Eames House Conservation Project: Investigations 2011 to 2016

Research Report

Edited by Laura Matarese
with Chandler McCoy and Gail Ostergren

The Getty Conservation Institute

Eames House Conservation Project: Investigations 2011 to 2016

Edited by Laura Matarese
with Chandler McCoy and Gail Ostergren

THE GETTY CONSERVATION INSTITUTE
LOS ANGELES

The Getty Conservation Institute
1200 Getty Center Drive, Suite 700
Los Angeles, CA 90049-1684
United States
Telephone 310 440-7325
Fax 310 440-7702
E-mail gciweb@getty.edu
www.getty.edu/conservation

The Getty Conservation Institute (GCI) works internationally to advance conservation practice in the visual arts—broadly interpreted to include objects, collections, architecture, and sites. The Institute serves the conservation community through scientific research, education and training, field projects, and the dissemination of information. In all its endeavors, the GCI creates and delivers knowledge that contributes to the conservation of the world's cultural heritage.

ISBN: 978-1-937433-57-4 (online resource)

Cover: Contractors undertaking conservation treatment on the wood paneling in the Eames House living room.
Photo: Arlen Heginbotham, 2012

Contents

CHAPTER 6

Eames House Landscape Survey and Assessment

Carlberg Associates

CHAPTER 2

In Situ Paint Investigation of the Exterior Steelwork of the Eames House Residence and Studio

Emily MacDonald-Korth

2.1. Introduction

From March 2012 to February 2013, an in situ paint investigation was carried out on the exterior of the Eames House by Emily MacDonald-Korth, Associate Project Specialist, the Getty Conservation Institute (GCI) (fig. 2.1). The investigation aimed to reveal the stratigraphy of the exterior paint color at the residence and studio of the Eames House, and specifically at three significant dates: 1949, when the house was completed; 1978 when Charles Eames died; and 1988 when Ray Eames died. Color information was also obtained during the investigation and may be used to develop paint color recommendations for future painting campaigns. This investigation builds upon the results of the historic research, as well as the scientific analysis of paint stratigraphy, pigments, and organic binders (see chapter 1).

2.2. Methodology

This section outlines the methodologies and techniques that were used to determine the stratigraphy and approximate dates of paint campaigns at the Eames House residence and studio.

FIGURE 2.1
The Eames House during the in situ paint excavations, 2013.

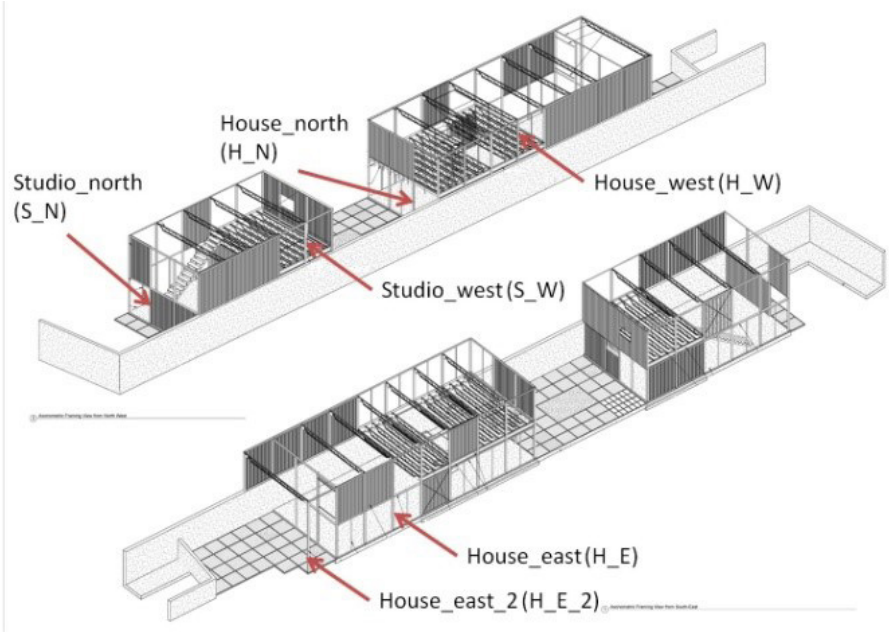

FIGURE 2.2
Locations of in situ paint excavation sites.
Drawing: Adapted from drawing by Escher GuneWardena Architecture, © Eames Office.

2.2.1 Excavation Exposure Windows

The in situ paint investigation is focused solely on the paint on the exterior steel framework of the Eames House. Six in situ paint excavation exposure windows, and complementary cross-sectional optical microscopy, were carried out on the exterior steel beams on the north, east, and west elevations of the residence and on north and west elevations of the studio (fig. 2.2). The paint excavation sites (sample sites) were selected based on proximity to sampling sites undertaken in 2011, and on the need to study different elevations.

The paint excavation names and dates of excavations are as follows:

- House_north (H_N) – June 20 2012
- House_east (H_E) – July 3 2012
- House_west (H_W) – July 20 2012
- Studio_north (S_N) – July 20 2012
- Studio_west (S_W) – July 20 2012
- House_east_2 (H_E_2) – October 10 2012

The in situ paint excavations sought to reveal all layers of paint from the uppermost paint layer to the steel beam substrate on a sufficient scale to gauge the hue with the naked eye and take color measurements where required. The results of the in situ paint investigation were compared with the results of the GCI's 2011 investigations and historic research on the paint campaigns at the Eames House (see chapter 1).

Using a small stainless steel scalpel blade and other mechanical techniques, each paint layer was carefully scraped and cleaved away to reveal the layer beneath, from the steel substrate to the uppermost paint layer (figs. 2.3–2.4). The sizes of the exposure windows varied; they were approximately 1 × 1–2.5 in. (2.5 × 2.5–6.4 cm). Observations made during in situ examination were written and recorded with digital photo documentation before and after excavation. A digital microscope was also used to photograph select sample sites. Sample sites are not visually distracting from a distance, but are large enough to reveal the color of each layer when viewed up close.

FIGURE 2.3
Emily MacDonald-Korth excavating exterior paint layers at the Eames House (sample location House_ east), 2013.
Photo: Scott Warren

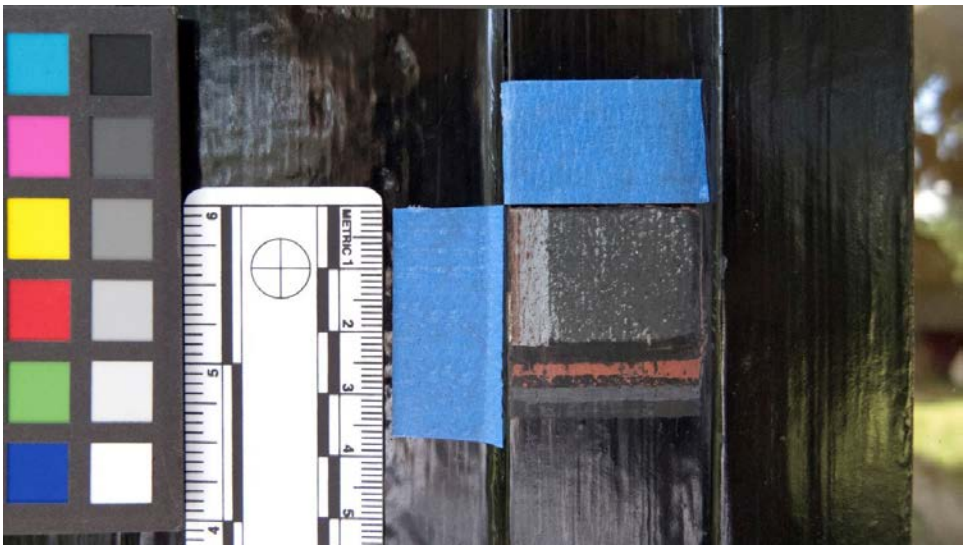

FIGURE 2.4
Detail of in situ paint excavation exposure window (H_E) after completion.
Photo: Scott Warren

2.2.2 Sampling

Cross section samples were taken from the edge of each sample site, and samples were collected using a wearable magnification visor and a stainless steel microscalpel (blade #15). Sampling aimed to include as many layers as possible and to be certain all layers revealed in the exposure window were collected. The samples were taken on a very small scale and sampling was kept to a minimum to preserve the work in its most intact form and to limit the need for later intervention.

