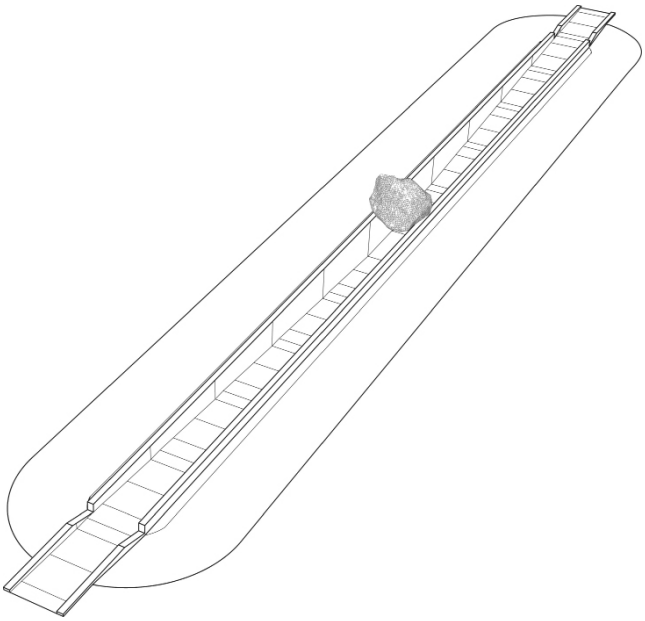
An Anti-Graffiti Coating for Michael Heizer's *Levitated Mass*

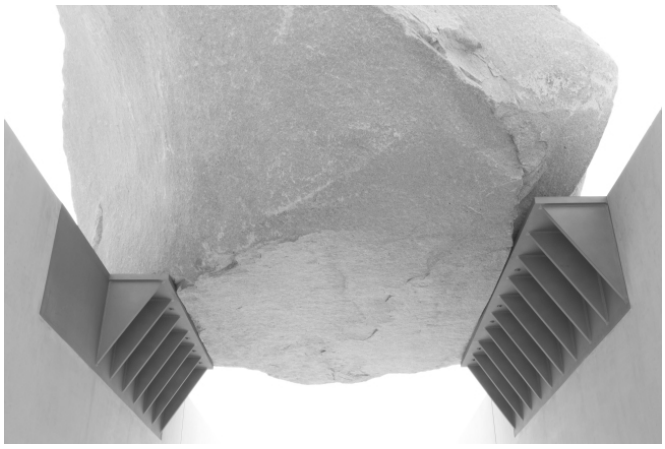


Introduction

Levitated Mass is a monumental sculpture by the contemporary artist, Michael Heizer, recently installed in the northeast corner of the campus of the Los Angeles County Museum of Art.

The installation consists of a 340 ton boulder straddling the walls of a 139 meter long trench. The boulder is bolted to two 6.35cm thick stainless steel shelves that are attached to the top of the trench. The trench descends from ground level to 4.5 meters below the boulder at its center allowing visitors to stand directly beneath it.

The boulder and trench are surrounded by 2.5 acres of compressed, decomposed granite and are encircled by an oval shaped line of Corten Steel embedded in the earth. The boulder and trench along with the surrounding acreage are considered an integral part of the artist's design.



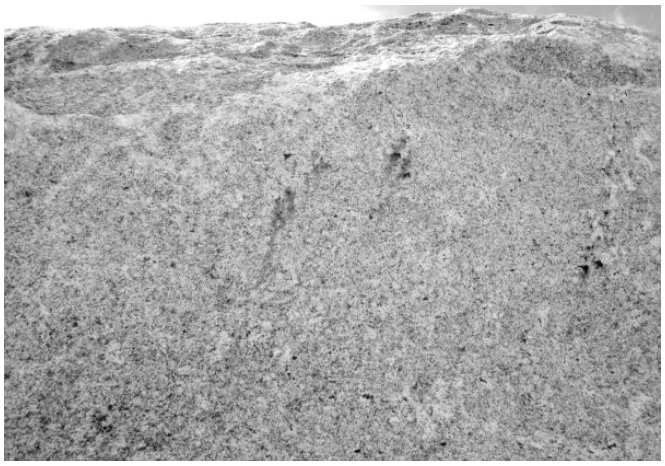
The artwork was first conceived in 1968. The artist's first attempt at its construction using a 120 ton boulder failed when the boom of the crane broke. Later in 1996 Heizer discovered a much larger boulder at Stone Valley Quarry in Jurupa Valley in Riverside County, California. With the help of LACMA, the funding was secured for the removal and transportation of the boulder and for the construction of the finished work. The boulder was transported from the quarry in February 2012 on an 89.96 meter long (196 wheeled) custom built transporter. The trip took 11 days. Completion of the concrete trench and the final securing of the boulder took an additional three months.

