded, as the coating thickness was not

appropriate. Coating tests have been performed per ASTM A-90[1] to document the actual coating thickness of all the sample materials. These values are listed in the fourth column above.

Knowing the exact dimensions of these coupons provides an accurate determination of coating thickness reduction when the samples are retrieved and analyzed. The stud-type samples are one-inch (25.4 mm) nominal segments of 3-5/8 inch (92.1 mm) (web dimension) C-section studs. The area of these samples cannot be exactly determined; however, their weight loss due to corrosion can be determined upon retrieval. The stud type samples also provide a visual evaluation of any corrosion that may occur at edges or bends of rolled studs.

Throughout the installations, where space allowed, the number of samples installed was intended to allow for analysis in triplicates after one, three, five, and seven years of exposure. Additional samples were also installed, if possible, in case additional long-term data is eventually desired.

TEST SITES AND INSTALLATIONS

The four test sites are described below in Table 2. They represented a range of climates and typical building types for each region. The sites were chosen such that field results would be applicable to a large selection of homes and climates.

TABLE 2 - TEST SITES

SITE NO.	LOCATION	ENVIRONMENT	FOUNDATION	DISTANCE TO WATER	EXTERIOR FINISH
1	Miami, Florida	Humid, inland	Slab-on-grade	Several miles from Atlantic Ocean	Stucco
2	Leonardtown, Maryland	Semi-marine with humid summers	Crawlspace	Less than 75 feet from Potomac River	Vinyl
3	Long Beach Island, New Jersey	Marine	Piers with enclosed area under house	Less than 1/4 mile from Atlantic Ocean	Aluminum Siding
4	Hamilton, Ontario	Industrial with cold winters	Basement	Inland	Brick Veneer

For SI: 1 mile = 1.61 km

Engineers from the NAHB Research Center have installed corrosion samples at all four sites. Two of the four sites, Hamilton and Long Beach Island, were also equipped with environmental monitoring systems that record conditions such as relative humidity and temperature in the sample colonies for one year.

[1]ASTM A-90. *Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings*. American Society for Testing and Materials, West Conshohocken, PA.

Miami, Florida Test Site

The Miami site (Figure 2) is in a Habitat for Humanity Development in southwest Miami, where 16 of the 90 homes have been framed with steel systems. The site is a single-story steel framed structure with a slab foundation. It has plywood sheathing with a stucco exterior finish. The wall interior is 5/8" (16 mm) painted drywall. The attic has kraft faced (facing the drywall) fiberglass batts with an R-30, while the walls have either R-11 or R-13 batts. The walls are 6" (152 mm) wide. The attic is vented with soffit vents (19 vents total, each is 22" x 4"). No ridge vents are present, and one small gable end vent is visible in the front of the house.

No notable sources of interior moisture sources are present, with all bathrooms venting directly to the outside and no saunas or whirlpools. There is no washer or dryer in the house. The house is air conditioned. The type of environment can be classified as humid/inland. Although the site is in southern Florida it is several miles from any large water body. There is no shading of the house on the western exposure, where the wall cavity colonies are located.

Sample colonies were located in both the attic (see Figure 3) and an exterior wall. The attic colony contained samples that were suspended from the roof framing. This stock of samples includes galvanized, galfan, and galvalume plates and studs. A small quantity of bare samples was also installed. The attic is vented by soffit vents on the east and west sides of the house.

The wall cavity colony has a west-facing exposure, and contained samples which were accessible for retrieval through access panels. The samples consisted of galvanized, galfan, and galvalume stud and plate pieces. The samples were embedded into the fiberglass batt insulation in the wall cavity.

Figure 2 - Miami, Florida Corrosion Site

Figure 3 – Attic Specimens in Miami, Florida Site

Leonardtown, Maryland Test Site

The Leonardtown, Maryland, house (Figure 4) is directly on the lower Potomac River before it empties into the Chesapeake Bay. The two-story home is roughly 75 feet (22.9 m) from the Potomac River, with strong winds often blowing spray towards the house from the brackish river water. The walls were framed with 18 gauge (43 mil) C-section studs, while steel trusses were used for the roof framing. Steel floor joists were used in the crawlspace along with R-19 fiberglass batts. A layer of poly is installed on the crawlspace floor. The attic was insulated with 11 in. (27.9 cm) of blown cellulose. The attic was vented with a ridge vent and soffit vents. The walls consist of 5/8" (16 mm) drywall, wet-blown cellulose (R-13), OSB sheathing, 1" (25.4 mm) of non-foil faced foam cladding (R-5), a Tyvek air infiltration barrier, and vinyl siding. The only notable interior moisture source was a large Jacuzzi tub in the master bathroom. All bathrooms were vented directly to the outside. The foundation was vented with perimeter vents in the block wall

NAHB Research Center personnel installed specimens in the attic, an exterior wall, the crawl space, and under the outdoor deck.

Figure 4 - Leonardtown, Maryland, Site on Lower Potomac River

The attic colony contained all three coating types in both plate and stud form. These specimens were suspended in the attic with either vinyl cord or string. A second set of samples was also embedded in the attic's cellulose insulation. The purpose of this second set was to investigate any interaction between the galvanized coating and the cellulose insulation.

The exterior wall colony, which had a south/southeast exposure, contained galvanized, galfan, and galvalume plates. These specimens were embedded in the cellulose wall insulation.

The crawlspace contained a set of suspended samples and another set that was partially embedded in the fiberglass batts between the joists (see Figures 5 and 6). The suspended set was fully exposed to the ambient crawlspace environment, and contained plates of all three coating types. Galvanized, galvalume, galfan, and bare (stripped) stud-type specimens were also suspended. The bare samples displayed extensive corrosion after just two months of exposure, indicating the aggressive environment in the crawlspace (see Figure 7). The set that was partially embedded in the floor insulation contained galvanized and galvalume stud samples. Their installation was designed to duplicate the exposure conditions of a floor joist.

Figure 5 - Crawlspace Specimens Embedded in Floor Insulation

Figure 6 – Stud Specimen in Leonardtown Site Crawlspace

Figure 7 – Water (Foreground) in Leonardtown Crawlspace

Specimens were installed under the outdoor deck, which represents an extreme worst-case environment. The deck is boldly exposed to any river spray, and is actually framed with wood. The sample colony under the decking will provide performance data in an extremely aggressive environment. The colony contained galvanized, galvalume, galfan, and bare stud samples.

Hamilton, Ontario (Canada) Test Site

The Hamilton, Ontario, site (Figures 8 and 9) is a single-story in a retirement community. It is the end unit, with a walk-out basement. Three of the four basement walls are concrete block, with the fourth wall (east facing) being steel-framed wall. The framed walls are designed as follows: interior wall covering is 5/8" (15 mm) drywall, behind which a poly vapor barrier is installed. The walls are insulated with R-13 fiberglass batts. Beyond the framing is 1-1/4" (32 mm) of foam sheathing (R-7). Outside of the foam sheathing is a 1" (25.4 mm) air gap, with a brick veneer finish beyond this.

The block walls in the basement (3 of the 4) are 8" (203 mm) thick concrete, with the above-grade portions insulated on the interior by 6" (152 mm) of fiberglass batt insulation (R-19) that is covered by a poly vapor barrier. The below grade foundation walls are also protected on the exterior by a solid plastic membrane that is designed to shield the foundation walls from soil moisture. The slab edge insulation is an R-28 Isynene foam product. A poly damp proof course lies between the block foundation wall and the bottom track of the exterior basement wall. The basement is finished so there is no insulation in the basement ceiling. The attic is framed with wood roof trusses. An R-32 layer of blown-in fiberglass is in the attic. The attic is vented with soffit vents and a ridge vent.

The duplex structure was equipped with both corrosion samples and monitoring equipment in winter 1997. The house has a brick veneer and is located in an industrial-type air quality environment. Samples and monitoring sensors were installed in the attic and an exterior basement wall.

Figure 8 - Hamilton, Ontario, Test Site (Front View)

Figure 9 - Hamilton, Ontario, Test Site (Rear View)

The attic samples were suspended in the air and consisted of galvanized, galfan, and galvalume coatings. Thermistors were attached to one plate of each coating type to record the metal surface temperatures of the three metal types. The attic ambient temperature and relative humidity were also measured. A time of wetness sensor that was mounted to a galvanized specimen recorded the percentage of time that a moisture film was present.

The exterior wall colony in the Hamilton house was located in the basement's framed wall (see Figure 10). Galvanized, galfan, and galvalume samples were installed in the wall. As in the attic, thermistors were installed to monitor the surface temperature of the three sample types, and two additional sensors monitored the temperature of the wall's base plate and a steel wall stud. The wall cavity ambient relative humidity and temperature was also recorded. Lastly, a time of wetness sensor was mounted to a wall stud to quantify the frequency of condensation on the stud.

Figure 10 - Wall Cavity Specimens and Sensors in Hamilton, Ontario, Site

Long Beach Island, New Jersey, Test Site

The Long Beach Island, New Jersey site (Figure 11) was the last addition to the research study. The site is a beachfront house on the New Jersey shore, and is separated from the ocean by a low-lying dune roughly 1/4 mile (400 m) wide (see Figure 12). The house was originally a one-story structure, and was remodeled to include a new second floor and roof that are both framed with cold-formed steel (Figures 13 and 14). The house is occupied primarily during the summer season, and is left vacant during the winter.

The site is a renovated 1-story wood frame structure that has been added to with an expanded first story and a completely new second story. The additions are framed with cold-formed steel. The site is beachfront although the beach is a substantial distance from the house across grass dunes. The front of the house faces west and rear towards the ocean (east).

The house foundation is on wooden pilings. These are original to the house although additional structural members were added during the remodeling. The crawlspace is a loosely enclosed area used for storage and possibly parking. The wood sheathing around the crawlspace is light and serves as a blow-away wall in the event of flooding. The first floor joists are mounted on the pilings. The underside of the joists, which are mostly wood, is covered with 1/2" (13 mm) Celotex Tuff R (R3.8) and 6" (152 mm) fiberglass batts are stuffed between the joists (R30).

The second floor exterior walls are framed with 43 mils (18-gauge, 1.09 mm) studs and stuffed with high-density R-15 fiberglass batts. The interior finish is painted drywall. Beyond the studs is 7/16" (11 mm) plywood sheathing, which is covered with Tyvek house wrap. Outside of this layer is 1/2" (12 mm) Tuff R (R3.8) with cedar shingle siding on top of this.

Three sample colonies were established in the New Jersey site. The first was located in the joist system that supports the first story. A full set of studs and plates was located in the space between the joists. This location should carry some risk of corrosive conditions because it is not immune to infiltration air and outdoor conditions. The second colony was located on a cantilevered deck that hangs off the second story of the home and faces the beach. The joist bays under the deck are vented, which presented an opportunity for ocean breezes to deposit salt and/or moisture on the samples. A full set of plates was installed under this deck. The third colony was in a steel-framed exterior wall on the second floor. The colony contained plate samples.

All three-sample colonies in the New Jersey site were also equipped with sensors that measured sample surface temperature for each coating type (galvanized, galvalume, galfan) as well as the ambient relative humidity and temperature. Building components such as wall studs and floor joists were also monitored for surface temperature, establishing a one-year long record of humidity and temperature conditions for the site. The environmental measurements were analyzed following the same approach used for the Hamilton, Ontario data.

Figure 11 – New Jersey Site

Figure 12 – Open Land Between the New Jersey Site and the Ocean

Figure 13 –New Jersey Site Under Construction

Figure 14 –Balcony for the New Jersey Site

Table 3 provides an overview of where samples are installed in the four sites.

TABLE 3 - SUMMARY OF INSTALLED SAMPLES

SITE	SAMPLES/SENSORS BY COLONY			
	Crawlspace	**Wall Cavity**	**Attic**	**Other**
Miami	N/A	Studs – all 3 coatings	Plates and studs – all 3 coatings	N/A
Leonardtown	Plates – all 3 coatings; studs – all 3 coatings and bare	Plates – all 3 coatings	Plates and studs – all 3 coatings	Studs – all 3 coatings and bare samples under outdoor deck
New Jersey	Plates and studs – all 3 coatings; Sensors – metal surface temperature, and ambient relative humidity, temperature	Plates – all 3 coatings; Sensors – metal surface temperature, and ambient relative humidity, temperature	N/A	Plates – all 3 coatings under beachfront deck with metal surface temperature and ambient relative humidity, temperature, inside, and outdoor
Hamilton	N/A	Plates – all 3 coatings; Sensors – metal surface temperature, ambient relative humidity, temperature, and condensation	Plates – all 3 coatings; Sensors – metal surface temperature, ambient relative humidity, temperature, and condensation	Outdoor relative humidity, temperature

RESULTS AND DISCUSSION

General

The one-, three-, and five-year sample retrieval results were reported to ILZRO in a previous report[2]. This report includes the previous results plus the seven-year site retrieval visit and subsequent coating loss analyses on the retrieved samples. This process has been conducted with guidance from ASTM G1 – *Standard Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens*[3].

Specifically, this standard has been applied to the treatment and cleaning of samples once they are retrieved from test sites in an effort to take a post-exposure mass reading that does not include corrosion by-products. Otherwise, post-exposure mass measurements could include the mass of corrosion by-products and not accurately reflect the change in coating mass (and thickness) of the specimen.

[2] ILZRO RESEARCH PROGRAM ZC-4 *Galvanized Steel Framing for Residential Buildings*. September 2003. NAHB Research Center, Upper Marlboro, MD.
[3] ASTM G1-90 (1999) e1. *Standard Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens*. American Society for Testing and Materials, West Conshohocken, PA.

This standard offers different means by which samples can be cleaned after field exposure: mechanical, chemical, and electrolytic. When using any of these methods, the process should not result in the removal of any base metal (which would skew the mass loss measurement in the other direction). Mechanical means of cleaning was used as a first step.

The NAHB Research Center protocol in applying cleaning processes to the retrieved samples has involved the following steps:

1. Performing a visual assessment of retrieved samples and setting aside samples with any visual evidence of corrosion for cleaning.
2. Performing an initial mass measurement of all retrieved samples. Those samples showing a mass increase of 0.03 grams or more are set aside for cleaning. With a mass balance accuracy of +/- 0.01 grams, a mass gain of 0.03 grams was determined as an appropriate threshold for the possibility of corrosion products on samples.
3. For the subset of samples set aside for cleaning, a slurry solution of 1 teaspoon "Bon Ami" mild abrasive cleaner (no chlorine, 325 mesh feldspar) with 600 ml water is used to gently scrub the samples with a plastic brush. Samples are immediately dried.[4]

Chromium testing was also conducted on three-year exposed samples that were retrieved in August 2001. This testing was conducted in accordance with ASTM B201 – *Standard Practice for Testing Chromate Coatings on Zinc and Cadmium Surfaces*[5]. The purpose of this testing was to determine if a chromate covering was still present on the surfaces of any samples, because this could possibly be viewed as contributing to the corrosion resistance of the specimens. Of the nine samples tested, *none* of them showed any sign of having chromate on their surface. Summaries of mass loss results for each of the four sites are listed below.

Miami, Florida

The Miami site was first instrumented with samples in the spring/summer of 1997, and all four rounds of retrievals (one-, three-, five-, and seven-year) have been completed for this site. Table 4 characterizes the location, coating type, and corrosion loss of the samples retrieved from Miami. In almost all cases each of the measurements was performed in triplicate. Example, for galvalume plates hanging in the attic, three separate plates were retrieved and analyzed during each visit. The same is true for galvalume studs in the attic, as well as other locations and coating types.

TABLE 4 - SUMMARY OF MIAMI SITE SPECIMENS COATING LOSS DATA

[4]Cleaning with an ammonium persulfate solution per ASTM G1 was also applied on a small number of year three samples, but has been replaced with the slurry cleaning method because of the standard's recommendation for first applying mechanical means and a tendency for the ammonium persulfate method to remove base metal from samples.

[5]ASTM B201-80 (2000) *Standard Practice for Testing Chromate Coatings on Zinc and Cadmium Surfaces*. American Society for Testing and Materials, West Conshohocken, PA.

LOCATION	TYPES OF SAMPLES	YEAR 1 AVERAGE MASS LOSS[1] (gram)	YEAR 3 AVERGAE MASS LOSS [1] (gram)	YEAR 5 AVERAGE MASS LOSS[1] (gram)	YEAR 7 AVERGAE MASS LOSS[1] (gram)
Hanging in attic	Studs, plates – all 3 coatings	0.01	0.00	0.012	0.024
Exterior wall	Studs – all 3 coatings	0.01	0.00	0.01	0.024

[1] These are nominal time values. The actual values, measured in months, are close to the nominal values and vary somewhat due to multiple installation trips (e.g., multiple "starting" times) in 1997.

This data demonstrates that the coating loss that has occurred over the course of this program to the samples installed at the Miami test site is minimal. This data is based on all retrieved samples. The maximum measured coating mass loss for any sample type in any location during any exposure duration is show in Table 5.

