


Memorandum

CS Memorandum No. 1284

To: Distribution

From: Susan MacKenzie, Document Control Manager 

Date: November 12, 2012

Reference: Project No. M544.1, Contract No. CS-149
Task No. 1-8.02, Change Control

Subject: Configuration Management Board Meeting No. 99

Attached please find minutes for Configuration Management Board Meeting No. 99 held on October 31, 2012.

Attachments: CMB Meeting No. 99 Rev. 0 Minutes with attachments

Cc: David Kuehn, STV (w/attachments) david.kuehn@stvinc.com
Brad Lebovitz, STV (w/attachments) bradley.lebovitz@stvinc.com
Matt Lee, SFCTA (w/attachments) matt@sfcta.org
Shahnam Farhangi, SFMTA (w/attachments)
Roger Nguyen, SFMTA (w/attachments)
Arthur Wong, SFMTA (w/attachments)
Jane Wang, SFMTA (w/attachments)
Carlos Campillo, CSP (w/attachments)
Quon Chin, CSP (w/attachments)
Chuck Morganson, HNTB/B&C (w/attachments)
Aileen Read, CSDG (w/attachments)
CS File No. M544.1.5.0890

Distribution:

Luis Zurinaga, SFCTA (luis.zurinaga@sfcta.org)
John Funghi, SFMTA
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Joon Park, SFMTA
Richard Redmond, CSP
Ross Edwards, CSP
Mark Latch, CSP
Mark Benson, CSP
Eric Stassevitch, CSP
Beverly Ward, CSP
Michael Acosta, DPW

CMB Meeting Minutes #99

DATE: November 01, 2012

MEETING DATE: **October 31, 2012**

LOCATION: 821 Howard St, Main Conference Room

TIME: 3:00 PM

ATTENDEES: J Funghi (JF), A. Hoe (AH), J. Park (JP), Richard Redmond (RR), R. Edwards (RE), M. Latch (ML), M. Benson (MB), E. Stassevitch (ES), B. Ward (BW), M. Acosta (MA), L. Zurinaga (LZ),

COPIES TO: Attendees: S. Farhangi (SF), A. Wong (AW), R. Nguyen (RN), Q. Chin (QC), J. Wang (JW), C. Campillo (CC), C. Morganson (CM), A. Read (AR), M. Lee (ML), B. Lebovitz (BL), D. Kuehn (DK), File No. M544.1.5.0890

REFERENCE Project No. M544.1, Contract No. 149 Task 1-8.02
Final Design

SUBJECT: Configuration Management Board Meeting # 99– Rev. No. 0

RECORD OF MEETING *(Italicized text indicates status update of open items)*

ITEM #	DISCUSSION	ACTION BY DUE DATE
1-	1251 - M. Benson and M. Acosta presented for approval Trend No. 77 – Additional work due to differing conditions encountered during the installation of Qwest, TCG and UCCO Infrastructure. The RE is still working on the appropriate distribution for reimbursement amounts to SFMTA for the \$41K utility work; moreover the Utility companies have acknowledged the work which took place at the direction of their engineers. AGREE – CMB 0081 , contingent upon receipt of evidence from all utilities that cost are reimbursable to SFMTA through the form B process.	
2-	1251 - M. Benson and M. Acosta presented for approval Trend No. 47: Enlarge Muni Vault 900A on Stockton between Post and Geary - There was not enough space to install duct banks so enlargement of the intercept vault was necessary. Trend No. 58: Additional streetlight conduit on 5th Street between Harrison and Bryant - Existing streetlight did not have electricity a new conduit needed to be installed from the power source. Trend No. 76: - Adjustment to OCS on Mason Street, and Trend No. 78 - Unforeseen conditions encountered during excavation of OCS poles along Mason and 5th Streets. Both trend numbers 76 and 78 are late COR's which are part of the OCS work done along Folsom St. between 4 th and 5 th Streets and the installation of Foundations and Poles (see attached) AGREE – CMB 0082.	
3-	1252 – R. Edwards PCC – 06 Additional BART Tunnel Instrumentation (see attached). The Proposed contract work to be done: 1) Determiner the actual load in 12 bolts, 2) Install 12 bold force sensors at bolts identified, 3) Install dynamic strain gauges on rapid cycle. The CMB concurred with the proposed contract change giving direction to proceed with pursuing a price quote to perform the work from the CN1252 Contractor. PCC Cost Estimate for this work is being vetted by Sr. Program Management. This item will be	

