



February 10, 2015

Sutro Tower, Inc.  
1 La Avanzada Street  
San Francisco, CA 94131-1124

Attention: Mr. Eric Dausman

Re: Review of Annual Maintenance  
977-ft Self-Support Tower  
San Francisco, California  
TCI Project Number 14.082.001

Dear Mr. Dausman,

Tower Consultants Incorporated (TCI) performed a field evaluation of the structural repair and maintenance work performed on the 977-ft self-support tower located in San Francisco, California. Jeff Altmyer, P.E. and Yevgeny Kabatski performed the site observation from September 2014, through November 2014 as part of Sutro Tower's annual inspection.

The purpose of the field observation was to monitor repairs resulting from TCI's 2013 annual inspection as documented in its field evaluation to Sutro Tower, Inc. dated December 16, 2013 (TCI Project Number 13.082.001), as directed by Simpson Gumpertz & Heger Inc. (the "Recommendations").

The maintenance work consisted of the following (note that photos referred to below are representative and do not document all locations where maintenance was performed):

1. Clean rust from tower members and bolts and repaint (Photo Nos. 2 – 16). This work was accomplished this year at levels 2, 3 and 6 and in leg B and at all 3 antenna stacks and all tower bases. PVC pipes were added to the beam drain holes to alleviate corrosion (Photo Nos. 31 – 33).
2. Rusted bolt replacement (Photo Nos. 17 – 24). This year bolts were replaced at levels 2, 3 and 6 and partially at level 4 and in the antenna stacks. In some cases mildly rusted bolts were replaced in lieu of painting due to limited accessibility for preparation. We estimate that 1,000 bolts have been replaced this year.
3. Gusset replacement on leg B just below level 2 (Photo Nos. 25 & 26).
4. Bent Member reinforcement at level 6 (Photo Nos. 29 & 30).
5. Elevator anchorage repair (Photo Nos. 27 & 28).
6. TCI checked all tension on guy wires and found some that were out of tolerance. Those guy wires that had incorrect guy tensions were adjusted to the proper guy tensions by TCI. See attached tables in appendix A for details post adjustment.

# Tower Consultants, Inc.

7. Repair of the cracked weld for the A tower leg column to the base plate (Photo Nos. 34 & 35).

The maintenance work as inspected appeared to be in compliance with the Recommendations and in keeping with good industry practice. The inspections and tower work have been performed in accordance with the requirements of the ANSI/TIA-222-G standard and all applicable codes. All work was coordinated with Structural Engineer Ron Hamburger.

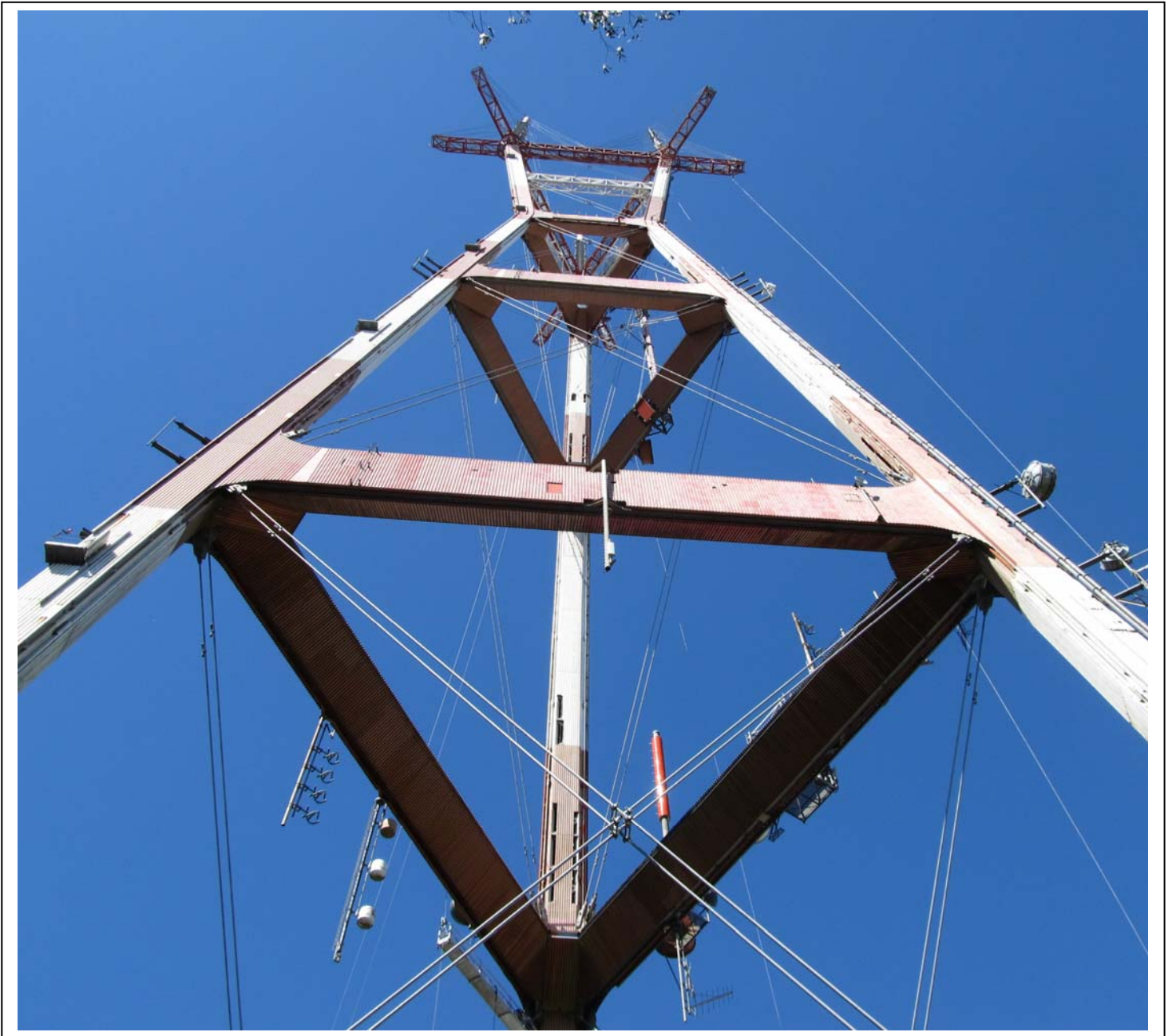
We appreciate the opportunity to be of service to Sutro Tower, Inc and we will be available to answer any questions in regards to this letter.