TABLE 5 - MAXIMUM SINGLE MASS LOSS (MIAMI SITE)

RETRIEVAL YEAR	MASS LOSS[1] (grams)	MATERIAL	LOCATION
Year 1	0.02	Galfan, Galvalume, Galvanized	Suspended in Attic West Wall Cavity
Year 3	0.03	Galfan	Suspended in Attic
Year 5	0.04	Galfan	Suspended in Attic
Year 7	0.05	Galfan	Suspended in Attic

[1] The mass loss shown is the maximum mass loss or gain (absolute value) for each sample. The weight gain can be attributed to the formation of corrosion products that removes zinc from the protective coating.

During each of the four retrieval visits to this site, the samples had remained installed in their original positions and no new unusual conditions were observed. Some instances of "white rust" have been observed on chords of the steel attic trusses.

Leonardtown, Maryland

Samples at the Leonardtown site were originally installed during the fall/winter of 1997, and all four rounds of retrievals (one-, three-, five-, and seven-year) have been completed for this site (Table 6).

TABLE 6 - SUMMARY OF LEONARDTOWN SITE SPECIMENS COATING LOSS DATA

LOCATION	TYPES OF SAMPLES[1]	YEAR 1 AVERAGE MASS LOSS[2] (gram)	YEAR 3 AVERAGE MASS LOSS[2] (gram)	YEAR 5 AVERAGE MASS LOSS[2] (gram)	YEAR 7 AVERAGE MASS LOSS[2] (gram)
Hanging in crawlspace	Studs, plates-all 3 coatings	0.01	0.00	0.03	0.030
Embedded in crawlspace insulation	Studs-all 3 coatings	0.02	0.00	0.01	0.029
Hanging under outdoor deck	Studs-all 3 coatings	0.01	0.01	0.03	0.033
In exterior wall (cellulose insulation)	Plates-all 3 coatings	0.01	0.02	0.02	0.027
Hanging in attic	Studs, plates-all 3 coatings	0.01	0.01	0.01	0.017
Embedded in attic insulation	Galvanized 2 plates	0.01	0.01	0.01	0.029

[1] These are nominal time values. The actual values, measured in months, are close to the nominal values and may vary somewhat due to multiple installation trips.

[2] Some locations also contained bare steel samples, which have been exposed and analyzed, but this data is not included here because it would mischaracterize the performance of the coated specimens.

The mass loss figures presented above also show very little loss of coating mass over the seven-year exposure durations. Table 7 provides a summary of the single-largest mass decline for each retrieval period.

TABLE 7 - MAXIMUM SINGLE MASS LOSS (LEONARDTOWN SITE)

RETRIEVAL YEAR	MASS LOSS[1] (grams)	MATERIAL	LOCATION
Year 1	0.03	Galfan	Under Outdoor Deck
Year 3	0.03	Galfan, Galvanized	Under Outdoor Deck Open Crawl Space
Year 5	0.03	Galfan, Galvanized	Under Outdoor Deck Open Crawl Space
Year 7	0.037	Galfan, Galvanized	Open Crawl Space Under Outdoor Deck

[1] The mass loss shown is the maximum mass loss or gain (absolute value) for each sample. The weight gain can be attributed to the formation of corrosion products that removes zinc from the protective coating.

Hamilton, Ontario

The Hamilton site has been under operation since winter of 1997, and all four (one-, three-, five-, and seven-year) rounds of retrievals have been completed for this site (Table 8). In July 1999 the first batch of specimens was retrieved from the site and the data acquisition system was also removed. This monitoring network had recorded temperature and humidity conditions throughout the structure for a one-year period (see below).

TABLE 8 - SUMMARY OF HAMILTON SITE SPECIMENS COATING LOSS DATA

LOCATION	TYPES OF SAMPLES	YEAR 1 AVERAGE MASS LOSS[1] (gram)	YEAR 3 AVERAGE MASS LOSS[1] (gram)	YEAR 5 AVERAGE MASS LOSS[1] (gram)	YEAR 7 AVERAGE MASS LOSS[1] (gram)
Hanging in attic	Plates-all coatings	0.00	0.00	0.01	0.014
Exterior wall	Plates-all 3 coatings	0.00	N/A[2]	0.01	0.020

[1] These are nominal time values. The actual values, measured in months, are close to the nominal values and vary due to multiple installation trips.

[2] Exterior wall samples were not retrieved during the Year 3 trip because of the low number of installed samples due to space constraints. It was deemed more valuable to keep the remaining samples in this location until Years 5 and 7.

The mass loss figures presented above also show very little loss of coating mass over the seven-year exposure durations. Table 9 provides a summary of the single-largest mass decline for each retrieval period.

TABLE 9 - MAXIMUM SINGLE MASS LOSS (HAMILTON SITE)

RETRIEVAL YEAR	MASS LOSS[1] (grams)	MATERIAL	LOCATION
Year 1	0.01	All	All Locations
Year 3	0.02	Galvanized	Hanging in Attic
Year 5	0.01	All	All Locations
Year 7	0.02	All	All Locations

[1] The mass loss shown is the maximum mass loss or gain (absolute value) for each sample. The weight gain can be attributed to the formation of corrosion products that removes zinc from the protective coating.

Mass loss measurements for samples retrieved from Hamilton show very little decrease in magnitude. This corresponds well with the environmental data collected throughout 1998, which indicated almost no potential for any condensation conditions based upon surface temperatures and dew point temperatures near the samples.

A one-year record of environmental conditions within the structure had been recorded and processed (up to December 1998). The chief measurements used in the analysis of conditions

were metal surface temperatures, ambient relative humidity and temperature in each sample colony, and outdoor relative humidity and temperature. The ambient relative humidity and temperature measurements were used to determine a local (i.e., within the wall) vapor pressure and dew point temperature for each sample colony as well as outdoors. When combined with the surface temperatures of the metal samples and other framing components, which are measured with small bead thermistors, a comparison could be made of sample temperatures and the local dew point temperature for a location. In this way, a record of potential condensation and wetness on the samples was gained.

A sample of the output from the dew point analysis is shown below in Figure 15. The graph depicts the temperatures of the test samples and framing components located in the ventilated attic space colony. It also compares these temperatures to the attic dew point temperature.

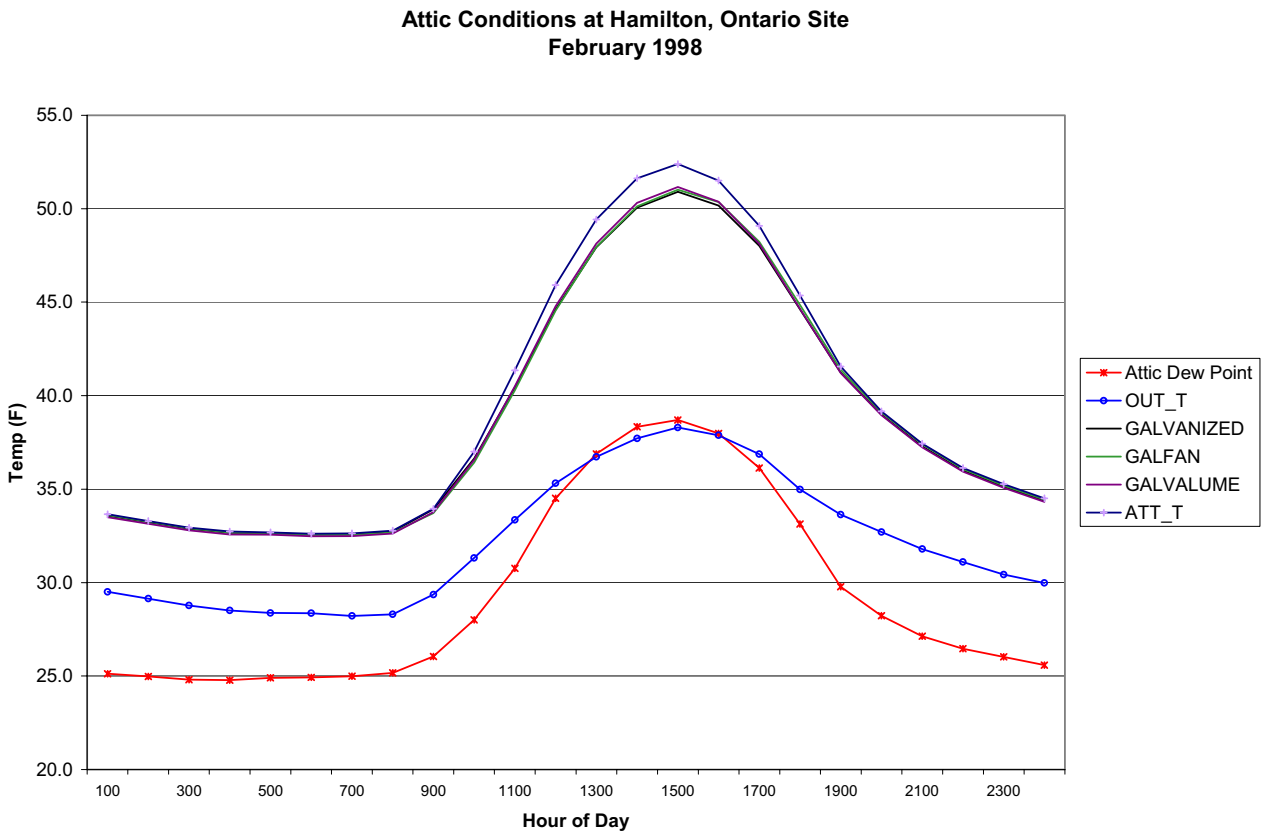

Figure 15 - Temperatures vs. Dew Point at Hamilton Site

This analysis was performed for both the wall colony and the attic colony for every month of the year. In most instances, metal surface temperatures – as well as the surface temperatures of a wall stud and base plate – remained above dew point temperature for the space. This result demonstrates that the thermal performance and moisture control of the site were sufficient to prevent wetness in the wall cavity or the attic.

The graph shown in Figure 15 is based on hourly averages taken during each day of the month. For instance, all of the 1:00 p.m. readings for attic temperature were averaged together to arrive at an average value of 49.4°F (9.1°C) While this approach is useful in summarizing a large

amount of data, it tends to dampen out extreme conditions, possibly hiding short-term circumstances during which condensation conditions could have existed.

Therefore, an even more rigorous examination was performed on the data to determine if conditions for condensation were ever present. This involved looking at every hour of data for the year and comparing all surface temperatures and dew points for the attic and exterior wall colonies. The results demonstrated that for every hour of the year, the surface temperatures of the corrosion samples were greater than dew point (both attic and wall colonies). The bottom track of the wall cavity, however, experienced conditions for wetness during 120 hours of the year – or 1 percent of the time. Lastly, the exterior wall stud was colder than dew point about 7 hours during the year.

Long Beach Island, New Jersey

The New Jersey site was equipped with corrosion samples and a monitoring system in August 1998. All four rounds (one-, three-, five-, and seven-year) of retrievals have been completed for this site and the data acquisition system removed. The retrieved samples have been analyzed for coating weight loss (Table 10) and the environmental data processed using the same approach explained above in the Hamilton section.

TABLE 10 - SUMMARY OF LONG BEACH ISLAND, NJ SITE, COATING LOSS DATA

LOCATION	TYPES OF SAMPLES	YEAR 1 AVERAGE MASS LOSS[1] (gram)	YEAR 3 AVERAGE MASS LOSS[1] (gram)	YEAR 5 AVERAGE MASS LOSS[1] (gram)	YEAR 7 AVERAGE MASS LOSS[1] (gram)
Suspended between joists in carport area beneath house	Studs, plates-all 3 coatings	0.01	0.01	0.02	0.04
Suspended between joists supporting 2nd floor outdoor deck	Plates-all 3 coatings	0.01	0.00	0.01	0.03
Exterior wall in 2nd floor bathroom	Plates-all 3 coatings	0.00	0.00	0.02	0.013

[1] These are nominal time values. The actual values, measured in months, are close to the nominal values.

The mass loss figures presented above also show very little loss of coating mass over the seven-year exposure duration. Table 11 provides a summary of the single-largest mass decline for each retrieval period. The data for the New Jersey site is consistent with the other sites and shows very low mass-loss values over the seven years of exposure.

TABLE 11 - MAXIMUM SINGLE MASS LOSS (NEW JERSEY SITE)

RETRIEVAL YEAR	MASS LOSS[1] (grams)	MATERIAL	LOCATION
Year 1	0.02	Galfan	Suspended between joists in carport area beneath house
Year 3	0.02	Galvanized	Under Outdoor Deck
Year 5	0.02	Galfan	Inside Bathroom Wall
Year 7	0.04	Galfan	Suspended between joists in carport area beneath house

[1] The mass loss shown is the maximum mass loss or gain (absolute value) for each sample. The weight gain can be attributed to the formation of corrosion products that removes zinc from the protective coating.

The results of the one-year environmental analysis revealed that all measured building component (e.g., steel studs, joists) and sample temperatures remained above the dew point in all three colonies. This result was true for both the monthly analysis and for the hour-by-hour analysis of the entire year. None of the samples or building components (a tie down, deck joist, and floor joist) that were monitored for surface temperature experienced even 1 hour below dew point temperature. The first-floor joist area, exterior deck joist area, and bathroom exterior wall colonies all maintained temperature and humidity conditions that would prevent condensation from forming on the metal surfaces. An example from the New Jersey data analysis is shown in Figure 16.

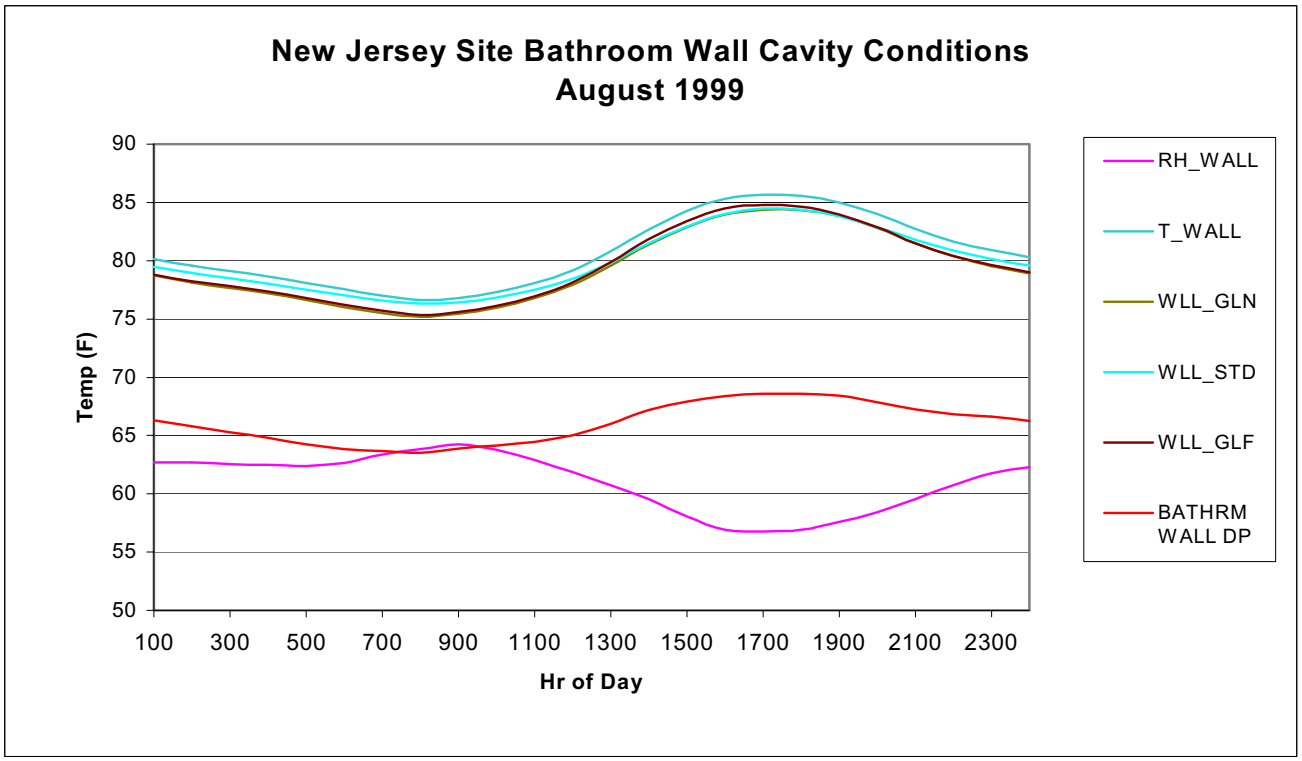

Figure 16 - Temperatures vs. Dew Point at New Jersey Site

Corrosion Results

Tables 12 and 13 summarize the average mass loss for all four sites, all samples, and all locations.

