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DATE:	August 10, 2016
TO:	**Architectural Review Committee (ARC) of the Historic Preservation Commission**
FROM:	Eiliesh Tuffy, Preservation Planner, (415) 575-9191
REVIEWED BY:	Tim Frye, Historic Preservation Officer, (415) 575-6822
RE:	Review and Comment for Golden Triangle Light Standards Case No. 2016-007806COA

The Planning Department (Department) and Pacific Gas & Electric company (PG&E or Sponsor) are requesting review and comment before the Architectural Review Committee (ARC) regarding the proposal to install cast-fiberglass posts with LED light fixtures to fully replace the historic cast-iron and arc lamp Golden Triangle Light Standards designated as City Landmark No. 233 under Article 10, Sections 1004 and 1004.4 of the Planning Code.

BACKGROUND

The ca. 1915 light standards, located in the triangular-shaped geographic area bounded by Market, Mason and Sutter Streets (not including alleys), were installed curbside throughout the commercial retail district surrounding Union Square. The decorative cast iron fixtures incorporated amber glass light globes to diminish ultra-violet rays of light and at the same time illuminate the streets and public sidewalks. Highly stylized acanthus leaves along with a fluted shaft and scrolled modillions decorate the street fixtures.

Each cast iron and glass light standard measures 22-feet from sidewalk to top-of-fixture and weighs over 1 ton. The dual-lamp torchere and finial at the top of each fixture is supported internally by a 4-inch diameter pipe, set in concrete. The original glass globes have been replaced over time with similar globes made of new materials. There are approximately 189 Golden Triangle light standards standing today. Of the remaining fixtures, 24 have had their cast iron cladding repaired or replaced in-kind when accidents made them impossible to repair.

- The Golden Triangle Light Standards were designated under city ordinance in 2003 as Landmark No. 233. In addition to local landmark status, the light standards are located within boundaries of the Kearny-Market-Mason-Sutter Conservation District, the C-3 (Downtown Retail) Zoning District, and an 80-130-F Height and Bulk District. All fixtures are located in the public right-of-way, and are lit and maintained by the Pacific Gas and Electric Company (PG&E). While the Golden Triangle Light Standards are not specifically called out in the Kearny-Market-Mason-Sutter Conservation District, they have a connection to the history of the downtown commercial retail district and they are extant historic fabric from the district's period of significance.

The Landmark Designation Report identified the following criteria for eligibility, period of significance, and features to be preserved:

National Register Criteria

Criterion A: Association with events that have made a significant contribution to the broad patterns of our history.

> *Associated with the Panama-Pacific International Exposition of 1915 and the development of merchant businesses in the present-day Union Square retail district of San Francisco.*

Criterion B: Association with the lives of persons significant in our past.

> *Association with Walter D'Arcy Ryan, Chief of Illumination for the Panama-Pacific International Exposition of 1915 and Director of the Illuminating Laboratory for the General Electric Company during the early 20th century. Association with J.W. Gosling, a lighting designer who also worked in the illuminating Laboratory for the General Electric Company in the early 20th century and designed lighting effects for the Panama-Pacific International Exposition of 1915.*

Criterion C: Embody distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

> *The light standards typify early 20th century innovations in street lighting and embody characteristics of the City Beautiful movement.*

Period of Significance: 1915-1918, to correspond with the manufacture and installation of the original light standards.

Features that should be preserved:

1. Decorative metal standards (Meaning the metal base, pole, and top.)
2. San Francisco Carrara-Style Glass globes (8-panel, ribbed amber glass globe).
3. Existence within the Triangle District, which is bordered by Market, Mason and Sutter Streets.

PROJECT DESCRIPTION

The Sponsor proposes to replace all of the remaining historic cast iron and amber glass light standards with replica fixtures using substitute materials. The new fixtures would be cast in fiberglass using molds created from the historic light standards to replicate the size, design and decorative ornament of the originals.

The Sponsor proposes the project in response to failures of the light fixtures in recent years that have resulted in third-party property damage. PG&E stated the cause of the structural failures as corrosion of the internal steel-core support pole combined with high wind conditions. The utility company estimates that 60 fixtures require some level of maintenance: 50 requiring a new foundation, new interior steel support pole, and new exterior cladding; 10 requiring new exterior cladding only.

As part of the project, PG&E has fabricated a mock-up of the proposed fiberglass light standard manufactured to the desired standard. The bases, which are most prone to impact, are proposed to be cast ½" thick to resist cracking. The fiberglass would be painted dark gray in a finish to replicate cast iron metal. Members of the Architectural Review Committee will have an opportunity to conduct a site visit to view the substitute material for compatibility with the historic cast iron fixtures in the field.

OTHER ACTIONS REQUIRED

The proposed project is being brought to the ARC for comment prior to review by the HPC of a request for a Certificate of Appropriateness for alterations to city Landmark No. 233 pursuant to Article 10 of the Planning Code.

STAFF ANALYSIS

The Department seeks the advice of the ARC regarding compatibility of the project with Article 10 of the Planning Code, the designating Ordinance, the *Secretary of the Interior's Standards for Rehabilitation* (Secretary's Standards) and with *Preservation Brief 16: The Use of Substitute Materials on Historic Building Exterior*. The Department would like the ARC to consider the following information:

Secretary of the Interior's Standards for Rehabilitation

Standard #2

The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.

Standard #5

Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a historic property shall be preserved.

Standard #6

Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

Preservation Brief 16: The Use of Substitute Materials on Historic Building Exteriors

The National Park Service brief on substitute materials states that "all preservation options should be explored thoroughly before substitute materials are used" and calls out 4 circumstances that warrant the consideration of substitute materials:

1. the unavailability of historic materials;

   Cast iron is still a material that is readily available to create replacement light standard pieces.

2. the unavailability of skilled craftsmen;

   The sponsor packets indicate that a manufacturer of replacement cast iron light standard pieces is in operation and molds exist from which new iron could be cast.

3. inherent flaws in the original materials; and

   The outer cast iron cladding pieces appear to have normal levels of deterioration, particularly rusting at unfinished edges, for metal of its age. The durability of the original material has been evidenced over the course of their 97 year lifespan to date.

4. code-required changes (which in many cases can be extremely destructive of historic resources).

   There are no known codes preventing the use of cast iron in this application. Title 24 requirements encourage the use of energy efficient lighting sources, which could be addressed by retrofitting the fixtures with light-level appropriate LED bulbs.

The brief outlines the Pros and Cons of substitute materials, including the sponsor's proposed material of choice: fiberglass. Advantages of fiberglass include a high material strength-to-weight ratio, good molding ability, the ability to take paint well, ease of installation, and corrosions/rot resistance. Disadvantages of fiberglass include combustibility, damage upon impact, and the need for frequently-placed expansion joints.

Based on the *Secretary of the Interior's Standards for Rehabilitation* and the National Park Service's publication, "Preservation Brief 16: The Use of Substitute Materials on Historic Building Exteriors", the project as proposed does not meet the criteria outlined to support replacement of the historic Golden Triangle Light Standards.

Recommendations:

- *The proposed project would result in a 100% loss the existing cast iron cladding, which is the predominant character-defining feature of the designated landmark. A project resulting in the complete loss of original historic fabric would call into question the validity of the Article 10 Landmark Designation.*
- *While fiberglass has the advantage of good molding ability to replicate decorative ornament and takes paint well, the visibility of the expansion joints if they would introduce visual breaks in the cladding material is a detail of concern. The bases of the fixtures appear to be most prone to damage from collision, which raises concerns about fiberglass as a substitute material that is fragile to impact. The existing cast iron cladding appears to be in sound condition, with rust occurring primarily at unpainted surfaces where cladding sections adjoin with one another.*
- *Because cast iron and glass are materials still readily available and that manufacturers are capable of replicating the historic light standard from molds of the original, the Department recommends that historic fabric be retained and repaired. Cast iron cladding that is beyond repair should first be replaced using historic cast iron pieces currently available at the sponsor's storage yard. Once historic pieces have been exhausted, new cast iron should be installed to match the old in design, color, texture, and other visual qualities. Should cast iron, or the craftsmen to create replacements, no longer exist then a substitute materials should be considered.*
- *As part of PG&E's ongoing maintenance plans for the light standards, regularly scheduled inspections of the interior steel support poles and water infiltration should be conducted. Fixtures found to be in danger of structural failure should be repaired through the installation of new, sound interior steel that is protected from corrosion without altering the appearance of the historic cast iron cladding.*
- *As examples of existing historic fabric from the period of significance of the surrounding Art. 11 Conservation District, it is recommended that the historic cast iron cladding be retained to maintain as much of the historic character of the district as is feasible.*

REQUESTED ACTION

Specifically, the Department seeks comments on:

- The project recommendations proposed by staff.
- The compatibility of the project with the Secretary of the Interior's Standards.

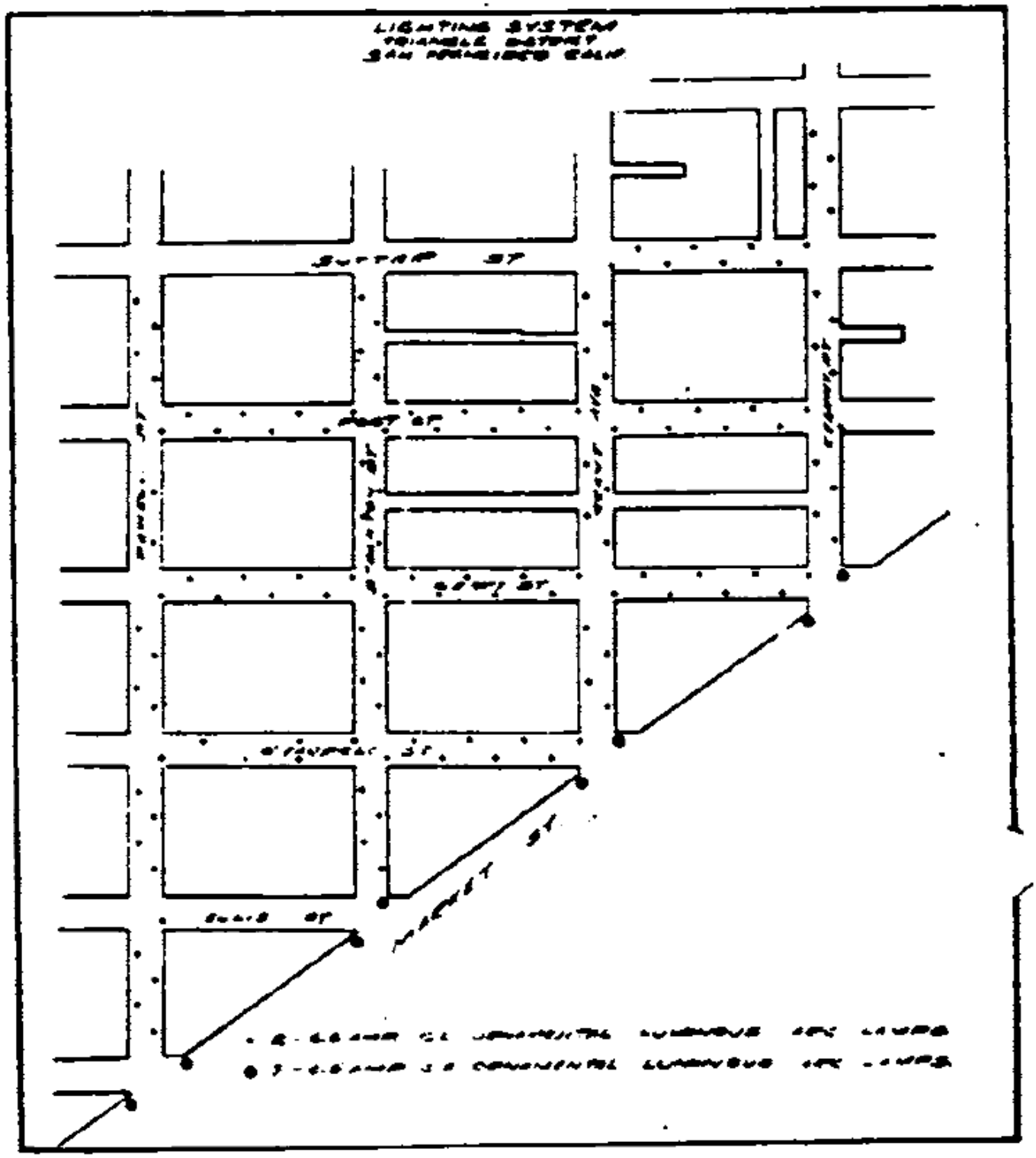
ATTACHMENTS

- Photos
- Project sponsor submittal entitled, "SF Golden Triangle Ornamental Streetlights: Fiberglass Replacement Alternative & Pilot", dated May 11th, 2016
- Landmark No. 233, Designating Ordinance
- *Preservation Brief 16: The Use of Substitute Materials on Historic Building Exteriors* (National Park Service; Sept., 1988)

Existing Cast Iron and Glass Light Standard

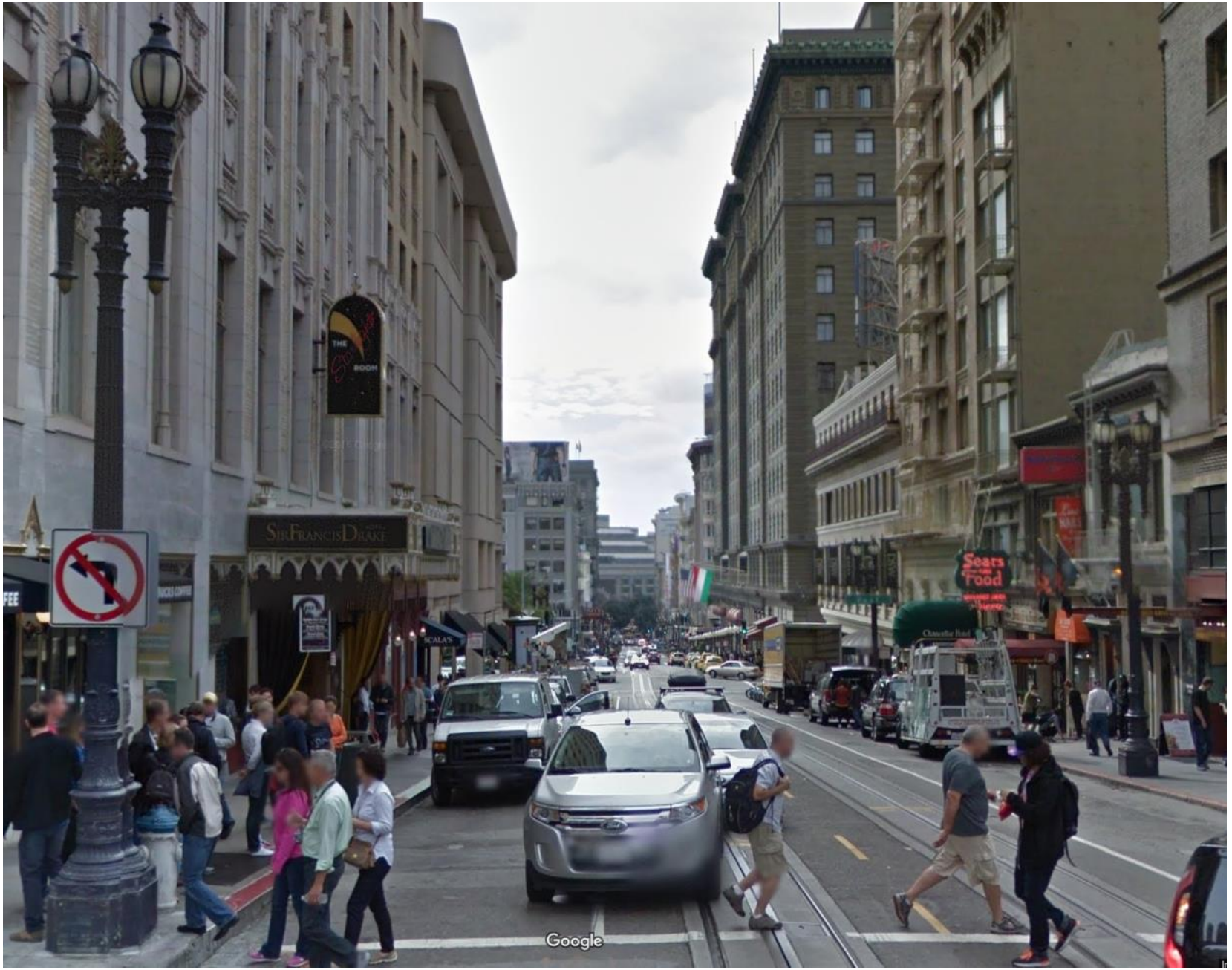
Proposed Fiberglass Light Standard

Map of Golden Triangle Lighting System, 1919 (Journal of Electricity, May 1, 1919)