ITEM #	DISCUSSION	ACTION BY DUE DATE
	brought back to the CMB at a later date.	
4-	1252 - Grant Avenue Conversion between Post Street and Geary Street from One-way to Two-way Street which was presented at CMB meeting No. 87 and as a follow up action to close the agenda item. E. Stassevitch showed a comparison table of the two cost proposals received from DPT and BIH to perform the work. The proposals were relativity close in price with some minor differences noted in the "Summary Delta" (see attached). This follow up action is considered Closed.	

ACTION ITEMS

ITEM #	MTG DATE	MTG ACTION DATE	DESCRIPTION	BIC	DUE DATE	STATUS
1	07/18/12	07/18/12	1252 – Grant Street Detour Cost Comparison	M. Benson	07/25/12	CLOSED
3	07/25/12	08/01/12	1252 – MOS Traffic Signal Reroute (Trend#15)	M. Benson	08/15/12	Open
5	08/08/12	08/29/12	1252 – PCC 1252-02 UMS Headwalls	M. Benson	10/10/12	Open
3	10/03/12	10/03/12	1252 – PCC 1252-03 Traffic Detour Signage	M. Benson	11/07/12	Open

Meeting adjourned at 5:00pm

These meeting minutes have been prepared by B. Ward and reviewed by E. Stassevitch, and are the preparer's interpretation of discussions that took place. If the reader's interpretation differs, please contact the author in writing within four (4) days of receipt of these minutes.

Signed:  [initials of preparer & reviewer] Date: 07 Nov 12 [Date review completed]

Meeting Agenda

Project No. M544.1, Contract No. CS-149
Program/Construction Management
Configuration Management Board (CMB) Meeting No. 99
October 31, 2012
3:00pm – 5:00pm
 Central Subway Project Office
 821 Howard St. 2nd Floor
 Main Conference Room

Attendees:

Mark Benson	Albert Hoe	Matt Lee	Beverly Ward	
Ross Edwards	Jim Kelly	Roger Nguyen	Arthur Wong	
Shahnam Farhangi	David Kuehn	Joon Park	Luis Zurinaga	
John Funghi	Mark Latch	Richard Redmond		
John Haley	Brad Lebovitz	Eric Stassevitch		

1. **1250** – Nothing to Report
2. **1251** – Additional Work Related to Qwest, TCG and UCCO Infrastructure (Trend No. 77) – *For Approval*
 – Muni Vault 900A, Additional SL Work, Additional OCS Work (Trends 47, 58, 76 and 78) – *For Approval*
3. **1252** – Additional BART Tunnel Instrumentation (PCC No. 06) – *For Review*
4. **1253 (UMS)** – Nothing to Report
5. **1254 (CTS)** – Nothing to Report
6. **1255 (MOS)** – Nothing to Report
7. **1256 (STS)** – Nothing to Report
8. **Trend/Change Log** –
9. **Other Business** –

Meeting Attendance Sheet

Project No. M544.1, Contract No. 149
 Program/Construction Management
 Configuration Management Board Meeting No. 99
 October 31, 2012
 3:00 p.m. – 5:00 p.m.
 Central Subway Project Office
 821 Howard, 2nd Floor
 Main Conference Room

Deliver Meeting Attendance Sheet with original signatures/initials to Document Control.