TABLE 12 - SUMMARY OF AVERAGE MASS LOSS FOR HAMILTON, MIAMI, AND NEW JERSEY SITES[1]

Site Location	Sample Material	Sample Type	Sample Location	Average Mass Loss (grams) Retrieval Year			
				Year 1	Year 3	Year 5	Year 7
Hamilton, Ontario	Galvanized 2	Plate	Attic	0	0	0	0.013
			Wall	0	-	0.01	0.020
	Galvalume		Attic	0	0	0.01	0.017
			Wall	0.01	-	0.01	0.020
	Galfan		Attic	0.01	0	0	0.013
			Wall	0	-	0.01	0.020
Miami, Florida	Galvanized 1	Stud	Attic	0.02	0.01	0.01	0.017
			Wall	0.01	0.01	0.01	0.020
	Galvalume		Attic	-	0	0	0.020
			Wall	0.01	0	0.01	0.023
	Galfan		Attic	0.01	0	0.01	0.033
			Wall	0.02	0.01	0.01	0.030
	Galvanized 2	Plate	Attic	0.01	0.01	0	0.017
	Galvalume			0.01	0	0.01	0.013
	Galfan			0	0.01	0.04	0.033
Long Beach Island, New Jersey	Galvanized 1	Stud	Crawl Space/Floor	0	0	0.01	0.023
	Galvalume			0	0	0	0.020
	Galfan			0	0.01	0.01	0.027
	Galvanized 1	Plate	Wall	0.01	0	0.01	0.013
			Crawl Space/Floor	0.01	0.01	0.01	0.020
			Under Deck	0.02	0.02	0	0.030
	Galvalume		Wall	0	0	0.01	0.013
			Crawl Space/Floor	0.01	0.01	0.01	0.027
			Under Deck	0.01	0.01	0	0.023
	Galfan		Wall	0.01	0	0.01	0.013
			Crawl Space/Floor	0.02	0.01	0.01	0.040
			Under Deck	0.01	0.01	0.01	0.027

[1]The mass loss shown is the maximum mass loss or gain (absolute value) for each sample. The weight gain can be attributed to the formation of corrosion products that removes zinc from the protective coating.

TABLE 13 – SUMMARY OF AVERAGE MASS LOSS FOR LEONARDTOWN SITE[1]

Site Location	Sample Material	Sample Type	Sample Location	Average Mass Loss (grams) Retrieval Year			
				Year 1	Year 3	Year 5	Year 7
Leonardtown, Maryland	Galvanized 1	Stud	Attic	0.01	0	0	0.023
			Crawl Space/Open	0.01	0.01	0.01	0.017
			Crawl Space/Batts	0	0.02	0.02	0.037
			Under Deck	0.02	0.03	0.03	0.037
	Galvalume		Attic	0	0	0	0.017
			Crawl Space/Open	0.01	0	0.01	0.033
			Crawl Space/Batts	0.01	0.01	0.01	0.027
			Under Deck	0.01	0	0.01	0.030
	Galfan		Attic	—	0	0	0.010
			Crawl Space/Open	—	0.02	0.02	0.037
			Crawl Space/Batts	0.03	0.01	0.01	0.023
			Under Deck	0.03	0.02	0.02	0.033
	Galvanized 2	Plate	Attic	0.01	0.01	0.01	0.017
			Wall	0.02	0.02	0.01	0.020
			Crawl Space/Open	—	0.01	0.03	0.037
	Galvalume		Attic	—	0.01	0	0.017
			Wall	0	—	—	—
			Crawl Space/Open	—	0.01	0.01	0.030
	Galfan		Attic	—	0.02	0	0.017
			Wall	—	0.02	0.02	0.033
			Crawl Space/Open	—	0	0.01	0.023

[1]The mass loss shown is the maximum mass loss or gain (absolute value) for each sample. The weight gain can be attributed to the formation of corrosion products that removes zinc from the protective coating.

Estimated Life

The average corrosion rate (life expectancy) of the plate samples can be estimated using the calculation method in ASTM G 1-90[6] and shown below:

Corrosion Rate = (KxW)/(AxTxD)

Where:

K = constant = 8.76×10^7 μm/yr,
W = mass loss in grams,
A = area in cm^2 (100 cm^2)
T = time of exposure in hours, and
D = density in g/cm^3.

The mass loss used (W) is the 7-year maximum single mass loss for each of the coating types and sample locations (from Appendix A). This provides a conservative estimate (lower bound) for the life span of each coating type. For example, the maximum single mass loss for the Galfan plates at the New Jersey site (suspended in carport beneath house) is 0.04 grams for year seven retrieval. This mass loss is used in the corrosion rate calculation. Furthermore, the estimated life expectancy shown in Table 14 is conservatively based on 75 percent of the initial coating thickness.

Table 15 provides the estimated life span using the nominal coating weight of each of the samples listed in Table 14 instead of the actual coating weight. For example, the Galvanized 2 plates in the Hamilton, Ontario site have an actual (measured) coating thickness of 29 microns and a coating weight of 206 g/m^2. The nominal coating weight of the galvanized samples is 180 g/m^2 (Z180) with a coating thickness of 25 microns. Using the nominal values provides a lower bound estimate of the life expectancy for the standard coated samples.

Table 16 provides the percent difference between the estimated life expectancy of the coated samples using the measured coated thickness (Table 14) and the nominal coating thickness (Table 15).

Table 17 shows the average life span for the different coatings for all locations based on the average seven-year retrieval mass loss for each particular coating type (i.e., the average of year 7 retrievals from Appendix A and Table 12).

[6] ASTM G1-90 (1999) e1. *Standard Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens*. American Society for Testing and Materials, West Conshohocken, PA

TABLE 14 - ESTIMATED LIFE EXPECTANCY – MEASURED COATING WEIGHT (PLATE SAMPLES, MAXIMUM SINGLE MASS LOSS)

Site Location	Sample Material	Sample Location	Mass Loss (grams)	Exposure Duration (months)	Corrosion Rate (μ/yr)	Estimated Life Expectancy (years)
Hamilton Ontario	Galvanized 2	Attic	0.02	98	0.1439	302
		Wall	0.02	98	0.1439	302
	Galvalume	Attic	0.02	98	0.2740	246
		Wall	0.02	98	0.2740	246
	Galfan	Attic	0.02	98	0.1534	460
		Wall	0.02	98	0.1534	460
Miami Florida	Galvanized 2	Attic	0.02	99	0.1424	305
	Galvalume		0.02	99	0.2712	249
	Galfan		0.04	99	0.3036	232
Long Beach Island New Jersey	Galvanized 1	Wall	0.02	87	0.1621	352
		Floor	0.02	87	0.1621	352
		Under Deck	0.04	87	0.3242	176
	Galvalume	Wall	0.02	87	0.3086	219
		Floor	0.03	87	0.4629	146
		Under Deck	0.03	87	0.4629	146
	Galfan	Wall	0.02	87	0.1727	408
		Floor	0.05	87	0.4318	163
		Under Deck	0.03	87	0.2591	272
Leonardtown Maryland	Galvanized 2	Attic	0.02	93	0.1516	287
		Wall	0.02	93	0.1516	287
		Crawl /Open	0.04	93	0.3033	143
	Galvalume	Attic	0.02	98	0.2740	246
		Crawl /Open	0.04	98	0.5480	123
	Galfan	Attic	0.02	98	0.1534	460
		Wall	0.04	98	0.3067	230
		Crawl /Open	0.03	98	0.2300	306

[1]The mass loss shown is the maximum single mass loss or gain (absolute value) for each sample from year seven retrieval results.

TABLE 15 - ESTIMATED LIFE EXPECTANCY - NOMINAL COATING WEIGHT (PLATE SAMPLES, MAXIMUM SINGLE MASS LOSS)

Site Location	Sample Material	Sample Location	Mass Loss (grams)	Exposure Duration (months)	Corrosion Rate (μ/yr)	Estimated Life Expectancy (years)
Hamilton Ontario	Galvanized 2	Attic	0.02	98	0.1439	261
		Wall	0.02	98	0.1439	261
	Galvalume	Attic	0.02	98	0.2740	224
		Wall	0.02	98	0.2740	224
	Galfan	Attic	0.02	98	0.1534	401
		Wall	0.02	98	0.1534	401
Miami Florida	Galvanized 2	Attic	0.02	99	0.1424	263
	Galvalume		0.02	99	0.2712	227
	Galfan		0.04	99	0.3036	203
Long Beach Island New Jersey	Galvanized 1	Wall	0.02	87	0.1621	231
		Floor	0.02	87	0.1621	231
		Under Deck	0.04	87	0.3242	116
	Galvalume	Wall	0.02	87	0.3086	199
		Floor	0.03	87	0.4629	133
		Under Deck	0.03	87	0.4629	133
	Galfan	Wall	0.02	87	0.1727	356
		Floor	0.05	87	0.4318	142
		Under Deck	0.03	87	0.2591	237
Leonardtown Maryland	Galvanized 2	Attic	0.02	93	0.1516	247
		Wall	0.02	93	0.1516	247
		Crawl /Open	0.04	93	0.3033	124
	Galvalume	Attic	0.02	98	0.2740	224
		Crawl /Open	0.04	98	0.5480	112
	Galfan	Attic	0.02	98	0.1534	401
		Wall	0.04	98	0.3067	201
		Crawl /Open	0.03	98	0.2300	267

[1]The mass loss shown is the maximum single mass loss or gain (absolute value) for each sample from year seven retrieval results.

TABLE 16 – PERCENT DIFFERENCE BETWEEN ESTIMATED LIFE EXPECTANCY FOR MEASURED AND NOMINAL COATING WEIGHT

Site Location	Sample Material	Sample Location	Life Expectancy based on Measured Coating Thickness (years)	Life Expectancy based on Nominal Coating Thickness (years)	Percent Difference[1]
Hamilton Ontario	Galvanized 2	Attic	302	261	-16.00%
		Wall	302	261	-16.00%
	Galvalume	Attic	246	224	-9.76%
		Wall	246	224	-9.76%
	Galfan	Attic	460	401	-14.63%
		Wall	460	401	-14.63%
Miami Florida	Galvanized 2	Attic	305	263	-16.00%
	Galvalume		249	227	-9.76%
	Galfan		232	203	-14.63%
Long Beach Island New Jersey	Galvanized 1	Wall	352	231	-52.00%
		Floor	352	231	-52.00%
		Under Deck	176	116	-52.00%
	Galvalume	Wall	219	199	-9.76%
		Floor	146	133	-9.76%
		Under Deck	146	133	-9.76%
	Galfan	Wall	408	356	-14.63%
		Floor	163	142	-14.63%
		Under Deck	272	237	-14.63%
Leonardtown Maryland	Galvanized 2	Attic	287	247	-16.00%
		Wall	287	247	-16.00%
		Crawl /Open	143	124	-16.00%
	Galvalume	Attic	246	224	-9.76%
		Crawl /Open	123	112	-9.76%
	Galfan	Attic	460	401	-14.63%
		Wall	230	201	-14.63%
		Crawl /Open	306	267	-14.63%

[1]The percent difference is calculated as: Nominal Coating Thickness Estimated Life minus Measured Coating Thickness Estimated Life) divided by Nominal Coating Thickness Estimated Life.

TABLE 17 - ESTIMATED LIFE EXPECTANCY – MEASURED COATING WEIGHT (PLATE SAMPLES, 7-YEAR AVERAGE MASS LOSS)

Site Location	Sample Material	Sample Location	Mass Loss (grams)	Exposure Duration (months)	Corrosion Rate (μ/yr)	Estimated Life Expectancy (years)
Hamilton Ontario	Galvanized 2	Attic	0.013	98	0.0935	465
		Wall	0.020	98	0.1439	302
	Galvalume	Attic	0.017	98	0.2329	187
		Wall	0.020	98	0.2740	246
	Galfan	Attic	0.013	98	0.0997	707
		Wall	0.020	98	0.1534	460
Miami Florida	Galvanized 2	Attic	0.017	99	0.1211	359
	Galvalume		0.013	99	0.1763	383
	Galfan		0.033	99	0.2505	281
Long Beach Island New Jersey	Galvanized 1	Wall	0.013	87	0.1054	541
		Floor	0.020	87	0.1621	352
		Under Deck	0.030	87	0.2431	234
	Galvalume	Wall	0.013	87	0.2006	336
		Floor	0.027	87	0.4166	162
		Under Deck	0.023	87	0.3549	190
	Galfan	Wall	0.013	87	0.1123	628
		Floor	0.040	87	0.3455	204
		Under Deck	0.027	87	0.2332	302
Leonardtown Maryland	Galvanized 2	Attic	0.017	93	0.1289	337
		Wall	0.020	93	0.1516	287
		Crawl /Open	0.037	93	0.2805	155
	Galvalume	Attic	0.017	98	0.2329	290
		Crawl /Open	0.030	98	0.4110	164
	Galfan	Attic	0.017	98	0.1303	541
		Wall	0.033	98	0.2530	279
		Crawl /Open	0.023	98	0.1764	400

CONCLUSIONS

All four rounds (one-, three-, five, and seven-year) of retrievals have been completed for all four-test sites. Coating loss measurements from the four sites have indicated minor mass loss rates for all sample types (e.g., studs, plates), all sample coatings (e.g., galvanized, galvalume, and galfan), and all sample colonies (e.g., crawlspaces, walls, attics, joists). The fastest coating corrosion rate observed for any of the four sites was a loss of 0.05 grams for one galfan plate sample installed in the floor above the carport of the New Jersey site after seven years of exposure.

The estimated life spans for all plate samples were calculated based on the maximum duration of exposure (i.e., seven year exposure). The life expectancy was calculated using the ASTM G1 method. The life expectancy based on single maximum mass losses for plate samples ranged from 123 to 460 years for all samples at all locations. The highest life span would be for the galfan plate sample located in the attic and wall cavity of the Hamilton site and in the attic of the Leonardtown site (0.02 grams mass loss after seven years of exposure).

The next highest life span was calculated for a galfan plate sample in the New Jersey site (408 years). The lowest life span (123 years) was calculated for one galvalume plate sample located in the crawl space floor of the Leonardtown site after seven years of exposure.

The estimated life expectancy of the coated samples using the nominal coating weights was on average -17.75% lower than the estimated life expectancy using the actual (measured) coating weight. The estimated life expectancy using the nominal coating weights ranged from 112 to 401 years with an average of 233 years for all samples at all locations. Table 18 summarizes the average estimated life spans for each of the coatings (at all locations):

TABLE 18 - ESTIMATED AVERAGE LIFE SPAN BASED SEVEN YEAR EXPOSURE

COATING	AVERAGE LIFE SPAN IN YEARS BASED ON:		
	AVERAGE MASS LOSS (ACTUAL COATING THICKNESS) [1]	MAXIMUM SINGLE MASS LOSS (ACTUAL COATING THICKNESS) [1]	MAXIMUM MASS LOSS (NOMINAL COATING THICKNESS) [1]
Galvanized 1	376	293	193
Galvanized 2	318	271	234
Galvalume	392	324	295
Galfan	422	332	290
Average	**377**	**305**	**253**

The environmental data collected from the Hamilton and New Jersey sites in the earlier years of this program indicates that the samples and their micro-environments (e.g., a wall cavity) remain dry throughout the year. This observation supports the low coating loss measurements reported for these two sites over one-, three-, five-, and seven-year exposure periods.

APPENDIX A

SAMPLE RETRIEVAL DATA

Year 1 Retrieval Results
Hamilton, Ontario Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure(g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-255	92.16	92.15	0.01	16-Oct-97	22-Jul-99	21	plate	galvanized2	7.14	206	29	E wall, colony A
6-256	92.34	92.35	-0.01	16-Oct-97	22-Jul-99	21	plate	galvanized2	7.14	206	29	E wall, colony A
6-257	90.31	90.31	0.00	16-Oct-97	22-Jul-99	21	plate	galvanized2	7.14	206	29	E wall, colony A
AVG. LOSS/GAIN: 0.00												
6-264	92.38	92.37	0.01	16-Oct-97	22-Jul-99	21	plate	Galvanize2	7.14	206	29	attic
6-265	91.73	91.73	0.00	16-Oct-97	22-Jul-99	21	plate	galvanized2	7.14	206	29	attic
6-267	92.54	92.54	0.00	16-Oct-97	22-Jul-99	21	plate	galvanized2	7.14	206	29	attic
AVG. LOSS/GAIN: 0.00												
7-191	69.65	69.65	0.00	16-Oct-97	22-Jul-99	21	plate	galvalume2	3.75	168	45	E wall, colony A
7-192	69.57	69.56	0.01	16-Oct-97	22-Jul-99	21	plate	galvalume2	3.75	168	45	E wall, colony A
7-193	69.61	69.60	0.01	16-Oct-97	22-Jul-99	21	plate	galvalume2	3.75	168	45	E wall, colony A
AVG. LOSS/GAIN: 0.01												
7-200	69.47	69.47	0.00	16-Oct-97	22-Jul-99	21	plate	galvalume2	3.75	168	45	attic
7-201	69.88	69.88	0.00	16-Oct-97	22-Jul-99	21	plate	galvalume2	3.75	168	45	attic
7-205	69.54	69.53	0.01	16-Oct-97	22-Jul-99	21	plate	galvalume2	3.75	168	45	attic
AVG. LOSS/GAIN: 0.00												
8-39	117.73	117.73	0.00	16-Oct-97	22-Jul-99	21	plate	galfan	6.7	315	47	E wall, Colony A
8-40	117.61	117.61	0.00	16-Oct-97	22-Jul-99	21	plate	galfan	6.7	315	47	E wall, Colony A
8-41	117.83	117.83	0.00	16-Oct-97	22-Jul-99	21	plate	galfan	6.7	315	47	E wall, Colony A
AVG. LOSS/GAIN: 0.00												
8-51	116.78	116.78	0.00	16-Oct-97	22-Jul-99	21	plate	galfan	6.7	315	47	attic
8-52	117.57	117.56	0.01	16-Oct-97	22-Jul-99	21	plate	galfan	6.7	315	47	attic
8-53	117.94	117.93	0.01	16-Oct-97	22-Jul-99	21	plate	galfan	6.7	315	47	attic
AVG. LOSS/GAIN: 0.01												