2.2.3 Cross-Sectional Optical Microscopy Procedures

Cross-sectional optical microscopy provides information about paint layer stratigraphy and allows for some characterization of binders and coatings, based on the morphology of layers and particles, and autofluorescence of the layers under varying wavelengths. The

samples were cast in acrylic resin, sanded, and polished to expose the cross section surface. In the laboratory, cross section samples were examined using a stereomicroscope, and the fragments selected for examination as cross sections were mounted in Technovit 2000 LC resin, a UV-curing acrylic. After curing, the mounted samples were fine-sanded and dry-polished by hand. The prepared cross section samples were examined under visible light with a polarizing filter and ultraviolet (UV) light, to view autofluorescence, using a Leica DM4000 microscope. Digital images were captured through the microscope using a Diagnostic Instruments Flex camera. Using fluorescence microscopy and imaging techniques, the stratigraphy was identified. The stratigraphy of the excavation exposure window and the stratigraphy of the cross section samples were compared.

2.2.4 Color Measurement and Matching Procedures

Color measurements of the stratigraphic layers were taken in situ at the sample sites with a tristimulus handheld spectrophotometer, manufactured by Konica Minolta (CM-2600d), to measure color revealed as the earliest paint layer on excavation site House_East (appendix 2.1). The color data is communicated in the CIELAB color space, which is very accurate, but is not widely used by paint manufacturers. Munsell color systems are more widely used and the data can be translated to the Munsell system, if necessary. The Tnemec paint system was preselected for the project. The color of the earliest extant (estimated to be the original) paint layer was matched by eye and by color data correlated to the selected swatches. The change in color in the CIELAB system is measured as total color difference or ΔE^*; the perceptible difference between two colors is accepted to be 2–5 ΔE, although well-trained eyes may see as little as 1 ΔE.

Color measurements of the residence and studio were taken, and the earliest extant layer estimated to be the original paint layer of the steelwork was measured. Colors were measured on site; the exposure window was compared to color swatches of commercial paint over different times of day and at different elevations (Tnemec Industrial Coatings). The swatches that most closely matched the earliest extant paint layer were then measured with a handheld spectrophotometer, and the closest commercial paint color match was selected as a guide for future paint campaigns.

2.2.5 Complementary Techniques of the GCI Paint Investigations

In 2011, the GCI scientists performed an extensive paint analysis investigation on samples taken from the interior and exterior steel beams and window frames of the Eames House (see chapter 1). The investigation included optical microscopy and organic and inorganic analysis to characterize the materials and identify the components in an attempt to determine the age of the paints based on their chemistry, products on the market at certain dates, and known dates of painting campaigns at the site. Chapter 1 discusses the results of the broad study of the paint layering history and describes the characteristics of each paint layer in great detail.

The cross-sectional optical microscopy in the 2011 investigation and in situ paint excavation exposure windows undertaken in 2012–13 are valuable complementary techniques for multiple reasons. Cross-sectional optical microscopy is necessary when performing paint excavations to compare the layers revealed in the exposure window to the layers visible in the cross-sectional sample; more layers are often visible in cross section. There is a value in viewing historic colors at the macro scale: cross-sectional representations of colors often cannot represent hues accurately, though relative color differences can be compared between strata; and an exposure window made through paint excavation tech-

niques can be extremely valuable for communication among the project partners. Furthermore, accurate color measurements cannot usually be made using standard colorimeters, but require a larger area from which to measure the color. Under the microscope, it is possible to see very subtle structural variations; to identify differences between layers using ultraviolet light; and to see temporal changes, such as dirt. Excavation exposure windows reveal paint layers on a scale visible with the unaided eye, and yields textural material property data not possible to get with microscopy; observations about layers such as brittle, tough, soft, or well-adhered are regularly made during paint excavation. There are advantages to each method, but using both together is the most valuable approach. Comparisons of the results of these techniques are discussed in Section 2.4.

2.2.6 Limitations

In many paint excavations, it can be nearly impossible to separate all of the layers because of the thickness, hardness, texture, bonding, or cleaving at layer interfaces, or the degree of deterioration. For example, a very thin and brittle paint layer is often more difficult to reveal than a thick and tough paint layer because the brittle layer will likely fracture during removal of the layer above it. Similarly, two semisoft layers can interact in such a way that their border becomes joined and impossible to separate at the interface with standard excavation methods.

In most cases the sheen cannot be accurately evaluated in an exposure window because of abrasion to the surface, interactions between layers over time, possible sanding before repainting, and the scraping and damage to the paint layer caused during excavation with a scalpel. In some cases, paint layers cleave completely and cleanly because of poor adhesion, potentially making it possible to accurately evaluate the sheen.

A number of excavations were carried out on warm days and in direct sun causing the paint layers to soften. In some areas the softened layers would not separate without nicks. Cooler weather allowed these layers to cleave more readily.

2.3. Analysis of the Exterior Paint Stratigraphy of the Steelwork at the Eames House

The six excavation sites had very similar stratigraphy, with few and slight variations in layering structure. The results of the in situ paint investigation were as expected: the stratigraphy correlated closely to the stratigraphy identified in the 2011 investigation. For example, the initial excavation on the east wall aligns with the previous paint analysis. The residence was originally a warm gray and was painted a series of grays and blacks before being painted the current black paint color. In the 2011 study, a warm gray paint comprised of fine black, white, red, blue-green, and yellow particles was identified in all exterior samples and is accepted as the original exterior paint color. A representative sample from each study was compared, and the photomicrographs were diagrammed and annotated. It was observed that select elevations appeared to deviate slightly from the general stratigraphy, which is described below, though the first several coating layers are alike in all samples. The stratigraphic variations between excavation sites may be a result of localized repairs and maintenance.

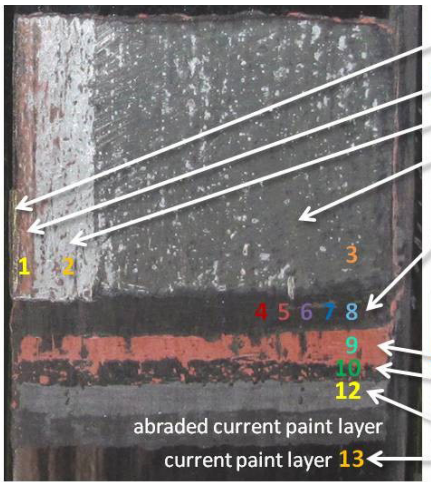

FIGURE 2.5
In situ paint excavation exposure window after completion (H_E), with layers numbered chronologically from lowest (earliest, number 0) to uppermost (most recent, number 13), and annotations where necessary.

FIGURE 2.6
Paint layering structure diagram (not to scale), with arrows referring to the adjacent exposure window diagram.

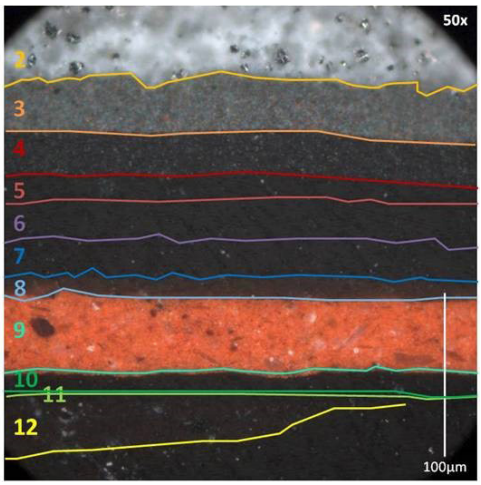

FIGURE 2.7
Photomicrograph of cross-sectional sample taken from the exposure window in figure 2.5 (H_E). Layers are delineated and numbered.