Sincerely,

Jeff Altmeyer, P.E.  
Tower Engineer  
Tower Consultants Incorporated

# Tower Consultants, Inc.

## Photo Log

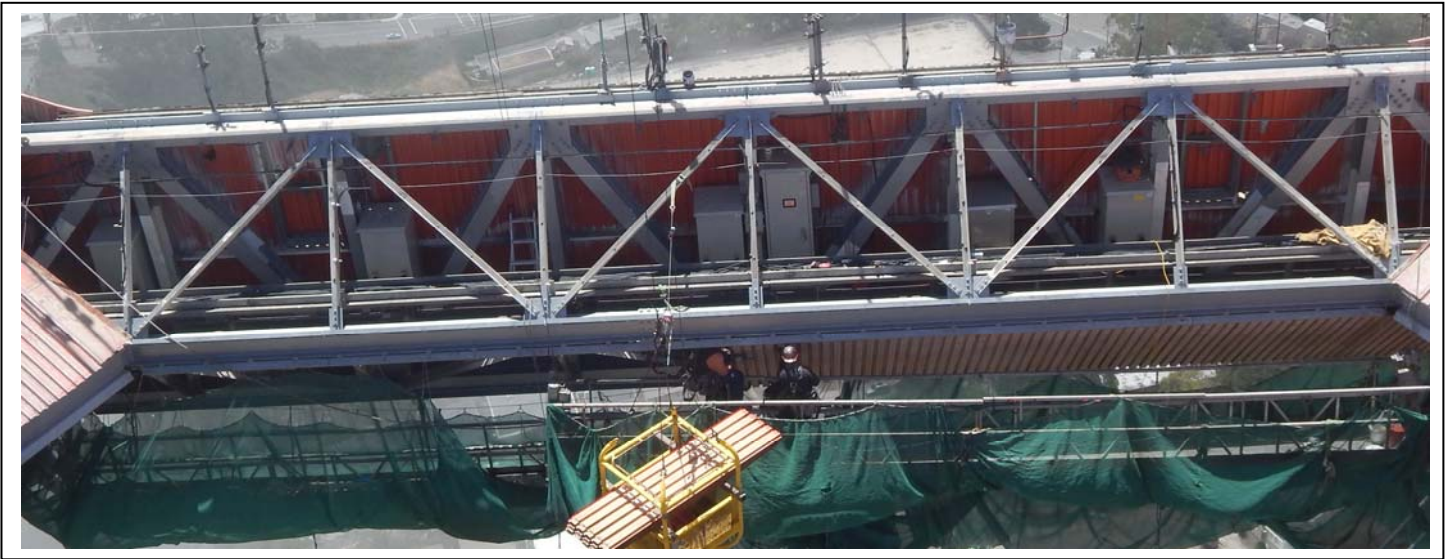


**Photo No. 1**

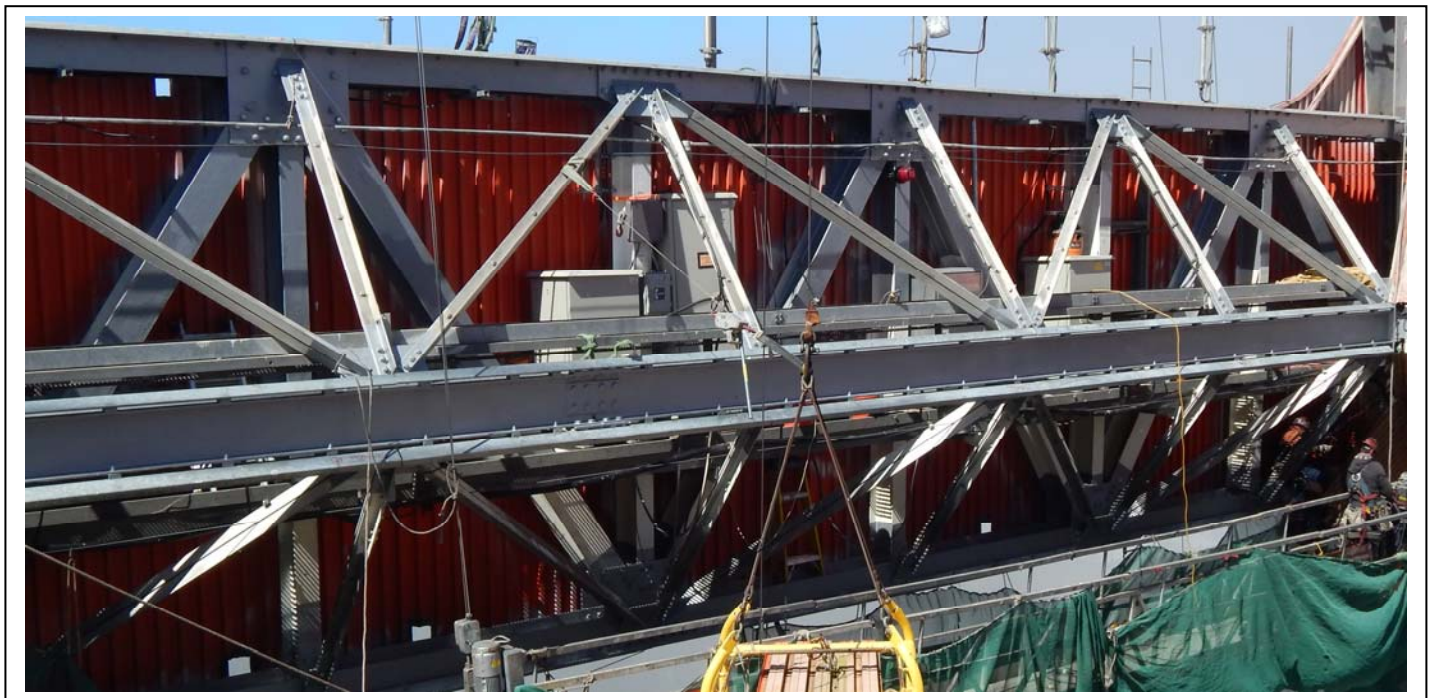
Photo No. 1 is an overall view of the 977-ft self-supporting tower.

*East Coast: 15 Surrey Court, Columbia, South Carolina 29212 Phone: (803) 407-8489 Fax: (803) 407-8691  
West Coast: 19711 64<sup>th</sup> Avenue W., Suite A, Lynnwood, Washington 98036 Phone: (425) 778-5169 Fax: (425) 778-5103*

# Tower Consultants, Inc.



**Photo No. 2**



**Photo No. 3**

Photo Nos. 2 and 3 are views of freshly painted members on the south face at level 3.

# Tower Consultants, Inc.



**Photo No. 4 (Before)**



**Photo No. 5 (After)**

Photo Nos. 4 and 5 show a beam before and after rust treatment and painting.

*East Coast: 15 Surrey Court, Columbia, South Carolina 29212 Phone: (803) 407-8489 Fax: (803) 407-8691  