Streetscape: Sutter Street, between Kearny & Grant

Streetscape: Powell Street at Sutter, looking south



Streetscape: Powell Street at Geary, looking south

SF Golden Triangle Ornamental Streetlights

Fiberglass Replacement Alternative & Pilot

May 11th, 2016

SF Decorative Streetlights Background

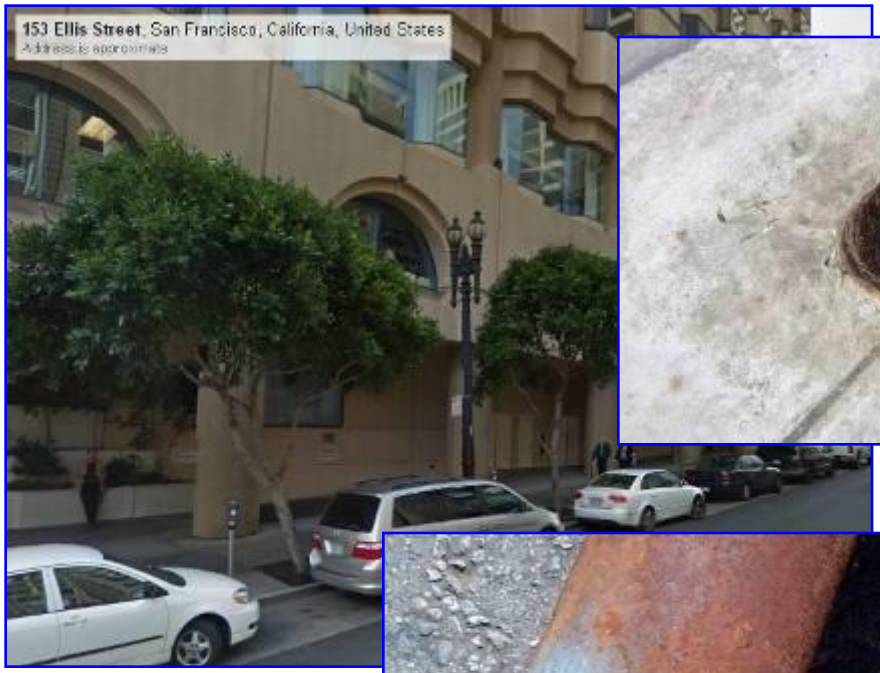
In March and April 2012, two ornamental streetlights toppled during high wind conditions in San Francisco's Golden Triangle area. Neither incident resulted in injury, but significant third-party damage was realized, and public safety was compromised. Both streetlights toppled due to internal steel-core failure as a result of extensive metal corrosion.

PG&E hired Osmose Engineers to inspect all historic streetlights in the "Golden Triangle" area of San Francisco (Union Square). Their assessment and prioritization of repairs has been carried out by PG&E over the last 4 years.

To date, PG&E has replaced the foundation and inner steel-core pole at 34 locations. Of these locations, 24 have also received new and or refurbished shells (cast-iron street lights). Please see the appendix slides for a map and of these locations.

Currently there are 50 lights still requiring new foundations, inner-core poles, and streetlight shells. An additional 10 lights require new shells only.

First Recent Failure: March 31st 2012



High Wind Advisory Event
No Injury
Minor Third Party Damage
Primary Cause: Steel Core Corroded
Pre-Condition: No Inspection

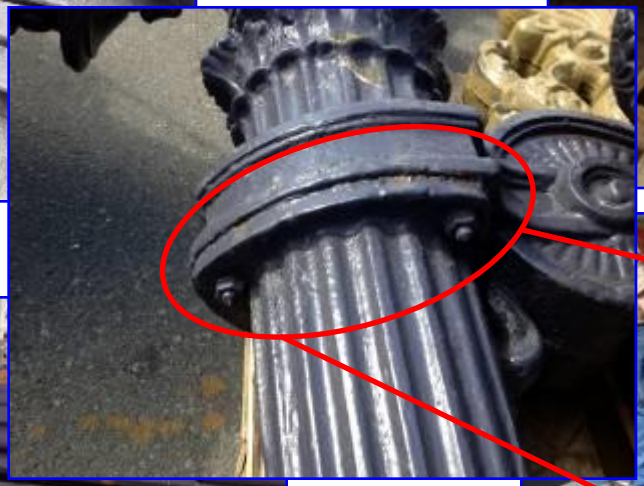
Second Recent Failure: April 17th 2012

Significant Wind Conditions
No Injury
Major Third Party Damage
Primary Cause: Steel Core Corroded
Secondary Cause: Multiple DPW Attachments
Pre-Condition: No Inspection

M&C Electric Field Primary Findings

We found multiple steel pipe cores corroded (from top to bottom) and many streetlights with CCSF DPW attachments on them.

M&C Electric Field Secondary Findings



Base bolts for streetlight spear points are also corroded at flange locations. This poses additional risk to public.

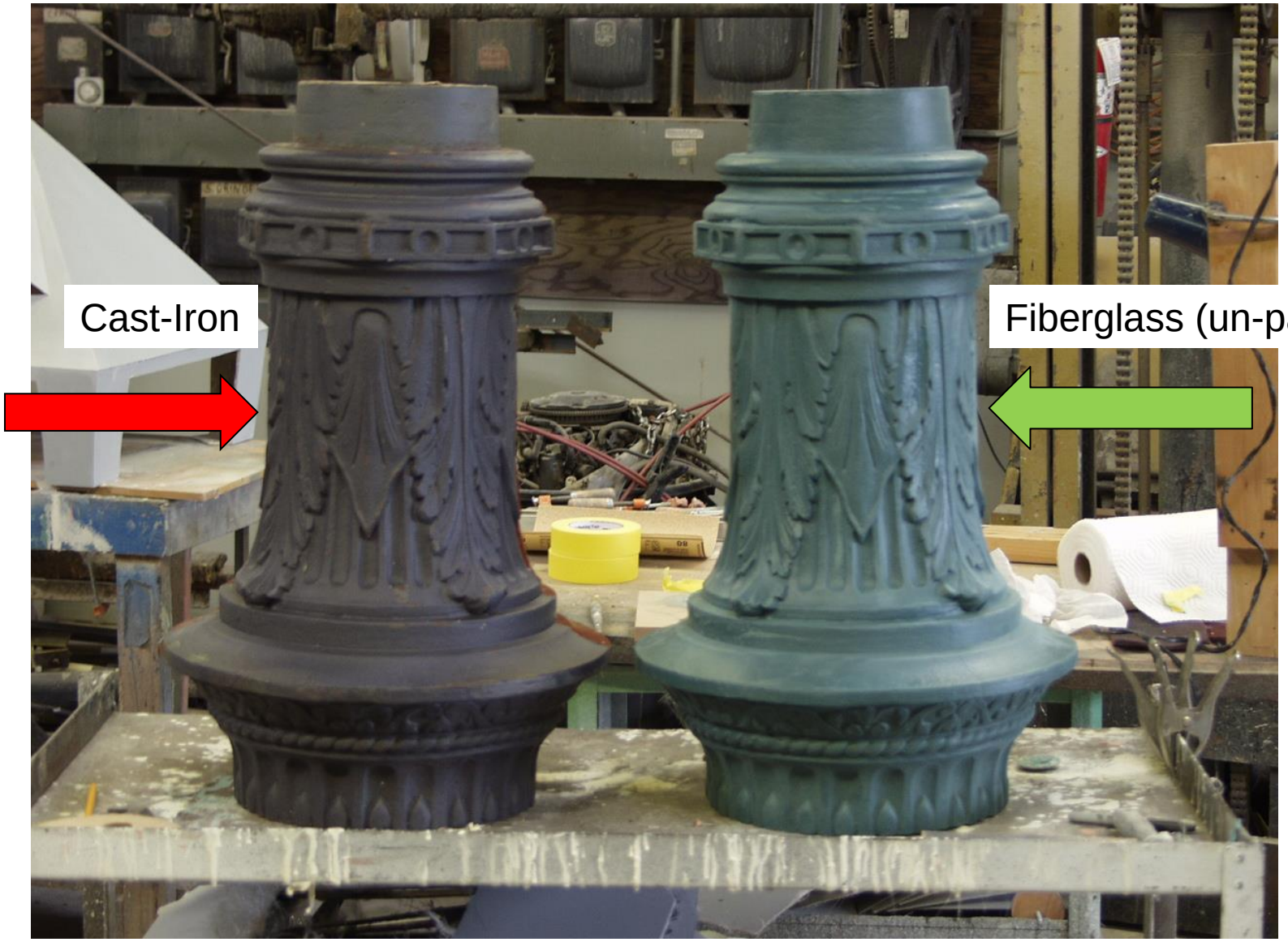
Material – Exterior Shell

- Fiberglass Pilot
  - PG&E is proposing a pilot installation of the Fiberglass manufactured street light shell on Post Street (between Powell St. & Mason St.). The foundation and inner steel-core pole were replaced in 2015. We would take the existing refurbished shell and use this at another location on our replacement list.
  - Lera Glass Inc. (local fabrication manufacturer) has created molds from the original cast-iron streetlight shell out of Fiberglass. All components look identical to the original cast-iron pieces in both size and appearance.
  - All fiberglass components are made using top quality Class 1 Fire Retardant Resin, and are designed to withstand the elements. The base of the lights are composed of a polyurethane rubber, very similar to the material used in flexible bumper panels on automobiles to withstand any vehicular impacts sustained.
  - Lera Glass has provided a detailed letter describing the material they use, and more details about their process, please see the appendix.

Cast-Iron vs. Fiberglass Replica

	Cast-Iron	Fiberglass
Housing Material Cost	Negotiated price, minimum order requirements	1/2 of Cast-Iron, molds built locally
Center Support Pipe	Steel	Steel
Housing Weight	2,000 lbs.	481 lbs.
Material Availability (including spare parts)	El Paso, Texas, 8-10 months	San Bruno, CA, under 4 weeks
Installation	Challenging - Due to heavy weight	Much easier due to light weight especially when installing in aerial basements
Safety	Conductive material	Non-conductive Material

Cast-Iron vs. Fiberglass Replica (Picture)



Fiberglass

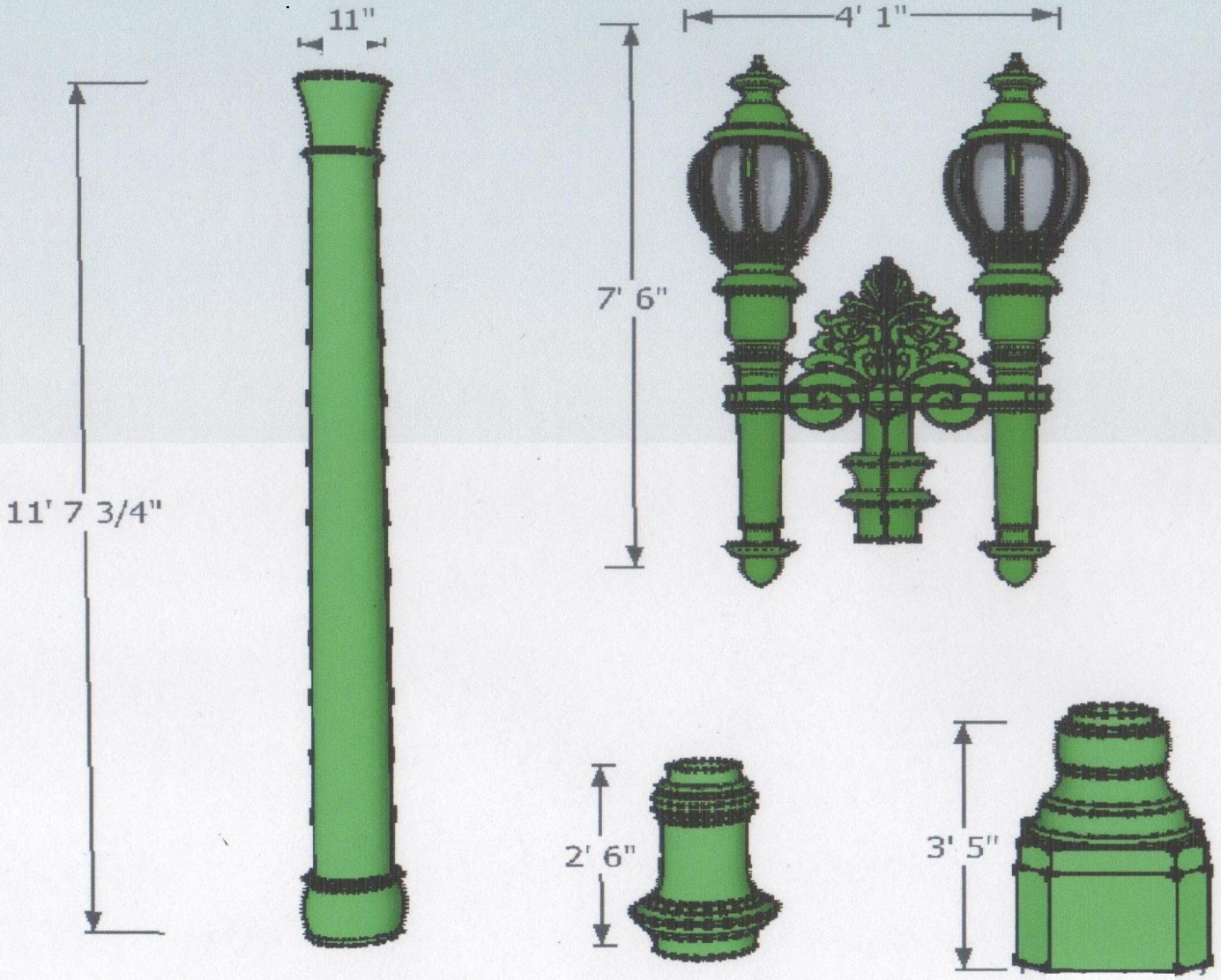
Appendix

Appendix – Locations of street lights repaired since 2013

Appendix- – Locations of street lights repaired since 2013

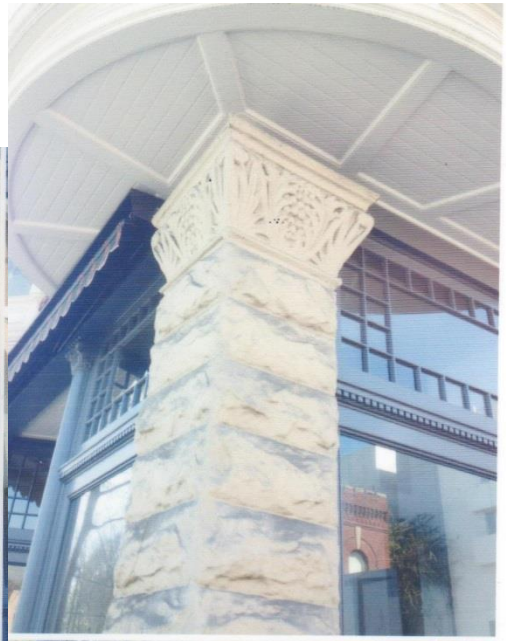
Location	Year Completed
480 Sutter	2014
NW CO Kearny St. and Post	2014
*Across from 444 Post- **Proposed Pilot Location (Green Marker on map)**	2015
Across from 459 Sutter	2014
246 Sutter St.	2014
153 Kearny	2014
225 Powell	2014
150 Post	2014
Across from 130 Sutter St	2014
SE CO Sutter and Kearny	2015
88 Kearny	2014
Across from 501 Post	2014
NW CO Grant St and Geary St	2013
33 Grant St	2014
72 Ellis	2015
NW CO Turk and Mason	2015
414 Mason St	2015
SW CO Eddy and Cyril Magnin	2015
124 Ellis	2015
462 Powell	2014
229 Kearny St	2014
447 Sutter	2014
176 Sutter St	2014
133 Kearny St	2014
124 Sutter St	2014
251 Grant St	2014
255 Post St.	2015
165 Post	2015
434 Post	2014
246 Powell St	2015
1 Post St	2014
(126) 100 Post	2015
111 Powell	2014
135 Post	2014
301 Geary	2014
65 Post	2013

Existing Cast Iron & Fiber Glass Lamp Post Dimensions



Appendix – Fiberglass In The Field

These images from the St. James Hotel in Downtown San Jose are examples of Lera Glass work that has been in the field for 35yrs. These were fabricated with molds of existing features on the building to produce what you see in these pictures.