2.3.1 Details of the Paint Stratigraphy Analysis

From the results of the in situ investigation, a general paint stratigraphy for the exterior steelwork of the residence and studio can be summarized as follows. The steel substrate shows one to three layers of primer and a corrosion inhibitor, followed by a warm gray paint. A dark gray paint was applied at some time, followed by a series of one to three black paints. The black paint was then coated with a shiny brown material, followed by a black paint and then a gray paint, before the current black paint was applied (figs. 2.5–2.7).

The colors of the first and second paint layers were made using a painterly method—they were mixed as a fine artist might—and suggest a great care in achieving very specific grays. These two earliest gray paints differ in color, but have compositional similarities. They were made via subtractive color mixing with red, blue-green, and yellow particles in addition to white and black. The lower warm gray is estimated to be the original surface coating for the house and it was a unique gray. Early accounts of the house mention a “dark warm gray” or “dark neutral gray” color for the metalwork (Eames and Entenza 1949, 29–30). Ray Eames was an artist and colorist, and the earliest paint layers at the Eames House may demonstrate her influence on the selection of paint colors

Detailed observations from each sample site and associated cross section sample can be found in figures 2.8–2.13. Diagrammed photomicrographs of each sample cross section with annotations (under reflected visible and ultraviolet lights) can be found in figures 2.14–2.18.

House_north

FIGURE 2.8A
Eames House paint excavation location: House_north.

FIGURE 2.8B
House_north, in situ paint excavation exposure window.

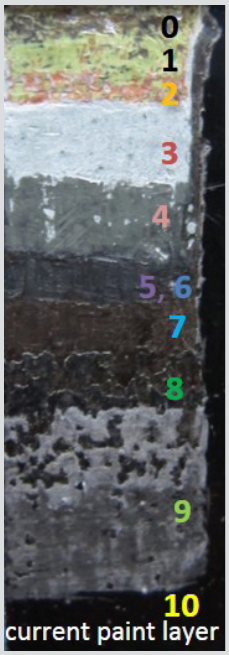

FIGURE 2.8C
House_north, in situ paint excavation exposure window.

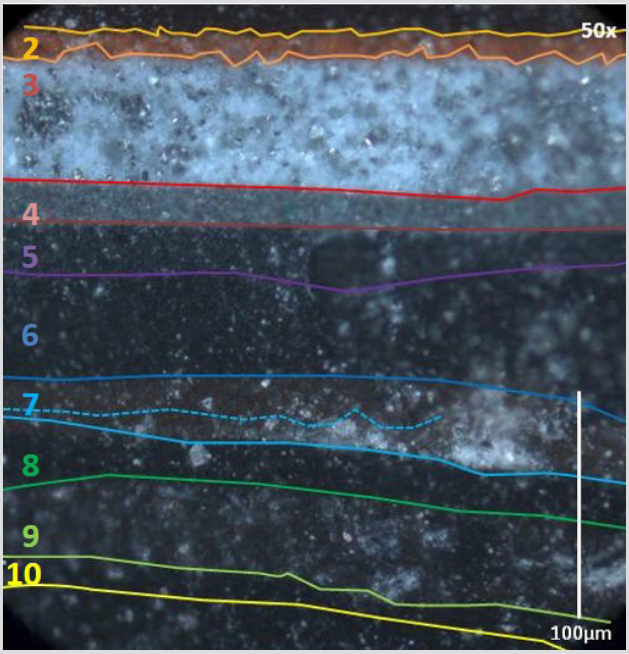

FIGURE 2.8D
House_north cross section microphotograph, with stratigraphic layers numbered (reflected visible light, 50×).

KEY:

0. Steel, (not included in cross section)
1. Primer, yellow-green (not included in cross section)
2. Primer, orange
3. Corrosion inhibitor
4. Warm gray paint (white, black, red, yellow, blue-green particles), the first exterior paint layer
5. Dark gray paint (black, white, and red particles)
6. Black paint (uniform black particle content)
7. Brown layer, possibly a coating
8. Black paint (uniform black particle content)
9. Dark gray paint (black and white particles)
10. Current paint layer, black paint

House_north

FIGURE 2.9A
Eames House paint excavation location: House_east. Pictured: Tom Learner and Ana Paula Arato Gonçalves from the GCI.

FIGURE 2.9B
House_east, in situ paint excavation exposure window.

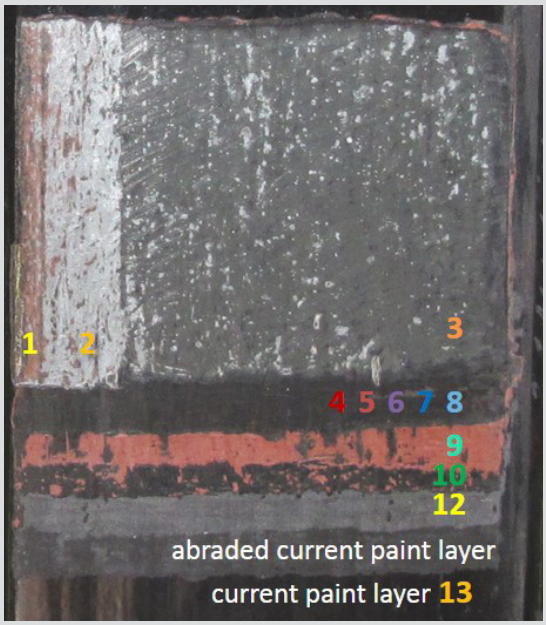

FIGURE 2.9C
House_east, in situ paint excavation exposure window with numbered layers.

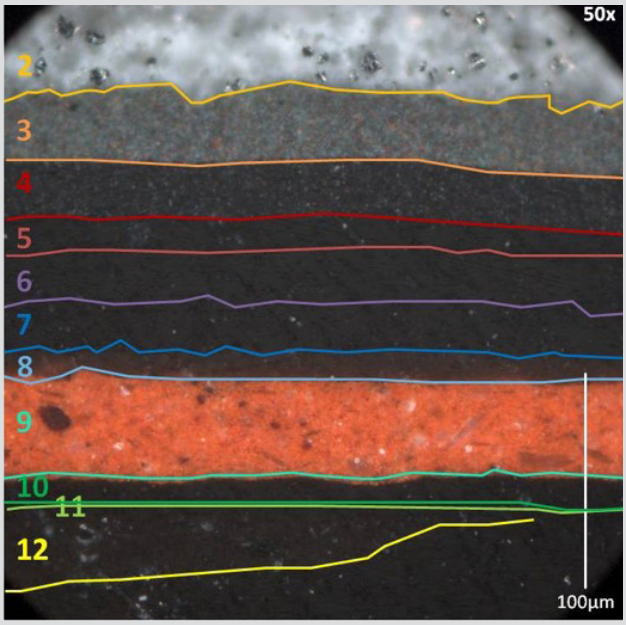

FIGURE 2.9D
House_east cross section microphotograph with stratigraphic layers numbered (reflected visible light, 50×).

KEY

0. Steel, not pictured
1. Primer (not included in cross section image)
2. Corrosion inhibitor
3. Warm gray paint (white, black, red, yellow, blue-green particles), the first exterior paint layer
4. Dark gray paint (black, white, and red particles)
5. Black paint (uniform black particle content)
6. Black paint (uniform black particle content)
7. Black paint (uniform black particle content)
8. Brown layer, possibly a coating
9. Orange primer
10. Black paint (uniform black particle content)
11. Dirt/grime layer
12. Dark gray paint (black and white particles)
13. Current paint layer, black paint (not included in cross section image)

House_east_2

FIGURE 2.10A
Eames House paint excavation location: House_east_2

FIGURE 2.10B
An additional excavation was performed on beam 4D. A cross section sample was taken but was not imaged in 2013, at the time this report was prepared.