West Coast: 19711 64<sup>th</sup> Avenue W., Suite A, Lynnwood, Washington 98036 Phone: (425) 778-5169 Fax: (425) 778-5103*

# Tower Consultants, Inc.



**Photo No. 6 (Before)**



**Photo No. 7 (After)**



**Photo No. 8 (Before)**



**Photo No. 9 (After)**

Photo Nos. 6 - 9 show beams before and after rust treatment and painting.

# Tower Consultants, Inc.



**Photo No. 10 (Before)**



**Photo No. 11 (After)**

Photo Nos. 10 and 11 show beams before and after rust treatment and painting.

# Tower Consultants, Inc.



**Photo No. 12 (Before)**



**Photo No. 13 (After)**

Photo Nos. 12 and 13 show beams before and after rust treatment and painting.

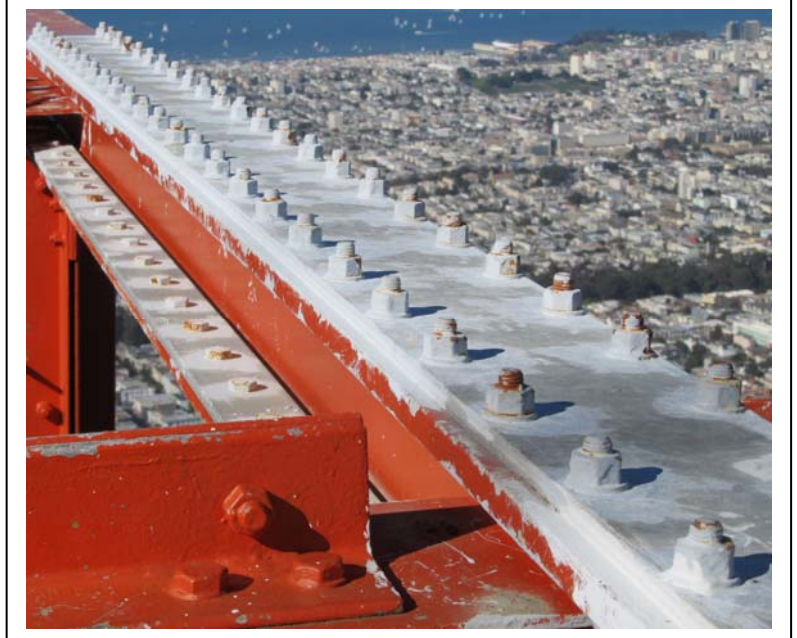
*East Coast: 15 Surrey Court, Columbia, South Carolina 29212 Phone: (803) 407-8489 Fax: (803) 407-8691  
West Coast: 19711 64<sup>th</sup> Avenue W., Suite A, Lynnwood, Washington 98036 Phone: (425) 778-5169 Fax: (425) 778-5103*