NAME	AFFILIATION	PHONE	E-MAIL (for minutes)	INITIALS
Please enter initials if your name is listed below. Please enter name, affiliation, phone number and email address if your name is not listed below.				
Benson, Mark	CSP	(415) 701-4295	Mark.Benson@sfmta.com	<i>MB</i>
Dombrowski, Charles	Hill/PCC	(415) 701-5272	Charles.Dombrowski@sfmta.com	
Edwards, Ross	CSP	(415) 581-5165	Ross.Edwards@sfmta.com	<i>RE</i>
Farhangi, Shahnam	SFMTA	(415) 554-0721	Shahnam.Farhangi@sfmta.com	
Funghi, John	SFMTA	(415) 701-4299	John.Funghi@sfmta.com	<i>FF</i>
Haley, John	SFMTA		John.Haley@sfmta.com	
Hoe, Albert	SFMTA	(415) 581-5164	Albert.Hoe@sfmta.com	<i>AH</i>
Kelly, Jim	SFMTA		Jim.Kelly@sfmta.com	
Kuehn, David	STV/PMOC	(510) 464-8053	David.kuehn@stvinc.com	
Latch, Mark	CSP	(415) 701-5294	Mark.Latch@sfmta.com	<i>ML</i>
Lebovitz, Brad	STV/PMOC	(510) 464-8052	Bradley.lebovitz@stvinc.com	
Lee, Matt	SFCTA	(415) 522-4813	matt@sfcta.org	

central  subway

NAME	AFFILIATION	PHONE	E-MAIL (for minutes)	INITIALS
Nguyen, Roger	SFMTA	(415) 701-4312	Roger.Nguyen@sfmta.com	
Park, Joon	SFMTA	(415) 701-4742	Joon.Park@sfmta.com	JP
Redmond, Richard	CSP	(415) 701-4288	Richard.Redmon@sfmta.com	RR
Stassevitch, Eric	CSP	(415) 701-4426	Eric.Stassevitch@sfmta.com	ES
Ward, Beverly	CSP	(415) 701-5291	Beverly.Ward@sfmta.com	BW
Wong, Arthur	SFMTA	(415) 701-4305	Arthur.Wong@sfmta.com	
Zurinaga, Luis	SFCTA	(415) 716-6956	Luis.zurinaga@sfcta.org	LZ
Mike Acosta	CSP	701-5282		MA

CMB Change No.: CMB – 0081

Initial Implementing Change Control Procedure No.: 1251 – CMod Trend #77



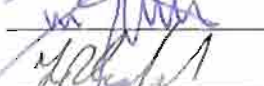


GENERAL	
Proposed Change Sponsor:	M. Acosta Received by CMB: <u>10/31/2012</u> (Date)
Affected Disciplines:	Utilities
Impacts of Change:	Trend #77 - additional work due to differing conditions encountered during the installation of Qwest, TCG and UCCO infrastructure

Contract(s) Directly Affected by this Proposed Change:

1250	1251	1252	1253	1254	1255	1256
1 <input type="checkbox"/>	2 <input checked="" type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>	7 <input type="checkbox"/>
(CP01)	(CP02)	(CP03)	(CP04)	(CP05)	(CP06)	(CP07)

CONFIGURATION MANAGEMENT BOARD APPROVALS

Signatures

	Agree with the Change	Disagree with the Change	Date
Senior Program Manager:			10-31-12
Deputy Program Manager:			10/31/12
PM Project Services:			31 OCT 12
PM Project Development/Delivery:			10/31/12
SFMTA O & M Manager:			
SFMTA Safety and Security			
SFCTA PMO			31 OCT '12

Comments

Contingent on CMOD PACKAGE TO INCLUDE EVIDENCE FROM ALL UTILITIES THAT COST ARE REIMBURSABLE TO SFMTA THRU THE FORM B PROCESS