KEY

1. Primer, yellow-green
2. Primer, orange
3. Corrosion inhibitor
4. Warm gray paint; the first exterior layer
5. Dark gray paint
6. Black paint
7. Brown layer, possibly a coating
8. Current paint layer, black paint

FIGURE 2.10C
House_east_2, in situ paint excavation exposure window with numbered layers.

House_west

FIGURE 2.11A
Eames House paint excavation location: House_west.

FIGURE 2.11B
House_north, in situ paint excavation exposure window.

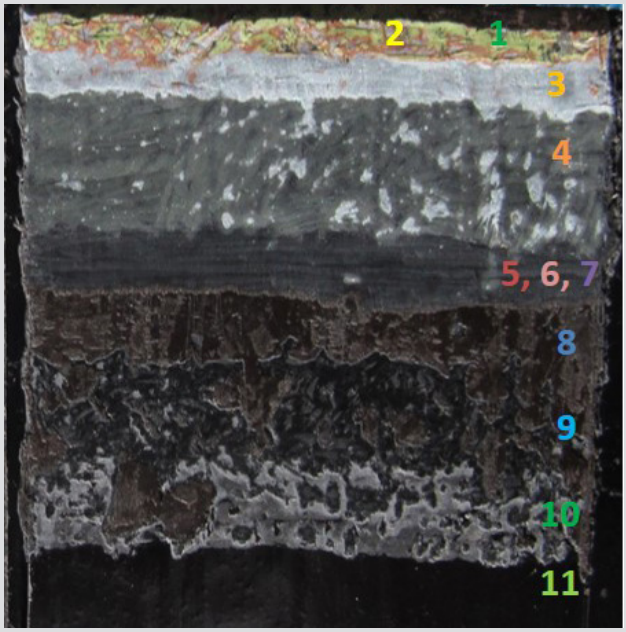

FIGURE 2.11C
House_west, in situ paint excavation exposure window.

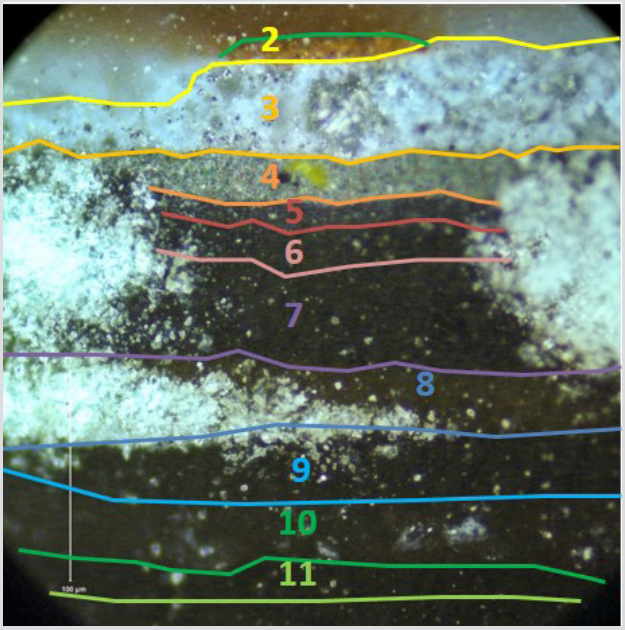

FIGURE 2.11D
House_west, cross section microphotograph, with stratigraphic layers numbered (reflected visible light, 50×).

KEY

0. Steel, (not included in cross section)
1. Primer, yellow-green (not included in cross section)
2. Primer, orange
3. Corrosion inhibitor
4. Warm gray paint (white, black, red, yellow, blue-green particles), the first exterior paint layer
5. Dark gray paint (black, white, and red particles)
6. Black paint (uniform black particle content)
7. Black paint (uniform black particle content)
8. Brown layer, possibly a waterproofing layer
9. Black paint (uniform black particle content)
10. Dark gray paint (black and white particles)
11. Current paint layer, black paint

Studio_north

FIGURE 2.12A
Eames House paint excavation location: Studio_north.

FIGURE 2.12B
Studio_north, in situ paint excavation exposure window.

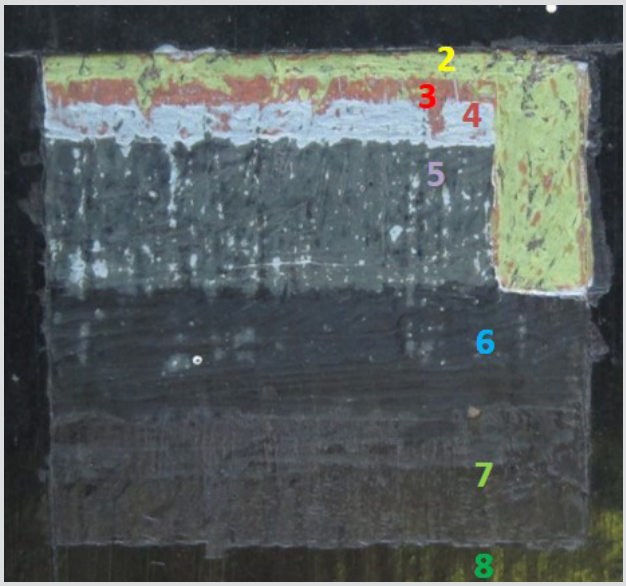

FIGURE 2.12C
Studio_north, in situ paint excavation exposure window.

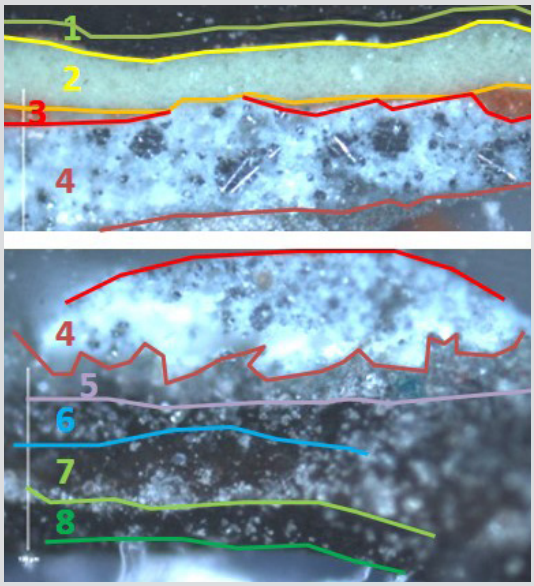

FIGURE 2.12D
Studio_north, cross section photomicrographs of one sample in two fragments with stratigraphic layers numbered (reflected visible light, 50×), the sample fractured during mounting.

KEY
0. Steel, (not included in cross section)
1. Black primer
2. Yellow-green primer
3. Orange primer
4. Light gray corrosion inhibitor (contains Zn particles)
5. Warm gray paint (white, black, red, yellow, blue-green particles), the first exterior paint layer
6. Dark gray paint (black, white, and red particles)

Studio_west

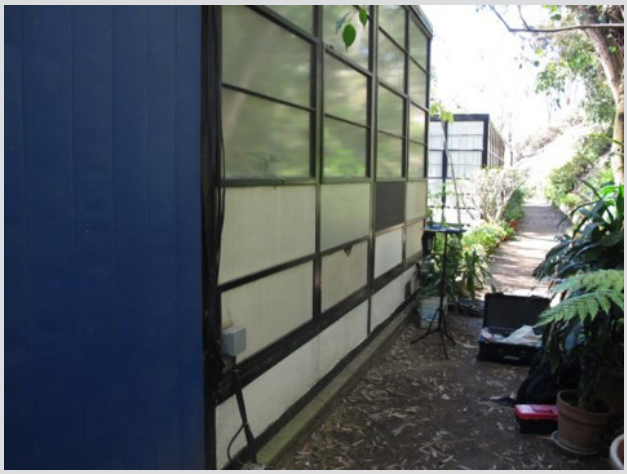

FIGURE 2.13A
Eames House paint excavation location: Studio_west.

FIGURE 2.13B
Studio_west, in situ paint excavation exposure window.