# Tower Consultants, Inc.



**Photo No. 14 (Before)**



**Photo No. 15 (Before)**

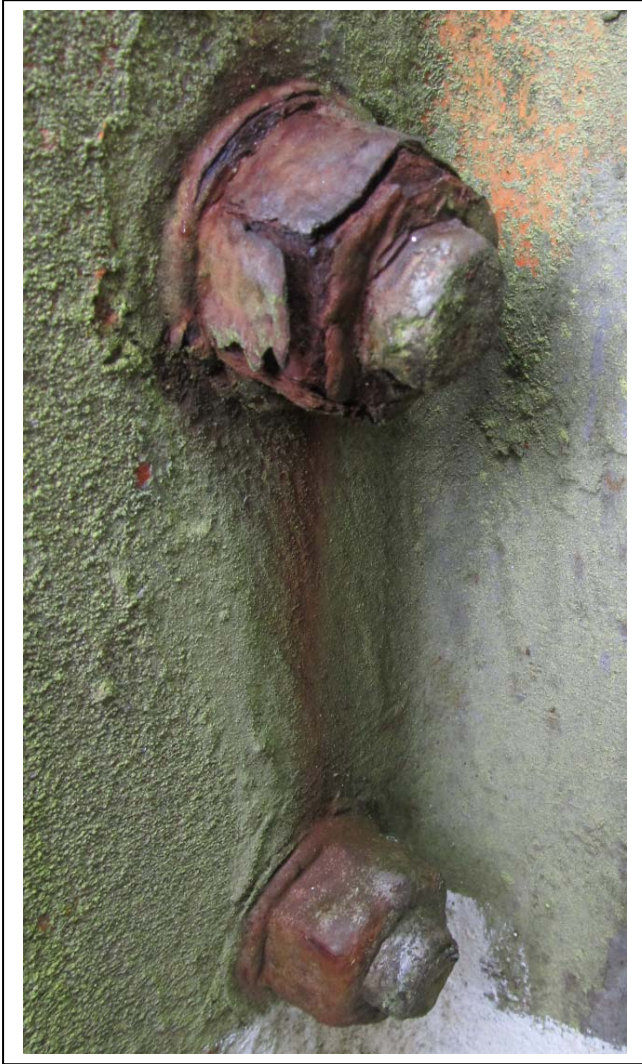


**Photo No. 16 (After)**

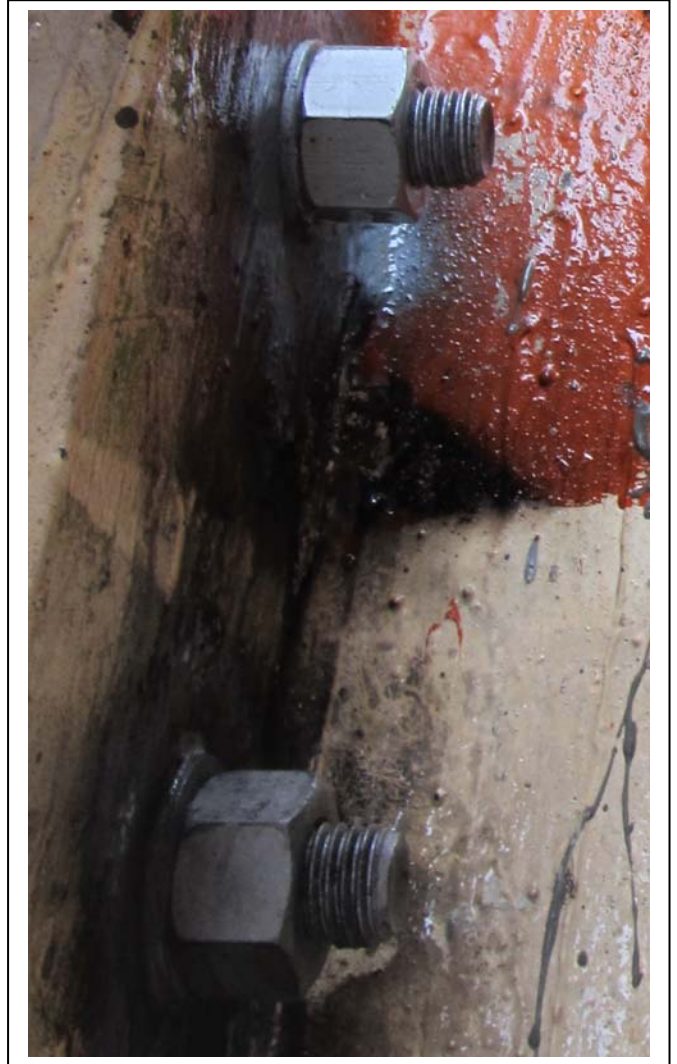
Photo Nos. 14 - 16 are views of the rust treated bolts at level 6.

*East Coast: 15 Surrey Court, Columbia, South Carolina 29212 Phone: (803) 407-8489 Fax: (803) 407-8691  
West Coast: 19711 64<sup>th</sup> Avenue W., Suite A, Lynnwood, Washington 98036 Phone: (425) 778-5169 Fax: (425) 778-5103*

# Tower Consultants, Inc.



**Photo No. 17 (Before)**



**Photo No. 18 (After)**

Photo Nos. 17 and 18 show leg bolts before and after they were replaced.