Appendix- Fiberglass in the field cont.

Lera Glass Inc.

Innovative Solutions To You Fabrication And Manufacturing Needs

Fiberglass Lamp Post Information

The purpose of this document is to provide information about construction, and manufacturing details for the fiberglass lamp post project. And also to provide some information about the viability of fiberglass and polyurethane rubber for this application.

During the meeting with City Representatives Timothy Frye, and Anne Brask, some questions were asked about details of construction, and the longevity of fiberglass. Timothy also asked for some drawings with dimensions, and other supporting information.

With regard to construction, all the molds used to produce the components for these lamp posts were taken directly from original cast iron pieces. So all the components will be exactly the same size as the originals, and have exactly the same appearance as the originals. We have been in business nearly 40 years. We have developed mold making techniques that lend themselves well to historical restoration. For more information about out capabilities in this area, please view our website leraglass.com.

The basic assembly of the fiberglass lamp posts is nearly identical to the cast iron lamp posts. This design features the identical steel support structure. All the fiberglass components will be made using top quality Class 1 Fire Retardant Resin. And will be laid up very thick in areas where the most abuse is likely. Some components will be made using a polurethane rubber. This rubber is very similar to the material used in flexible bumper panels on automobiles. Except it will be a little harder, and thicker. This same polyurethane is already being used to manufacture street lighting in Colorado.

We have provided images showing all the cast iron lamp post components, and all the fiberglass lamp post components. So that these can be compared side by side. Timothy Frye asked for drawings with dimensions, so we have provided this. He also had reservations about the longevity of fiberglass. So we have included recent images of our very first historical restoration project. These components have been on the street for 35 years. We also provided spec sheets for the materials we intend to use.

I know there have been concerns about another vendor's attempts with regard to decorative lampost components. Durabitity, with regard to fiberglass, is a result of material quality, and part thickness. Fiberglass is used in the bodies of FMC's Bradly Fighting Vehicle. Fiberglass sheeting is also the key material used in bullet proofing limousines, and other bullet proof vehicles. The key in both these cases is the thickness of the material. The thicker it is, the heavier the firepower it will resist. I have seen some of the failed lamp bases frrom the vendor in question. These parts were 3/16ths, or so thick. Our bases are ½ inch thick. If need be these can be made thicker using the same tooling. At ½ inch thick, the fiberglass bases may already be stronger than the cast iron bases.

Hopefully we have answered you questions. If not, please feel free to call.

Thanks,

John Rook

1245 San Mateo Ave. San Bruno, CA 94066 650-589-8919 leraglass@gmail.com

FILE NO. 020295 ORDINANCE NO. 92-03

[Ordinance to Designate the Golden Triangle Light Standards As a Landmark Under Planning Code Article 10.]

Ordinance Designating The Golden Triangle Light Standards As Landmark No. 233 Pursuant To Article 10, Sections 1004 And 1004.4 Of The Planning Code.

Note: Additions are *single-underline italics Times New Roman*; deletions are ~~*strikethrough italics Times New Roman*~~. Board amendment additions are double underlined. Board amendment deletions are ~~strikethrough normal~~.

Be it ordained by the People of the City and County of San Francisco:

Section 1. Findings

The Board of Supervisors hereby finds that the Golden Triangle Light Standards, located along the streets in the area bounded by Market, Mason and Sutter Streets (not including alleys), have a special character and special historical, architectural and aesthetic interest and value, and that their designation as a Landmark will further the purposes of, and conform to the standards set forth in, Article 10 of the City Planning Code.

(a) Designation: Pursuant to Section 1004 of the City Planning Code Golden Triangle Light Standards is hereby designated as Landmark No. 233. This designation has been fully approved by Resolution No. 534 of the Landmarks Preservation Advisory Board and Resolution No. 16222 of the Planning Commission, which Resolutions are on file with the Clerk of the Board of Supervisors under File No. 020295 and which Resolutions are incorporated herein and made part hereof as though fully set forth.

(b) Priority Policy Findings:

Pursuant to Section 101.1 of the Planning Code, the Board of Supervisors makes the following findings:

(1) The designation is in conformity with the Priority Policies of Planning Code Section 101.1 and with the General Plan as set forth in the letter dated February 11, 2002 from the Director of Planning. Such letter is on file with the Clerk of the Board in File No. 020295 .

(2) The Board of Supervisors finds that this ordinance is in conformity with the Priority Policies of Section 101.1 of the Planning Code and with the General Plan, and hereby adopts the findings set forth in the letter dated February 11, 2002 from the Director of Planning and incorporates such findings by reference as if fully set forth herein.

(b) Required Data:

(1) The description, location and boundary of the Landmark site are the footprints of the Golden Triangle Light Standards that line the streets in the area bounded by Market, Mason and Sutter Streets (not including alleys).

(2) The characteristics of the Landmark which justify its designation are described and shown in the Landmark Designation Report adopted by the Landmarks Preservation Advisory Board on June 20, 2001 and other supporting materials contained in Planning Department Docket No. 1999.481L. In brief the characteristics of the landmark which justify its designation are as follows:

(a) Associated with the Panama-Pacific International Exposition of 1915 and the development of merchant businesses in the present-day Union Square retail district of San Francisco.

(b) Association with Walter D'Arcy Ryan, Chief of Illumination for the Panama-Pacific International Exposition of 1915 and Director of the Illuminating Laboratory for the General Electric Company during the early 20th century. Association with J.W. Gosling, a lighting designer who also worked in the Illuminating Laboratory for the General Electric Company in

the early 20^{th} century and designed lighting effects for the Panama-Pacific International Exposition of 1915.

(c) The light standards typify early 20^{th} century innovations in street lighting and embody characteristics of the City Beautiful movement.

(3) That the particular exterior features that should be preserved, or replaced in-kind as determined necessary, are those generally shown in the photographs and described in the Landmark Designation Report, both which can be found in the case docket 1999.481L which is incorporated in this designation ordinance as though fully set forth. In brief, the description of the particular features that should be preserved are as follows:

(a) Decorative metal standards (Meaning the metal base, pole, and top).

(b) San Francisco Carrarra-Style Glass globes.

(c) Existence within the Triangle District, which is bordered by Market, Mason and Sutter Streets.

Section 2. The property shall be subject to following further controls and procedures, pursuant to this Board of Supervisor's Ordinance and Planning Code Article 10.

APPROVED AS TO FORM:
DENNIS J. HERRERA, City Attorney

By: Sarah Ellen Owsowitz
Sarah Ellen Owsowitz
Deputy City Attorney

RECOMMENDED:
PLANNING COMMISSION

By: [signature]
Gerald G. Green
Director of Planning

City and County of San Francisco
Tails
Ordinance

City Hall
1 Dr. Carlton B. Goodlett Place
San Francisco, CA 94102-4689

File Number: 020295 **Date Passed:**

Ordinance Designating The Golden Triangle Light Standards As Landmark No. 233 Pursuant To Article 10, Sections 1004 And 1004.4 of the Planning Code.

May 6, 2003 Board of Supervisors — PASSED ON FIRST READING

Ayes: 11 - Ammiano, Daly, Dufty, Gonzalez, Hall, Ma, Maxwell, McGoldrick, Newsom, Peskin, Sandoval

May 13, 2003 Board of Supervisors — FINALLY PASSED

Ayes: 10 - Daly, Dufty, Gonzalez, Hall, Ma, Maxwell, McGoldrick, Newsom, Peskin, Sandoval
Excused: 1 - Ammiano

File No. 020295

I hereby certify that the foregoing Ordinance was FINALLY PASSED on May 13, 2003 by the Board of Supervisors of the City and County of San Francisco.

Gloria L. Young
Clerk of the Board

Date Approved

Mayor Willie L. Brown Jr.

Case No. 1999.481L
Golden Triangle Light Standards
Area bounded by Market, Mason and
Sutter Streets

SAN FRANCISCO

PLANNING COMMISSION

RESOLUTION NO. 16222

ADOPTING FINDINGS RELATED TO THE APPROVAL OF LANDMARK DESIGNATION AND RECOMMENDATION OF APPROVAL TO THE BOARD OF SUPERVISORS OF SUCH DESIGNATION OF THE GOLDEN TRIANGLE LIGHT STANDARDS AS LANDMARK NO. 233.

1. **WHEREAS**, on June 2, 1999, the Landmarks Preservation Advisory Board (Landmarks Board) established its Landmark Designation Work Program for fiscal year 1999-2000. Planning Department staff prepared Landmark Designation Reports for each of the eight sites chosen for the Landmark Designation Work Program. All eight sites were to be brought to the Landmarks Board for review, comment, and consideration of initiation of landmark designation. Included among the sites were the Golden Triangle Light Standards, located along the streets in the area bounded by Market, Mason and Sutter Streets (not including alleys); and

2. The Landmarks Board, at its regular meeting of June 20, 2001, reviewed a draft Golden Triangle Light Standards Landmark Designation Report prepared by Mary Hashemi, Planning Department staff. The Landmarks Board considered the report to be a final Golden Triangle Light Standards Landmark Designation Report; and

3. At its regular meeting of June 20, 2001, the Landmarks Board found that the Golden Triangle Light Standards Landmark Designation Report describes the location and boundaries of the landmark site, describes the characteristics of the landmark which justifies its designations, and describes the particular features that should be preserved and therefore meets the requirements of Planning Code Section 1004(b) and 1004(c)(1), that Designation Report is fully incorporated by reference into this resolution; and

4. At its regular meeting of June 20, 2001, the Landmarks Board reviewed and endorsed the description, location and footprints of the Landmark site as the Golden Triangle Light Standards that line the streets in the area bounded by Market, Mason and Sutter Streets (not including alleys; and

5. At its regular meeting of June 20, 2001,the Landmarks Board, in considering the proposed landmark designation employed the National Register Criteria and found that the Golden Triangle Light Standards are significant under Criterion A (associated with events that have made a significant contribution to the broad patterns of our history), B (associated with the lives of persons significant in our past), and C (embodies distinctive characteristics of a type, period, or method of construction, or that represents a significant and distinguishable entity whose components may lack individual distinction); and

6. At its regular meeting of June 20, 200, the Landmarks Board reviewed and endorsed the following description of the characteristics of the Landmark which justify its designation:

   (a) Associated with the Panama-Pacific International Exposition of 1915 and the development of merchant businesses in the present-day Union Square retail district of San Francisco.
   (b) Association with Walter D'Arcy Ryan, Chief of Illumination for the Panama-Pacific International Exposition of 1915 and Director of the Illuminating Laboratory for the General Electric Company during the early 20th century. Association with J.W. Gosling, a lighting designer who also worked in the Illuminating Laboratory for the General Electric Company in the early 20th century and designed lighting effects for the Panama-Pacific International Exposition of 1915.
   (c) The light standards typify early 20th century innovations in street lighting and embody characteristics of the City Beautiful movement.

7. At its regular meeting of June 20, 2001, the Landmarks Board reviewed and endorsed the following particular features that should be preserved:

   (a) Decorative metal standards (Meaning the metal base, pole, and top.)
   (b) San Francisco Carrarra-Style Glass globes.
   (c) Existence within the Triangle District, which is bordered by Market, Mason and Sutter Streets.

8. At its regular meeting of June 20, 2001, the Landmarks Board has reviewed documents, correspondence and oral testimony on matters relevant to the proposed landmark designation, at a duly noticed public hearing held on June 20, 2001.

9. At the same June 20, 2001 hearing, the Landmarks Board recommended that the Planning Commission approve the landmark designation of the Golden Triangle Light Standards as Landmark No. 233, pursuant to Article 10 of the Planning Code; and

10. At the same June 20, 2001 hearing, the Landmarks Board directed its Recording Secretary to transmit Landmarks Board Resolution No. 533, the Golden Triangle Light Standards designation report and other pertinent materials in the case file 1999.481L to the Planning Commission; and

11. The Planning Commission reviewed the case file and considered the findings and recommendation of the Landmarks Board set forth in the Landmarks Board Resolution No. 533, and held a duly noticed public hearing on the matter on September 6, 2001;

12. THEREFORE BE IT RESOLVED, First, That the Planning Commission does hereby concur with the findings and recommendation of the Landmarks Board and **APPROVES** the landmark designation of the Golden Triangle Light Standards, as Landmark No. 233;

13. AND BE IT FURTHER RESOLVED, that the special character and special historical, architectural and aesthetic interest and value of the landmark is set forth in the adopted the Golden Triangle Light Standards Designation Report, Landmarks Board Resolution No. 533 and other materials on file in the Planning Department Docket No. 1999.481L, which is incorporated herein and made a part of thereof as though fully set forth;

14. AND BE IT FURTHER RESOLVED, That the Planning Commission hereby directs its Secretary to transmit the adopted the Golden Triangle Light Standards Designation Report, the photographs and other pertinent materials in the Case File No. 1999.481L, and a copy of this Resolution of Approval to the Board of Supervisors for appropriate action.

I hereby certify that the foregoing Resolution was adopted by the Planning Commission on September 6, 2001.

Linda D. Avery
Commission Secretary

AYES:

NOES:

ABSENT:

ADOPTED:

LANDMARK DESIGNATION REPORT DATE: CASE NO: 1999.481L PAGE 1 OF 11	LANDMARKS BOARD VOTE: APPROVED: PLANNING COMMISSION VOTE: APPROVED: PROPOSED LANDMARK NO: 233

HISTORIC NAME: Golden Triangle Light Standards
POPULAR NAME: Streetlights

ADDRESS: Golden Triangle streetlights line the streets in the area bounded by Market, Mason and Sutter Streets, not including alleys
BLOCK/LOT: No Assessor's block and lot is available as the lights line public right-of-ways

OWNER: Pacific Gas & Electric
Jeff Joy, Director of Operations, Maintenance and Construction
2225 Folsom Street
San Francisco, CA 94110

Pacific Gas & Electric
Lester Olmstead-Rose, Director of Government Relations
77 Beale Street, B29K
San Francisco, CA 94177

ORIGINAL USE: Streetlights
CURRENT USE: Streetlights
ZONING: Located on public right-of-ways within a C-3 (Downtown Commercial) District

NATIONAL REGISTER CRITERIA:

(A) x Association with events that have made a significant contribution to the broad patterns of our history.
(B) x Association with the lives of persons significant in our past.
(C) x Embody distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.
(D) _____ Has yielded, or may be likely to yield information important in history or prehistory.

- **Period of Significance:** 1915-1918
- **Integrity:** The Golden Triangle streetlights maintain integrity of location, design, setting, materials, workmanship, feeling and association. Alterations have been made to the streetlights (see Description and Integrity section for more detail). However, these alterations do not obscure or negatively impact the significant characteristics of the streetlights -- these being the metal standard and glass globes.

ARTICLE 10 REQUIREMENTS - SECTION 1004(b):

- **Boundaries of the Landmark Site:**

  Encompassing all of and limited to the footprint of each of the existing 189 Golden Triangle light standards, as identified by its design shown in the photography sections of the DPR 523 A,B, and L forms completed for the Golden Triangle light standards, that line the streets (not including alleys) between Market, Mason and Sutter Streets. Please see the attached Landmark Boundaries Map.

- **Characteristics of the Landmark which justify its designation:**

  National Register Criteria A, B and C
  (A) Associated with the Panama-Pacific International Exposition of 1915 and the development of merchant businesses in the present-day Union Square retail district of San Francisco.

  (B) Association with Walter D'Arcy Ryan, Chief of Illumination for the Panama-Pacific International Exposition of 1915 and Director of the Illuminating Laboratory for the General Electric Company during the early 20th century. Association with J.W. Gosling, a lighting designer who also worked in the Illuminating Laboratory for the General Electric Company in the early 20th century and designed lighting effects for the Panama-Pacific International Exposition of 1915.

  (C) The light standards typify early 20th century innovations in street lighting and embody characteristics of the City Beautiful movement.

- **Description of the particular features that should be preserved:**

  1. Decorative metal standards (Meaning the metal base, pole, and top.)
  2. San Francisco Carrarra-Style Glass globes.
  3. Existence within the Triangle District, which is bordered by Market, Mason and Sutter Streets.