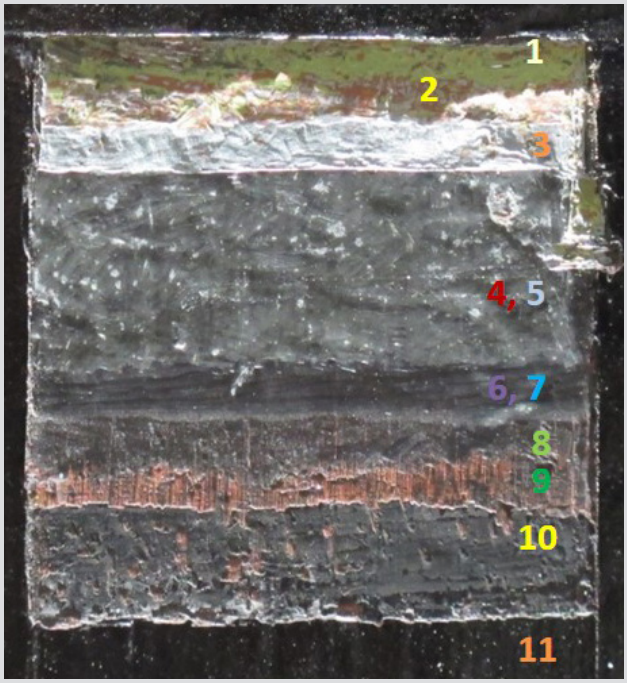

FIGURE 2.13C
Studio_west, in situ paint excavation exposure window.

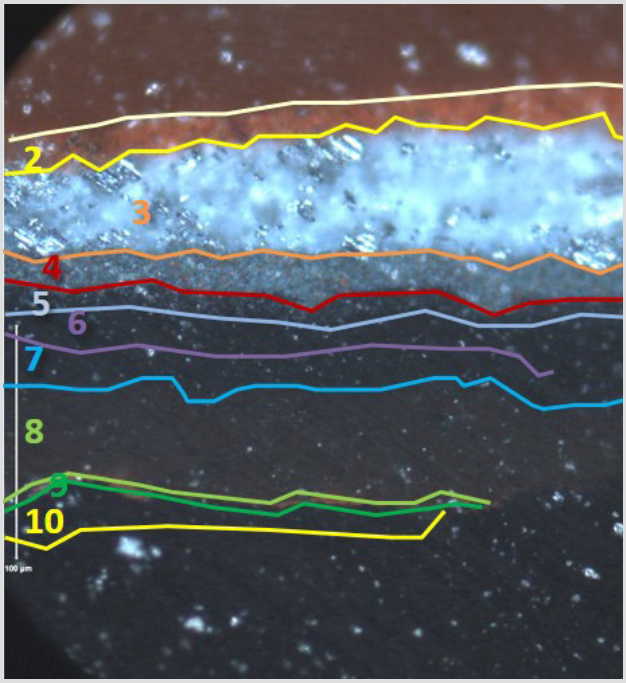

FIGURE 2.13D
Studio_west, cross section photomicrograph, with numbered layers (reflected visible light, 50×).

KEY

0. Steel, (not included in cross section)
1. Primer, yellow-green (not included in cross section)
2. Primer, orange
3. Corrosion inhibitor
4. Warm gray paint (white, black, red, yellow, blue-green particles), the first exterior paint layer
5. Dark gray paint (black, white, and red particles)
6. Black paint (uniform black particle content)
7. Black paint (uniform black particle content)
8. Brown layer, possibly a waterproofing layer
9. Primer, orange
10. Dark gray paint (black and white particles)
11. Current paint layer, black paint (not included in cross section)

House_north

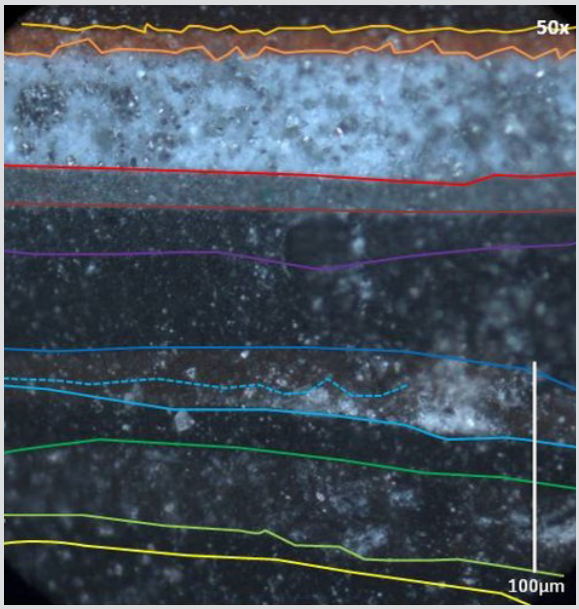

FIGURE 2.14A
House_north, cross section photomicrograph, with stratigraphic layers numbered (reflected visible light, 50×).

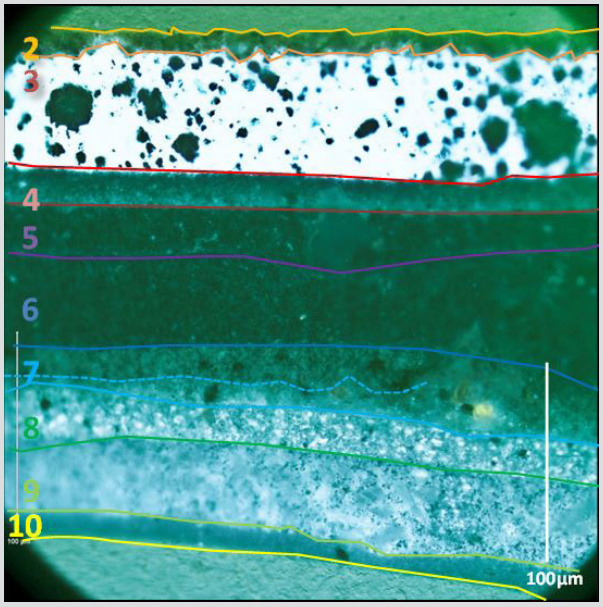

FIGURE 2.14B
House_north, cross section photomicrograph, with stratigraphic layers numbered (reflected ultraviolet light, 50×).

House_east

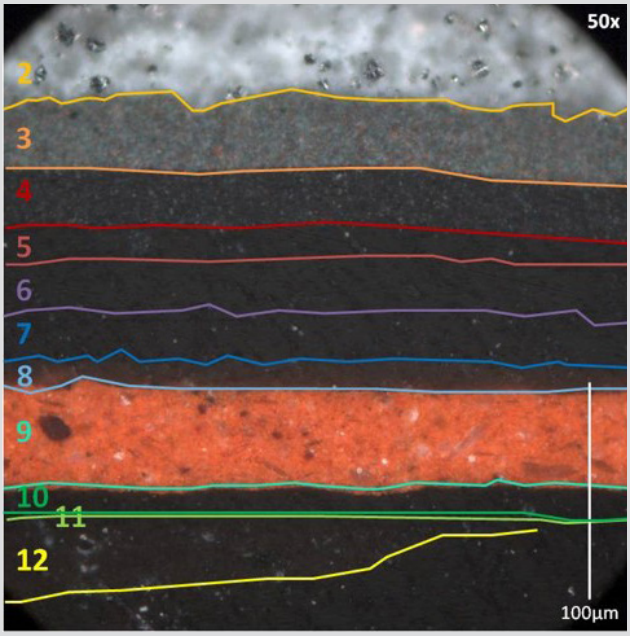

FIGURE 2.15A
House_east, cross section photomicrograph, with stratigraphic layers numbered (reflected visible light, 50×).