# Tower Consultants, Inc.



**Photo No. 19 (Before)**



**Photo No. 20 (After)**

Photo Nos. 19 and 20 show vertical beam connection bolts before and after they were replaced.

# Tower Consultants, Inc.



**Photo No. 21 (Before)**



**Photo No. 22 (After)**

Photo Nos. 21 and 22 show connection bolts before and after they were replaced.

# Tower Consultants, Inc.



**Photo No. 23 (Before)**



**Photo No. 24 (After)**

Photo Nos. 23 and 24 show leg bolts before and after they were replaced.

# Tower Consultants, Inc.



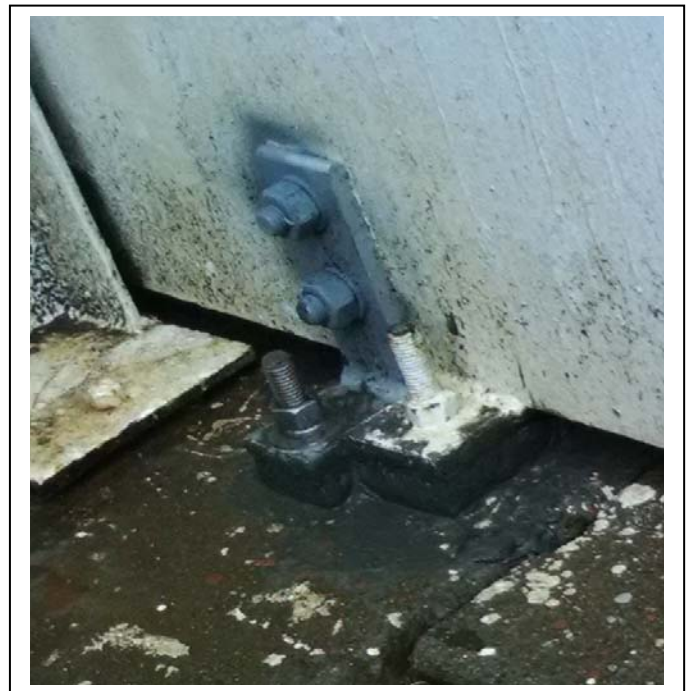
**Photo No. 25 (Before)**



**Photo No. 26 (After)**



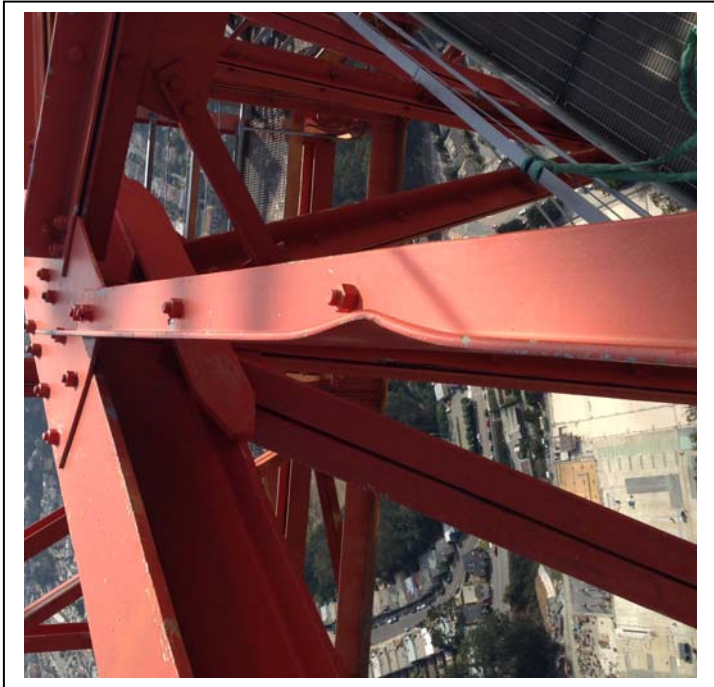
**Photo No. 27 (Before)**



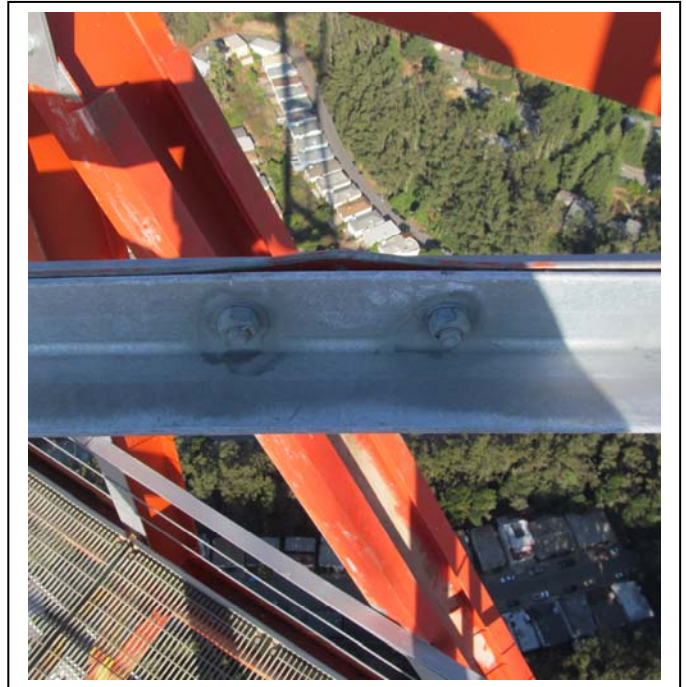
**Photo No. 28 (After)**

Photo Nos. 25 & 26 show the severely rusted gusset in leg B before and after the recent repair work.  
Photo Nos. 27 & 28 show an elevator anchorage before and after the recent repair work.