Throughout the installation the artist was particularly concerned about the possibility of vandalism and graffiti given the large amount of publicity associated with the boulder's transport and installation at LACMA. After considering a number of options, the artist gave his approval for the application of an anti-graffiti coating provided the coating did not alter the appearance of the boulder making it look like "plastic."

Because the Conservation Center was given less than a month to address the artist's concerns prior to the public unveiling of the sculpture, no attempt was made to assess the performance and durability of the anti-graffiti coating using the ASTM standard (2008) or the newly developed European guidelines (Garcia 2008, 2012; www.graffitage.com). Nonetheless an assessment of the anti-graffiti coating was undertaken using actual samples of the boulder under conditions approaching its real-time application. In this paper the authors discuss the selection, testing, and application of a commercial anti-graffiti coating which yielded surprisingly good results.

Boulder

The granite boulder is pyramidal in shape with a flat bottom allowing it to straddle the channel. While this was its natural formation, the boulder was actually shaped to some extent by the artist using a range of tools including a blow torch to spall away areas of the rock surface that were aesthetically displeasing. The granite is extremely porous due to the presence of intergranular cracks randomly distributed and propagating throughout the stone matrix, with veins of iron oxide running through it. The artist expressed a dislike for the areas with rust stains which he attempted to remove or minimize.



When removed from the quarry, a large section at the apex of the boulder was lost and had to be reattached with pins and epoxy resin and the seams blended in using colored epoxy. Epoxy was also injected into cores drilled into the boulder, as well as other areas, to give it added strength in areas of observed weakness.

Anti-graffiti coatings

Graffiti can be a major problem in both urban and rural environments and affects historic and non-historic buildings and monuments (Ashurst 2002; English Heritage 1998; Fidler 2002; Grimmer 1998; Urquhart 1999; Weaver 1995). While much has been published in the literature over the years on its prevention and removal, no one method for graffiti prevention and removal has found widespread application. While commercial anti-graffiti agents work well on concrete, glass, metal, and certain types of stone, their application on historical substrates is often problematic due to their porosity and inhomogeneity.

In general, anti-graffiti coatings fall into two categories: sacrificial coatings and permanent coatings. Sacrificial coatings are applied and then removed following vandalism and must be reapplied after each event. Permanent coatings on the other hand are meant to last indefinitely. They are designed so that the graffiti can either be easily removed from the substrate by means of a cleaning solution or the coating acts as a barrier to which the graffiti cannot penetrate or adhere. Many so-called permanent coatings, however, are in fact semi-permanent given they can only tolerate a finite number of cleanings and must then be reapplied.

In the case of Heizer's *Levitated Mass* the application of a permanent anti-graffiti coating was considered impractical. Once applied, if the artist was dissatisfied with its appearance, its removal would not be possible without significant damage to the granite substrate. For this reason only sacrificial coatings were given consideration.

A wide variety of sacrificial anti-graffiti coatings are commercially available today. These frequently include emulsions of carbohydrates, waxes, or acrylic polymers in water or organic solvents. The use of sacrificial coatings, however, is not without its drawbacks. Recent studies have shown that some coatings may undergo small but detectable changes in color and tend to soil more quickly than permanent coatings (English Heritage 1998). Also, the effectiveness of the sacrificial coating has been found to decrease in some instances with repeated application.

The use of hot water under pressure to remove these coatings has also been found to damage some weathered surfaces. Not surprisingly, sacrificial barriers respond differently to different markers which may penetrate some coatings and thus stain the underlying substrate. Some of these draw-

backs however are not particularly relevant in the case of *Levitated Mass* given that small changes in appearance following the application of a sacrificial coating would not be detectable. Aggressive cleaning with high pressure washers would most likely have minimal effect on the stonework. Soiling of the stone surface would also not be a factor in selecting a suitable sacrificial coating.

PSS-20

A quick review of the conservation and commercial literature including conversations with colleagues soon yielded a promising product manufactured by KEIM Mineral Coatings referred to as PSS-20 (www.keim.com). PSS-20 is sold as a completely reversible protection system for protection against graffiti for both indoor and outdoor use. It is water-based and made from vegetable polysaccharides. It can be brushed on or applied by spray applicator to give a thin invisible film with a high moisture vapor transmission rate.