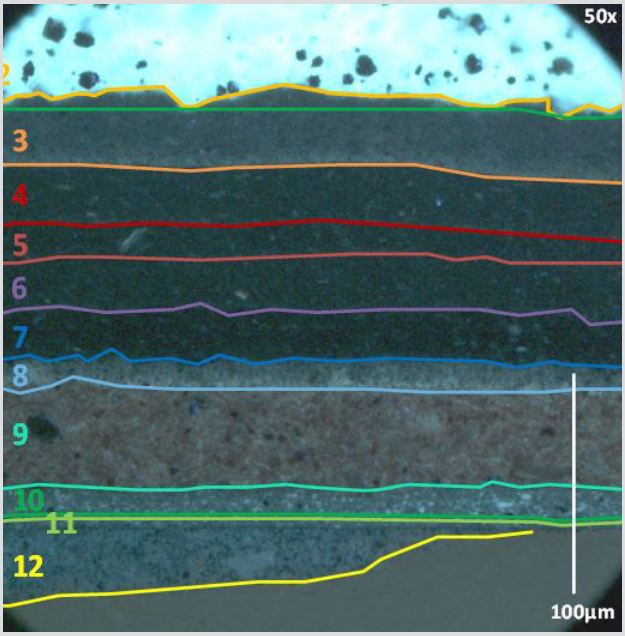

FIGURE 2.15B
House_east, cross section photomicrograph, with stratigraphic layers numbered (reflected ultraviolet light, 50×).

House_west

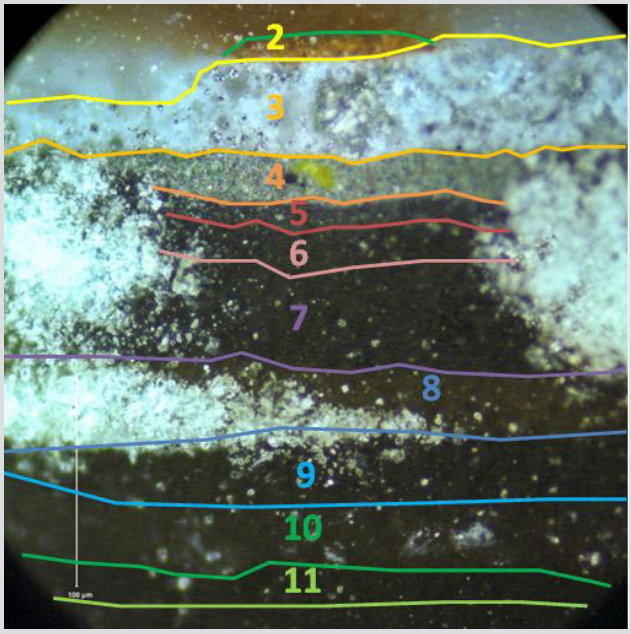

FIGURE 2.16A
House_west, cross section photomicrograph, with stratigraphic layers numbered (reflected visible light, 50×).

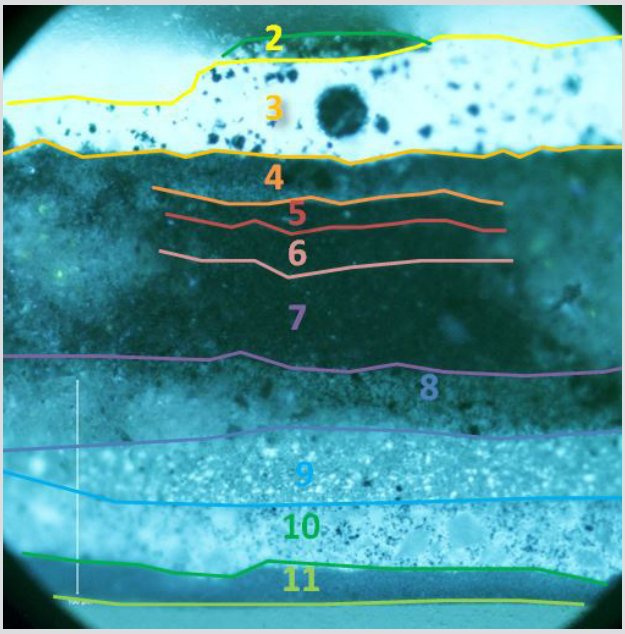

FIGURE 2.16B
House_west cross section photomicrograph, with stratigraphic layers numbered (reflected ultraviolet light, 50×).

Studio_north

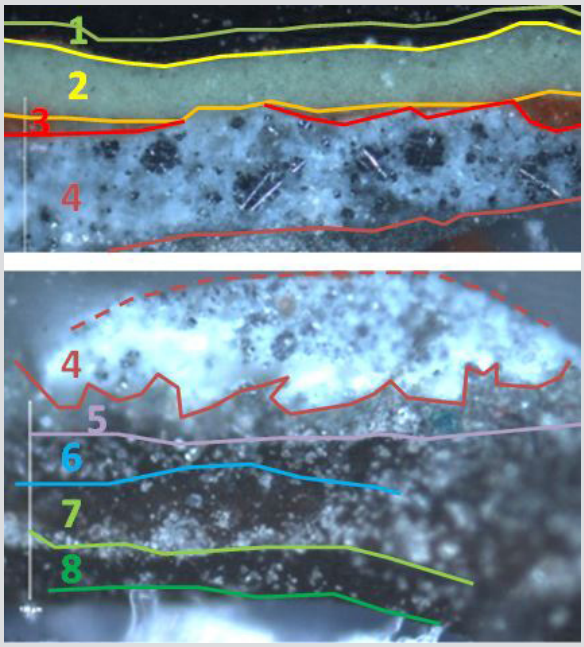

FIGURE 2.17A
Studio_north, cross section photomicrograph, with stratigraphic layers numbered (reflected visible light, 50×).

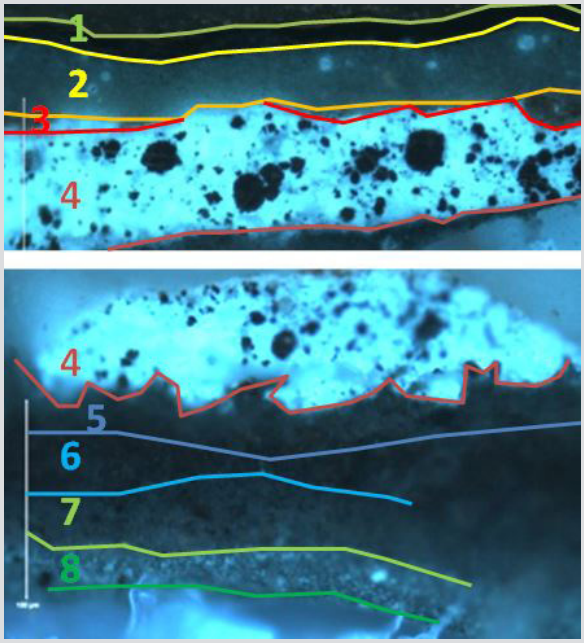

FIGURE 2.17B
Studio_north cross section photomicrograph, with stratigraphic layers numbered (reflected ultraviolet light, 50×).

Studio_west

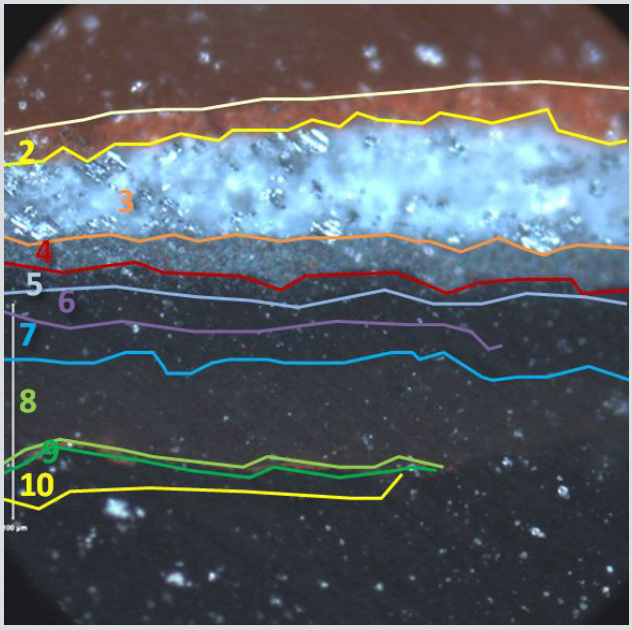

FIGURE 2.18A
Studio_west, cross section photomicrograph, with stratigraphic layers numbered (reflected visible light, 50×).