# Tower Consultants, Inc.



**Photo No. 29 (Before)**



**Photo No. 30 (After)**

Photo Nos. 29 & 30 show the bent angle at level 6 before and after the recent repair work.

# Tower Consultants, Inc.



**Photo No. 31 (Before)**



**Photo No. 32 (After)**



**Photo No. 33 (After)**

Photo No. 31 is a picture of a drain hole in a beam before the recent maintenance project.  
Photo Nos. 32 and 33 show a drain hole after the maintenance project was completed.



# Tower Consultants, Inc.



**Photo No. 34 (Before)**



**Photo No. 35 (After)**

Photo No. 34 is a picture of the weld for the tower leg column to the tower base plate before the recent maintenance project.

Photo No. 35 shows the base plate weld after the maintenance project was completed.

**APPENDIX A**  
**LOAD TEST RESULTS**  
**FOR STRANDS AND GUY WIRES**

**GUY TENSIONS DETERMINED BY THE DIRECT METHOD**

**977' SELF SUPPORTED TOWER, SAN FRANCISCO (SUTRO), CA**

Date: 8-4-14 thru 8-12-14

Weather Conditions: Sunny, Calm, 65 degrees

T = Measured Tension at 65 degrees (kips)

Td = Design Tension at 65 degrees (kips)

Less than 5% out of tolerance is acceptable

<b>STACK "A"</b>				
Guy Location	Guy Size	T (kips)	Td (kips)	% out of Tolerance
1A-AR	HPTG 130000	29.30	28.00	4.6
1A-AL	HPTG 130000	29.30	28.00	4.6
1A-BR	HPTG 130000	29.30	28.00	4.6
1A-BL	HPTG 130000	29.30	28.00	4.6
1A-CR	HPTG 130000	29.30	28.00	4.6
1A-CL	HPTG 130000	29.30	28.00	4.6
1A-DR	HPTG 130000	29.30	28.00	4.6
1A-DL	HPTG 130000	29.30	28.00	4.6
2A-AR	HPTG 130000	29.30	28.00	4.6
2A-AL	HPTG 130000	29.30	28.00	4.6
2A-BR	HPTG 130000	29.30	28.00	4.6
2A-BL	HPTG 130000	29.30	28.00	4.6
2A-CR	HPTG 130000	29.30	28.00	4.6
2A-CL	HPTG 130000	29.30	28.00	4.6
2A-DR	HPTG 130000	29.30	28.00	4.6
2A-DL	HPTG 130000	29.30	28.00	4.6
3A-AR	HPTG 130000	29.30	28.00	4.6
3A-AL	HPTG 130000	29.30	28.00	4.6
3A-BR	HPTG 130000	29.30	28.00	4.6
3A-BL	HPTG 130000	29.30	28.00	4.6
3A-CR	HPTG 130000	29.30	28.00	4.6
3A-CL	HPTG 130000	29.30	28.00	4.6
3A-DR	HPTG 130000	29.30	28.00	4.6
3A-DL	HPTG 130000	29.30	28.00	4.6



19711 64th Ave. W, Suite A  
Lynnwood, WA 98036  
425-778-5169 FAX 425-778-5103

**977' SELF SUPPORTED TOWER  
SAN FRANCISCO, CA  
SUTRO**

Sheet No.	<b>A-1</b>
Project No.	14.082.001
Date :	
Scale:	None

**GUY TENSIONS DETERMINED BY THE DIRECT METHOD**

**977' SELF SUPPORTED TOWER, SAN FRANCISCO (SUTRO), CA**

Date: 8-4-14 thru 8-12-14

Weather Conditions: Sunny, Calm, 65 degrees

T = Measured Tension at 65 degrees (kips)

Td = Design Tension at 65 degrees (kips)

Less than 5% out of tolerance is acceptable

<b>STACK "B"</b>				
Guy Location	Guy Size	T (kips)	Td (kips)	% out of tolerance
1B-AR	HPTG 130000	29.30	28.00	4.6
1B-AL	HPTG 130000	29.30	28.00	4.6
1B-BR	HPTG 130000	29.30	28.00	4.6
1B-BL	HPTG 130000	29.30	28.00	4.6
1B-CR	HPTG 130000	29.30	28.00	4.6
1B-CL	HPTG 130000	29.30	28.00	4.6
1B-DR	HPTG 130000	29.30	28.00	4.6
1B-DL	HPTG 130000	29.30	28.00	4.6
2B-AR	HPTG 130000	29.30	28.00	4.6
2B-AL	HPTG 130000	29.30	28.00	4.6
2B-BR	HPTG 130000	29.30	28.00	4.6
2B-BL	HPTG 130000	29.30	28.00	4.6
2B-CR	HPTG 130000	29.30	28.00	4.6
2B-CL	HPTG 130000	29.30	28.00	4.6
2B-DR	HPTG 130000	29.30	28.00	4.6
2B-DL	HPTG 130000	29.30	28.00	4.6
3B-AR	HPTG 160000	37.60	36.00	4.4
3B-AL	HPTG 160000	37.60	36.00	4.4
3B-BR	HPTG 160000	37.60	36.00	4.4
3B-BL	HPTG 160000	37.60	36.00	4.4
3B-CR	HPTG 160000	37.60	36.00	4.4
3B-CL	HPTG 160000	37.60	36.00	4.4
3B-DR	HPTG 160000	37.60	36.00	4.4
3B-DL	HPTG 160000	37.60	36.00	4.4
4B-AR	HPTG 130000	29.30	28.00	4.6
4B-AL	HPTG 130000	29.30	28.00	4.6
4B-BR	HPTG 130000	29.30	28.00	4.6
4B-BL	HPTG 130000	29.30	28.00	4.6
4B-CR	HPTG 130000	29.30	28.00	4.6
4B-CL	HPTG 130000	29.30	28.00	4.6
4B-DR	HPTG 130000	29.30	28.00	4.6
4B-DL	HPTG 130000	29.30	28.00	4.6