In practice, it can only be used on vertical surfaces because once wet the treated surface becomes extremely slippery. It is recommended for both natural and artificial stone surfaces as well as concrete, brick, and metal facades. In addition to its reversibility and near neutral pH, its primary advantage for use as an anti-graffiti coating is its environmentally benign nature and biodegradability which is important given the amount of material needed to treat the boulder and the need for reapplication over time.

The manufacturer recommends PSS-20 be applied to the surface in two or three coats using an airless sprayer at a pressure of between 1450-2900psi. For each coat a quantity of PSS-20 between a minimum of 0.10 to a maximum of 0.20 liters/square meter should be applied. The thickness of the protective coating after drying should be approximately 1.18-1.38 mil.

For porous surfaces it is recommended that the surface is pre-wetted thus filling the pores allowing the PSS-20 to form a protective coat on the surface with as little as possible penetration of the coating into the substrate. It is important to note that judging the thickness of the coating is not easy and requires practice to visually apply the proper thickness. If the coating is invisible and too thin, graffiti will penetrate the substrate. When applied to be just visible with a slight sheen, the thickness is correct and the graffiti can be removed as the coating is removed.

For the removal of the PSS-20 and graffiti the manufacturer recommends soaking the surface with hot water (60 ^{0}C) for several minutes to swell the coating underneath the graffiti prior to removing it altogether using hot water from a pressure washer. According to the manufacturer the coating protection last between three and five years before it needs to be renewed depending upon climatic conditions.

Widely employed in Europe to protect both historic and non-historic monuments and buildings, PSS-20 has been used continuously as an anti-graffiti coating on the Brandenberg Gate in Berlin since 1991 (www.keim.com). Every two years the gate is washed down to remove accumulated dirt and graffiti using hot water and the protective coating of PSS-20 reapplied to the damp stone.

Preliminary tests

A series of preliminary tests were conducted to verify the manufacturer's product description and to evaluate its graffiti resistance. The test samples (measuring approximately 10cm long x 10cm wide x2cm deep) consisted of small chips of granite provided by the artist which were spalled from the boulder. The test samples were coated with PSS-20 by brush and then marked using several different marking materials including: wax crayon, permanent ink marker, lipstick, tar, and alkyd spray paint. Graffiti resistance was determined after 3 days following application. The graffiti was easily removed by washing with hot water (60^{0}C) without the need for brushing or scrubbing.

To simulate actual application conditions PSS-20 was also applied to the surface of several large granite boulders (152cm wide x 28cm wide x 55cm deep) collected from the same quarry as *Levitated Mass* and brought to LACMA. Each boulder was given three coatings of PSS-20 using an airless sprayer allowing each coat to dry in-between applications. Using the markers mentioned above graffiti was applied to large areas of the granite surface and then allowed to set for three days. The graffiti was then removed using a hot water pressure washer operated at 60^{0}C. In all cases the graffiti was removed with little or no residual evidence.

Application

Given the above, it was decided to apply PSS-20 to *Levitated Mass*. The coating was applied by a professional applicator. Prior to the application of the anti-graffiti coating the stone was steam cleaned. The stone was then given three coats of PSS-20 over a period of several days letting each coat thoroughly dry between applications. The third and final coating rendered the east facing side of the stone slightly glossy. This was reduced by rinsing with cold water. A total of 150 liters of PSS-20 was used to coat the stone.

Field and laboratory evaluation

Due to the lack of time, natural and accelerated weathering tests could not be performed prior to the application of PSS-20 to the boulder. However, it was possible to apply graffiti periodically to discrete, inconspicuous areas of the boulder to test its removal using localized treatment with hot water. This was performed every 3 months for a year using the same graffiti markers mentioned above and in each case the graffiti was easily removed.

Graffiti resistance of coatings was also determined after laboratory accelerated ageing before marking with graffiti. Coated rock samples were exposed to ultraviolet light in a UV fluorescence cabinet (Spectroline Model CL-150) and aged to an equivalent of one and two years (Suryawashi 2012). In each case graffiti applied to the laboratory aged coatings was easily removed with hot water. PSS-20 is easily susceptible to photo-chemical degradation. Glass slides coated with PSS-20 and subjected to accelerated aging using UV irradiance visibly yellowed after an equivalent exposure of only 1 week.

Conclusions

To date, the use of KEIM's PSS-20 has proved to be an effective sacrificial coating against graffiti for the protection of Michael Heizer's monumental sculpture, *Levitated Mass*. Its use under these conditions is not typical of most applications and is admittedly unique in the sense that yellowing of the coating and the concerns over the use of high pressure water systems that have been found to damage weathered stone are not an issue.

Further testing however is needed to determine the reversibility and protective properties of the anti-graffiti coating over time and after repeated applications.

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