DESCRIPTION:

The Golden Triangle Light Standards are streetlight fixtures located in the area bounded by Market, Mason and Sutter Streets. The fixtures are made up of a base, an ornamental fluted column with two volutes and an anthemion at the top. The two volutes are a support for a cross-arm which holds two arc lamps in place. Concealed within the lampposts is a 4-inch diameter pipe set in concrete, which carries the weight of the anthemion and arc lamps. The entire street light weighs over a ton and is 22 feet tall, from the sidewalk to the arcs. The lamp

originally used was the General Electric 6.6 amp. The lamp is enclosed with an eight-panel ribbed globe. The original globes were composed of "San Francisco Golden Cararra" glass. These globes have been replaced over time with similar globes made out of new materials. The San Francisco Golden Cararra glass was an amber glass that was designed to diminish ultra-violet rays of light and at the same time illuminate the streets.

The arc lamps are a pair of fluted torchère, which are capped at top with a finial. At the bottom of the two torchères is a decorative, acorn shaped metal element. The high base and ornate capital of the light fixture most closely resemble the Corinthian order. Highly stylized acanthus leaves along with a fluted shaft and scrolled modillions decorate the street fixtures.

In 1918, the first 139 Golden Triangle light standards were installed along both sides of all the streets, not including alleys, within the area bounded by Market, Powell, Sutter, and Kearny Streets. These same light standards were later added to Mason Street between Market and Sutter, Sutter Street between Kearny and Sansome, and Post Street between Kearny and Montgomery. It appears that the lights added to Mason, Sutter and Post were installed soon after the original installation. A few of the bases of the lights along Mason Street have plates that read "Property of PG&E, Erected under the auspices of the Downtown Associates" and "Joshua Handy Ironworks, San Francisco, 1917". Since the early 1900's only three new Golden Triangle lights have been made. These were made circa 1991 for placement in front of the Hilton Hotel located at 333 O'Farrell Street. There are approximately 189 Golden Triangle light standards standing today.

Presently, a variety of replacement lights from different eras randomly alternate with the original Golden Triangle light standards. Golden Triangle light standards have been replaced where accidents or structural problems made them impossible to repair. PG&E (Pacific Gas & Electric), the company that originally owned and operated the light standards, maintains the light standards with parts made from a mold. The mold, not the original, was made using an existing light standard and has been used in the last decade to make new bases for some of the Golden Triangle light standards. These new bases were made for existing bases where repair was impossible. The mold was also used to make the three light standards for the Hilton Hotel mentioned above. In many instances the Golden Triangle light standards have also been moved to accommodate widenings or other alterations to the streets and sidewalks. The original wiring has been replaced with modern standards, and a photocell was added to the anthemion. The photocell regulates the lights so that during the daylight the lights are turned off, and turned on at night to light the streets. There is no information about the original color scheme for the Golden Triangle light standards and today they are painted in different colors ranging from a faded light gray to a recently painted dark gray-blue. Only a few have had the details painted in a contrasting color. The original San Francisco Golden Cararra Glass globes have been replaced as necessary over time. The replacements are of the same design as the original but of a different material.

The overall condition of the existing Golden Triangle Light Standards is generally good– with most showing some rust and peeing paint yet still appearing structurally sound. Only those light standards along Mason Street and a few others randomly located throughout the triangle district of Market, Mason and Sutter Streets appear to have been painted in the past decade.

STATEMENT OF SIGNIFICANCE:

The Golden Triangle light standards are significant under criteria A due to association with the Panama-Pacific International Expostion of 1915 and the development of merchant businesses in the present-day Union Square retail district of San Francisco. Significant figures in the development of the Golden Triangle lights included Walter D'Arcy Ryan, Chief of Illumination for the Panama-Pacific International Exposition and Director of the Illuminating Laboratory for the General Electric Company, and J.W. Gosling, also of the Illuminating Laboratory. The lights are significant under criteria B primarily for their association with Ryan and secondarily for their association with Gosling. The lights are also significant under criteria C since they typify early 20th-century innovations in street lighting and embody characteristics of the City Beautiful movement.

Criteria A – Associated with events that have made a significant contribution to the broad patterns of our history

The innovations in illumination at the 1915 Panama-Pacific Exposition, an international fair held to celebrate the linking of the Atlantic and Pacific oceans via the Panama Canal, influenced the street lighting of San Francisco. Local merchants and government officials, inspired by the ornamental high-current luminous arc lamp used for façade and avenue lighting at the Exposition, sought improved modern lighting for Market Street. As a result of their efforts, Market Street was officially lit with 327 Path of Gold street light standards in 1916. Today, the Path of Gold is a city landmark; significant for its connections to: the City Beautiful movement, nationwide development of street lighting, contribution to local business development, designers, local government officials and business owners, and the San Francisco Graft Trials of 1907.

Once the Path of Gold was completed, local merchants began advocating the extension of this lighting system to the remaining portion of the retail district, known then as the Triangle District and generally bounded by Market, Powell, and Sutter Streets. A lighting system already existed within the Triangle District, but it obviously didn't satisfy the local merchants who were clamoring for a better system. The merchants believed that a better lighting system would increase trade and help maintain the area's status as a major retail center. The local merchants and property owners worked together as members of the Downtown Association to review and choose the design of the Golden Triangle light standards, and to raise money to partially fund maintanence costs. In the original agreement concerning the light standards, PG&E paid $85,000 for the production and installation, and the Downtown Association and local government combined funds to pay the yearly maintanence costs of $30,000.

Installation of lights in the Triangle District began in the spring of 1917. Though work temporarily stopped with the outbreak of World War I, construction continued after the war and the installation was completed by the winter holidays of 1918.

Upon completion of the new lighting system, Mr. Fennimore, chairman of the Downtown Association and head of the campaign for new lighting, proclaimed "We have at last solved the problem which will largely contribute to holding and solidifying the retail business district into a permanent location. The solution in one word is light."

The new lighting system, which was later called the Golden Triangle by its designer Walter D'Arcy Ryan, was designed like the Path of Gold to provide intense lighting that was more powerful and at the same time more diffuse than older lighting systems. The new lighting uniformly distributed light, lit the facades of buildings and eliminated glaring street light that irritated the eyes of passers-by. The lighting plan for the system also included the burning of some designated lamps all night and the extinguishing of other designated lamps at midnight. Local merchants believed that this new lighting would create more attractive streets and lengthen the amount of time people had to window shop. Other benefits included fire protection and freedom from burglaries, via more people and more eyes to detect smoke, fire and thieves.

The removal of trolley poles along the streets of the Triangle District was a street beautification measure associated with the installation of the Golden Triangle lights. The trolley poles were removed before the light standards were installed and the trolley span wires were then attached to eyebolts placed in the facades of adjacent buildngs. The removal of the trolley poles was thought to beautify the streetscape as it created a more orderly and therefore visually appealing view of the street.

Criteria B – Associated with the lives of persons significant in our past

Walter D'Arcy Ryan was responsible for the lighting effects at the Panama-Pacific International Exposition of 1915 and he used his knowledge and expertise to help design a system of lighting for the Path of Gold and Triangle District. Ryan first designed the Path of Gold, and it was the success of these lights that led the Downtown Association, a local merchants group, to request his expertise as an electrical engineer for the Triangle District.

Ryan appeared to have a major impact on the development of lighting systems throughout the United States, and possibly the world. Newspaper and journal accounts published after the 1915 Exposition record his involvement in the design of lighting systems for Los Angeles and New York. A 1917 article, published in the San Francisco Examiner, quotes Ryan's description of the countrywide and worldwide demand for his expertise and knowledge of lighting design. It states, "I have just returned from a 12,000 mile trip and no matter where I went, there was a demand for information and data on the San Francisco Path of Gold. Already twelve cities are installing modified systems of the one that we have here. Requests for information are being received daily form all parts of the world, especially South America. Even London has written." At the 1915 Exposition, Ryan's lighting designs were surely seen by and so could have influenced the nearly twenty million people that attended the Exposition over a ten month period. Among the attendees were representatives of twenty-nine states and twenty-five foreign countries that were participating in the Exposition. The powerful impression made by Ryan's lighting designs is also illustrated by the fact that two books about the 1915 Exposition devoted whole chapters to discussing and praising his work.

Ryan's participation in the 1915 Exposition and subsequent influence on the development of street lighting in San Francisco is clear, and so then is his significance in San Francisco history. More research, however, would be needed to fully analyze Ryan's influence on the development of street lighting for the rest of the country and world.

J.W. Gosling of the Illuminating Laboratory worked with Ryan and designed the Golden Triangle light standard. Gosling also designed many of the light standards used at the Panama-Pacific Exposition. Gosling is therefore signficant in the history of San Francisco.

A San Francisco Examiner article states that Leo Lentelli, the sculptor for the tops of the Path of Gold light standards, worked with Ryan in preparing the lighting service for the Triangle District. None of the other journal articles used to research this report, however, mention Lentelli's involvement. Unless further research provides other information, Lentelli's involvement should not be grounds for findng signifcance of the resource under criteria B.

Lastly, the role of San Francisco Beautiful, a private community organization founded in 1964 to promote civic beauty, in preserving the Golden Triangle Light Standards is included here as a point of interest. In 1965, San Francisco Beautiful President Mrs. Hans Klussman circulated a petition to stop the San Francisco Department of Pubic Works from removing the light standards and replacing them with new modern light standards.

Criteria C – Embody distinctive method and period of construction

The Golden Triangle light standards were not the first electrical lighting in the downtown, but were innovative for their time. In fact, they and the Path of Gold lights represent the most advanced street illumination known to exist in the United States in the early decades of the twentieth century. Both Market Street and the Triangle District were lit with the same type of inovative arc lamps used at the Panama-Pacific Exposition; the fair designed to celebrate the future.

The Golden Triangle lights were equipped with a new type of glass and more powerful lamps that uniformly distributed light, did not cast large shadows, lit the facades of the buildings, helped eliminate harmful ultra-violet rays of light and provided a soft and radiante spread of light. The glass was amber and was known as San Francisco Golden Carrarra glass. As the Journal of Electricity reported in 1919, "The system [Golden Triangle lighting system], unlike many other bright illuminatory systems, is not injurious to the eyes, and the absence of the flaming, piercing, eye-straining arc so common in unscientific illumination, makes it the hightest class of street lighting in existence. It is predicted that all improvements in street lighting in the future for years to come will be along the lines of the present system". This same article also reported that the new light standards were more efficient than older models and had a relatively low maintanence cost.

The type of glass and lamp used in the Golden Triangle and Path of Gold light standards was clearly a significant technological advancement for San Francisco streets. More research is needed to determine the national application and importance of these innovations. However, a 1916 article in the Architect and Engineer states that the same type of arc lamps used to modernize San Francisco was also used in "over a hundred cities", and a 1917 article published in the San Francisco Examiner quotes Ryan as stating that the globes of street lights in New York had been colored yellow in imitation of the amber glass used in the Path of Gold.

The Golden Triangle light standards are also important remnants of the City Beautiful movement that brought city planner Daneil Burnham to San Francisco in 1906 and shaped the design of Civic Center. The classical styling of the light standards reflect the popularity of and emphasis on classical styles that were characteristic of the City Beautiful movement. The standard design employs such classical elements as a Corinthian base and capital, acanthus leaves and scolled modillions. Additionally, the advocation of local citizens for beautification measures was also a hallmark of the City Beautiful movement. In this case local merchants,

through the Downtown Association, sought to improve the quality of streets in the retail section of the city by providing more attractive lighting.

Integrity

In 1918, the first 139 Golden Triangle light standards were installed along both sides of all the streets, not including alleys, within the area bounded by Market, Powell, Sutter, and Kearny Streets. These same light standards were later added to Mason Street between Market and Sutter, Sutter Street between Kearny and Sansome, and Post Street between Kearny and Montgomery. It appears that the lights added to Mason, Sutter and Post were installed soon after the original installation. A few of the bases of the lights along Mason Street have plates that read "Property of PG&E, Erected under the auspices of the Downtown Associates" and "Joshua Handy Ironworks, San Francisco, 1917". Since the early 1900's only three new Golden Triangle lights have been made. These were made circa 1991 for placement in front of the Hilton Hotel located at 333 O'Farrell Street. There are approximately 189 Golden Triangle light standards standing today.

Presently, a variety of replacement lights from different eras randomly alternate with the original Golden Triangle light standards. Golden Triangle light standards have been replaced where accidents or structural problems made them impossible to repair. PG&E (Pacific Gas & Electric), the company that originally owned and operated the light standards, maintains the light standards with the parts made from a mold. The mold, not the original, was made using an existing light standard and has been used in the last decade to make new bases for some of the Golden Triangle light standards. These new bases were made to replace existing bases where repair was impossible. The mold was also used to make the three light standards for the Hilton Hotel mentioned above. In many instances the Golden Triangle light standards have also been moved to accommodate widenings or other alterations to the streets and sidewalks. The original wiring has been replaced with modern standards and a photocell was added to the anthemion. The photocell regulates the lights so that during the daylight the lights are turned off, but turned on at night to light the streets. There is no information about the original color scheme for the Golden Triangle light standards and today they are painted in different colors ranging from a faded light gray to a recently painted dark gray-blue. Only a few have had the details painted in a contrasting color. The original San Francisco Golden Cararra Glass globes have been replaced as necessary over time. The replacements are of the same design as the original but of a different material.

Overall, the majority of the original Golden Triangle light standards still survive, stand near their original placement, and maintain their original casing and original style of glass globes. The condition of the Golden Triangle Light Standards is generally good– with most showing some rust and peeing paint yet still appearing structurally sound. Only those light standards along Mason Street and a few others randomly located throughout the triangle district of Market, Mason and Sutter Streets appear to have been painted in the past decade. Consequently, the Golden Triangle streetlights do retain integrity of location, design, setting, materials, workmanship, and feeling. The PG&E Company still maintains control of lights, but does confer with local merchants and the city regarding maintanence and operation.

REFERENCES:

1. Bloomfield, Anne. Case Report for Landmark Designation of the Path of Gold Light Standards. San Francisco Planning Department, 1991.
2. Dickerson, A.F. "Lighting of San Francisco's Triangle District", Journal of Electricity, May 1, 1919.
3. Neuhaus, Eugen. *The Art of the Exposition.* San Francisco, Paul Elder and Company Publishers.
4. Reid, H.C. "Recent Progress in Municipal Street Lighting", The Architect and Engineer, November 1928.
5. Richards, Rand. *Historic San Francisco.* San Francisco, Heritage House Publishers, 1995.
6. Ryan, Walter D'Arcy. "Proposed New Illumination Effects", The Architect and Engineer, June 1917.
7. Ryan, Walter D'Arcy. "San Francisco's New Path of Gold", The Architect and Engineer, 1917.
8. San Francisco Architectural Heritage. *San Francisco Downtown Inventory Evaluation Sheet*, Files. 1978.
9. San Francisco Architectural Heritage. *Splendid Survivors, San Francisco's Downtown Architectural Hertiage,* California Living Books, 1979.
10. Todd, Frank Morton. *The Story of the Exposition.* New York, London, The Knickerbocker Press, 1921.
11. "Would Illumine Market Street, Luminous Arc Lights Urged", San Francisco Chronicle, January 6, 1916.
12. "Path of Gold Bringing Fame", San Francisco Examiner, January 11, 1917.
13. "San Francisco to Have New White Way", The Architect and Engineer, April 1916.
14. "Lamp Pole Fight", San Francisco Chronicle, October 1, 1965.
15. Interviews: Rocko Colicchia, Senior Program Manager, PG&E. Telephone interview (415-973-1064), 1999 and 2001.
    Gilbert Munos, Staff, PG&E. Telephone interview (415-695-3550), 1999.
    Dan Weaver, Urban Planner and Member of San Francisco Beautiful, Telephone interview, 1999.

RATINGS: San Francisco Architectural Heritage. *Splendid Survivors, San Francisco's Downtown Architectural Heritage*, California Living Books, 1976.

Rated A -- Highest Importance: Individually the most important buildings in downtown San Francisco, distinguished by outstanding qualities of architecture, historical values, and relationship to the environment. All A-group buildings are eligible for the National Register, and of highest priority for City Landmark status.

The Planning Department recommends rating the Golden Triangle light standards a 3 according to the National Register Status Codes. This rating means that the structure appears eligible for the National Register to the person completing or reviewing the evaluation form.