19711 64th Ave. W, Suite A  
Lynnwood, WA 98036  
425-778-5169 FAX 425-778-5103

**977' SELF SUPPORTED TOWER  
SAN FRANCISCO, CA  
SUTRO**

Sheet No.	<b>A-2</b>
Project No.	14.082.001
Date :	
Scale:	None

**GUY TENSIONS DETERMINED BY THE DIRECT METHOD**

**977' SELF SUPPORTED TOWER, SAN FRANCISCO (SUTRO), CA**

Date: 8-4-14 thru 8-12-14  
 Weather Conditions: Sunny, Calm, 65 degrees  
 T = Measured Tension at 65 degrees (kips)  
 Td = Design Tension at 65 degrees (kips)

Less than 5% out of tolerance is acceptable

<b>STACK "C"</b>				
Guy Location	Guy Size	T (kips)	Td (kips)	% out of Tolerance
1C-AR	HPTG 130000	29.30	28.00	4.6
1C-AL	HPTG 130000	29.30	28.00	4.6
1C-BR	HPTG 130000	29.30	28.00	4.6
1C-BL	HPTG 130000	29.30	28.00	4.6
1C-CR	HPTG 130000	29.30	28.00	4.6
1C-CL	HPTG 130000	29.30	28.00	4.6
1C-DR	HPTG 130000	29.30	28.00	4.6
1C-DL	HPTG 130000	29.30	28.00	4.6
2C-AR	HPTG 130000	29.30	28.00	4.6
2C-AL	HPTG 130000	29.30	28.00	4.6
2C-BR	HPTG 130000	29.30	28.00	4.6
2C-BL	HPTG 130000	29.30	28.00	4.6
2C-CR	HPTG 130000	29.30	28.00	4.6
2C-CL	HPTG 130000	29.30	28.00	4.6
2C-DR	HPTG 130000	29.30	28.00	4.6
2C-DL	HPTG 130000	29.30	28.00	4.6
3C-AR	HPTG 130000	29.30	28.00	4.6
3C-AL	HPTG 130000	29.30	28.00	4.6
3C-BR	HPTG 130000	29.30	28.00	4.6
3C-BL	HPTG 130000	29.30	28.00	4.6
3C-CR	HPTG 130000	29.30	28.00	4.6
3C-CL	HPTG 130000	29.30	28.00	4.6
3C-DR	HPTG 130000	29.30	28.00	4.6
3C-DL	HPTG 130000	29.30	28.00	4.6



19711 64th Ave. W, Suite A  
 Lynnwood, WA 98036  
 425-778-5169 FAX 425-778-5103

**977' SELF SUPPORTED TOWER  
 SAN FRANCISCO, CA  
 SUTRO**

Sheet No.	<b>A-3</b>
Project No.	14.082.001
Date :	
Scale:	None

**MAIN GUY TENSIONS DETERMINED BY THE DIRECT METHOD**

**977' SELF SUPPORTED TOWER, SAN FRANCISCO (SUTRO), CA**

Date: 8-4-14 thru 8-12-14

Weather Conditions: Sunny, Calm, 65 degrees

T = Measured Tension at 65 degrees (kips)

Td = Design Tension at 65 degrees (kips)

Less than 5% out of tolerance is acceptable

<b>LEVEL 1</b>				
Guy Location	Guy Size	T (kips)	Td (kips)	% out of Tolerance
A-B INNER	3" BS	270.02	270.00	0.0
A-B OUTER	3" BS	270.02	270.00	0.0
A-C INNER	3" BS	259.86	270.00	-3.8
A-C OUTER	3" BS	267.99	270.00	-0.7
B-A INNER	3" BS	270.02	270.00	0.0
B-A OUTER	3" BS	270.02	270.00	0.0
B-C INNER	3" BS	267.99	270.00	-0.7
B-C OUTER	3" BS	263.93	270.00	-2.2
C-A INNER	3" BS	259.86	270.00	-3.8
C-A OUTER	3" BS	267.99	270.00	-0.7
C-B INNER	3" BS	267.99	270.00	-0.7
C-B OUTER	3" BS	263.93	270.00	-2.2
<b>LEVEL 2</b>				
Guy Location	Guy Size	T (kips)	Td (kips)	% out of Tolerance
A-B INNER	3" BS	263.93	270.00	-2.2
A-B OUTER	3" BS	267.99	270.00	-0.7
A-C INNER	3" BS	270.02	270.00	0.0
A-C OUTER	3" BS	267.99	270.00	-0.7
B-A INNER	3" BS	263.93	270.00	-2.2
B-A OUTER	3" BS	267.99	270.00	-0.7
B-C INNER	3" BS	263.93	270.00	-2.2
B-C OUTER	3" BS	267.99	270.00	-0.7
C-A INNER	3" BS	270.02	270.00	0.0
C-A OUTER	3" BS	267.99	270.00	-0.7
C-B INNER	3" BS	263.93	270.00	-2.2
C-B OUTER	3" BS	267.99	270.00	-0.7