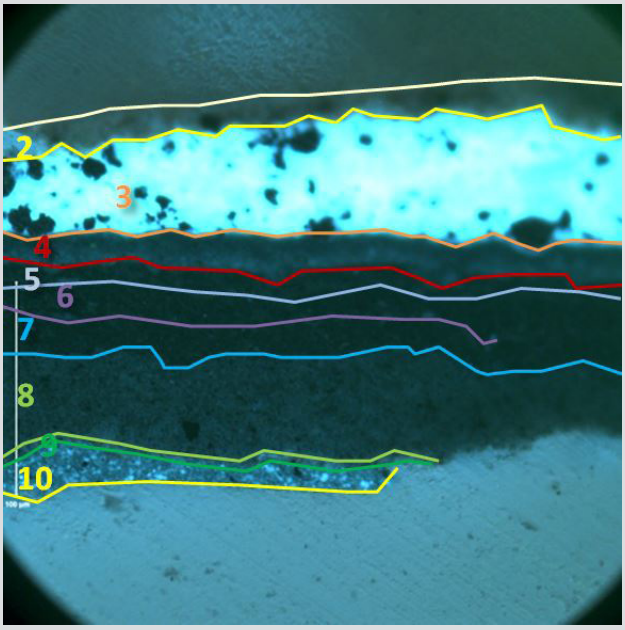

FIGURE 2.18B
Studio_west cross section photomicrograph, with stratigraphic layers numbered (reflected ultraviolet light, 50×).

2.3.2 Deduction of Estimated Painting Campaign Dates and Related Observations

In 2011, the GCI attempted to date each coating layer using historical records and methods of chemical analysis (see chapter 1). The study yielded a great deal of information about the coatings, but the date of each painting campaign could not be identified. Reasonable approximations were made, however, based on available resources and are illustrated in an estimated timeline. Known and approximate dates of painting campaigns were based on physical evidence found in the in situ investigation and compared to the results of the 2011 investigation and to documentation from the Eames Foundation.

The results of the paint investigations at the Eames House residence and studio show between eight and thirteen layers, organized in six to eight painting campaigns between 1949 and 2013 (fig. 2.19). The samples from the exterior metalwork give evidence for repeated campaigns of priming and painting, and the residence and studio show nearly the same painting history.

Documentation of painting campaigns is held by the Eames Foundation and serves as temporal reference points for comparing revealed strata. These dates are taken from chapter 1:

- 1949 The residence and studio were painted at the completion of construction Source: Entenza and Eames 1949a: 29–30.
- 1958 The Eames House was painted. Source: Note by Dan Osloff, no other supporting documentation.
- 1966 The Eames House studio and residence were painted by Paul Isley in October 1966. Source: Notes from Paul Isley.

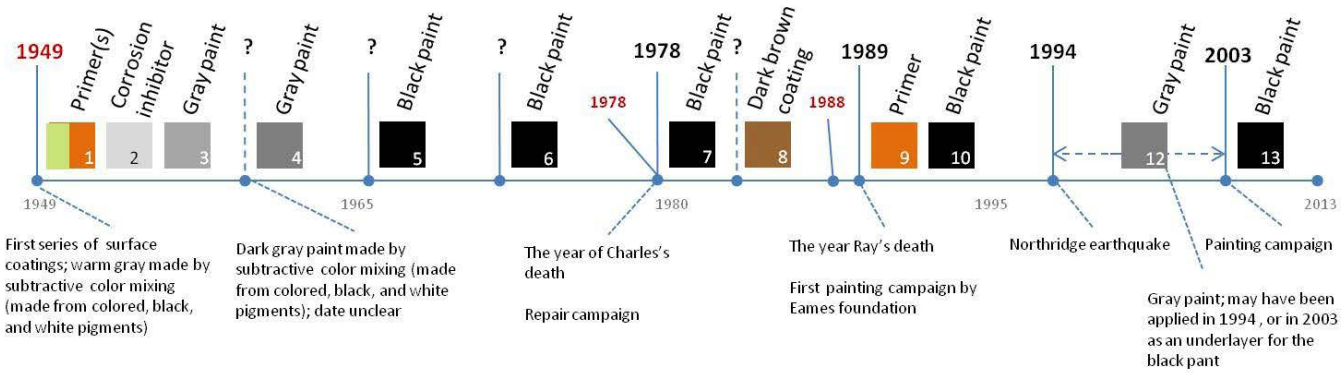

FIGURE 2.19
Estimated timeline of the Eames House exterior paint history. The timeline shows estimated dates for each painting campaign and notes regarding each date or approximate date. Each layer is numbered and each generation is separated with a vertical line that signifies a specific date. The three significant dates are indicated in red. Known dates for paint generations are identified wherever possible and approximate dates are noted with a question mark (e.g. 1978?). Dotted vertical lines and horizontal arrows represent unknown temporal differences between the paint layers on both sides.

- 1968–1973 Several partial painting campaigns of the residence and studio, touch ups. Source: Paul Isley invoices and notes, 1968; 1972; 1973.
- 1974 The Eames House studio and residence were painted on the exterior and interior in July and August 1974. Source: Dan's Painting Company invoice dated October 9, 1974.
- 1977–1978 Several partial painting campaigns of the residence and studio, touch ups. Source: Eames House maintenance log.
- 1989 Eames House painted by Clayton Coatings Inc. Source: Quotations, notes, and recollections of Foundation staff.
- 2003 Eames House exterior painted by Dan Elliott. Source: Invoice by Dan Elliott dated November 2003.

According to the Eames Foundation, no painting campaigns have been undertaken since 2003.

These historical records do not make it clear exactly when the paint color shifted from gray to black.

The same pattern of two adjacent paint layers, dense black over dark gray, at the uppermost level appears in all exposure windows and samples from the exterior metalwork of the building and suggests that these two uppermost layers derive from a recent repainting intervention (or possibly two separate interventions), most likely 2003. The uppermost (black) paint layer can be connected with the known painting campaign in 2003, but whether the dark gray layer immediately beneath derives from that campaign, as undercoat to the black, or from an earlier repair campaign, perhaps immediately after the Northridge earthquake in 1994, cannot be ascertained from the evidence within the samples.

Samples of paint from fragments of putty that were detached in the Northridge earthquake were examined during the GCI's 2011 investigation (see chapter 1). The putty samples show distinct correspondences with the paint samples taken from the residence and studio, and serve as a time-marker. By comparing the layers of the putty fragments (which can be dated pre-1994 with certainty) to exposure windows and samples taken from the structure, a definite dating of the post-1994 layers can be made. The uppermost two layers in the putty fragment samples, black paint over red primer, correspond to layers found in exposure windows and samples from the exterior metalwork of the building. These strata represent the most recent coatings prior to the 1994 earthquake.

Accordingly, based on both their position in the stratigraphy and their composition, these layers can be securely linked to the first repainting campaign commissioned after Ray Eames's death in 1989. The metal framework of the house was black in color in 1989. Immediately beneath the paint and primer layers applied in 1989 lies a dark brown, tough

coating, the status and dating of which are relatively uncertain, but surely pre-1989. This layer may be a water-repellent sealant.

In each of these samples, lying directly beneath the dark brown potential sealant is a sequence of black paint layers that appear to represent multiple painting campaigns. The dates of these black painting campaigns cannot be determined with any certainty from the evidence. The materials applied in 1989 are known, however, and the uppermost black paint lies beneath the 1989 coatings and also under the dark brown layer, so it is logical to conclude that the exterior metalwork was black in color at the time of Ray Eames's death in 1988. If the uppermost layer of this early black sequence is tentatively linked to the 1978 repair campaign, then the lower black paint layers must be earlier and could predate Charles Eames's death, suggesting that the exterior metalwork was painted black during Charles's lifetime. Each black paint layer has a distinct interface which indicates complete drying before subsequent paint application. There is no dirt layer present, which could indicate a temporal change, but the surfaces were most likely cleaned before painting. Different numbers of black paint layers among investigation sites suggest some areas may have undergone localized maintenance, touch-ups, for example.