PREPARED BY: Mary Koonts Hashemi
ADDRESS: Planning Department
City and County of San Francisco
1660 Mission Street
San Francisco, CA 94103-2414

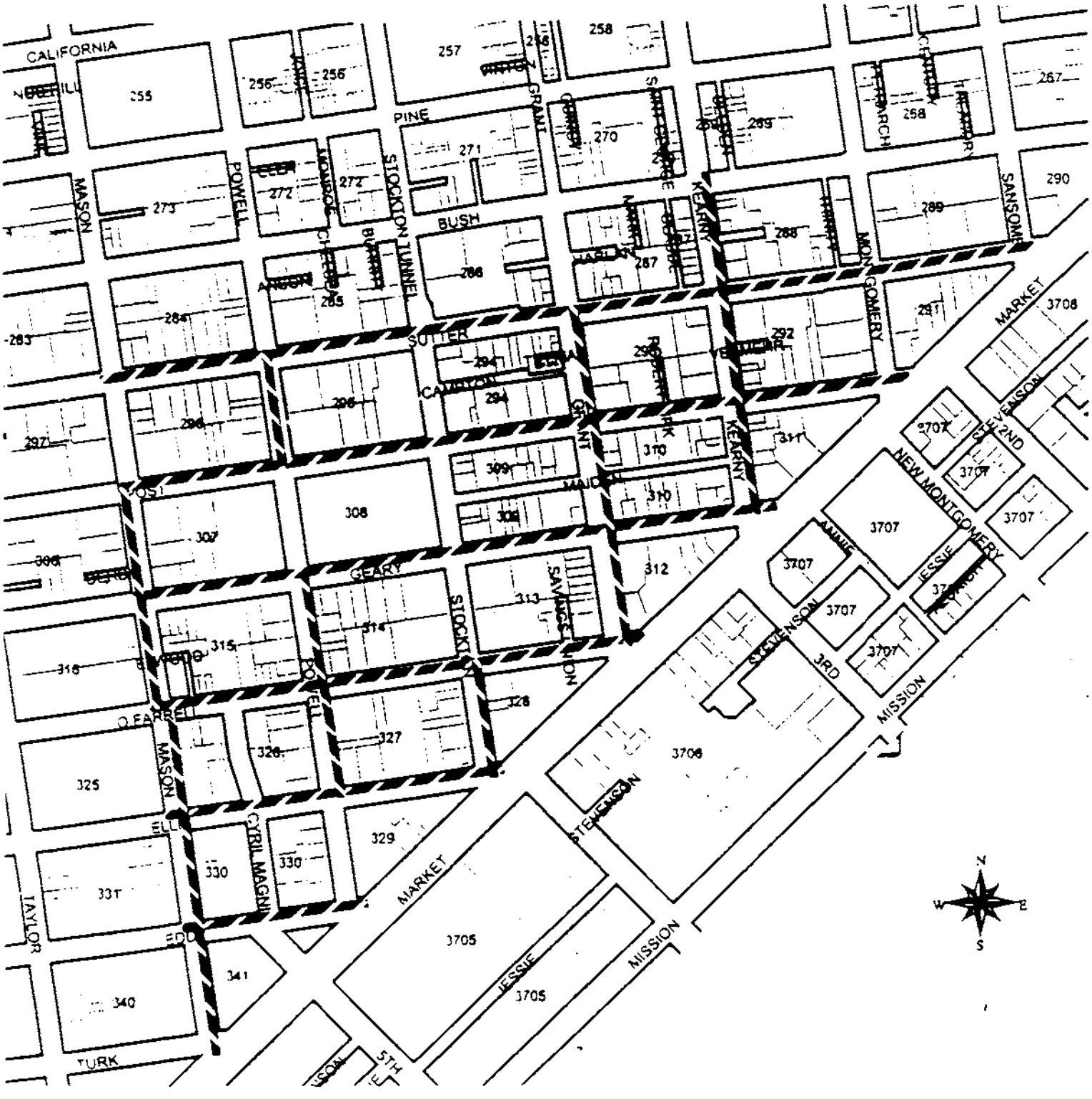
ATTACHMENTS:
_X_DPR 523 A, B, L, and J Forms (Exhibit B)
___Context Statement
___Photographs
_X_Map and Conditions Report (Exhibit A)
___Other

EXHIBIT A
Landmark Boundaries Map and Conditions Report

Landmarks Boundaries Map
Golden Triangle Light Standards

Golden Triangle lights, 189 in all, line both sides of the streets marked below. Planning Department staff gathered this information during site visits in July 1999 and February 2001. The map provided here was made on March 29, 2001. A report on the condition of these light standards is attached to this map.

Legend: Streets with Golden Triangle Light Standards



Golden Triangle Light Standards – Condition Assessment

Site visits conducted by the Planning Department in July 1999 and February 2001

Street	Block	No. of GT lights	Condition	Notes
Mason	Sutter to Post	0	N/A	No GT standards on this block. Only modern style standards.
	Post to Geary	5	Good	Paint is faded and light gray.
	Geary to O'Farrell	2	Good	Paint is faded and light gray. Two modern lights on block.
	O'Farrell to Ellis	6	Fair to Good	Some standards tilt slightly and are rusting. Paint is faded, light gray, and peeling.
	Ellis to Eddy	6	Good	Some graffiti on standards. West side: painted light gray with peeling paint and rust. East side: painted a dark gray-blue color.
	Eddy to Market	6	Good	Recently painted dark gray-blue color.
Powell	Sutter to Post	4	Good	Paint is faded and light gray, with some rust and peeling.
	Post to Geary	0	N/A	No GT lights. Several other types of standards.
	Geary to O'Farrell	6	Good	Recently painted dark gray-blue color.
	O'Farrell to Ellis	3	Good	Paint is faded and light gray.
	Ellis to Market	0	N/A	No GT standards on this block. Only modern style, black standards.
Stockton	Sutter to Post	0	N/A	No GT standards on this block.
	Post to Geary	0	N/A	No GT standards on this block. Only modern style, blue standards.
	Geary to O'Farrell	0	N/A	No GT standards on this block. Only different older style standards.
	O'Farrell to Ellis/Market	4	Good	Paint is faded and light gray.
Grant	Sutter to Post	4	Good	Paint is faded and light gray.
	Post to Geary	4	Good	Paint is faded and light gray. Different light types front Maiden Lane.
	Geary to O'Farrell	4	Good	Paint is faded and light gray. Other types of older style standards on block.
Kearny	Bush to Sutter	3	Good	Paint is faded and light gray.
	Sutter to Post	4	Fair to Good	Paint is faded and light gray.
	Post to Geary/Market	4	Fair	Two glass globes have been broken. A base on one of the GT standards is missing. Paint is faded and light gray.
Montgomery	Sutter to Post/Market	0	N/A	No GT standards on this block.
Sutter	Mason to Powell	1	Good	GT standard is painted a faded, light gray. Assorted standards with parts from Path of Gold lights, GT lights, and other old and new styles.
	Powell to Stockton	8	Good	One GT standard has broken glass globe. All have peeling green paint and are rusting.
	Stockton to Grant	4	Good	All GT standards have peeling green paint and are rusting. GT standards on south side of street and modern standards on north side.
	Grant to Kearny	7	Good	Paint is faded and light gray.
	Kearny to Montgomery	8	Good	Paint is faded and light gray, and standards are rusting.
	Montgomery to Sansome	6	Good	Paint is faded and light gray.
Post	Mason to Powell	7	Good	Paint is faded and light gray. GT standards on north side of street, and other older style standards on south side.
	Powell to Stockton	4	Good	Recently painted dark gray-blue color. Two detailed with gold paint. GT on north side and other older style on south side of street.
	Stockton to Grant	6	Good	Paint is faded and light gray with gold details.
	Grant to Kearny	8	Good	Paint is faded and light gray with gold details.
	Kearny to Montgomery	6	Good	Paint is faded and light gray.
Geary	Mason to Powell	4	Good	Paint is faded and light gray. GT standards on south and north side of street.
	Powell to Stockton	4	Good	Recently painted dark gray-blue with gold details. GT standards on south side of street with other old styles on north side.
	Stockton to Grant	6	Good	Paint is faded and light gray.
	Grant to Kearny/Market	6	Good	Paint is faded and light gray. GT standards on south and north side of street.
O'Farrell	Mason to Powell	4	Good	Paint is faded and light gray.
	Powell to Stockton	6	Good	Paint is faded and light gray.
	Stockton to Grant/Market	6	Good	Paint is faded and light gray.
Ellis	Mason to Powell	7	Good	Paint is faded and light gray.
	Powell to Stockton/Market	6	Good	Paint is faded and light gray.
Eddy Street	Mason to Cyril Magnin/Market	2	Good	Paint is faded and light gray. GT standards on west half of block and modern standards on east half of block.
TOTAL		189		

Legend:

GT	means Golden Triangle light standards.
Good	means standards generally appear structurally sound, though would require minor repairs due to rust and peeling paint.
Fair	means standards would require significant structural repair.

EXHIBIT B
DPR 523 A, B, L, and J Forms

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3
Other Listings *Splendid Survivors*, SF Architectural Heritage, Rated A (Highest Importance)
Review Code Reviewer Date

Page 1 of 10 * Resource name(s) or number: Golden Triangle Light Standards

P1. Other Identifier:

*P2. Location: Not for Publication Unrestricted

*a. County San Francisco

*b. USGS 7.5' Quad Date T ; R ; ¼ of ¼ of Sec; B.M.

c. Address Golden Triangle light standards that line streets in the area bounded by Market, Mason, and Sutter Streets, not including alleys

City San Francisco Zip

d.UTM: (Give more than one for large and/or linear resources) Zone , mE/ mN

e. Assessor's Parcel Number Public right-of-ways; no assessor's information available

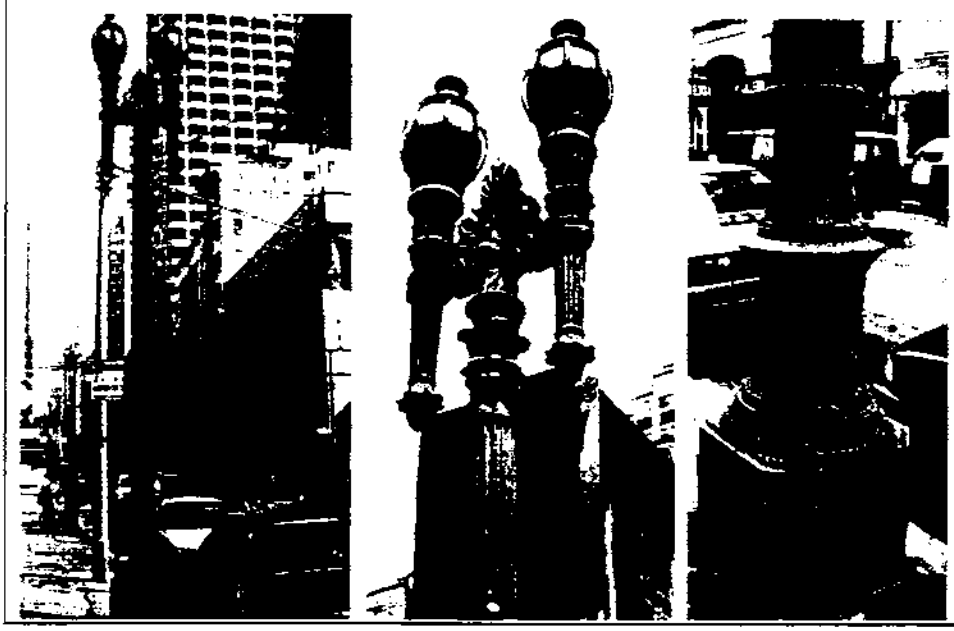
*P3a. Description:

The Golden Triangle Light Standards are streetlight fixtures located in the area bounded by Market, Mason and Sutter Streets. The fixtures are made up of a base, an ornamental fluted column with two volutes and an anthemion at the top. The two volutes are a support for a cross-arm which holds two arc lamps in place. Concealed within the lampposts is a 4-inch diameter pipe set in concrete, which carries the weight of the anthemion and arc lamps. The entire street light weighs over a ton and is 22 feet tall, from the sidewalk to the arcs. The lamp originally used was the General Electric 6.6 amp. The lamp is enclosed with an eight-panel ribbed globe. The original globes were composed of "San Francisco Golden Cararra" glass. These globes have been replaced over time with similar globes made out of new materials. The San Francisco Golden Cararra glass is an amber glass that was designed to diminish ultra-violet rays of light and at the same time illuminate the streets. (See continuation sheet, page 3.)

*P3b. Resource Attributes: (HP28)—Street Furniture

*P4. Resources Present: ☐Building ☒Structure ☐Object ☐Site ☐District ☐Element of District ☐Other

P5a. Photo



P5b. Photo date: 1999

*P6. Date Constructed/Sources: 1917 – 1918, Journal of Electricity, May 1, 1919

*P7. Owner and Address: Pacific Gas & Electric Company, Jeff Joy, Director of Operations, Maintanence and Construction, 2225 Folsom Street, San Francisco, CA 94110

*P8. Recorded by: Mary Hashemi, Jennifer Hirsch, and Dan DiBartolo, San Francisco Planning Department, 1660 Mission Street, San Francisco, CA 94103

*P9. Date Recorded: March 2001

*P10. Survey Type: 1999-2000 Work Program, San Francisco Landmarks Preservation Advisory Board, nomination investigation of city landmark status.

*P11. Report Citation: None

*Attachments: ☐NONE ☒Location Map ☐Sketch Map ☒Continuation Sheet ☒Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List)

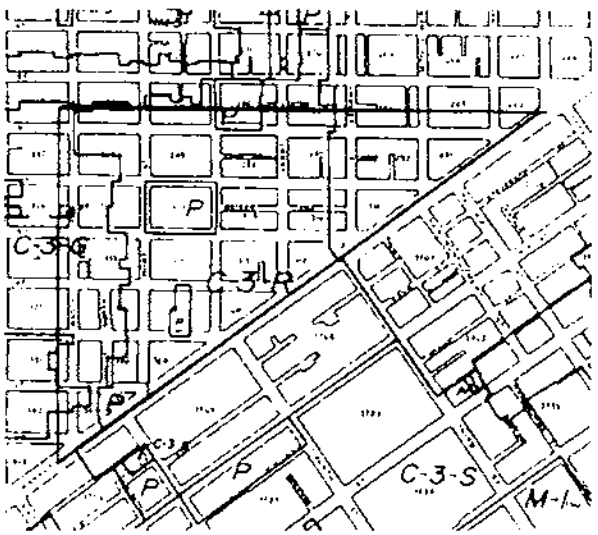
B1. Historic name: Golden Triangle Light Standards
B2. Common name: Triangle District / Union Square Area Streetlights
B3. Original Use: Streetlights
B4. Present use: Streetlights
***B5. Architectural Style:** Beaux Arts / City Beautiful
***B6. Construction History:** Designed 1916 –1917; Installed 1917, suspended because of World War I; End of War, installation continued and completed by holidays of 1918
***B7. Moved?** ☐No ☒Yes ☐Unknown **Date:** See Integrity section for more details. **Original Location:** Market, Mason and Sutter Streets
***B8. Related Features:** None
B9a. Architect: J.W. Gosling, Illuminating Laboratory, General Electric Company; Glassware produced by Gleason-Tiebout Company and designed through collaboration of the same company and Walter D'Arcy Ryan of the General Electric Company
B9b. Builder: Pacific Gas and Electric Company (PG&E)
***B10. Significance: Theme** City and Commercial Development, Technology **Area** City of San Francisco
Period of Significance 1915 – 1918 **Property Type** Street Furniture **Applicable Criteria** A, B, C

The Golden Triangle light standards are significant under criteria A due to association with the Panama-Pacific International Expostion of 1915 and the development of merchant businesses in the present-day Union Square retail district of San Francisco. Significant figures in the development of the Golden Triangle lights included Walter D'Arcy Ryan, Chief of Illumination for the Panama-Pacific International Exposition and Director of the Illuminating Laboratory for the General Electric Company, and J.W. Gosling, also of the Illuminating Laboratory. The lights are significant under criteria B primarily for their association with Ryan and secondarily for their association with Gosling. The lights are also significant under criteria C since they typify early 20th-century innovations in street lighting and embody characteristics of the City Beautiful movement.

Criteria A – Associated with events that have made a significant contribution to the broad patterns of our history

The innovations in illumination at the 1915 Panama-Pacific Exposition, an international fair held to celebrate the linking of the Atlantic and Pacific oceans via the Panama Canal, influenced the street lighting of San Francisco. Local merchants and government officials, inspired by the ornamental high-current luminous arc lamp used for façade and avenue lighting at the Exposition, sought improved modern lighting for Market Street. As a result of their efforts, Market Street was officially lit with 327 Path of Gold street light standards in 1916. Today, the Path of (See continuation sheet, page 3.)

Sketch Map



B11. Additional Resource Attributes: (HP28)—Street Furniture
***B12. References:** See continution sheet, page 5.