Year 3 Retrieval Results
Hamilton, Ontario Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure(g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-261	91.07	91.08	-0.01	16-Oct-97	02-Nov-01	48	plate	galvanized2	7.14	206	29	attic
6-262	91.62	91.62	0.00	16-Oct-97	02-Nov-01	48	plate	galvanized2	7.14	206	29	attic
6-263	91.98	91.96	0.02	16-Oct-97	02-Nov-01	48	plate	galvanized2	7.14	206	29	attic
AVG. LOSS/GAIN: 0.00												
7-197	69.59	69.58	0.01	16-Oct-97	02-Nov-01	48	plate	galvalume2	3.75	168	45	attic
7-198	69.55	69.55	0.00	16-Oct-97	02-Nov-01	48	plate	galvalume2	3.75	168	45	attic
7-202	69.82	69.82	0.00	16-Oct-97	02-Nov-01	48	plate	galvalume2	3.75	168	45	attic
AVG. LOSS/GAIN: 0.00												
8-45	116.88	116.87	0.01	16-Oct-97	02-Nov-01	48	plate	galfan	6.7	315	47	attic
8-46	116.85	116.85	0.00	16-Oct-97	02-Nov-01	48	plate	galfan	6.7	315	47	attic
8-47	117.84	117.85	-0.01	16-Oct-97	02-Nov-01	48	plate	galfan	6.7	315	47	attic
AVG. LOSS/GAIN: 0.00												
6-261	91.07	91.08	-0.01	16-Oct-97	02-Nov-01	48	plate	galvanized2	7.14	206	29	attic
6-262	91.62	91.62	0.00	16-Oct-97	02-Nov-01	48	plate	galvanized2	7.14	206	29	attic
6-263	91.98	91.96	0.02	16-Oct-97	02-Nov-01	48	plate	galvanized2	7.14	206	29	attic
AVG. LOSS/GAIN: 0.00												

Year 5 Retrieval Results
Hamilton, Ontario Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure (g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-268	92.04	92.04	0.00	16-Oct-97	21-Dec-02	62	plate	galvanized2	7.14	206	29	Attic - Hanging
6-269	91.73	91.72	0.01	16-Oct-97	21-Dec-02	62	plate	galvanized2	7.14	206	29	Attic - Hanging
6-270	91.22	91.22	0.00	16-Oct-97	21-Dec-02	62	plate	galvanized2	7.14	206	29	Attic- Hanging
AVG. LOSS/GAIN: 0.00												
6-258	92.16	92.16	0.00	16-Oct-97	21-Dec-02	62	Plate	galvanized2	7.14	206	29	Wall
6-259	91.70	91.69	0.01	16-Oct-97	21-Dec-02	62	Plate	galvanized2	7.14	206	29	Wall
6-260	91.52	91.51	0.01	16-Oct-97	21-Dec-02	62	Plate	galvanized2	7.14	206	29	Wall
AVG. LOSS/GAIN: 0.01												
7-194	70.05	70.04	0.01	16-Oct-97	21-Dec-02	62	plate	galvalume2	3.75	168	45	Wall
7-195	69.59	69.59	0.00	16-Oct-97	21-Dec-02	62	plate	galvalume2	3.75	168	45	Wall
7-196	69.64	69.63	0.01	16-Oct-97	21-Dec-02	62	plate	galvalume2	3.75	168	45	Wall
AVG. LOSS/GAIN: 0.01												
7-202	69.82	69.81	0.01	16-Oct-97	21-Dec-02	62	plate	galvalume2	3.75	168	45	Attic - Hanging
7-203	69.69	69.68	0.01	16-Oct-97	21-Dec-02	62	plate	galvalume2	3.75	168	45	Attic - Hanging
7-204	69.90	69.90	0.00	16-Oct-97	21-Dec-02	62	plate	galvalume2	3.75	168	45	Attic - Hanging
AVG. LOSS/GAIN: 0.01												
8-48	116.75	116.74	0.01	16-Oct-97	21-Dec-02	62	plate	galfan	6.7	315	47	Attic - Hanging
8-49	117.66	117.66	0.00	16-Oct-97	21-Dec-02	62	plate	galfan	6.7	315	47	Attic - Hanging
8-50	117.96	117.96	0.00	16-Oct-97	21-Dec-02	62	plate	galfan	6.7	315	47	Attic - Hanging
AVG. LOSS/GAIN: 0.00												
8-42	115.81	115.8	0.01	16-Oct-97	21-Dec-02	62	plate	galfan	6.7	315	47	Wall
8-43	116.79	116.78	0.01	16-Oct-97	21-Dec-02	62	plate	galfan	6.7	315	47	Wall
8-44	116.91	116.91	0.00	16-Oct-97	21-Dec-02	62	plate	galfan	6.7	315	47	Wall
AVG. LOSS/GAIN: 0.01												

Year 7 Retrieval Results
Hamilton, Ontario Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure (g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-750	90.73	90.72	0.01	16-Oct-97	7-Dec-05	98	plate	galvanized2	7.14	206	29	Attic - Hanging
6-751	91.14	91.12	0.02	16-Oct-97	7-Dec-05	98	plate	galvanized2	7.14	206	29	Attic - Hanging
6-752	91.07	91.06	0.01	16-Oct-97	7-Dec-05	98	plate	galvanized2	7.14	206	29	Attic- Hanging
AVG. LOSS/GAIN: 0.013												
6-753	91.61	91.59	0.02	16-Oct-97	7-Dec-05	98	Plate	galvanized2	7.14	206	29	Wall
6-754	91.46	91.44	0.02	16-Oct-97	7-Dec-05	98	Plate	galvanized2	7.14	206	29	Wall
6-755	91.58	91.56	0.02	16-Oct-97	7-Dec-05	98	Plate	galvanized2	7.14	206	29	Wall
AVG. LOSS/GAIN: 0.02												
7-865	115.45	115.43	0.02	16-Oct-97	7-Dec-05	98	plate	galvalume2	3.75	168	45	Wall
7-866	115.32	115.30	0.02	16-Oct-97	7-Dec-05	98	plate	galvalume2	3.75	168	45	Wall
7-867	114.98	114.96	0.02	16-Oct-97	7-Dec-05	98	plate	galvalume2	3.75	168	45	Wall
AVG. LOSS/GAIN: 0.020												
7-862	69.74	69.72	0.02	16-Oct-97	7-Dec-05	98	plate	galvalume2	3.75	168	45	Attic - Hanging
7-863	69.68	69.66	0.02	16-Oct-97	7-Dec-05	98	plate	galvalume2	3.75	168	45	Attic - Hanging
7-864	69.81	69.8	0.01	16-Oct-97	7-Dec-05	98	plate	galvalume2	3.75	168	45	Attic - Hanging
AVG. LOSS/GAIN: 0.017												
8-850	116.75	116.73	0.02	16-Oct-97	7-Dec-05	98	plate	galfan	6.7	315	47	Attic - Hanging
8-851	117.66	117.65	0.01	16-Oct-97	7-Dec-05	98	plate	galfan	6.7	315	47	Attic - Hanging
8-852	117.96	117.95	0.01	16-Oct-97	7-Dec-05	98	plate	galfan	6.7	315	47	Attic - Hanging
AVG. LOSS/GAIN: 0.013												
8-856	115.96	115.94	0.02	16-Oct-97	7-Dec-05	98	plate	galfan	6.7	315	47	Wall
8-857	116.12	116.1	0.02	16-Oct-97	7-Dec-05	98	plate	galfan	6.7	315	47	Wall
8-858	116.87	116.85	0.02	16-Oct-97	7-Dec-05	98	plate	galfan	6.7	315	47	Wall
AVG. LOSS/GAIN: 0.020												

Year 1 Retrieval Results
Miami, Florida Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure(g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-1	48.52	48.51	0.01	7-May-97	24-Jul-98	15	stud	galvanized1	7.14	273	38	attic - hanging
6-2	46.74	46.72	0.02	7-May-97	24-Jul-98	15	stud	galvanized1	7.14	273	38	attic - hanging
6-3	41.29	41.27	0.02	7-May-97	24-Jul-98	15	stud	galvanized1	7.14	273	38	attic - hanging
AVG. LOSS/GAIN: 0.02												
6-39	45.17	45.16	0.01	7-May-97	24-Jul-98	15	stud	galvanized1	7.14	273	38	west wall - 5'
6-40	44.50	44.49	0.01	7-May-97	24-Jul-98	15	stud	galvanized1	7.14	273	38	west wall - 5'
6-41	45.78	45.78	0.00	7-May-97	24-Jul-98	15	stud	galvanized1	7.14	273	38	west wall - 5'
AVG. LOSS/GAIN: 0.01												
6-200	92.46	92.48	-0.02	28-Aug-97	24-Jul-98	11	plate	galvanized2	7.14	206	29	attic - hanging
6-201	91.99	91.99	0.00	28-Aug-97	24-Jul-98	11	plate	galvanized2	7.14	206	29	attic - hanging
6-202	91.36	91.36	0.00	28-Aug-97	24-Jul-98	11	plate	galvanized2	7.14	206	29	attic - hanging
AVG. LOSS/GAIN: -0.01												
7-1	31.73	31.72	0.01	7-May-97	24-Jul-98	15	stud	galvalume1	3.75	227	60	attic - hanging
7-2	36.15	36.15	0.00	7-May-97	24-Jul-98	15	stud	galvalume1	3.75	227	60	attic - hanging
7-3	37.70	37.71	-0.01	7-May-97	24-Jul-98	15	stud	galvalume1	3.75	227	60	attic - hanging
AVG. LOSS/GAIN: 0.00												
7-83	43.3	43.31	-0.01	20-Mar-98	24-Jul-98	4	stud	galvalume2	3.75	168	45	west wall - 2'
7-86	45.59	45.57	0.02	20-Mar-98	24-Jul-98	4	stud	galvalume2	3.75	168	45	west wall - 5'
7-89	45.26	45.25	0.01	20-Mar-98	24-Jul-98	4	stud	galvalume2	3.75	168	45	west wall - 7.5'
AVG. LOSS/GAIN: 0.01												
7-150	70.06	70.06	0.00	28-Aug-97	24-Jul-98	15	plate	galvalume2	3.75	168	45	attic - hanging
7-151	69.67	69.65	0.02	28-Aug-97	24-Jul-98	15	plate	galvalume2	3.75	168	45	attic - hanging
7-152	69.40	69.39	0.01	28-Aug-97	24-Jul-98	15	plate	galvalume2	3.75	168	45	attic - hanging
AVG. LOSS/GAIN: 0.01												

Year 1 Retrieval Results (cont.)
Miami, Florida Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure(g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
8-1	117.12	117.12	0.00	28-Aug-97	24-Jul-98	15	plate	galfan	6.7	315	47	attic - hanging
8-2	118.23	118.23	0.00	28-Aug-97	24-Jul-98	15	plate	galfan	6.7	315	47	attic - hanging
8-3	116.48	116.48	0.00	28-Aug-97	24-Jul-98	15	plate	galfan	6.7	315	47	attic - hanging
AVG. LOSS/GAIN: 0.00												
8-150	68.47	68.46	0.01	28-Aug-97	24-Jul-98	15	stud	galfan	6.7	315	47	attic - hanging
8-152	73.77	73.75	0.02	28-Aug-97	24-Jul-98	15	stud	galfan	6.7	315	47	attic - hanging
8-153	71.62	71.61	0.01	28-Aug-97	24-Jul-98	15	stud	galfan	6.7	315	47	attic - hanging
AVG. LOSS/GAIN: 0.01												
8-165	60.92	60.9	0.02	28-Aug-97	24-Jul-98	11	stud	galfan	6.7	315	47	west wall - 2'
8-171	65.29	65.27	0.02	28-Aug-97	24-Jul-98	11	stud	galfan	6.7	315	47	west wall - 5'
8-174	67.25	67.23	0.02	28-Aug-97	24-Jul-98	11	stud	galfan	6.7	315	47	west wall - 7.5'
AVG. LOSS/GAIN: 0.02												

Year 3 Retrieval Results
Miami, Florida Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure(g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-4	38.05	38.06	-0.01	7-May-97	21-Apr-00	35	stud	galvanized1	7.14	273	38	attic - hanging
6-6	43.16	43.17	-0.01	7-May-97	21-Apr-00	35	stud	galvanized1	7.14	273	38	attic - hanging
AVG. LOSS/GAIN: -0.01												
6-16	42.28	42.28	0.00	7-May-97	21-Apr-00	35	stud	galvanized1	7.14	273	38	attic- on drywall
6-17	42.79	42.80	-0.01	7-May-97	21-Apr-00	35	stud	galvanized1	7.14	273	38	attic- on drywall
6-18	46.56	46.56	0.00	7-May-97	21-Apr-00	35	stud	galvanized1	7.14	273	38	attic- on drywall
AVG. LOSS/GAIN: 0.00												
6-43	43.16	43.18	-0.02	7-May-97	21-Apr-00	35	stud	galvanized1	7.14	273	38	west wall - 5'
6-44	46.97	46.98	-0.01	7-May-97	21-Apr-00	35	stud	galvanized1	7.14	273	38	west wall - 5'
6-45	45.56	45.57	-0.01	7-May-97	21-Apr-00	35	stud	galvanized1	7.14	273	38	west wall - 5'
AVG. LOSS/GAIN: -0.01												
6-46$	43.88	42.56	1.32	7-May-97	21-Apr-00	35	stud	galvanized1	7.14	273	38	attic- on drywall
6-47$	46.11	44.71	1.40	7-May-97	21-Apr-00	35	stud	galvanized1	7.14	273	38	attic- on drywall
AVG. LOSS/GAIN: 1.36												
6-203	90.86	90.88	-0.02	28-Aug-97	21-Apr-00	31	plate	galvanized2	7.14	206	29	attic - hanging
6-204	92.35	92.36	-0.01	28-Aug-97	21-Apr-00	31	plate	galvanized2	7.14	206	29	attic - hanging
6-205	91.54	91.55	-0.01	28-Aug-97	21-Apr-00	31	plate	galvanized2	7.14	206	29	attic - hanging
6-206	92.35	92.36	-0.01	28-Aug-97	21-Apr-00	31	plate	galvanized2	7.14	206	29	attic - hanging
AVG. LOSS/GAIN: -0.01												
7-4	33.21	33.21	0.00	7-May-97	21-Apr-00	31	stud	galvalume1	3.75	227	60	attic - hanging
7-5	37.92	37.92	0.00	7-May-97	21-Apr-00	35	stud	galvalume1	3.75	227	60	attic - hanging
7-6	39.82	39.83	-0.01	7-May-97	21-Apr-00	35	stud	galvalume1	3.75	227	60	attic - hanging
AVG. LOSS/GAIN: 0.00												

Year 3 Retrieval Results (cont.)
Miami, Florida Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure(g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
7-78	46.46	46.46	0.00	20-Mar-98	21-Apr-00	24	stud	galvalume2	3.75	168	45	attic - hanging
7-79	48.46	48.46	0.00	20-Mar-98	21-Apr-00	24	stud	galvalume2	3.75	168	45	attic - hanging
7-80	38.44	38.43	0.01	20-Mar-98	21-Apr-00	24	stud	galvalume2	3.75	168	45	attic - hanging
AVG. LOSS/GAIN: 0.00												
7-87	46.24	46.24	0.00	20-Mar-98	21-Apr-00	24	stud	galvalume2	3.75	168	45	west wall - 5'
7-88	49.47	49.47	0.00	20-Mar-98	21-Apr-00	24	stud	galvalume2	3.75	168	45	west wall - 5'
AVG. LOSS/GAIN: 0.00												
7-153	69.06	69.05	0.01	28-Aug-97	21-Apr-00	31	plate	galvalume2	3.75	168	45	attic - hanging
7-154	69.38	69.37	0.01	28-Aug-97	21-Apr-00	31	plate	galvalume2	3.75	168	45	attic - hanging
7-155	69.50	69.51	-0.01	28-Aug-97	21-Apr-00	31	plate	galvalume2	3.75	168	45	attic - hanging
AVG. LOSS/GAIN: 0.00												
8-4	116.28	116.29	-0.01	28-Aug-97	21-Apr-00	31	plate	galfan	6.7	315	47	attic - hanging
8-5	116.58	116.58	0.00	28-Aug-97	21-Apr-00	31	plate	galfan	6.7	315	47	attic - hanging
8-6	116.68	116.67	0.01	28-Aug-97	21-Apr-00	31	plate	galfan	6.7	315	47	attic - hanging
8-7	116.94	116.91	0.03	28-Aug-97	21-Apr-00	31	plate	galfan	6.7	315	47	attic - hanging
AVG. LOSS/GAIN: 0.01												
8-156	56.61	56.60	0.01	28-Aug-97	21-Apr-00	31	stud	galfan	6.7	315	47	attic - hanging
8-157	70.42	70.42	0.00	28-Aug-97	21-Apr-00	31	stud	galfan	6.7	315	47	attic - hanging
8-158	67.55	67.55	0.00	28-Aug-97	21-Apr-00	31	stud	galfan	6.7	315	47	attic - hanging
AVG. LOSS/GAIN: 0.00												
8-172	68.90	68.89	0.01	28-Aug-97	21-Apr-00	31	stud	galfan	6.7	315	47	west wall - 5'
8-173	66.61	66.61	0.00	28-Aug-97	21-Apr-00	31	stud	galfan	6.7	315	47	west wall - 5'
AVG. LOSS/GAIN: 0.00												