Beneath the series of black paints are two grays: a very dark gray over a lighter warm gray. It is extremely likely that the lower pair of paint layers, dark gray over a lighter warm gray, represent the first two applications of paint to the exterior metalwork.

Both gray paints are made by subtractive color mixing (see chapter 1). The dark gray paint is comprised of black, white, and red particles; similarly, the warm gray is comprised of white, black, green, red, and yellow particles, but is more abundant in red particles (figs. 2.20–2.21). The subsequent paint layers, several blacks and another gray, do not exhibit subtractive color mixing, but are instead made of exclusively black or black and white pigments. Because the two lowest gray paints are made by a painterly method of subtractive color mixing, and are mixed from similar materials in different quantities, it suggests both the dark gray and warm gray paints were made and applied when Charles and Ray Eames were living at the Eames House.

The investigations indicate that the warm gray was completely dry before the dark gray was applied which indicates some time passed, though it is impossible to estimate how long that was. There is no dirt layer between the first and second gray which would indicate a gap in time between painting (and a generational difference), however, the surface could have been prepared or cleaned before the new paint was applied. Historic documentation includes a note that the Eames House was painted in 1958; it is possible that the dark gray paint was applied during this painting campaign. The lower, warm gray paint is estimated to be the original surface coating, applied in 1949. Beneath the warm gray paint are one to three layers of primers (black, yellow-green, and/or orange) followed by a pale gray corrosion inhibitor that features metallic particles (Zn particles).

As the lowest warm gray paint layer is considered to be the original exterior paint color, its color was measured from an exposure window with a Konica Minolta (CM-2600d) handheld spectrophotometer. The color was matched to a commercial paint color that may be considered in future painting campaigns. The color data can be found in appendix 2.1.

2.3.3 Some Qualifications of Results

The residence and studio exterior steelwork have undergone a number of painting campaigns since 1949. The painting history in one location may differ from another, and the small scale of the paint excavation windows leaves additional room for misinterpretation because of the limited surface area that is revealed. For this reason, exposure windows

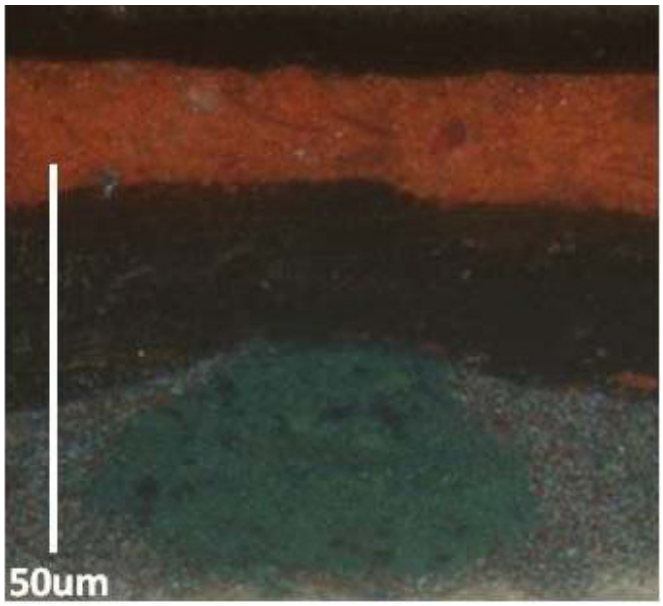

FIGURE 2.20
Cross-sectional photomicrograph of sample taken from putty fragment, showing a large blue-green pigment aggregate and very fine red particles in the gray layer.

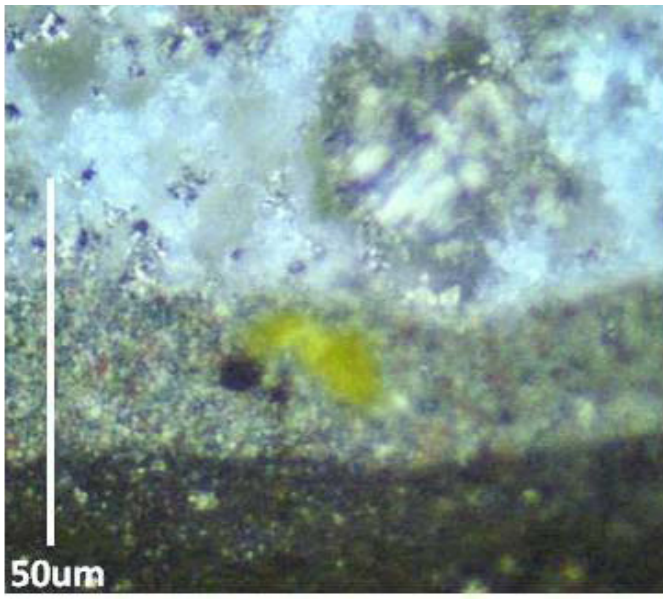

FIGURE 2.21
Cross-sectional photomicrograph of sample taken from exterior paint, showing a large yellow pigment aggregate and very fine red particles in the gray layer. Note the metallic zinc particles in the adjacent layer.

were carried out on multiple elevations, aimed at gathering as much information as possible without compromising the aesthetics of the building.

Paint excavations were undertaken on steel beams with a flat face and away from window frames, which often have more frequent maintenance coatings. The excavations were still relatively close to window frames in many cases and may have been repainted more frequently than other locations. Though there were repair and maintenance campaigns on the window frames, which resulted in varying strata, there is little variation between the layering structure of the steel beams of the residence and studio. There is no evidence of any underlayer having been stripped or heavily sanded, however, this does not rule out this possibility.

2.4 Conclusions

The in situ paint investigation, coupled with the GCI's 2011 paint analysis, reveals the complex painting history of the residence and studio of the Eames House and gives an estimate of the exterior paint colors at significant historical dates. A first-generation paint layer, a warm gray distinctively mixed with colored pigments, was identified, which tends to confirm the original warm gray color of the metalwork described in early accounts of the Eames House.

As expected, the stratigraphy correlates to that identified in the 2011 investigation (see chapter 1). The six excavations sites were found to have a very similar stratigraphy; the house was originally a warm gray and went through a series of grays and blacks before the current black paint color. Based on the results of two paint investigation projects, the color of the residence and studio at the three significant dates is estimated to be gray in 1949, black in 1978, and black in 1988.

The investigations reveal between eight and thirteen layers, organized in six to eight painting campaigns between 1949 and 2003. Although the date of each painting campaign could not be identified, well-informed approximations can be made, and a stratigraphy is summarized as follows:

- 1949 The steel substrate was coated in 1 to 3 layers of primer and a corrosion inhibitor, followed by a warm gray paint.
- 1958 A dark gray paint was applied at some time.
- 1978 A series of 1 to 3 black paints were applied, the final black layer of this series estimated to c. 1978. The black paint was then coated with a brown material.
- 1989 A black paint was applied.
- 2003 A gray paint, potentially a primer for the final and current black paint.

It is extremely likely that the lower pair of paint layers, dark gray over a lighter warm gray, represent the first two applications of paint to the exterior metalwork. The lower warm gray is most likely the first coat of paint applied to the exterior metalwork in 1949. The dark gray paint may have been applied in 1958, although the temporal relationship of the two gray layers is uncertain. The two earliest paint layers were mixed as a fine artist might, using a painterly method of subtractive color mixing. This suggests great care in achieving very specific grays, and may contribute to the historical value of the original exterior paint color. The warm gray paint layer was measured from an exposure window with handheld spectrophotometer. The color was matched to a commercial paint color made by a manufacturer that may be recommended in future painting campaigns.

Works Cited

Eames, Charles, and John Entenza. 1949a. Case Study House for 1949: Designed by Charles Eames. *Arts and Architecture* 66 (12): 26-39.