B13. Remarks: As of March 2001 PG&E plans for the lights included continued maintanence and updates of interior lighting mechanisms per advancements in lighting technology.

***B14. Evaluator:** Mary Hashemi, Jennifer Hirsch, and Dan DiBartolo, San Francisco Planning Department

***Date of Evaluation:** March 2001

(This space reserved for official comments.)

[*P3a. Description, cont.]

The arc lamps are a pair of fluted torchère, which are capped at top with a finial. At the bottom of the two torchères is a decorative, acorn shaped metal element. The high base and ornate capital of the light fixture most closely resemble the Corinthian order. Highly stylized acanthus leaves along with a fluted shaft and scrolled modillions decorate the street fixtures.

In 1918, the first 139 Golden Triangle light standards were installed along both sides of all the streets, not including alleys, within the area bounded by Market, Powell, Sutter, and Kearny Streets. These same light standards were later added to Mason Street between Market and Sutter, Sutter Street between Kearny and Sansome, and Post Street between Kearny and Montgomery. It appears that the lights added to Mason, Sutter and Post were installed soon after the original installation. A few of the bases of the lights along Mason Street have plates that read "Property of PG&E, Erected under the auspices of the Downtown Associates" and "Joshua Handy Ironworks, San Francisco, 1917". Since the early 1900's only three new Golden Triangle lights have been made. These were made circa 1991 for placement in front of the Hilton Hotel located at 333 O'Farrell Street. There are approximately 189 Golden Triangle light standards standing today.

Presently, a variety of replacement lights from different eras randomly alternate with the original Golden Triangle light standards. Golden Triangle light standards have been replaced where accidents or structural problems made them impossible to repair. PG&E (Pacific Gas & Electric), the company that originally owned and operated the light standards, maintains the light standards with the parts made from a mold. The mold, not the original, was made using an existing light standard and has been used in the last decade to make new bases for some of the Golden Triangle light standards. These new bases were made for existing bases where repair was impossible. The mold was also used to make the three light standards for the Hilton Hotel mentioned above. In many instances the Golden Triangle light standards have also been moved to accommodate widenings or other alterations to the streets and sidewalks. The original wiring has been replaced with modern standards, and a photocell was added to the anthemion. The photocell regulates the lights so that during the daylight the lights are turned off, and turned on at night to light the streets. There is no information about the original color scheme for the Golden Triangle light standards and today they are painted in different colors ranging from a faded light gray to a recently painted dark gray-blue. Only a few have had the details painted in a contrasting color. The original San Francisco Golden Cararra glass globes have been replaced as necessary over time. The replacements are of the same design as the original but of a different material.

The overall condition of the existing Golden Triangle Light Standards is generally good– with most showing some rust and peelng paint yet still appearing structurally sound. Only those light standards along Mason Street and a few others randomly located throughout the triangle district of Market, Mason and Sutter Streets appear to have been painted in the past decade.

[B10. Significance, cont.]

Gold is a city landmark; significant for its connections to: the City Beautiful movement, nationwide development of street lighting, contribution to local business development, designers, local government officials and business owners, and the San Francisco Graft Trials of 1907.

Once the Path of Gold was completed, local merchants began advocating the extension of this lighting system to the remaining portion of the retail district, known then as the Triangle District and generally bounded by Market, Powell, and Sutter Streets. A lighting system already existed within the Triangle District, but it obviously didn't satisfy the local merchants who were clamoring for a better system. The merchants believed that a better lighting system would increase trade and help maintain the area's status as a major retail center. The local merchants and property owners worked together as members of the Downtown Association to review and choose the design of the Golden Triangle light standards, and to raise money to partially fund maintanence costs. In the original agreement concerning the light standards, PG&E paid $85,000 for the production and installation, and the Downtown Association and local government combined funds to pay the yearly maintanence costs of $30,000.

Installation of lights in the Triangle District began in the spring of 1917. Though work temporarily stopped with the outbreak of World War I, construction continued after the war and the installation was completed by the winter holidays of 1918.

[B10. Significance, cont.]

Upon completion of the new lighting system, Mr. Fennimore, chairman of the Downtown Association and head of the campaign for new lighting, proclaimed "We have at last solved the problem which will largely contribute to holding and solidifying the retail business district into a permanent location. The solution in one word is light."

The new lighting system, which was later called the Golden Triangle by its designer Walter D'Arcy Ryan, was designed like the Path of Gold to provide intense lighting that was more powerful and at the same time more diffuse than older lighting systems. The new lighting uniformly distributed light, lit the facades of buildings and eliminated glaring street light that irritated the eyes of passers-by. The lighting plan for the system also included the burning of some designated lamps all night and the extinguishing of other designated lamps at midnight. Local merchants believed that this new lighting would create more attractive streets and lengthen the amount of time people had to window shop. Other benefits included fire protection and freedom from burglaries, via more people and more eyes to detect smoke, fire and thieves.

The removal of trolley poles along the streets of the Triangle District was a street beautification measure associated with the installation of the Golden Triangle lights. The trolley poles were removed before the light standards were installed and the trolley span wires were then attached to eyebolts placed in the facades of adjacent buildngs. The removal of the trolley poles was thought to beautify the streetscape as it created a more orderly and therefore visually appealing view of the street.

Criteria B – Associated with the lives of persons significant in our past

Walter D'Arcy Ryan was responsible for the lighting effects at the Panama-Pacific International Exposition of 1915 and he used his knowledge and expertise to help design a system of lighting for the Path of Gold and Triangle District. Ryan first designed the Path of Gold, and it was the success of these lights that led the Downtown Association, a local merchants group, to request his expertise as an electrical engineer for the Triangle District.

Ryan appeared to have a major impact on the development of lighting systems throughout the United States, and possibly the world. Newspaper and journal accounts published after the 1915 Exposition record his involvement in the design of lighting systems for Los Angeles and New York. A 1917 article, published in the San Francisco Examiner, quotes Ryan's description of the countrywide and worldwide demand for his expertise and knowledge of lighting design. It states, "I have just returned from a 12,000 mile trip and no matter where I went, there was a demand for information and data on the San Francisco Path of Gold. Already twelve cities are installing modified systems of the one that we have here. Requests for information are being received daily form all parts of the world, especially South America. Even London has written." At the 1915 Exposition, Ryan's lighting designs were surely seen by and so could have influenced the nearly twenty million people that attended the Exposition over a ten month period. Among the attendees were representatives of twenty-nine states and twenty-five foreign countries that were participating in the Exposition. The powerful impression made by Ryan's lighting designs is also illustrated by the fact that two books about the 1915 Exposition devoted whole chapters to discussing and praising his work.

Ryan's participation in the 1915 Exposition and subsequent influence on the development of street lighting in San Francisco is clear, and so then is his significance in San Francisco history. More research, however, would be needed to fully analyze Ryan's influence on the development of street lighting for the rest of the country and world.

J.W. Gosling of the Illuminating Laboratory worked with Ryan and designed the Golden Triangle light standard. Gosling also designed many of the light standards used at the Panama-Pacific Exposition. Gosling is therefore signficant in the history of San Francisco.

A San Francisco Examiner article states that Leo Lentelli, the sculptor for the tops of the Path of Gold light standards, worked with Ryan in preparing the lighting service for the Triangle District. None of the other journal articles used to research this report, however, mention Lentelli's involvement. Unless further research provides other information, Lentelli's involvement should not be grounds for findng signifcance of the resource under criteria B.

Lastly, the role of San Francisco Beautiful, a private community organization founded in 1964 to promote civic beauty, in preserving the Golden Triangle Light Standards is included here as a point of interest. In 1965, San Francisco Beautiful President Mrs. Hans Klussman circulated a petition to stop the San Francisco Department of Public Works from removing the light standards and replacing them with new modern light standards.

[B10. Significance, cont.]

Criteria C – Embody distinctive method and period of construction

The Golden Triangle light standards were not the first electrical lighting in the downtown, but were innovative for their time. In fact, they and the Path of Gold lights represent the most advanced street illumination known to exist in the United States in the early decades of the twentieth century. Both Market Street and the Triangle District were lit with the same type of inovative arc lamps used at the Panama-Pacific Exposition; the fair designed to celebrate the future.

The Golden Triangle lights were equipped with a new type of glass and more powerful lamps that uniformly distributed light, did not cast large shadows, lit the facades of the buildings, helped eliminate harmful ultra-violet rays of light and provided a soft and radiante spread of light. The glass was amber and was known as San Francisco Golden Carrarra glass. As the Journal of Electricity reported in 1919, "The system [Golden Triangle lighting system], unlike many other bright illuminatory systems, is not injurious to the eyes, and the absence of the flaming, piercing, eye-straining arc so common in unscientific illumination, makes it the hightest class of street lighting in existence. It is predicted that all improvements in street lighting in the future for years to come will be along the lines of the present system". This same article also reported that the new light standards were more efficient than older models and had a relatively low maintanence cost.

The type of glass and lamp used in the Golden Triangle and Path of Gold light standards was clearly a significant technological advancement for San Francisco streets. More research is needed to determine the national application and importance of these innovations. However, a 1916 article in the Architect and Engineer states that the same type of arc lamps used to modernize San Francisco was also used in "over a hundred cities", and a 1917 article published in the San Francisco Examiner quotes Ryan as stating that the globes of street lights in New York had been colored yellow in imitation of the amber glass used in the Path of Gold.

The Golden Triangle light standards are also important remnants of the City Beautiful movement that brought city planner Daneil Burnham to San Francisco in 1906 and shaped the design of Civic Center. The classical styling of the light standards reflect the popularity of and emphasis on classical styles that were characteristic of the City Beautiful movement. The standard design employs such classical elements as a Corinthian base and capital, acanthus leaves and scolled modillions. Additionally, the advocation of local citizens for beautification measures was also a hallmark of the City Beautiful movement. In this case local merchants, through the Downtown Association, sought to improve the quality of streets in the retail section of the city by providing more attractive lighting.

Integrity

In 1918, the first 139 Golden Triangle light standards were installed along both sides of all the streets, not including alleys, within the area bounded by Market, Powell, Sutter, and Kearny Streets. These same light standards were later added to Mason Street between Market and Sutter, Sutter Street between Kearny and Sansome, and Post Street between Kearny and Montgomery. It appears that the lights added to Mason, Sutter and Post were installed soon after the original installation. A few of the bases of the lights along Mason Street have plates that read "Property of PG&E, Erected under the auspices of the Downtown Associates" and "Joshua Handy Ironworks, San Francisco, 1917". Since the early 1900's only three new Golden Triangle lights have been made. These were made circa 1991 for placement in front of the Hilton Hotel located at 333 O'Farrell Street. There are approximately 189 Golden Triangle light standards standing today.

Presently, a variety of replacement lights from different eras randomly alternate with the original Golden Triangle light standards. Golden Triangle light standards have been replaced where accidents or structural problems made them impossible to repair. PG&E (Pacific Gas & Electric), the company that originally owned and operated the light standards, maintains the light standards with the parts made from a mold. The mold, not the original, was made using an existing light standard and has been used in the last decade to make new bases for some of the Golden Triangle light standards. These new bases were made for existing bases where repair was impossible. The mold was also used to make the three light standards for the Hilton Hotel mentioned above. In many instances the Golden Triangle light standards have also been moved to accommodate widenings

[B10. Significance, cont.]

or other alterations to the streets and sidewalks. The original wiring has been replaced with modern standards and a photocell was added to the anthemion. The photocell regulates the lights so that during the daylight the lights are turned off, but turned on at night to light the streets. There is no information about the original color scheme for the Golden Triangle light standards and today they are painted in different colors ranging from a faded light gray to a recently painted dark gray-blue. Only a few have had the details painted in a contrasting color. The original San Francisco Golden Cararra glass globes have been replaced as necessary over time. The replacements are of the same design as the original but of a different material.

Overall, the majority of the original Golden Triangle light standards still survive, stand near their original placement, and maintain their original casing and original style of glass globes. The condition of the Golden Triangle Light Standards is generally good– with most showing some rust and peelng paint yet still appearing structurally sound. Only those light standards along Mason Street and a few others randomly located throughout the triangle district of Market, Mason and Sutter Streets appear to have been painted in the past decade. Consequently, the Golden Triangle streetlights do retain integrity of location, design, setting, materials, workmanship, and feeling. The PG&E Company still maintains control of lights, but does confer with local merchants and the city regarding maintanence and operation.

[B12. References, cont.]

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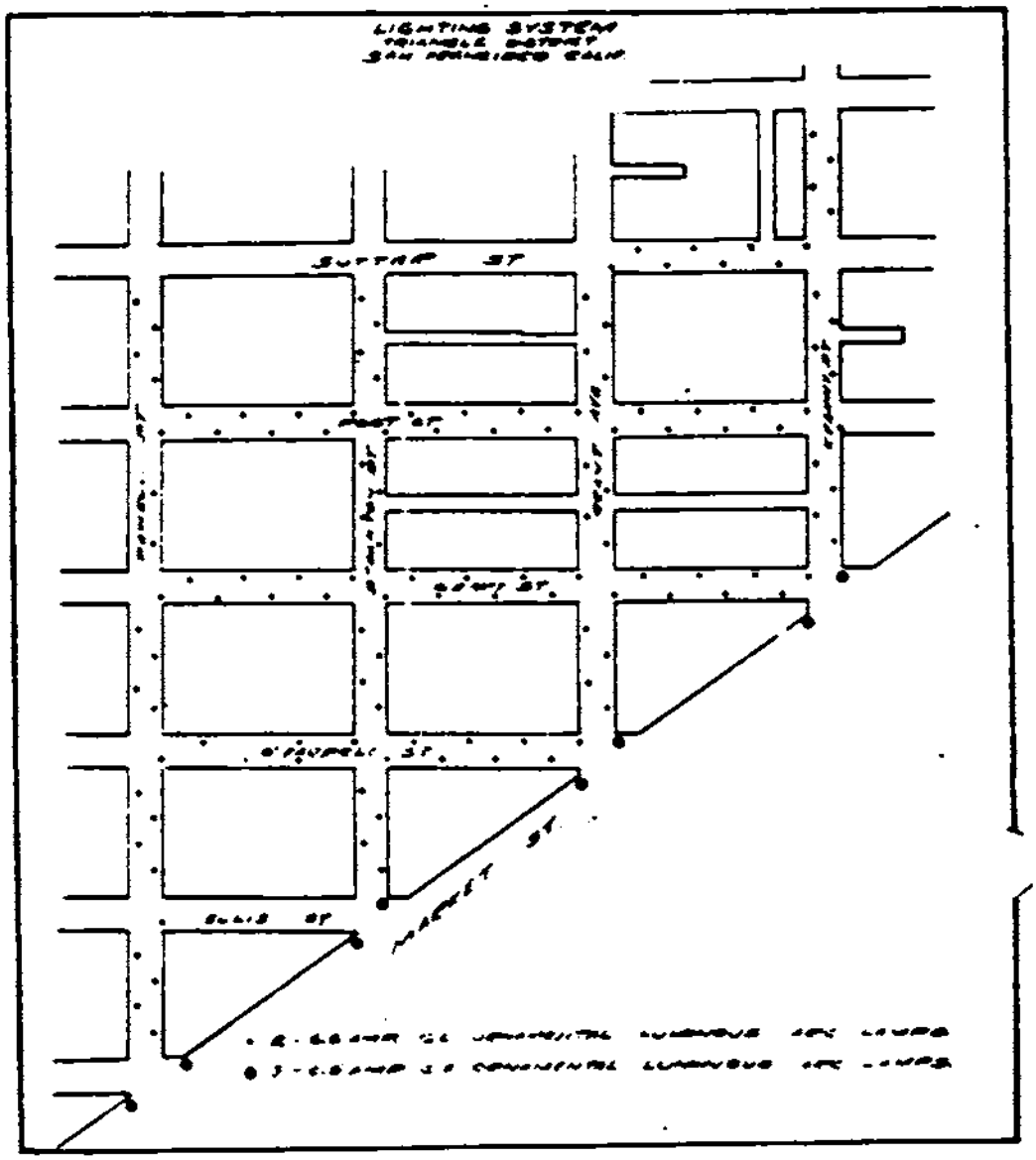
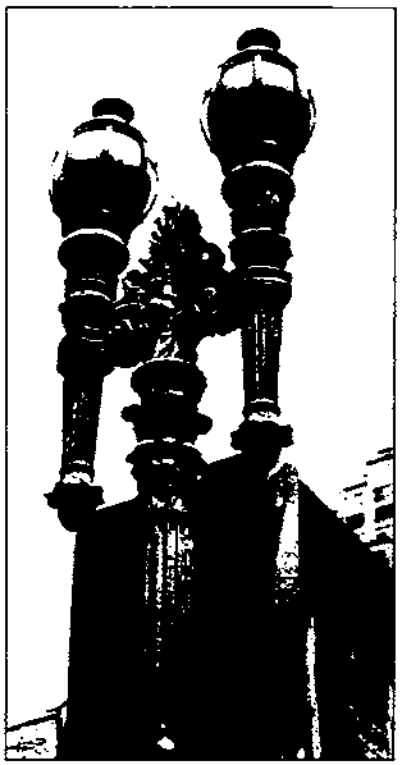
Interviews: Rocko Colicchia, Senior Program Manager, PG&E. Telephone interview (415-973-1064), 1999 and 2001.
Gilbert Munos, Staff, PG&E. Telephone interview (415-695-3550), 1999.
Dan Weaver, Urban Planner and Member of San Francisco Beautiful, Telephone interview, 1999.