Year 5 Retrieval Results
Miami, Florida Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure(g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-13	42.09	42.11	-0.02	7-May-97	02-Jan-02	56	stud	galvanized1	7.14	273	38	attic - hanging
6-14	42.06	42.07	-0.01	7-May-97	02-Jan-02	56	stud	galvanized1	7.14	273	38	attic - hanging
6-15	45.30	45.31	-0.01	7-May-97	02-Jan-02	56	stud	galvanized1	7.14	273	38	attic - hanging
AVG. LOSS/GAIN: -0.01												
6-24	39.48	39.48	0.00	7-May-97	02-Jan-02	56	stud	galvanized1	7.14	273	38	attic- on drywall
6-25	38.84	38.84	0.00	7-May-97	02-Jan-02	56	stud	galvanized1	7.14	273	38	attic- on drywall
6-26	47.07	47.07	0.00	7-May-97	02-Jan-02	56	stud	galvanized1	7.14	273	38	attic- on drywall
AVG. LOSS/GAIN: 0.00												
6-33	48.94	48.95	-0.01	7-May-97	02-Jan-02	56	stud	galvanized1	7.14	273	38	west wall - 2'
6-37	45.51	45.52	-0.01	7-May-97	02-Jan-02	56	stud	galvanized1	7.14	273	38	west wall - 5'
6-42	44.80	44.81	-0.01	7-May-97	02-Jan-02	56	stud	galvanized1	7.14	273	38	west wall - 5'
AVG. LOSS/GAIN: -0.01												
6-50$	45.56	44.18	1.38	7-May-97	02-Jan-02	56	stud	galvanized1	7.14	273	38	attic- on drywall
6-51$	46.33	44.94	1.39	7-May-97	02-Jan-02	56	stud	galvanized1	7.14	273	38	attic- on drywall
AVG. LOSS/GAIN: 1.39												
6-207	91.00	91.00	0.00	28-Aug-97	02-Jan-02	52	plate	galvanized2	7.14	206	29	attic - hanging
6-208	91.97	91.98	-0.01	28-Aug-97	02-Jan-02	52	plate	galvanized2	7.14	206	29	attic - hanging
6-209	91.61	91.60	0.01	28-Aug-97	02-Jan-02	52	plate	galvanized2	7.14	206	29	attic - hanging
AVG. LOSS/GAIN: 0.00												
7-75	38.42	38.43	-0.01	20-Mar-98	02-Jan-02	45	stud	galvalume2	3.75	168	45	attic - hanging
7-76	39	39.00	0.00	20-Mar-98	02-Jan-02	45	stud	galvalume2	3.75	168	45	attic - hanging
7-77	42.45	42.44	0.01	20-Mar-98	02-Jan-02	45	stud	galvalume2	3.75	168	45	attic - hanging
AVG. LOSS/GAIN: 0.00												

Year 5 Retrieval Results (cont.)
Miami, Florida Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure(g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
7-84	44.26	44.26	0.00	20-Mar-98	02-Jan-02	45	stud	galvalume2	3.75	168	45	west wall - 2'
7-90	52.36	52.38	-0.02	20-Mar-98	02-Jan-02	45	stud	galvalume2	3.75	168	45	west wall - 7.5'
7-109	45.31	45.31	0.00	20-Mar-98	02-Jan-02	45	stud	galvalume2	3.75	168	45	west wall - 7.5'
AVG. LOSS/GAIN: -0.01												
7-156	69.69	69.69	0.00	28-Aug-97	02-Jan-02	52	plate	galvalume2	3.75	168	45	attic - hanging
7-157	69.68	69.66	0.02	28-Aug-97	02-Jan-02	52	plate	galvalume2	3.75	168	45	attic - hanging
AVG. LOSS/GAIN: 0.01												
8-8	115.83	115.79	0.04	28-Aug-97	02-Jan-02	52	plate	galfan	6.7	315	47	attic - hanging
8-9	115.86	115.83	0.03	28-Aug-97	02-Jan-02	52	plate	galfan	6.7	315	47	attic - hanging
8-10	116.49	116.46	0.03	28-Aug-97	02-Jan-02	52	plate	galfan	6.7	315	47	attic - hanging
AVG. LOSS/GAIN: 0.03												
8-154	64.23	64.23	0.00	28-Aug-97	02-Jan-02	52	stud	galfan	6.7	315	47	attic - hanging
8-155	59.84	59.85	-0.01	28-Aug-97	02-Jan-02	52	stud	galfan	6.7	315	47	attic - hanging
8-162	68.51	68.52	-0.01	28-Aug-97	02-Jan-02	52	stud	galfan	6.7	315	47	attic - hanging
AVG. LOSS/GAIN: -0.01												
8-166	58.89	58.88	0.01	28-Aug-97	02-Jan-02	52	stud	galfan	6.7	315	47	west wall - 2'
8-167	59.63	59.62	0.01	28-Aug-97	02-Jan-02	52	stud	galfan	6.7	315	47	west wall - 2'
8-168	69.42	69.41	0.01	28-Aug-97	02-Jan-02	52	stud	galfan	6.7	315	47	west wall - 2'
AVG. LOSS/GAIN: 0.01												

Year 7 Retrieval Results
Miami, Florida Site

Specimen Number	Initial Weight (gram)	Final Weight (gram)	Coating Weight Loss During Exposure (g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density Of Coating (g/cm^3)	Coating Wt Of Source (g/m^2)	Coating Thickness (Microns)	Sample Location
6-610	43.03	43.02	0.01	7-May-97	04-Dec-05	102	stud	galvanized1	7.14	273	38	attic - hanging
6-611	42.02	42.01	0.01	7-May-97	04-Dec-05	102	stud	galvanized1	7.14	273	38	attic - hanging
6-612	44.15	44.13	0.02	7-May-97	04-Dec-05	102	stud	galvanized1	7.14	273	38	attic - hanging
AVG. LOSS/GAIN: 0.013												
6-613	39.58	39.56	0.02	7-May-97	04-Dec-05	102	stud	galvanized1	7.14	273	38	attic- on drywall
6-614	38.65	38.63	0.02	7-May-97	04-Dec-05	102	stud	galvanized1	7.14	273	38	attic- on drywall
6-615	39.07	39.06	0.01	7-May-97	04-Dec-05	102	stud	galvanized1	7.14	273	38	attic- on drywall
AVG. LOSS/GAIN: 0.017												
6-616	48.12	48.10	0.02	7-May-97	04-Dec-05	102	stud	galvanized1	7.14	273	38	west wall - 2'
6-617	45.23	45.20	0.03	7-May-97	04-Dec-05	102	stud	galvanized1	7.14	273	38	west wall - 5'
6-618	47.16	47.15	0.01	7-May-97	04-Dec-05	102	stud	galvanized1	7.14	273	38	west wall - 5'
AVG. LOSS/GAIN: 0.02												
6-710	91.15	91.13	0.02	28-Aug-97	04-Dec-05	99	plate	galvanized2	7.14	206	29	attic - hanging
6-711	91.29	91.27	0.02	28-Aug-97	04-Dec-05	99	plate	galvanized2	7.14	206	29	attic - hanging
6-712	91.45	91.44	0.01	28-Aug-97	04-Dec-05	99	plate	galvanized2	7.14	206	29	attic - hanging
AVG. LOSS/GAIN: 0.017												
7-710	39.24	39.22	0.02	20-Mar-98	04-Dec-05	92	stud	galvalume2	3.75	168	45	attic - hanging
7-711	41.26	41.25	0.01	20-Mar-98	04-Dec-05	92	stud	galvalume2	3.75	168	45	attic - hanging
7-712	43.01	42.98	0.03	20-Mar-98	04-Dec-05	92	stud	galvalume2	3.75	168	45	attic - hanging
AVG. LOSS/GAIN: 0.020												

Year 7 Retrieval Results (cont.)
Miami, Florida Site

Specimen Number	Initial Weight (gram)	Final Weight (gram)	Coating Weight Loss During Exposure (g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density Of Coating (g/cm^3)	Coating Weight Of Source (g/m^2)	Coating Thickness (Microns)	Sample Location
7-713	46.34	46.31	0.03	20-Mar-98	04-Dec-05	92	stud	galvalume2	3.75	168	45	west wall - 2'
7-714	51.24	51.23	0.01	20-Mar-98	04-Dec-05	92	stud	galvalume2	3.75	168	45	west wall - 7.5'
7-715	54.23	54.20	0.03	20-Mar-98	04-Dec-05	92	stud	galvalume2	3.75	168	45	west wall - 7.5'
AVG. LOSS/GAIN: 0.023												
7-810	68.89	68.88	0.01	28-Aug-97	04-Dec-05	99	plate	galvalume2	3.75	168	45	attic - hanging
7-811	69.02	69.00	0.02	28-Aug-97	04-Dec-05	99	plate	galvalume2	3.75	168	45	attic - hanging
7-812	69.18	69.17	0.01	28-Aug-97	04-Dec-05	99	plate	galvalume2	3.75	168	45	attic - hanging
AVG. LOSS/GAIN: 0.013												
8-810	116.34	116.30	0.04	28-Aug-97	04-Dec-05	99	plate	galfan	6.7	315	47	attic - hanging
8-811	116.56	116.53	0.03	28-Aug-97	04-Dec-05	99	plate	galfan	6.7	315	47	attic - hanging
8-812	116.92	116.89	0.03	28-Aug-97	04-Dec-05	99	plate	galfan	6.7	315	47	attic - hanging
AVG. LOSS/GAIN: 0.033												
8-910	58.92	58.89	0.03	28-Aug-97	04-Dec-05	99	stud	galfan	6.7	315	47	attic - hanging
8-911	64.79	64.76	0.03	28-Aug-97	04-Dec-05	99	stud	galfan	6.7	315	47	attic - hanging
8-912	66.14	66.11	0.04	28-Aug-97	04-Dec-05	99	stud	galfan	6.7	315	47	attic – hanging
AVG. LOSS/GAIN: 0.033												
8-913	65.45	65.41	0.04	28-Aug-97	04-Dec-05	99	stud	galfan	6.7	315	47	west wall - 2'
8-914	62.34	62.32	0.02	28-Aug-97	04-Dec-05	99	stud	galfan	6.7	315	47	west wall - 2'
8-915	68.12	68.09	0.03	28-Aug-97	04-Dec-05	99	stud	galfan	6.7	315	47	west wall - 2'
AVG. LOSS/GAIN: 0.03												

Year 1 Retrieval Results
Long Beach Island, New Jersey Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure(g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-173	57.77	57.77	0.00	26-Aug-98	21-Feb-00	18	stud	galvanized1	7.14	273	38	joist area/crawl
6-174	50.87	50.86	0.01	26-Aug-98	21-Feb-00	18	stud	galvanized1	7.14	273	38	joist area/crawl
6-175	47.93	47.93	0.00	26-Aug-98	21-Feb-00	18	stud	galvanized1	7.14	273	38	joist area/crawl
AVG. LOSS/GAIN: 0.00												
6400	31.93	31.92	0.01	26-Aug-98	21-Feb-00	18	plate	galvanized1	7.14	273	38	joist area/crawl
6401	31.86	31.85	0.01	26-Aug-98	21-Feb-00	18	plate	galvanized1	7.14	273	38	joist area/crawl
6402	31.79	31.78	0.01	26-Aug-98	21-Feb-00	18	plate	galvanized1	7.14	273	38	joist area/crawl
AVG. LOSS/GAIN: 0.01												
6410	32.00	32.03	-0.03	26-Aug-98	21-Feb-00	18	plate	galvanized1	7.14	273	38	under outdr deck
6411	32.03	32.04	-0.01	26-Aug-98	21-Feb-00	18	plate	galvanized1	7.14	273	38	under outdr deck
6412	32.05	32.06	-0.01	26-Aug-98	21-Feb-00	18	plate	galvanized1	7.14	273	38	under outdr deck
AVG. LOSS/GAIN: -0.02												
6423	31.96	31.97	-0.01	26-Aug-98	21-Feb-00	18	plate	galvanized1	7.14	273	38	bathroom wall
6424	32.06	32.06	0.00	26-Aug-98	21-Feb-00	18	plate	galvanized1	7.14	273	38	bathroom wall
6425	32.04	32.05	-0.01	26-Aug-98	21-Feb-00	18	plate	galvanized1	7.14	273	38	bathroom wall
AVG. LOSS/GAIN: -0.01												
7117	40.6	40.59	0.01	26-Aug-98	21-Feb-00	18	stud	galvalume2	3.75	168	45	joist area/crawl
7118	53.01	53.01	0.00	26-Aug-98	21-Feb-00	18	stud	galvalume2	3.75	168	45	joist area/crawl
7119	38.98	38.98	0.00	26-Aug-98	21-Feb-00	18	stud	galvalume2	3.75	168	45	joist area/crawl
AVG. LOSS/GAIN: 0.00												
7-213	69.77	69.76	0.01	26-Aug-98	21-Feb-00	18	plate	galvalume2	3.75	168	45	joist area/crawl
7-214	69.90	69.89	0.01	26-Aug-98	21-Feb-00	18	plate	galvalume2	3.75	168	45	joist area/crawl
7-215	69.86	69.86	0.00	26-Aug-98	21-Feb-00	18	plate	galvalume2	3.75	168	45	joist area/crawl
AVG. LOSS/GAIN: 0.01												

Year 1 Retrieval Results (cont.)
Long Beach Island, New Jersey Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure(g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
7-223	69.45	69.46	-0.01	26-Aug-98	21-Feb-00	18	plate	galvalume2	3.75	168	45	under outdr deck
7-224	69.47	69.47	0.00	26-Aug-98	21-Feb-00	18	plate	galvalume2	3.75	168	45	under outdr deck
7-225	69.41	69.42	-0.01	26-Aug-98	21-Feb-00	18	plate	galvalume2	3.75	168	45	under outdr deck
AVG. LOSS/GAIN: -0.01												
7-236	69.48	69.48	0.00	26-Aug-98	21-Feb-00	18	plate	galvalume2	3.75	168	45	bathroom wall
7-237	69.29	69.29	0.00	26-Aug-98	21-Feb-00	18	plate	galvalume2	3.75	168	45	bathroom wall
7-238	68.94	68.93	0.01	26-Aug-98	21-Feb-00	18	plate	galvalume2	3.75	168	45	bathroom wall
AVG. LOSS/GAIN: 0.00												
8-85	116.85	116.85	0.00	26-Aug-98	21-Feb-00	18	plate	galfan	6.7	315	47	bathroom wall
8-86	118.33	118.32	0.01	26-Aug-98	21-Feb-00	18	plate	galfan	6.7	315	47	bathroom wall
8-87	117.18	117.17	0.01	26-Aug-98	21-Feb-00	18	plate	galfan	6.7	315	47	bathroom wall
AVG. LOSS/GAIN: 0.01												
8222	56.03	56.03	0.00	26-Aug-98	21-Feb-00	18	stud	galfan	6.7	315	47	joist area/crawl
8223	55.34	55.35	-0.01	26-Aug-98	21-Feb-00	18	stud	galfan	6.7	315	47	joist area/crawl
8224	69.54	69.53	0.01	26-Aug-98	21-Feb-00	18	stud	galfan	6.7	315	47	joist area/crawl
AVG. LOSS/GAIN: 0.00												
8-61	115.92	115.91	0.01	26-Aug-98	21-Feb-00	18	plate	galfan	6.7	315	47	floor joist/crawl
8-63	118.07	118.05	0.02	26-Aug-98	21-Feb-00	18	plate	galfan	6.7	315	47	floor joist/crawl
AVG. LOSS/GAIN: 0.02												
8-71	116.35	116.34	0.01	26-Aug-98	21-Feb-00	18	plate	galfan	6.7	315	47	under outdr deck
8-72	115.87	115.86	0.01	26-Aug-98	21-Feb-00	18	plate	galfan	6.7	315	47	under outdr deck
8-73	116.26	116.26	0.00	26-Aug-98	21-Feb-00	18	plate	galfan	6.7	315	47	under outdr deck
AVG. LOSS/GAIN: 0.01												