19711 64th Ave. W, Suite A  
Lynnwood, WA 98036  
425-778-5169 FAX 425-778-5103

**977' SELF SUPPORTED TOWER  
SAN FRANCISCO, CA  
SUTRO**

Sheet No.	<b>A-4</b>
Project No.	14.082.001
Date :	
Scale:	None

**MAIN GUY TENSIONS DETERMINED BY THE DIRECT METHOD**

**977' SELF SUPPORTED TOWER, SAN FRANCISCO (SUTRO), CA**

Date: 8-4-14 thru 8-12-14

Weather Conditions: Sunny, Calm, 65 degrees

T = Measured Tension at 65 degrees (kips)

Td = Design Tension at 65 degrees (kips)

Less than 5% out of tolerance is acceptable

<b>LEVEL 3</b>				
Guy Location	Guy Size	T (kips)	Td (kips)	% out of Tolerance
A-B INNER	2.5" BS	188.81	190.00	-0.6
A-B OUTER	2.5" BS	188.81	190.00	-0.6
A-C INNER	2.5" BS	186.78	190.00	-1.7
A-C OUTER	2.5" BS	190.84	190.00	0.4
B-A INNER	2.5" BS	188.81	190.00	-0.6
B-A OUTER	2.5" BS	188.81	190.00	-0.6
B-C INNER	2.5" BS	190.84	190.00	0.4
B-C OUTER	2.5" BS	184.75	190.00	-2.8
C-A INNER	2.5" BS	190.84	190.00	0.4
C-A OUTER	2.5" BS	190.84	190.00	0.4
C-B INNER	2.5" BS	190.84	190.00	0.4
C-B OUTER	2.5" BS	184.75	190.00	-2.8
<b>LEVEL 4</b>				
Guy Location	Guy Size	T (kips)	Td (kips)	% out of Tolerance
A-B INNER	2.5" BS	192.87	190.00	1.5
A-B OUTER	2.5" BS	190.84	190.00	0.4
A-C INNER	2.5" BS	190.84	190.00	0.4
A-C OUTER	2.5" BS	190.84	190.00	0.4
B-A INNER	2.5" BS	192.87	190.00	1.5
B-A OUTER	2.5" BS	190.84	190.00	0.4
B-C INNER	2.5" BS	188.81	190.00	-0.6
B-C OUTER	2.5" BS	188.81	190.00	-0.6
C-A INNER	2.5" BS	190.84	190.00	0.4
C-A OUTER	2.5" BS	190.84	190.00	0.4
C-B INNER	2.5" BS	188.81	190.00	-0.6
C-B OUTER	2.5" BS	188.81	190.00	-0.6



19711 64th Ave. W, Suite A  
Lynnwood, WA 98036  
425-778-5169 FAX 425-778-5103

**977' SELF SUPPORTED TOWER  
SAN FRANCISCO, CA  
SUTRO**

Sheet No.	<b>A-5</b>
Project No.	14.082.001
Date :	
Scale:	None

**MAIN GUY TENSIONS DETERMINED BY THE DIRECT METHOD**

**977' SELF SUPPORTED TOWER, SAN FRANCISCO (SUTRO), CA**

Date: 8-4-14 thru 8-12-14

Weather Conditions: Sunny, Calm, 65 degrees

T = Measured Tension at 65 degrees (kips)

Td = Design Tension at 65 degrees (kips)

Less than 5% out of tolerance is acceptable

<b>LEVEL 5</b>				
Guy Location	Guy Size	T (kips)	Td (kips)	% out of Tolerance
A-B INNER	1.5" BS	67.36	70.00	-3.8
A-B OUTER	1.5" BS	70.17	70.00	0.2
A-C INNER	1.5" BS	66.66	70.00	-4.8
A-C OUTER	1.5" BS	66.66	70.00	-4.8
B-A INNER	1.5" BS	67.36	70.00	-3.8
B-A OUTER	1.5" BS	70.17	70.00	0.2
B-C INNER	1.5" BS	67.36	70.00	-3.8
B-C OUTER	1.5" BS	67.36	70.00	-3.8
C-A INNER	1.5" BS	67.36	70.00	-3.8
C-A OUTER	1.5" BS	66.66	70.00	-4.8
C-B INNER	1.5" BS	66.66	70.00	-4.8
C-B OUTER	1.5" BS	67.36	70.00	-3.8



19711 64th Ave. W, Suite A  
Lynnwood, WA 98036  
425-778-5169 FAX 425-778-5103

**977' SELF SUPPORTED TOWER  
SAN FRANCISCO, CA  
SUTRO**

Sheet No. **A-6**

Project No. 14.082.001

Date :

Scale: None