[P5a. Photo, cont.] [P5a. Photo, cont.]

Map of Golden Triangle Lighting System, 1919 (Journal of Electricity, May 1, 1919)



[P5a. Photo, cont.] Photographs of Golden Triangle light standards (Planning Department Site Visit, 1999)



State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

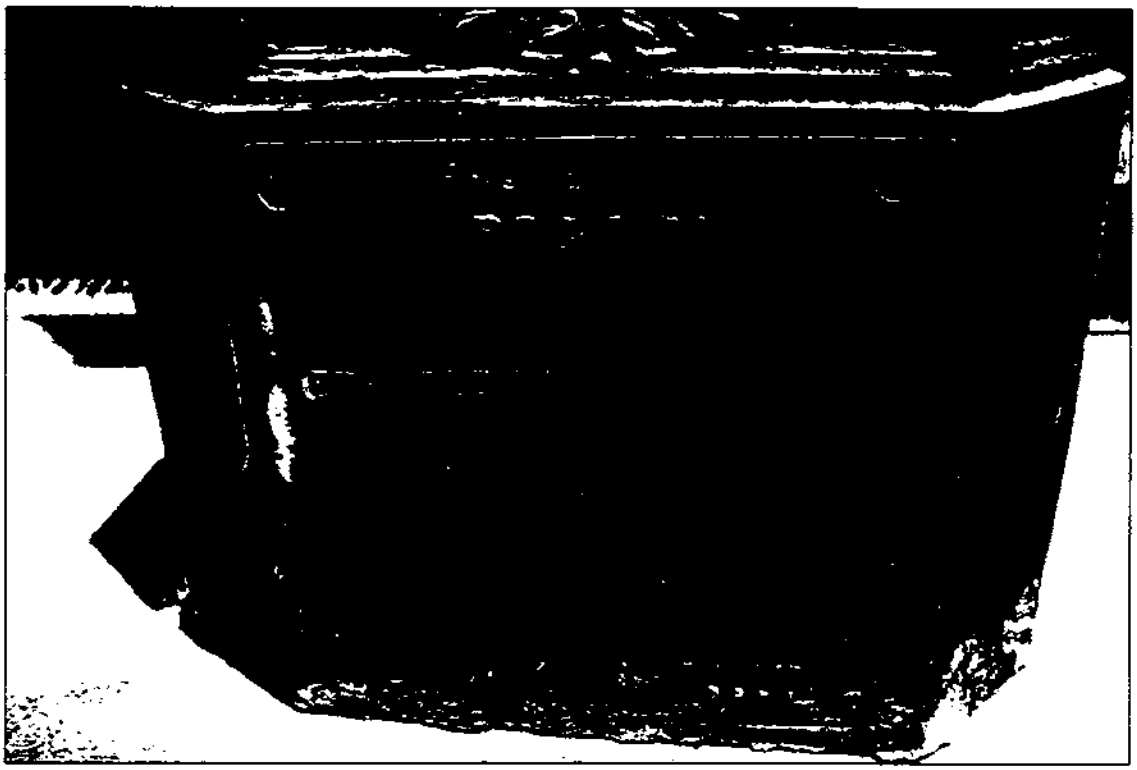
Primary #_____
HRI#_____
Trinomial _____

Resource Name or #* (Assigned by recorder) Golden Triangle Light Standards

Recorded by: Mary Hashemi, Jennifer Hirsch, and Dan DiBartolo **Date:** March 2001

X **Continuation** __ **Update**

[P5a. Photo, cont.] Photographs of Golden Triangle light standards (Planning Department Site Visit, 1999). This photograph shows the plaque affixed to the base of the light standard, which states "Property of PG&E Co, Erected under auspices of Downtown Assn, 1917".



Some of the web versions of the Preservation Briefs differ somewhat from the printed versions. Many illustrations are new and in color; Captions are simplified and some complex charts are omitted. To order hard copies of the Briefs, see Printed Publications.

PRESERVATION BRIEFS

16

The Use of Substitute Materials on Historic Building Exteriors

Sharon C. Park, AIA

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Cast alumnimum used as a replacement for cast iron. Photo: NPS files.

The Secretary of the Interior's Standards for Rehabilitation require that "deteriorated architectural features be repaired rather than replaced, wherever possible. In the event that replacement is necessary, the new material should match the material being replaced in composition, design, color, texture, and other visual properties." Substitute materials should be used only on a limited basis and only when they will match the appearance and general properties of the historic material and will not damage the historic resource.

Introduction

When deteriorated, damaged, or lost features of a historic building need repair or replacement, it is almost always best to use historic materials. In limited circumstances substitute materials that imitate historic materials may be used if the appearance and properties of the historic materials can be matched closely and no damage to the remaining historic fabric will result.

Great care must be taken if substitute materials are used on the exteriors of historic buildings. Ultraviolet light, moisture penetration behind joints, and stresses caused by changing temperatures can greatly impair the performance of substitute materials over time. Only after consideration of all options, in consultation with qualified professionals, experienced fabricators and contractors, and development of carefully written specifications should this work be undertaken.

The practice of using substitute materials in architecture is not new, yet it continues to pose practical problems and to raise philosophical questions. On the practical level the inappropriate choice or improper installation of substitute materials can cause a radical change in a building's appearance and can cause extensive physical damage over time. On the more philosophical level, the wholesale use of substitute materials can raise questions concerning the integrity of historic buildings

In the reconstruction of the clock tower at Independence Hall, the substitute materials used were cast stone and wood with fiberglass and polyester bronze ornamentation. Photo: NPS files.

largely comprised of new materials. In both cases the integrity of the historic resource can be destroyed.

Some preservationists advocate that substitute materials should be avoided in all but the most limited cases. The fact is, however, that substitute materials are being used more frequently than ever in preservation projects, and in many cases with positive results. They can be cost-effective, can permit the accurate visual duplication of historic materials, and last a reasonable time. Growing evidence indicates that with proper planning, careful specifications and supervision, substitute materials can be used successfully in the process of restoring the visual appearance of historic resources.

This Brief provides general guidance on the use of substitute materials on the exteriors of historic buildings. While substitute materials are frequently used on interiors, these applications are not subject to weathering and moisture penetration, and will not be discussed in this Brief. Given the general nature of this publication, specifications for substitute materials are not provided. The guidance provided should not be used in place of consultations with qualified professionals. This Brief includes a discussion of when to use substitute materials, cautions regarding their expected performance, and descriptions of several substitute materials, their advantages and disadvantages. This review of materials is by no means comprehensive, and attitudes and findings will change as technology develops.

Historical Use of Substitute Materials

The tradition of using cheaper and more common materials in imitation of more expensive and less available materials is a long one. George Washington, for example, used wood painted with sand-impregnated paint at Mount Vernon to imitate cut ashlar stone. This technique along with scoring stucco into block patterns was fairly common in colonial America to imitate stone.

Molded or cast masonry substitutes, such as dry-tamp cast stone and poured concrete, became popular in place of quarried stone during the 19th century. These masonry units were fabricated locally, avoiding expensive quarrying and shipping costs, and were versatile in representing either ornately carved blocks, plain wall stones or rough cut textured surfaces. The end result depended on the type of patterned or textured mold used and was particularly popular in conjunction with mail order houses. Later, panels of cementitious permastone or formstone and less expensive asphalt and sheet metal panels were used to imitate brick or stone.

Metal (cast, stamped, or brake-formed) was used for storefronts, canopies, railings, and other features, such as galvanized metal cornices substituting for wood or stone, stamped metal panels for Spanish clay roofing tiles, and cast-iron column capitals and even entire building fronts in imitation of building stone.

Substitute materials need to be located with care to avoid damage. The fiberglass column base has chipped, whereas the historic cast iron would have remained sound. Photo: NPS files.

Terra-cotta, a molded fired clay product, was itself a substitute material and was very popular in the late 19th and early 20th centuries. It simulated the appearance of intricately carved stonework, which was expensive and time-consuming to produce. Terra cotta could be glazed to imitate a variety of natural stones, from brownstones to limestones, or could be colored for a polychrome effect.

Nineteenth century technology made a variety of materials readily available that not only were able to imitate more expensive materials but were also cheaper to fabricate and easier to use. Throughout the century, imitative materials continued to evolve. For example, ornamental window hoods were originally made of wood or carved stone. In an effort to find a cheaper substitute for carved stone and to speed fabrication time, cast stone, an early form of concrete, or cast-iron hoods often replaced stone. Toward the end of the century, even less expensive sheet metal hoods, imitating stone, also came into widespread use. All of these materials, stone, cast stone, cast iron, and various pressed metals were in production at the same time and were selected on the basis on the basis of the availability of materials and local craftsmanship, as well as durability and cost. The criteria for selection today are not much different.

Many of the materials used historically to imitate other materials are still available. These are often referred to as the traditional materials: wood, cast stone, concrete, terra cotta and cast metals. In the last few decades, however, and partly as a result of the historic preservation movement, new families of synthetic materials, such as fiberglass, acrylic polymers, and epoxy resins, have been developed and are being used as substitute materials in construction. In some respects these newer

products (often referred to as high tech materials) show great promise; in others, they are less satisfactory, since they are often difficult to integrate physically with the porous historic materials and may be too new to have established solid performance records.

When to Consider Using Substitute Materials in Preservation Projects

Because the overzealous use of substitute materials can greatly impair the historic character of a historic structure, all preservation options should be explored thoroughly before substitute materials are used. It is important to remember that the purpose of repairing damaged features and of replacing lost and irreparably damaged ones is both to match visually what was there and to cause no further deterioration. For these reasons it is not appropriate to cover up historic materials with synthetic materials that will alter the appearance, proportions and details of a historic building and that will conceal future deterioration.

Some materials have been used successfully for the repair of damaged features such as epoxies for wood infilling, cementitious patching for sandstone repairs, or plastic stone for masonry repairs. Repairs are preferable to replacement whether or not the repairs are in kind or with a synthetic substitute material.

In general, four circumstances warrant the consideration of substitute materials:

1. the unavailability of historic materials;
2. the unavailability of skilled craftsmen;
3. inherent flaws in the original materials; and
4. code-required changes (which in many cases can be extremely destructive of historic resources).

The core of a deteriorated wood outrigger was first drilled out. Photos (left and right): Courtesy, Harrison Goodall.

An inert material was injected into the hollow outrigger, permitting the outer wood to be retained and preserved.

Cost may or may not be a determining factor in considering the use of substitute materials. Depending on the area of the country, the amount of material needed, and the projected life of less durable substitute materials, it may be cheaper in the long run to use the original material, even though it may be harder to find.

Due to many early failures of substitute materials, some preservationist are looking abroad to find materials (especially stone) that match the historic materials in an effort to restore historic buildings accurately and to avoid many of the uncertainties that come with the use of substitute materials.

1. The unavailability of the historic material.

The most common reason for considering substitute materials is the difficulty in finding a good match for the historic material (particularly a problem for masonry materials where the color and texture are derived from the material itself). This may be due to the actual unavailability of the material or to protracted delivery dates. For example, the local quarry that supplied the sandstone for a building may no longer be in operation. All efforts should be made to locate another quarry that could supply a satisfactory match. If this approach fails, substitute materials such as dry-tamp cast stone or textured precast concrete may be a suitable substitute if care is taken to ensure that the detail, color and texture of the original stone are matched. In some cases, it may be possible to use a sand-impregnated paint on wood as a replacement section, achieved using readily available traditional materials, conventional tools and work skills. Simple solutions should not be overlooked.

2. The unavailability of historic craft techniques and lack of skilled artisans.

These two reasons complicate any preservation or rehabilitation project. This is particularly true for intricate ornamental work, such as carved wood, carved stone, wrought iron, cast iron, or molded terra cotta. However, a number of stone and wood cutters now employ sophisticated carving machines, some even computerized. It is also possible to cast substitute replacement pieces using aluminum, cast stone, fiberglass, polymer concretes, glass fiber reinforced concretes and terra cotta. Mold making and casting takes skill and craftsmen who can undertake this work are available. Efforts should always be made, prior to replacement, to seek out artisans who might be able to repair ornamental elements and thereby save the historic features in place.

3. Poor original building materials.

Some historic building materials were of inherently poor quality or their modern counterparts are inferior. In addition, some materials were naturally incompatible with other materials on the building, causing staining or galvanic corrosion. Examples of poor quality materials were the very soft sandstones which eroded quickly. An example of poor quality modern replacement material is the tin coated steel roofing which is much less durable than the historic tin or terne iron which is no longer available. In some cases, more durable natural stones or precast concrete might be available as substitutes for the soft stones and modern terne-coated stainless steel or lead-coated copper might produce a more durable yet visually compatible replacement roofing.

Cast aluminum has been used as a replacement material for cast iron. Photo: NPS files.

4. Code-related changes.

Sometimes referred to as life and safety codes, building codes often require changes to historic buildings. Many cities in earthquake zones, for example, have laws requiring that overhanging masonry parapets and cornices, or freestanding urns or finials be securely re-anchored to new structural frames or be removed completely. In some cases, it may be acceptable to replace these heavy historic elements with light replicas. In other cases, the extent of historic fabric removed may be so great as to diminish the integrity of the resource. This could affect the significance of the structure and jeopardize National Register status. In addition, removal of repairable historic materials could result in loss of Federal tax credits for rehabilitation. Department of the Interior regulations make clear that the Secretary of the Interior's Standards for Rehabilitation take precedence over other regulations and codes in determining whether a project is consistent with the historic character of the building undergoing rehabilitation.

Two secondary reasons for considering the use of substitute materials are their lighter weight and for some materials, a reduced need of maintenance. These reasons can become important if there is a need to keep dead loads to a minimum or if the feature being replaced is relatively inaccessible for routine maintenance.

Cautions and Concerns

In dealing with exterior features and materials, it must be remembered that moisture penetration, ultraviolet degradation, and differing thermal expansion and contraction rates of dissimilar materials make any repair or replacement problematic. To ensure that a repair or replacement will perform well over time, it is critical to understand fully the properties of both the original and the substitute materials, to install replacement materials correctly, to assess their impact on adjacent historic materials, and to have reasonable expectations of future performance.

Many high tech materials are too new to have been tested thoroughly. The differences in vapor permeability between some synthetic materials and the historic materials have in some cases caused unexpected further deterioration. It is therefore difficult to recommend substitute materials if the historic materials are still available. As previously mentioned, consideration should always be given first to using traditional materials and methods of repair or replacement before accepting unproven techniques, materials or applications.

Substitute materials must meet three basic criteria before being considered: they must be compatible with the historic materials in appearance; their physical properties must be similar to those of the historic materials, or be installed in a manner that tolerates differences; and they must meet certain basic performance expectations over an extended period of time.

A waterproof coating is an inappropraite substitute material to apply to adobe as it seals in moisture and may result in spalling. Photo: NPS files.

Matching the Appearance of the Historic Materials

In order to provide an appearance that is compatible with the historic material, the new material should match the details and craftsmanship of the original as well as the color, surface texture, surface reflectivity and finish of the original material. The closer an element is to the viewer, the more closely the material and craftsmanship must match the original.

Matching the color and surface texture of the historic material with a substitute material is normally difficult. To enhance the chances of a good match, it is advisable to clean a portion of the building where new materials are to be used. If pigments are to be added to the substitute material, a specialist should determine the formulation of the mix, the natural aggregates and the types of pigments to be used. As all exposed material is subject to ultraviolet degradation, if possible, samples of the new materials made during the early planning phases should be tested or allowed to weather over several seasons to test for color stability.