Year 3 Retrieval Results
Long Beach Island, New Jersey Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure(g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-170	58.08	58.08	0.00	26-Aug-98	23-May-02	45	stud	galvanized1	7.14	273	38	floor joist/crawl
6-171	65.24	65.23	0.01	26-Aug-98	23-May-02	45	stud	galvanized1	7.14	273	38	floor joist/crawl
AVG. LOSS/GAIN: 0.01												
6403	32.16	32.17	-0.01	26-Aug-98	23-May-02	45	plate	galvanized1	7.14	273	38	joist area/crawl
6404	31.71	31.71	0.00	26-Aug-98	23-May-02	45	plate	galvanized1	7.14	273	38	joist area/crawl
6405	32.46	32.47	-0.01	26-Aug-98	23-May-02	45	plate	galvanized1	7.14	273	38	joist area/crawl
AVG. LOSS/GAIN: 0.00												
6413	31.85	31.87	-0.02	26-Aug-98	23-May-02	45	plate	galvanized1	7.14	273	38	under outdr deck
6414	31.73	31.74	-0.01	26-Aug-98	23-May-02	45	plate	galvanized1	7.14	273	38	under outdr deck
6415	31.90	31.92	-0.02	26-Aug-98	23-May-02	45	plate	galvanized1	7.14	273	38	under outdr deck
AVG. LOSS/GAIN: -0.01												
6426	31.82	31.83	-0.01	26-Aug-98	23-May-02	45	plate	galvanized1	7.14	273	38	bathrm wall
6427	31.78	31.78	0.00	26-Aug-98	23-May-02	45	plate	galvanized1	7.14	273	38	bathrm wall
6428	32.27	32.27	0.00	26-Aug-98	23-May-02	45	plate	galvanized1	7.14	273	38	bathrm wall
AVG. LOSS/GAIN: -0.02												
7114	41.64	41.64	0.00	26-Aug-98	23-May-02	45	stud	galvalume2	3.75	168	45	floor joist/crawl
7116	46.1	46.1	0.00	26-Aug-98	23-May-02	45	stud	galvalume2	3.75	168	45	floor joist/crawl
AVG. LOSS/GAIN: 0.00												
7-216	69.78	69.79	-0.01	26-Aug-98	23-May-02	45	plate	galvalume2	3.75	168	45	floor joist/crawl
7-217	69.83	69.83	0.00	26-Aug-98	23-May-02	45	plate	galvalume2	3.75	168	45	floor joist/crawl
7-218	69.53	69.54	-0.01	26-Aug-98	23-May-02	45	plate	galvalume2	3.75	168	45	floor joist/crawl
AVG. LOSS/GAIN: -0.01												
7-226	69.48	69.47	0.01	26-Aug-98	23-May-02	45	plate	galvalume2	3.75	168	45	under outdr deck
7-227	69.56	69.57	-0.01	26-Aug-98	23-May-02	45	plate	galvalume2	3.75	168	45	under outdr deck
7-228	69.16	69.17	-0.01	26-Aug-98	23-May-02	45	plate	galvalume2	3.75	168	45	under outdr deck
AVG. LOSS/GAIN: 0.00												

Year 3 Retrieval Results (cont.)
Long Beach Island, New Jersey Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Coating Weight Loss During Exposure(g)	Install Date	Recovery Date	Exposure Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
7-233	69.28	69.29	-0.01	26-Aug-98	23-May-02	45	plate	galvalume2	3.75	168	45	bathroom wall
7-234	69.34	69.34	0.00	26-Aug-98	23-May-02	45	plate	galvalume2	3.75	168	45	bathroom wall
7-235	69.10	69.10	0.00	26-Aug-98	23-May-02	45	plate	galvalume2	3.75	168	45	bathroom wall
AVG. LOSS/GAIN: 0.00												
8-64	116.83	116.84	-0.01	26-Aug-98	23-May-02	45	plate	galfan	6.7	315	47	floor joist/crawl
8-65	117.01	117.01	0.00	26-Aug-98	23-May-02	45	plate	galfan	6.7	315	47	floor joist/crawl
8-66	116.53	116.54	-0.01	26-Aug-98	23-May-02	45	plate	galfan	6.7	315	47	floor joist/crawl
AVG. LOSS/GAIN: -0.01												
8-74	116.20	116.20	0.00	26-Aug-98	23-May-02	45	plate	galfan	6.7	315	47	under outdr deck
8-75	117.84	117.83	0.01	26-Aug-98	23-May-02	45	plate	galfan	6.7	315	47	under outdr deck
8-76	117.35	117.34	0.01	26-Aug-98	23-May-02	45	plate	galfan	6.7	315	47	under outdr deck
AVG. LOSS/GAIN: 0.01												
8-88	117.63	117.63	0.00	26-Aug-98	23-May-02	45	plate	galfan	6.7	315	47	bathrm wall
8-89	116.92	116.93	-0.01	26-Aug-98	23-May-02	45	plate	galfan	6.7	315	47	bathrm wall
8-90	117.57	117.57	0.00	26-Aug-98	23-May-02	45	plate	galfan	6.7	315	47	bathrm wall
AVG. LOSS/GAIN: 0.00												
8220	57.68	57.68	0.00	26-Aug-98	23-May-02	45	stud	galfan	6.7	315	47	floor joist/crawl
8221	68.69	68.7	-0.01	26-Aug-98	23-May-02	45	stud	galfan	6.7	315	47	floor joist/crawl
AVG. LOSS/GAIN: 0.00												

Year 5 Retrieval Results
Long Beach Island, New Jersey Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-153	50.61	50.62	0.01	26-Aug-98	8-Aug-03	60	Stud	Galvanized1	7.14	273	38	Joist Area-Crawl Space
6-154	45.67	45.68	0.01	26-Aug-98	8-Aug-03	60	Stud	Galvanized1	7.14	273	38	Joist Area-Crawl Space
6-172	65.32	65.32	0	26-Aug-98	8-Aug-03	60	Stud	Galvanized1	7.14	273	38	Joist Area-Crawl Space
AVG. LOSS/GAIN: +0.01												
6-406	31.97	31.96	-0.01	26-Aug-98	8-Aug-03	60	Plate	Galvanized1	7.14	273	38	Joist Area-Crawl Space
6-407	32.00	31.99	-0.01	26-Aug-98	8-Aug-03	60	Plate	Galvanized1	7.14	273	38	Joist Area-Crawl Space
6-408	32.33	32.33	0	26-Aug-98	8-Aug-03	60	Plate	Galvanized1	7.14	273	38	Joist Area-Crawl Space
AVG. LOSS/GAIN: -0.01												
6-416	32.50	32.51	0.01	26-Aug-98	8-Aug-03	60	Plate	Galvanized1	7.14	273	38	Under Outdoor Deck
6-417	32.47	32.47	0	26-Aug-98	8-Aug-03	60	Plate	Galvanized1	7.14	273	38	Under Outdoor Deck
6-418	32.20	32.20	0	26-Aug-98	8-Aug-03	60	Plate	Galvanized1	7.14	273	38	Under Outdoor Deck
AVG. LOSS/GAIN: 0.00												
6-420	31.95	31.96	0.01	26-Aug-98	8-Aug-03	60	Plate	Galvanized1	7.14	273	38	Inside Bathroom Wall
6-421	31.79	31.80	0.01	26-Aug-98	8-Aug-03	60	Plate	Galvanized1	7.14	273	38	Inside Bathroom Wall
6-422	31.92	31.93	0.01	26-Aug-98	8-Aug-03	60	Plate	Galvanized1	7.14	273	38	Inside Bathroom Wall
AVG. LOSS/GAIN: +0.01												
7-112	50.47	50.47	0	26-Aug-98	8-Aug-03	60	Stud	Galvalume2	3.75	168	45	Joist Area-Crawl Space
7-113	45.71	45.70	-0.01	26-Aug-98	8-Aug-03	60	Stud	Galvalume2	3.75	168	45	Joist Area-Crawl Space
7-115	40.79	40.79	0	26-Aug-98	8-Aug-03	60	Stud	Galvalume2	3.75	168	45	Joist Area-Crawl Space
AVG. LOSS/GAIN: 0.00												
7-219	69.67	69.66	0.00	26-Aug-98	8-Aug-03	60	Plate	Galvalume2	3.75	168	45	Joist Area-Crawl Space
7-220	69.92	69.91	-0.01	26-Aug-98	8-Aug-03	60	Plate	Galvalume2	3.75	168	45	Joist Area-Crawl Space
7-221	69.96	69.95	-0.01	26-Aug-98	8-Aug-03	60	Plate	Galvalume2	3.75	168	45	Joist Area-Crawl Space
AVG. LOSS/GAIN: -0.01												

Year 5 Retrieval Results (cont.)
Long Beach Island, New Jersey Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
7-229	69.11	69.10	-0.01	26-Aug-98	8-Aug-03	60	Plate	Galvalume2	3.75	168	45	Under Outdoor Deck
7-230	69.06	69.06	0	26-Aug-98	8-Aug-03	60	Plate	Galvalume2	3.75	168	45	Under Outdoor Deck
7-231	69.17	69.17	0	26-Aug-98	8-Aug-03	60	Plate	Galvalume2	3.75	168	45	Under Outdoor Deck
AVG. LOSS/GAIN: 0.00												
7-239	69.06	69.05	-0.01	26-Aug-98	8-Aug-03	60	Plate	Galvalume2	3.75	168	45	Inside Bathroom Wall
7-240	69.06	69.06	0	26-Aug-98	8-Aug-03	60	Plate	Galvalume2	3.75	168	45	Inside Bathroom Wall
7-241	68.01	68.00	-0.01	26-Aug-98	8-Aug-03	60	Plate	Galvalume2	3.75	168	45	Inside Bathroom Wall
7-242	68.16	68.15	-0.01	26-Aug-98	8-Aug-03	60	Plate	Galvalume2	3.75	168	45	Inside Bathroom Wall
AVG. LOSS/GAIN: -0.01												
8-62	116.65	116.64	-0.01	26-Aug-98	8-Aug-03	60	Plate	Galfan	6.7	315	47	Joist Area-Crawl Space
8-67	117.08	117.07	-0.01	26-Aug-98	8-Aug-03	60	Plate	Galfan	6.7	315	47	Joist Area-Crawl Space
8-68	116.75	116.74	-0.01	26-Aug-98	8-Aug-03	60	Plate	Galfan	6.7	315	47	Joist Area-Crawl Space
AVG. LOSS/GAIN: -0.01												
8-77	116.80	116.80	0	26-Aug-98	8-Aug-03	60	Plate	Galfan	6.7	315	47	Under Outdoor Deck
8-79	116.59	116.60	0.01	26-Aug-98	8-Aug-03	60	Plate	Galfan	6.7	315	47	Under Outdoor Deck
8-80	117.51	117.52	0.01	26-Aug-98	8-Aug-03	60	Plate	Galfan	6.7	315	47	Under Outdoor Deck
AVG. LOSS/GAIN: +0.01												
8-82	117.28	117.27	-0.01	26-Aug-98	8-Aug-03	60	Plate	Galfan	6.7	315	47	Inside Bathroom Wall
8-83	117.32	117.30	-0.02	26-Aug-98	8-Aug-03	60	Plate	Galfan	6.7	315	47	Inside Bathroom Wall
8-84	117.29	117.28	-0.01	26-Aug-98	8-Aug-03	60	Plate	Galfan	6.7	315	47	Inside Bathroom Wall
AVG. LOSS/GAIN: -0.01												
8-208	66.12	66.11	-0.01	26-Aug-98	8-Aug-03	60	Stud	Galfan	6.7	315	47	Crawl Space in Batts
8-209	67.97	67.96	-0.01	26-Aug-98	8-Aug-03	60	Stud	Galfan	6.7	315	47	Crawl Space in Batts
8-219	73.11	73.11	0	26-Aug-98	8-Aug-03	60	Stud	Galfan	6.7	315	47	Crawl Space in Batts
AVG. LOSS/GAIN: -0.01												

Year 7 Retrieval Results
Long Beach Island, New Jersey Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density Of Coating (g/cm^3)	Density Of Source (g/m^2)	Coating Weight Of Thickness (microns)	Sample Location
6-431	50.22	50.19	0.03	26-Aug-98	4-Nov-05	87	Stud	Galvanized1	7.14	273	38	Joist Area-Crawl Space
6-432	49.89	49.87	0.02									
6-433	66.35	66.33	0.02									
AVG. LOSS/GAIN: 0.023												
6-438	32.21	32.19	0.02	26-Aug-98	4-Nov-05	87	Plate	Galvanized1	7.14	273	38	Joist Area-Crawl Space
6-437	33.15	33.13	0.02									
6-439	30.86	30.84	0.02									
AVG. LOSS/GAIN: 0.020												
6-434	31.68	31.64	0.04	26-Aug-98	4-Nov-05	87	Plate	Galvanized1	7.14	273	38	Under Outdoor Deck
6-435	30.99	30.97	0.02									
6-436	32.08	32.05	0.03									
AVG. LOSS/GAIN: 0.030												
6-440	31.64	31.63	0.01	26-Aug-98	4-Nov-05	87	Plate	Galvanized1	7.14	273	38	Inside Bathroom Wall
6-441	31.85	31.83	0.02									
6-442	32.25	32.24	0.01									
AVG. LOSS/GAIN: 0.013												
7-256	54.23	54.21	0.02	26-Aug-98	4-Nov-05	87	Stud	Galvalume2	3.75	168	45	Joist Area-Crawl Space
7-257	53.68	53.66	0.02									
7-249	54.28	54.26	0.02									
AVG. LOSS/GAIN: 0.020												
7-250	69.56	69.53	0.03	26-Aug-98	4-Nov-05	87	Plate	Galvalume2	3.75	168	45	Joist Area-Crawl Space
7-251	69.87	69.84	0.03									
7-252	69.46	69.44	0.02									
AVG. LOSS/GAIN: 0.027												

Year 7 Retrieval Results (cont.)
Long Beach Island, New Jersey Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density Of Coating (g/cm^3)	Density Of Source (g/m^2)	Coating Weight Of Thickness (microns)	Sample Location
7-247	69.05	69.03	0.02	26-Aug-98	4-Nov-05	87	Plate	Galvalume2	3.75	168	45	Under Outdoor Deck
7-248	69.48	69.46	0.02									
7-246	69.15	69.12	0.03									
AVG. LOSS/GAIN: 0.023												
7-253	69.54	69.52	0.02	26-Aug-98	4-Nov-05	87	Plate	Galvalume2	3.75	168	45	Inside Bathroom Wall
7-254	69.23	69.22	0.01									
7-255	69.08	69.07	0.01									
AVG. LOSS/GAIN: 0.013												
8-151	116.88	116.85	0.03	26-Aug-98	4-Nov-05	87	Plate	Galfan	6.7	315	47	Joist Area-Crawl Space
8-152	117.05	117.01	0.04									
8-153	116.78	116.73	0.05									
AVG. LOSS/GAIN: 0.040												
8-155	117.02	117	0.02	26-Aug-98	4-Nov-05	87	Plate	Galfan	6.7	315	47	Under Outdoor Deck
8-156	117.15	117.12	0.03									
8-159	117.01	116.98	0.03									
AVG. LOSS/GAIN: 0.027												
8-154	116.89	116.88	0.01	26-Aug-98	4-Nov-05	87	Plate	Galfan	6.7	315	47	Inside Bathroom Wall
8-157	117.08	117.06	0.02									
8-158	117.21	117.2	0.01									
AVG. LOSS/GAIN: 0.013												
8-242	67.85	67.83	0.02	26-Aug-98	4-Nov-05	87	Stud	Galfan	6.7	315	47	Crawl Space in Batts
8-244	66.23	66.2	0.03									
8-247	66.46	66.43	0.03									
AVG. LOSS/GAIN: 0.027												

Year 1 Retrieval Results
Leonardtown, Maryland Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-61$	44.51	42.98	1.53	16-May-97	22-Dec-98	19	stud	bare	n/a	n/a	n/a	crawl-open air
6-62$	44.43	42.99	1.44	16-May-97	22-Dec-98	19	stud	bare	n/a	n/a	n/a	crawl-open air
6-63$	41.17	39.79	1.38	16-May-97	22-Dec-98	19	stud	bare	n/a	n/a	n/a	crawl-open air
AVG. LOSS/GAIN: 1.45												
6-73$	48.17	46.37	1.80	16-May-97	22-Dec-98	19	stud	bare	n/a	n/a	n/a	under deck
6-74$	49.33	47.51	1.82	16-May-97	22-Dec-98	19	stud	bare	n/a	n/a	n/a	under deck
6-75$	44.64	42.88	1.76	16-May-97	22-Dec-98	19	stud	bare	n/a	n/a	n/a	under deck
AVG. LOSS/GAIN: 1.79												
6-77	41.60	41.58	0.02	16-May-97	22-Dec-98	19	stud	galvanized1	7.14	273	38	attic-hanging
6-78	44.94	44.94	0.00	16-May-97	22-Dec-98	19	stud	galvanized1	7.14	273	38	attic-hanging
6-79	45.81	45.79	0.02	16-May-97	22-Dec-98	19	stud	galvanized1	7.14	273	38	attic-hanging
AVG. LOSS/GAIN: 0.01												
6-104	46.80	46.8	0.00	16-May-97	22-Dec-98	19	stud	galvanized1	7.14	273	38	crawl-open air
6-105	46.47	46.46	0.01	16-May-97	22-Dec-98	19	stud	galvanized1	7.14	273	38	crawl-open air
6-106	45.50	45.5	0.00	16-May-97	22-Dec-98	19	stud	galvanized1	7.14	273	38	crawl-open air
AVG. LOSS/GAIN: 0.00												
6-116	43.42	43.44	-0.02	16-May-97	1-Feb-99	21	stud	galvanized1	7.14	273	38	under deck
6-117	43.05	43.07	-0.02	16-May-97	1-Feb-99	21	stud	galvanized1	7.14	273	38	under deck
6-118	40.73	40.74	-0.01	16-May-97	1-Feb-99	21	stud	galvanized1	7.14	273	38	under deck
AVG. LOSS/GAIN: -0.02												
6-160	49.83	49.82	0.01	6-Feb-98	22-Dec-98	11	stud	galvanized1	7.14	273	38	under deck
6-161	66.41	66.4	0.01	6-Feb-98	22-Dec-98	11	stud	galvanized1	7.14	273	38	under deck
6-162	68.61	68.6	0.01	6-Feb-98	22-Dec-98	11	stud	galvanized1	7.14	273	38	under deck
AVG. LOSS/GAIN: 0.01												
6-237	92.16	92.15	0.01	5-Sep-97	1-Feb-99	17	plate	galvanized2	7.14	206	29	attic - in cellulose
6-238	91.35	91.34	0.01	5-Sep-97	1-Feb-99	17	plate	galvanized2	7.14	206	29	attic - in cellulose
6-239	90.66	90.65	0.01	5-Sep-97	1-Feb-99	17	plate	galvanized2	7.14	206	29	attic - in cellulose
AVG. LOSS/GAIN: 0.01												

Year 1 Retrieval Results (cont.)
Leonardtown, Maryland Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-246	91.70	91.69	0.01	5-Sep-97	22-Dec-98	15	plate	galvanized2	7.14	206	29	SE wall (cellulose)
6-247	91.66	91.63	0.03	5-Sep-97	22-Dec-98	15	plate	galvanized2	7.14	206	29	SE wall (cellulose)
6-248	90.85	90.84	0.01	5-Sep-97	22-Dec-98	15	plate	galvanized2	7.14	206	29	SE wall (cellulose)
AVG. LOSS/GAIN: 0.02												
7-25	36.89	36.87	0.02	16-May-97	22-Dec-98	19	stud	galvalume1	3.75	227	60	attic - hanging
7-27	35.13	35.12	0.01	16-May-97	22-Dec-98	19	stud	galvalume1	3.75	227	60	attic - hanging
AVG. LOSS/GAIN: 0.02												
7-56	44.46	44.46	0.00	6-Feb-98	22-Dec-98	11	stud	galvalume2	3.75	168	45	crawl-open air
7-57	50.05	50.03	0.02	6-Feb-98	22-Dec-98	11	stud	galvalume2	3.75	168	45	crawl-open air
7-58	50.93	50.93	0.00	6-Feb-98	22-Dec-98	11	stud	galvalume2	3.75	168	45	crawl-open air
AVG. LOSS/GAIN: 0.01												
7-65	43.02	43.01	0.01	6-Feb-98	22-Dec-98	11	stud	galvalume2	3.75	168	45	under deck
7-66	41.45	41.45	0.00	6-Feb-98	22-Dec-98	11	stud	galvalume2	3.75	168	45	under deck
7-67	50.59	50.6	-0.01	6-Feb-98	22-Dec-98	11	stud	galvalume2	3.75	168	45	under deck
AVG. LOSS/GAIN: 0.00												
7-91	39.99	39.98	0.01	6-Feb-98	1-Feb-99	12	stud	galvalume2	3.75	168	45	attic - hanging
7-92	47.04	47.04	0.00	6-Feb-98	1-Feb-99	12	stud	galvalume2	3.75	168	45	attic - hanging
7-93	49.8	49.80	0.00	6-Feb-98	1-Feb-99	12	stud	galvalume2	3.75	168	45	attic - hanging
AVG. LOSS/GAIN: 0.00												
7-100	46.37	46.37	0.00	6-Feb-98	22-Dec-98	11	stud	galvalume2	3.75	168	45	crawl-in batts
7-101	48.97	48.95	0.02	6-Feb-98	22-Dec-98	11	stud	galvalume2	3.75	168	45	crawl-in batts
7-102	46.54	46.52	0.02	6-Feb-98	22-Dec-98	11	stud	galvalume2	3.75	168	45	crawl-in batts
AVG. LOSS/GAIN: 0.01												
7-188	69.75	69.75	0.00	5-Sep-97	1-Feb-99	17	plate	galvalume2	3.75	168	45	SE wall (cellulose)
7-189	69.76	69.76	0.00	5-Sep-97	1-Feb-99	17	plate	galvalume2	3.75	168	45	SE wall (cellulose)
7-190	69.51	69.51	0.00	5-Sep-97	1-Feb-99	17	plate	galvalume2	3.75	168	45	SE wall (cellulose)
AVG. LOSS/GAIN: 0.00												

Year 1 Retrieval Results (cont.)
Leonardtown, Maryland Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
8-198	67.54	67.52	0.02	6-Feb-98	22-Dec-98	11	stud	galfan	6.7	315	47	crawl-in batts
8-199	64.82	64.78	0.04	6-Feb-98	22-Dec-98	11	stud	galfan	6.7	315	47	crawl-in batts
8-200	76.94	76.92	0.02	6-Feb-98	22-Dec-98	11	stud	galfan	6.7	315	47	crawl-in batts
AVG. LOSS/GAIN: 0.03												
8-210	70.02	70.00	0.02	6-Feb-98	22-Dec-98	11	stud	galfan	6.7	315	47	under deck
8-211	71.94	71.91	0.03	6-Feb-98	22-Dec-98	11	stud	galfan	6.7	315	47	under deck
8-212	77.05	77.02	0.03	6-Feb-98	22-Dec-98	11	stud	galfan	6.7	315	47	under deck
AVG. LOSS/GAIN: 0.03												

Year 3 Retrieval Results
Leonardtown, Maryland Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-80	44.31	44.31	0.00	16-May-97	27-Apr-01	48	stud	galvanized1	7.14	273	38	attic-hanging
6-81	42.40	42.41	-0.01	16-May-97	27-Apr-01	48	stud	galvanized1	7.14	273	38	attic-hanging
6-82	46.31	46.31	0.00	16-May-97	27-Apr-01	48	stud	galvanized1	7.14	273	38	attic-hanging
AVG. LOSS/GAIN: 0.0												
6-92	44.85	44.86	-0.01	16-May-97	27-Apr-01	48	stud	galvanized1	7.14	273	38	crawl-in batts
6-93	42.07	42.08	-0.01	16-May-97	27-Apr-01	48	stud	galvanized1	7.14	273	38	crawl-in batts
6-94	42.21	42.22	-0.01	16-May-97	27-Apr-01	48	stud	galvanized1	7.14	273	38	crawl-in batts
AVG. LOSS/GAIN: -0.01												
6-107	41.55	41.57	-0.02	16-May-97	27-Apr-01	48	stud	galvanized1	7.14	273	38	crawl-open air
6-108	45.46	45.49	-0.03	16-May-97	27-Apr-01	48	stud	galvanized1	7.14	273	38	crawl-open air
6-109	44.98	45.00	-0.02	16-May-97	27-Apr-01	48	stud	galvanized1	7.14	273	38	crawl-open air
AVG. LOSS/GAIN: -0.02												
6-163	54.89	54.91	-0.02	6-Feb-98	27-Apr-01	39	stud	galvanized1	7.14	273	38	under deck
6-164	43.54	43.56	-0.02	6-Feb-98	27-Apr-01	39	stud	galvanized1	7.14	273	38	under deck
6-165	62.70	62.74	-0.04	6-Feb-98	27-Apr-01	39	stud	galvanized1	7.14	273	38	under deck
AVG. LOSS/GAIN: -0.03												
6-215	92.18	92.19	-0.01	5-Sep-97	27-Apr-01	44	plate	galvanized2	7.14	206	29	crawl-open air
6-216	92.01	92.02	-0.01	5-Sep-97	27-Apr-01	44	plate	galvanized2	7.14	206	29	crawl-open air
6-217	92.23	92.23	0.00	5-Sep-97	27-Apr-01	44	plate	galvanized2	7.14	206	29	crawl-open air
AVG. LOSS/GAIN: -0.01												
6-228	91.44	91.42	0.02	5-Sep-97	27-Apr-01	44	plate	galvanized2	7.14	206	29	attic - hanging
6-229	91.08	91.07	0.01	5-Sep-97	27-Apr-01	44	plate	galvanized2	7.14	206	29	attic - hanging
6-230	92.03	92.02	0.01	5-Sep-97	27-Apr-01	44	plate	galvanized2	7.14	206	29	attic - hanging
AVG. LOSS/GAIN: 0.01												
6-240	91.81	91.80	0.01	5-Sep-97	27-Apr-01	44	plate	galvanized2	7.14	206	29	attic - in cellulose
6-243	92.47	92.46	0.01	5-Sep-97	27-Apr-01	44	plate	galvanized2	7.14	206	29	attic - in cellulose
AVG. LOSS/GAIN: 0.01												

Year 3 Retrieval Results (cont.)
Leonardtown, Maryland Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-249	91.19	91.17	0.02	5-Sep-97	27-Apr-01	44	plate	galvanized2	7.14	206	29	SE wall (cellulose)
6-253	91.65	91.63	0.02	5-Sep-97	27-Apr-01	44	plate	galvanized2	7.14	206	29	SE wall (cellulose)
AVG. LOSS/GAIN: 0.02												
7-59	43.76	43.77	-0.01	6-Feb-98	27-Apr-01	39	stud	galvalume2	3.75	168	45	crawl-open air
7-60	41.72	41.74	-0.02	6-Feb-98	27-Apr-01	39	stud	galvalume2	3.75	168	45	crawl-open air
7-61	49.6	49.61	-0.01	6-Feb-98	27-Apr-01	39	stud	galvalume2	3.75	168	45	crawl-open air
AVG. LOSS/GAIN: -0.01												
7-68	49.69	49.69	0.00	6-Feb-98	27-Apr-01	39	stud	galvalume2	3.75	168	45	under deck
7-69	48.45	48.46	-0.01	6-Feb-98	27-Apr-01	39	stud	galvalume2	3.75	168	45	under deck
7-70	44.98	44.97	0.01	6-Feb-98	27-Apr-01	39	stud	galvalume2	3.75	168	45	under deck
AVG. LOSS/GAIN: 0.00												
7-94	47.6	47.61	-0.01	6-Feb-98	27-Apr-01	39	stud	galvalume2	3.75	168	45	attic - hanging
7-95	44.55	44.55	0.00	6-Feb-98	27-Apr-01	39	stud	galvalume2	3.75	168	45	attic - hanging
7-96	55.17	55.17	0.00	6-Feb-98	27-Apr-01	39	stud	galvalume2	3.75	168	45	attic - hanging
AVG. LOSS/GAIN: 0.00												
7-103	39.36	39.36	0.00	6-Feb-98	27-Apr-01	39	stud	galvalume2	3.75	168	45	crawl-in batts
7-104	46.27	46.27	0.00	6-Feb-98	27-Apr-01	39	stud	galvalume2	3.75	168	45	crawl-in batts
7-105	45.72	45.71	0.01	6-Feb-98	27-Apr-01	39	stud	galvalume2	3.75	168	45	crawl-in batts
AVG. LOSS/GAIN: 0.00												
7-165	69.77	69.76	0.01	5-Sep-97	27-Apr-01	44	plate	galvalume2	3.75	168	45	attic - hanging
7-166	69.59	69.60	-0.01	5-Sep-97	27-Apr-01	44	plate	galvalume2	3.75	168	45	attic - hanging
7-167	69.85	69.84	0.01	5-Sep-97	27-Apr-01	44	plate	galvalume2	3.75	168	45	attic - hanging
7-168	69.72	69.70	0.02	5-Sep-97	27-Apr-01	44	plate	galvalume2	3.75	168	45	attic - hanging
AVG. LOSS/GAIN: 0.01												
7-185	69.58	69.57	0.01	5-Sep-97	27-Apr-01	44	plate	galvalume2	3.75	168	45	crawl-open air
7-186	69.90	69.90	0.00	5-Sep-97	27-Apr-01	44	plate	galvalume2	3.75	168	45	crawl-open air
7-187	69.88	69.87	0.01	5-Sep-97	27-Apr-01	44	plate	galvalume2	3.75	168	45	crawl-open air
AVG. LOSS/GAIN: 0.01												

Year 3 Retrieval Results (cont.)
Leonardtown, Maryland Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
8-24	117.73	117.73	0.00	5-Sep-97	27-Apr-01	44	plate	galfan	6.7	315	47	crawl-open air
8-25	117.71	117.71	0.00	5-Sep-97	27-Apr-01	44	plate	galfan	6.7	315	47	crawl-open air
8-26	116.92	116.92	0.00	5-Sep-97	27-Apr-01	44	plate	galfan	6.7	315	47	crawl-open air
AVG. LOSS/GAIN: 0.00												
8-27	117.40	117.38	0.02	5-Sep-97	27-Apr-01	44	plate	galfan	6.7	315	47	attic - hanging
8-28	117.27	117.25	0.02	5-Sep-97	27-Apr-01	44	plate	galfan	6.7	315	47	attic - hanging
8-29	116.48	116.47	0.01	5-Sep-97	27-Apr-01	44	plate	galfan	6.7	315	47	attic - hanging
AVG. LOSS/GAIN: 0.02												
8-37	117.75	117.73	0.02	5-Sep-97	27-Apr-01	44	plate	galfan	6.7	315	47	SE wall (cellulose)
AVG. LOSS/GAIN: 0.02												
8-186	59.74	59.76	-0.02	5-Sep-97	27-Apr-01	44	stud	galfan	6.7	315	47	crawl-open air
8-187	64.00	64.03	-0.03	5-Sep-97	27-Apr-01	44	stud	galfan	6.7	315	47	crawl-open air
8-188	65.33	65.34	-0.01	5-Sep-97	27-Apr-01	44	stud	galfan	6.7	315	47	crawl-open air
AVG. LOSS/GAIN: -0.02												
8-189	59.53	59.52	0.01	5-Sep-97	27-Apr-01	44	stud	galfan	6.7	315	47	attic - hanging
8-190	74.17	74.18	-0.01	5-Sep-97	27-Apr-01	44	stud	galfan	6.7	315	47	attic - hanging
8-191	67.66	67.66	0.00	5-Sep-97	27-Apr-01	44	stud	galfan	6.7	315	47	attic - hanging
AVG. LOSS/GAIN: 0.00												
8-201	63.16	63.15	0.01	6-Feb-98	27-Apr-01	39	stud	galfan	6.7	315	47	crawl-in batts
8-202	65.85	65.85	0.00	6-Feb-98	27-Apr-01	39	stud	galfan	6.7	315	47	crawl-in batts
8-203	71.73	71.74	-0.01	6-Feb-98	27-Apr-01	39	stud	galfan	6.7	315	47	crawl-in batts
AVG. LOSS/GAIN: 0.00												
8-213	80.57	80.57	0.00	6-Feb-98	27-Apr-01	39	stud	galfan	6.7	315	47	under deck
8-214	83.54	83.55	-0.01	6-Feb-98	27-Apr-01	39	stud	galfan	6.7	315	47	under deck
8-215	66.7	66.72	-0.02	6-Feb-98	27-Apr-01	39	stud	galfan	6.7	315	47	under deck
AVG. LOSS/GAIN: -0.01												

Year 5 Retrieval Results
Leonardtown, Maryland Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-83	41.25	41.25	0.00	16-May-97	14-Feb-03	71	Stud	Galvanized1	7.14	273	38	Attic-Hanging
6-84	44.59	44.59	0.00	16-May-97	14-Feb-03	71	Stud	Galvanized1	7.14	273	38	Attic-Hanging
6-85	47.76	47.75	-0.01	16-May-97	14-Feb-03	71	Stud	Galvanized1	7.14	273	38	Attic-Hanging
AVG. LOSS/GAIN: 0.00												
6-95	43.15	43.16	+0.01	16-May-97	14-Feb-03	71	Stud	Galvanized1	7.14	273	38	Crawl Space, In Batts
6-96	43.73	43.73	0.00	16-May-97	14-Feb-03	71	Stud	Galvanized1	7.14	273	38	Crawl Space, In Batts
6-97	48.27	48.28	+0.01	16-May-97	14-Feb-03	71	Stud	Galvanized1	7.14	273	38	Crawl Space, In Batts
AVG. LOSS/GAIN: +0.01												
6-110	48.82	48.84	+0.02	16-May-97	14-Feb-03	71	Stud	Galvanized1	7.14	273	38	Crawl Space, Open Air
6-111	45.66	45.67	+0.01	16-May-97	14-Feb-03	71	Stud	Galvanized1	7.14	273	38	Crawl Space, Open Air
6-112	39.83	39.85	+0.02	16-May-97	14-Feb-03	71	Stud	Galvanized1	7.14	273	38	Crawl Space, Open Air
AVG. LOSS/GAIN: +0.02												
6-119	49.06	49.08	+0.02	16-May-97	14-Feb-03	71	Stud	Galvanized1	7.14	273	38	Under Deck
6-120	41.71	41.74	+0.03	16-May-97	14-Feb-03	71	Stud	Galvanized1	7.14	273	38	Under Deck
6-166	55.88	55.91	+0.03	06-Feb-98	14-Feb-03	60	Stud	Galvanized1	7.14	273	38	Under Deck
AVG. LOSS/GAIN: +0.03												
6-218	92.58	92.61	+0.03	5-Sep-97	14-Feb-03	65	Plate	Galvanized2	7.14	206	29	Crawl Space, Open Air
6-219	91.78	91.80	+0.02	5-Sep-97	14-Feb-03	65	Plate	Galvanized2	7.14	206	29	Crawl Space, Open Air
6-220	91.19	91.22	+0.03	5-Sep-97	14-Feb-03	65	Plate	Galvanized2	7.14	206	29	Crawl Space, Open Air
AVG. LOSS/GAIN: +0.03												
6-234	91.58	91.58	0.00	5-Sep-97	14-Feb-03	65	Plate	Galvanized2	7.14	206	29	Attic-Hanging
6-235	91.42	91.42	0.00	5-Sep-97	14-Feb-03	65	Plate	Galvanized2	7.14	206	29	Attic-Hanging
6-236	92.06	92.06	0.00	5-Sep-97	14-Feb-03	65	Plate	Galvanized2	7.14	206	29	Attic-Hanging
AVG. LOSS/GAIN: 0.00												
6-241	92.02	92.01	-0.01	5-Sep-97	14-Feb-03	65	Plate	Galvanized2	7.14	206	29	Attic-in Cellulose
6-242	92.46	92.46	0.00	5-Sep-97	14-Feb-03	65	Plate	Galvanized2	7.14	206	29	Attic-in Cellulose
AVG. LOSS/GAIN: -0.01												