Fabricators should supply a sufficient number of samples to permit onsite comparison of color, texture, detailing, and other

critical qualities. In situations where there are subtle variations in color and texture within the original materials, the substitute materials should be similarly varied so that they are not conspicuous by their uniformity.

Substitute materials, notably the masonry ones, may be more water-absorbent than the historic material. If this is visually distracting, it may be appropriate to apply a protective vapor-permeable coating on the substitute material. However, these clear coatings tend to alter the reflectivity of the material, must be reapplied periodically, and may trap salts and moisture, which can in turn produce spalling. For these reasons, they are not recommended for use on historic materials.

Matching the Physical Properties

While substitute materials can closely match the appearance of historic ones, their physical properties may differ greatly. The chemical composition of the material (i.e., presence of acids, alkalines, salts, or metals) should be evaluated to ensure that the replacement materials will be compatible with the historic resource. Special care must therefore be taken to integrate and to anchor the new materials properly. The thermal expansion and contraction coefficients of each adjacent material must be within tolerable limits. The function of joints must be understood and detailed either to eliminate moisture penetration or to allow vapor permeability. Materials that will cause galvanic corrosion or other chemical reactions must be isolated from one another.

To ensure proper attachment, surface preparation is critical. Deteriorated underlying material must be cleaned out. Noncorrosive anchoring devices or fasteners that are designed to carry the new material and to withstand wind, snow and other destructive elements should be used. Properly chosen fasteners allow attached materials to expand and contract at their own rates. Caulking, flexible sealants or expansion joints between the historic material and the substitute material can absorb slight differences of movement. Since physical failures often result from poor anchorage or improper installation techniques, a structural engineer should be a member of any team undertaking major repairs.

Some of the new high tech materials such as epoxies and polymers are much stronger than historic materials and generally impermeable to moisture. These differences can cause serious problems unless the new materials are modified to match the expansion and contraction properties of adjacent historic materials more closely, or unless the new materials are isolated from the historic ones altogether. When stronger or vapor impermeable new materials are used alongside historic ones, stresses from trapped moisture or differing expansion and contraction rates generally hasten deterioration of the weaker historic material. For this reason, a conservative approach to repair or replacement is recommended, one that uses more pliant materials rather than high-strength ones. Since it is almost impossible for substitute materials to match the properties of historic materials perfectly, the new system incorporating new and historic materials should be designed so that if material failures occur, they occur within the new material rather than the historic material.

Performance Expectations

While a substitute material may appear to be acceptable at the time of installation, both its appearance and its performance may deteriorate rapidly. Some materials are so new that industry standards are not available, thus making it difficult to specify quality control in fabrication, or to predict maintenance requirements and long term performance. Where possible, projects involving substitute materials in similar circumstances should be examined. Material specifications outlining stability of color and texture; compressive or tensile strengths if appropriate; the acceptable range of thermal coefficients, and the durability of coatings and finishes should be included in the contract documents. Without these written documents, the owner may be left with little recourse if failure occurs.

The historic cornice was successfully replaced with a fiberglass cornice. Photo: NPS files.

The tight controls necessary to ensure long-term performance extend beyond having written performance standards and selecting materials that have a successful track record. It is important to select qualified fabricators and installers who know what they are doing and who can follow up if repairs are necessary. Installers and contractors unfamiliar with specific substitute materials and how they function in your local environmental conditions should be avoided.

The surfaces of substitute materials may need special care once installed. For example, chemical residues or mold release agents should be removed completely prior to installation, since they attract pollutants and cause the replacement materials to appear dirtier than the adjacent historic materials. Furthermore, substitute materials may require more frequent cleaning, special cleaning products and protection from impact by hanging window-cleaning scaffolding. Finally, it is critical that the substitute materials be identified as part of the historical record of the building so that proper care and maintenance of all the building materials continue to ensure the life of the historic resource.

Choosing an Appropriate Substitute Material

Once all reasonable options for repair or replacement in kind have been exhausted, the choice among a wide variety of substitute materials currently on the market must be made. The charts at the end of this Brief describe a number of such materials, many of them in the family of modified concretes which are gaining greater use. The charts do not include wood, stamped metal, mineral fiber cement shingles and some other traditional imitative materials, since their properties and performance are better known. Nor do the charts include vinyls or molded urethanes which are sometimes used as cosmetic claddings or as substitutes for wooden millwork. Because millwork is still readily available, it should be replaced in kind.

The charts describe the properties and uses of several materials finding greater use in historic preservation projects, and outline advantages and disadvantages of each. It should not be read as an endorsement of any of these materials, but serves as a reminder that numerous materials must be studied carefully before selecting the appropriate treatment. Included are three predominantly masonry materials (cast stone, precast concrete, and glass fiber reinforced concrete); two predominantly resinous materials (epoxy and glass fiber reinforced polymers also known as fiberglass), and cast aluminum which has been used as a substitute for various metals and woods.

Pros and Cons of Various Substitute Materials

Cast Aluminum

Material: Cast aluminum is a molten aluminum alloy cast in permanent (metal) molds or onetime sand molds which must be adjusted for shrinkage during the curing process. Color is from paint applied to primed aluminum or from a factory finished coating. Small sections can be bolted together to achieve intricate or sculptural details. Unit castings are also available for items such as column plinth blocks.

Application: Cast aluminum can be a substitute for cast iron or other decorative elements. This would include grillwork, roof crestings, cornices, ornamental spandrels, storefront elements, columns, capitals, and column bases and plinth blocks. If not self-supporting, elements are generally screwed or bolted to a structural frame. As a result of galvanic corrosion problems with dissimilar metals, joint details are very important.

Advantages:

- light weight (1/2 of castiron)
- corrosion-resistant, noncombustible
- intricate castings possible
- easily assembled, good delivery time
- can be prepared for a variety of colors
- long life, durable, less brittle than cast iron

Disadvantages:

- lower structural strength than castiron
- difficult to prevent galvanic corrosion with other metals
- greater expansion and contraction than castiron; requires
- gaskets or caulked joints
- difficult to keep paint on aluminum

Checklist:

- Can existing be repaired or replaced inkind?
- How is cast aluminum to be with other metals attached?
- Have full-size details been developed for each piece to be cast?
- How are expansion joints detailed?
- Will there be a galvanic corrosion problem?
- have factory finishes been protected during installation?
- Are fabricators/installers experienced?

Cast Stone (dry tamped)

Material: Cast stone is an almost-dry cement, lime and aggregate mixture which is dry-tamped into a mold to produce a dense stone-like unit. Confusion arises in the building industry as many refer to high quality precast concrete as cast stone. In fact, while it is a form of precast concrete, the drytamp fabrication method produces an outer surface resembling a stone

surface. The inner core can be either drytamped or poured full of concrete. Reinforcing bars and anchorage devices can be installed during fabrication.

Application: Cast stone is often the most visually similar material as a replacement for unveined deteriorated stone, such as brownstone or sandstone, or terra cotta in imitation of stone. It is used both for surface wall stones and for ornamental features such as window and door surrounds, voussoirs, brackets and hoods. Rubberlike molds can be taken of good stones on site or made up at the factory from shop drawings.

Advantages:

- replicates stone texture with good molds (which can come from extant stone) and fabrication
- expansion/contraction similar to stone
- minimal shrinkage of material
- anchors and reinforcing bars can be built in
- material is firerated
- range of color available
- vapor permeable

Disadvantages:

- heavy units may require additional anchorage
- color can fade in sunlight
- may be more absorbent than natural stone
- replacement stones are obvious if too few models and molds are made

Checklist:

- Are the original or similar materials available?
- How are units to be installed and anchored?
- Have performance standards been developed to ensure color stability?
- Have large samples been delivered to site for color, finish and absorption testing?
- Has mortar been matched to adjacent historic mortar to achieve a good color/tooling match?
- Are fabricators/installers experienced?

Glass Fiber Reinforced Concretes (GFRC)

Material: Glass fiber reinforced concretes are lightweight concrete compounds modified with additives and reinforced with glass fibers. They are generally fabricated as thin shelled panels and applied to a separate structural frame or anchorage system. The GFRC is most commonly sprayed into forms although it can be poured. The glass must be alkaline resistant to avoid deteriorating effects caused by the cement mix. The color is derived from the natural aggregates and if necessary a small percentage of added pigments.

Application: Glass fiber reinforced concretes are used in place of features originally made of stone, terra cotta, metal or wood, such as cornices, projecting window and door trims, brackets, finials, or wall murals. As a molded product it can be produced in long sections of repetitive designs or as sculptural elements. Because of its low shrinkage, it can be produced from molds taken directly from the building. It is installed with a separate noncorrosive anchorage system. As a predominantly cementitious material, it is vapor permeable.

Advantages:

- lightweight, easily installed
- good molding ability, crisp detail possible
- weather resistant
- can be left uncoated or else painted
- little shrinkage during fabrication
- molds made directly from historic features
- cements generally breathable
- material is firerated

Disadvantages:

- non-loadbearing use only
- generally requires separate anchorage system
- large panels must be reinforced
- color additives may fade with sunlight
- joints must be properly detailed
- may have different absorption rate than adjacent historic material

Checklist:

- Are the original materials and craftsmanship still available?
- Have samples been inspected on the site to ensure detail/texture match?
- Has anchorage system been properly designed?
- Have performance standards been developed?
- Are fabricators/installers experienced?

Precast Concrete

Material: Precast concrete is a wet mix of cement and aggregate poured into molds to create masonry units. Molds can be made from existing good surfaces on the building. Color is generally integral to the mix as a natural coloration of the sand or aggregate, or as a small percentage of pigment. To avoid unsightly air bubbles that result from the natural curing process, great care must be taken in the initial and longterm vibration of the mix. Because of its weight it is generally used to reproduce individual units of masonry and not thin shell panels.

Application: Precast concrete is generally used in place of masonry materials such as stone or terra cotta. It is used both for flat wall surfaces and for textured or ornamental elements. This includes wall stones, window and door surrounds, stair treads, paving pieces, parapets, urns, balusters and other decorative elements. It differs from cast stone in that the surface is more dependent on the textured mold than the hand tamping method of fabrication.

Advantages:

- easily fabricated, takes shape well
- rubber molds can be made from building stones
- minimal shrinkage of material
- can be load bearing or anchorage can be cast in
- expansion/contraction similar to stone
- material is firerated
- range of color and aggregate available
- vapor permeable

Disadvantages:

- may be more moisture absorbent than stone although coatings may be applied
- color fades in sunlight
- small air bubbles may disfigure units
- replacement stones are conspicuous if too few models and molds are made

Checklist:

- Is the historic material still available?
- What are the structural/anchorage requirements?
- Have samples been matched for color/texture/absorption? Have shop drawings been made for each shape?
- Are there performance standards?
- Has mortar been matched to adjacent historic mortar to achieve good color/tooling match?
- Are fabricators/installers experienced?

Fiber Reinforced Polymers (FRP, Fiberglass)

Material: Fiberglass is the most well known of the FRP products generally produced as a thin rigid laminate shell formed by pouring a polyester or epoxy resin gelcoat into a mold. When tack-free, layers of chopped glass or glass fabric are added along with additional resins. Reinforcing rods and struts can be added if necessary; the gel coat can be pigmented or painted.

Application: Fiberglass, a non load-bearing material attached to a separate structural frame, is frequently used as a replacement where a lightweight element is needed or an inaccessible location makes frequent maintenance of historic materials difficult. Its good molding ability and versatility to represent stone, wood, metal and terra cotta make it an alternative to ornate or carved building elements such as column capitals, bases, spandrel panels, beltcourses, balustrades, window hoods or parapets. Its ability to reproduce bright colors is a great advantage.

Advantages:

- lightweight, long spans available with a separate structural frame
- high ratio of strength to weight
- good molding ability
- integral color with exposed high quality pigmented gel-coat or takes paint well
- easily installed, can be cut, patched, sanded
- non-corrosive, rot-resistant

Disadvantages:

- requires separate anchorage system
- combustible (fire retardants can be added); fragile to impact.
- high coefficient of expansion and contraction requires frequently placed expansion joints
- ultraviolet sensitive unless surface is coated or pigments are in gelcoat
- vapor impermeability may require ventilation detail

Checklist:

- Can original materials be saved/used?
- Have expansion joints been designed to avoid unsightly appearance?
- Are there standards for color stability/durability?
- Have shop drawings been made for each piece?
- Have samples been matched for color and texture?
- Are fabricators/installers experienced?
- Do codes restrict use of FRP?

Epoxies (Epoxy Concretes, Polymer Concretes)

Material: Epoxy is a resinous two-part thermosetting material used as a consolidant, an adhesive, a patching compound, and as a molding resin. It can repair damaged material or recreate lost features. The resins which are poured into molds are usually mixed with fillers such as sand, or glass spheres, to lighten the mix and modify their expansion/contraction properties. When mixed with aggregates, such as sand or stone chips, they are often called epoxy concrete or polymer concrete, which is a misnomer as there are no cementitious materials contained within the mix. Epoxies are vapor impermeable, which makes detailing of the new elements extremely important so as to avoid trapping moisture behind the replacement material. It can be used with wood, stone, terra cotta, and various metals.

Application: Epoxy is one of the most versatile of the new materials. It can be used to bind together broken fragments of terra cotta; to build up or infill missing sections of ornamental metal; or to cast missing elements of wooden ornaments. Small cast elements can be attached to existing materials or entire new features can be cast. The resins are poured into molds and due to the rapid setting of the material and the need to avoid cracking, the molded units are generally small or hollow inside. Multiple molds can be combined for larger elements. With special rods, the epoxies can be structurally reinforced. Examples of epoxy replacement pieces include: finials, sculptural details, small column capitals, and medallions.

Advantages:

- can be used for repair/replacement
- lightweight, easily installed
- good casting ability; molds can be taken from building material can be sanded and carved.

- color and ultraviolet screening can be added; takes paint well
- durable, rot and fungus resistant

Disadvantages:

- materials are flammable and generate heat as they cure and may be toxic when burned
- toxic materials require special protection for operator and adequate ventilation while curing
- material may be subject to ultraviolet deterioration unless coated or filters added rigidity of material
- often must be modified with fillers to match expansion coefficients
- vapor impermeable

Checklist:

- Are historic materials available for molds, or for splicing-in as a repair option?
- Has the epoxy resin been formulated within the expansion/contraction coefficients of adjacent materials?
- Have samples been matched for color/finish?
- Are fabricators/installers experienced?
- Is there a sound substrate of material to avoid deterioration behind new material?
- Are there performance standards?

Summary and References

Substitute materials—those products used to imitate historic materials—should be used only after all other options for repair and replacement in kind have been ruled out. Because there are so many unknowns regarding the longterm performance of substitute materials, their use should not be considered without a thorough investigation into the proposed materials, the fabricator, the installer, the availability of specifications, and the use of that material in a similar situation in a similar environment.

Substitute materials are normally used when the historic materials or craftsmanship are no longer available, if the original materials are of a poor quality or are causing damage to adjacent materials, or if there are specific code requirements that preclude the use of historic materials. Use of these materials should be limited, since replacement of historic materials on a large scale may jeopardize the integrity of a historic resource. Every means of repairing deteriorating historic materials or replacing them with identical materials should be examined before turning to substitute materials.

The importance of matching the appearance and physical properties of historic materials and, thus, of finding a successful longterm solution cannot be overstated. The successful solutions illustrated in this Brief were from historic preservation projects involving professional teams of architects, engineers, fabricators, and other specialists. Cost was not necessarily a factor, and all agreed that whenever possible, the historic materials should be used. When substitute materials were selected, the solutions were often expensive and were reached only after careful consideration of all options, and with the assistance of expert professionals.

Acknowledgements

The author gratefully acknowledges the invaluable assistance of coworker Michael Auer in editing this manuscript. The following individuals are to be thanked for their technical assistance: Mary Oehrlein A.I.A., Washington, D.C.; John G. Waite, Albany, NY: Hyman Myers, R.A., Philadelphia, PA, Thomas Fisher, Stamford, CT; Harrison Goodall, Kinnelon, NJ. In addition, the staff of Preservation Assistance Division, the cultural resources staff of the National Park Service Regional Offices, and Stan Graves, on behalf of the National Conference of State Historic Preservation Officers, provided useful comments that were incorporated into the manuscript.

This publication has been prepared pursuant to the National Historic Preservation Act of 1966, as amended, which directs the Secretary of the Interior to develop and make available information concerning historic properties. Technical Preservation Services (TPS), National Park Service prepares standards, guidelines, and other educational materials on responsible historic preservation treatments for a broad public.

September 1988

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