Year 5 Retrieval Results (cont.)
Leonardtown, Maryland Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
6-244	92.46	92.45	-0.01	5-Sep-97	14-Feb-03	65	Plate	Galvanized2	7.14	206	29	SE Wall - Cellulose
6-250	91.55	91.55	0.00	5-Sep-97	14-Feb-03	65	Plate	Galvanized2	7.14	206	29	SE Wall – Cellulose
6-251	92.21	92.20	-0.01	5-Sep-97	14-Feb-03	65	Plate	Galvanized2	7.14	206	29	SE Wall - Cellulose
6-254	91.91	91.90	-0.01	5-Sep-97	14-Feb-03	65	Plate	Galvanized2	7.14	206	29	SE Wall - Cellulose
AVG. LOSS/GAIN: -0.01												
7-62	52.08	52.09	+0.01	06-Feb-98	14-Feb-03	60	Stud	Galvalume2	3.75	168	45	Crawl Space, Open Air
7-63	45.82	45.84	+0.02	06-Feb-98	14-Feb-03	60	Stud	Galvalume2	3.75	168	45	Crawl Space, Open Air
7-64	44.08	44.09	+0.01	06-Feb-98	14-Feb-03	60	Stud	Galvalume2	3.75	168	45	Crawl Space, Open Air
AVG. LOSS/GAIN: +0.01												
7-71	49.39	49.41	+0.02	06-Feb-98	14-Feb-03	60	Stud	Galvalume2	3.75	168	45	Under Deck
7-72	48.77	48.77	0.00	06-Feb-98	14-Feb-03	60	Stud	Galvalume2	3.75	168	45	Under Deck
7-73	47.35	47.36	+0.01	06-Feb-98	14-Feb-03	60	Stud	Galvalume2	3.75	168	45	Under Deck
AVG. LOSS/GAIN: +0.01												
7-97	43.42	43.42	0.00	06-Feb-98	14-Feb-03	60	Stud	Galvalume2	3.75	168	45	Attic-Hanging
7-98	44.42	44.43	+0.01	06-Feb-98	14-Feb-03	60	Stud	Galvalume2	3.75	168	45	Attic-Hanging
7-99	40.53	40.53	0.00	06-Feb-98	14-Feb-03	60	Stud	Galvalume2	3.75	168	45	Attic-Hanging
AVG. LOSS/GAIN: 0.00												
7-106	42.93	42.94	+0.01	06-Feb-98	14-Feb-03	60	Stud	Galvalume2	3.75	168	45	Crawl Space, In Batts
7-107	45.97	45.98	+0.01	06-Feb-98	14-Feb-03	60	Stud	Galvalume2	3.75	168	45	Crawl Space, In Batts
7-108	47.10	47.10	0.00	06-Feb-98	14-Feb-03	60	Stud	Galvalume2	3.75	168	45	Crawl Space, In Batts
AVG. LOSS/GAIN: +0.01												
7-171	69.86	69.86	0.00	5-Sep-97	14-Feb-03	65	Plate	Galvalume2	3.75	168	45	Attic-Hanging
7-172	69.75	69.75	0.00	5-Sep-97	14-Feb-03	65	Plate	Galvalume2	3.75	168	45	Attic-Hanging
7-173	69.64	69.64	0.00	5-Sep-97	14-Feb-03	65	Plate	Galvalume2	3.75	168	45	Attic-Hanging
AVG. LOSS/GAIN: 0.00												
7-180	69.69	69.69	0.00	5-Sep-97	14-Feb-03	65	Plate	Galvalume2	3.75	168	45	Crawl Space, Open Air
7-181	69.70	69.72	+0.02	5-Sep-97	14-Feb-03	65	Plate	Galvalume2	3.75	168	45	Crawl Space, Open Air
7-182	69.65	69.66	+0.01	5-Sep-97	14-Feb-03	65	Plate	Galvalume2	3.75	168	45	Crawl Space, Open Air
AVG. LOSS/GAIN: +0.01												

Year 5 Retrieval Results (cont.)
Leonardtown, Maryland Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density of Coating Material (g/cm^3)	Coating Weight of Source (g/m^2)	Coating Thickness of Source Material (microns)	Sample Location
8-21	117.10	117.11	+0.01	5-Sep-97	14-Feb-03	65	Plate	Galfan	6.7	315	47	Crawl Space, Open Air
8-22	117.63	117.63	0.00	5-Sep-97	14-Feb-03	65	Plate	Galfan	6.7	315	47	Crawl Space, Open Air
8-23	118.17	118.18	+0.01	5-Sep-97	14-Feb-03	65	Plate	Galfan	6.7	315	47	Crawl Space, Open Air
AVG. LOSS/GAIN: +0.01												
8-33	116.96	116.96	0.00	5-Sep-97	14-Feb-03	65	Plate	Galfan	6.7	315	47	Attic-Hanging
8-34	118.11	118.11	0.00	5-Sep-97	14-Feb-03	65	Plate	Galfan	6.7	315	47	Attic-Hanging
8-35	116.72	116.71	-0.01	5-Sep-97	14-Feb-03	65	Plate	Galfan	6.7	315	47	Attic-Hanging
AVG. LOSS/GAIN: 0.00												
8-36	116.99	116.97	-0.02	5-Sep-97	14-Feb-03	65	Plate	Galfan	6.7	315	47	SE Wall - Cellulose
8-38	116.93	116.93	-0.02	5-Sep-97	14-Feb-03	65	Plate	Galfan	6.7	315	47	SE Wall - Cellulose
AVG. LOSS/GAIN: -0.02												
8-177	70.72	70.76	+0.04	5-Sep-97	14-Feb-03	65	Stud	Galfan	6.7	315	47	Crawl Space, Open Air
8-178	71.19	71.23	+0.04	5-Sep-97	14-Feb-03	65	Stud	Galfan	6.7	315	47	Crawl Space, Open Air
8-179	66.15	66.19	+0.04	5-Sep-97	14-Feb-03	65	Stud	Galfan	6.7	315	47	Crawl Space, Open Air
AVG. LOSS/GAIN: +0.04												
8-192	65.49	65.49	0.00	5-Sep-97	14-Feb-03	65	Stud	Galfan	6.7	315	47	Attic-Hanging
8-193	66.61	66.62	+0.01	5-Sep-97	14-Feb-03	65	Stud	Galfan	6.7	315	47	Attic-Hanging
8-194	68.46	68.46	0.00	5-Sep-97	14-Feb-03	65	Stud	Galfan	6.7	315	47	Attic-Hanging
AVG. LOSS/GAIN: 0.00												
8-204	68.52	68.53	+0.01	06-Feb-98	14-Feb-03	60	Stud	Galfan	6.7	315	47	Crawl Space, In Batts
8-205	69.65	69.66	+0.01	06-Feb-98	14-Feb-03	60	Stud	Galfan	6.7	315	47	Crawl Space, In Batts
8-206	75.85	75.85	0.00	06-Feb-98	14-Feb-03	60	Stud	Galfan	6.7	315	47	Crawl Space, In Batts
AVG. LOSS/GAIN: +0.01												
8-216	65.52	65.54	+0.02	06-Feb-98	14-Feb-03	60	Stud	Galfan	6.7	315	47	Under Deck
8-217	66.87	66.89	+0.02	06-Feb-98	14-Feb-03	60	Stud	Galfan	6.7	315	47	Under Deck
8-218	65.77	65.79	+0.02	06-Feb-98	14-Feb-03	60	Stud	Galfan	6.7	315	47	Under Deck
AVG. LOSS/GAIN: +0.02												
6-67	49.14	47.99	-1.150	16-May-97	14-Feb-03	71	Stud	Not Coated	7.14	273	38	Crawl Space, Open Air
6-68	42.71	41.73	-0.98	16-May-97	14-Feb-03	71	Stud	Not Coated	7.14	273	38	Crawl Space, Open Air
AVG. LOSS/GAIN: -1.07												

Year 5 Retrieval Results After Cleaning Leonardtown, Maryland Site								
Specimen Code	**Sample Type**	**Source Material**	**Duration (Months)**	**Initial Weight (g)**	**Final Weight (g)**	**Final Weight After Cleaning (g)**	**Loss During Exposure (g)**	**Sample Location**
6-120	Stud	Galvanized1	71	41.71	41.74	41.73	+0.02	Under Deck
6-166	Stud	Galvanized1	60	55.88	55.91	55.89	+0.01	Under Deck
6-218	Plate	Galvanized2	65	92.58	92.61	92.60	+0.02	Crawl Space, Open Air
6-220	Plate	Galvanized2	65	91.19	91.22	91.20	+0.01	Crawl Space, Open Air
8-177	Stud	Galfan	65	70.72	70.76	70.74	+0.02	Crawl Space, Open Air
8-178	Stud	Galfan	65	71.19	71.23	71.21	+0.02	Crawl Space, Open Air
8-179	Stud	Galfan	65	66.15	66.19	66.17	+0.02	Crawl Space, Open Air

Year 7 Retrieval Results
Leonardtown, Maryland Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density Of Coating (g/cm^3)	Density Of Source (g/m^2)	Coating Weight Of Thickness (microns)	Sample Location
6-136	46.21	46.19	0.02	6-Feb-98	28-Oct-05	93	Stud	Galvanized1	7.14	273	38	Attic-Hanging
6-137	42.54	42.52	0.02									
6-138	42.37	42.34	0.03									
AVG. LOSS/GAIN:0.023												
6-147	43.01	42.99	0.02	6-Feb-98	28-Oct-05	93	Stud	Galvanized1	7.14	273	38	Crawl Space, In Batts
6-148	43.53	43.51	0.02									
6-149	46.01	46.00	0.01									
AVG. LOSS/GAIN:0.017												
6-139	44.62	44.58	0.04	6-Feb-98	28-Oct-05	93	Stud	Galvanized1	7.14	273	38	Crawl Space, Open Air
6-140	42.78	42.74	0.04									
6-141	41.54	41.51	0.03									
AVG. LOSS/GAIN: 0.037												
6-150	45.36	45.33	0.03	06-Feb-98	28-Oct-05	93	Stud	Galvanized1	7.14	273	38	Under Deck
6-151	42.15	42.11	0.04									
6-152	43.56	43.52	0.04									
AVG. LOSS/GAIN: 0.037												
6-317	92.11	92.08	0.03	06-Feb-98	28-Oct-05	93	Plate	Galvanized2	7.14	206	29	Crawl Space, Open Air
6-318	92.44	92.4	0.04									
6-319	92.04	92.00	0.04									
AVG. LOSS/GAIN: 0.037												
6-301	90.46	90.44	0.02	06-Feb-98	28-Oct-05	93	Plate	Galvanized2	7.14	206	29	Attic-Hanging
6-302	91.33	91.31	0.02									
6-303	91.18	91.17	0.01									
AVG. LOSS/GAIN: 0.017												
6-296	90.7	90.69	0.01	06-Feb-98	28-Oct-05	93	Plate	Galvanized2	7.14	206	29	Attic-in Cellulose
6-297	91	90.99	0.01									
6-298	92.6	92.58	0.02									
AVG. LOSS/GAIN: 0.013												

Year 7 Retrieval Results (cont.)
Leonardtown, Maryland Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density Of Coating (g/cm^3)	Density Of Source (g/m^2)	Coating Weight Of Thickness (microns)	Sample Location
6-327	91.32	91.3	0.02	06-Feb-98	28-Oct-05	93	Plate	Galvanized2	7.14	206	29	SE Wall - Cellulose
6-328	91.54	91.52	0.02									
6-329	91.29	91.27	0.02									
AVG. LOSS/GAIN: 0.020												
7-125	42.2	42.17	0.03	06-Feb-98	28-Oct-05	93	Stud	Galvalume2	3.75	168	45	Crawl Space, Open Air
7-126	41.95	41.92	0.03									
7-127	49.89	49.85	0.04									
AVG. LOSS/GAIN: 0.033												
7-110	43.12	43.08	0.04	06-Feb-98	28-Oct-05	93	Stud	Galvalume2	3.75	168	45	Under Deck
7-120	42.85	42.82	0.03									
7-121	46.02	46	0.02									
AVG. LOSS/GAIN: 0.030												
7-122	48.18	48.16	0.02	06-Feb-98	28-Oct-05	93	Stud	Galvalume2	3.75	168	45	Attic-Hanging
7-123	45.58	45.56	0.02									
7-124	46.98	46.97	0.01									
AVG. LOSS/GAIN: 0.017												
7-128	44.62	44.6	0.02	06-Feb-98	28-Oct-05	93	Stud	Galvalume2	3.75	168	45	Crawl Space, In Batts
7-129	42.15	42.12	0.03									
7-130	45.23	45.2	0.03									
AVG. LOSS/GAIN: 0.027												
7-243	68.26	68.25	0.01	5-Sep-97	28-Oct-05	98	Plate	Galvalume2	3.75	168	45	Attic-Hanging
7-244	69.75	69.73	0.02									
7-245	69.78	69.76	0.02									
AVG. LOSS/GAIN: 0.017												
7-258	69.68	69.66	0.02	5-Sep-97	28-Oct-05	98	Plate	Galvalume2	3.75	168	45	Crawl Space, Open Air
7-259	69.45	69.41	0.04									
7-260	69.61	69.58	0.03									
AVG. LOSS/GAIN: 0.030												

Year 7 Retrieval Results (cont.)
Leonardtown, Maryland Site

Specimen Number	Initial Weight (g)	Final Weight (g)	Loss During Exposure (g)	Install Date	Recovery Date	Duration (Months)	Sample Type	Source Material	Density Of Coating (g/cm^3)	Density Of Source (g/m^2)	Coating Weight Of Thickness (microns)	Sample Location
8-100	116.42	116.4	0.02	5-Sep-97	28-Oct-05	98	Plate	Galfan	6.7	315	47	Crawl Space, Open Air
8-101	117.79	117.77	0.02									
8-102	117.94	117.91	0.03									
AVG. LOSS/GAIN: 0.023												
8-114	115.62	115.6	0.02	5-Sep-97	28-Oct-05	98	Plate	Galfan	6.7	315	47	Attic-Hanging
8-115	115.69	115.68	0.01									
8-116	117.2	117.18	0.02									
AVG. LOSS/GAIN: 0.017												
8-106	117.28	117.25	0.03	5-Sep-97	28-Oct-05	98	Plate	Galfan	6.7	315	47	SE Wall - Cellulose
8-107	118.84	118.8	0.04									
8-108	118.03	118	0.03									
AVG. LOSS/GAIN: 0.033												
8-225	64	63.96	0.04	06-Feb-98	28-Oct-05	93	Stud	Galfan	6.7	315	47	Crawl Space, Open Air
8-226	78.08	78.05	0.03									
8-227	67.96	67.92	0.04									
AVG. LOSS/GAIN: 0.037												
8-231	61.16	61.15	0.01	06-Feb-98	28-Oct-05	93	Stud	Galfan	6.7	315	47	Attic-Hanging
8-232	81.24	81.23	0.01									
8-233	65.75	65.74	0.01									
AVG. LOSS/GAIN: 0.010												
8-228	54.71	54.69	0.02	06-Feb-98	28-Oct-05	93	Stud	Galfan	6.7	315	47	Crawl Space, In Batts
8-229	68.18	68.15	0.03									
8-230	70.4	70.38	0.02									
AVG. LOSS/GAIN: 0.023												
8-234	58.11	58.08	0.03	06-Feb-98	28-Oct-05	93	Stud	Galfan	6.7	315	47	Under Deck
8-235	62.65	62.61	0.04									
8-236	65.06	65.03	0.03									
AVG. LOSS/GAIN: 0.033												

American Iron and Steel Institute

1140 Connecticut Avenue, NW
Suite 705
Washington, DC 20036

www.steel.org

Steel Framing Alliance™
Steel. The Better Builder.

1201 15th Street, NW
Suite 320
Washington, DC 20005

www.steelframing.org

The New Steel

Research Report RP-06-1