TREND NUMBER 77

SFMTA Contract No. 1251
 UNION SQUARE/MARKET STREET STATION
 UTILITIES RELOCATION

Contractor: Synergy Project Management Inc.
 30 Grant Street, Suite 300
 San Francisco, CA 94108

**SUPPLEMENTAL CHANGE ANALYSIS
 (FOR CMB APPROVAL)**

SCOPE OF WORK:

Compensate the contractor for additional work due to differing conditions encountered during the installation of Qwest, TCG and UCCO infrastructure. A summary table of Force Account Reports (FARs) compensated under this Contract Modification is attached for reference. The general scope of work includes demolition of existing ductbank and tying new conduits to their respective vaults.

REASON FOR CHANGE:

An existing duct structure that is not shown in the plan is in conflict with the new conduit alignment. The tie-in work as requested by the private utility owners is considered additional work as this scope was not in original contract.

Note: The utility owners associated with the changes contained herein (Qwest, TCG and UCCO) are aware of the costs associated with the additional work contained herein. The SFMTA Resident Engineer is in the process of securing a Form B reimbursement agreement letter from the aforementioned utility owners.

COST SUMMARY TABLE:

Description of Additional Work	Contractor's Cost Proposal	Forecasted Cost:	Trended Amount
Synergy FAR Cost (Items 1-7):	\$23,741.40	\$20,442.40	
PEC FAR Cost (Items 8 and 9):	\$21,001.57	\$21,001.57	
TOTAL:	\$44,742.97	\$41,443.97	\$45,000.00

COST ANALYSIS:

Each of the FARs submitted by the Contractor was thoroughly reviewed by the SFMTA Resident Engineer. After this comprehensive review it was determined that the final compensation value of these items will be \$41,443.97 as shown in the Cost Summary Table.

Approval of the Contract Modification cost contained herein will allow the Resident Engineer to conduct final negotiations with the Contractor which in turn will facilitate the compilation and execution of a Contract Modification.

SCHEDULE ANALYSIS:

This work does not impact the Substantial Completion Date. There is no time adjustment associated with this Contract Modification.

SUMMARY TABLE FOR TREND 77














SFMTA Central Subway Contract Number 1251 - Union Square/Market Street Station Utilities Relocation

Item #	FA #	Description	Synergy Requested Amount	SFMTA Current Approved Amount	Forecasted Final Amount	Outstanding Cost Differences
1	2386	Geary (East) excavation production of joint trench to UCCO, QWT, and TCG is impacted by an (E) duct structure. Started demo of (E) duct structure and also backfill joint trench to PG&E 573 in order to install joint trench and boxes of UCCO, QWT, and TCG.	\$8,134.57	\$6,354.28	\$6,354.28	\$0.00
2	2396	Geary (east) excavation production of joint trench to UCCO, QWT, and TCG is impacted by an (E) duct structure. Started demo of (E) duct structure.	\$8,155.42	\$4,439.63	\$6,454.78	\$2,015.15
3	2397	Geary (east) excavation production of joint trench to UCCO, QWT, and TCG is impacted by an (E) duct structure. Started demo of (E) duct structure.	\$1,843.54	\$4,966.45	\$4,966.45	\$0.00
4	2515	Market and Stockton - Phoenix Electric performed conduit tie-in work for utilities. 16 conduits for Qwest, 8 conduits for TCG and 1 conduit for UCCO.	\$898.50	\$271.09	\$271.09	\$0.00
5	2523	Market and Stockton - Phoenix Electric worked OT after 3:30PM to perform conduit tie-in work for utilities.	\$2,002.76	\$1,338.03	\$1,338.03	\$0.00
6	2529	Market and Stockton - Phoenix Electric performed conduit tie-in work for utilities. 16 conduits for Qwest, 8 conduits for TCG and 1 conduit for UCCO.	\$1,194.00	\$304.50	\$414.22	\$109.72
7	2530	Market and Stockton - Phoenix Electric worked OT after 3:30PM to perform conduit tie-in work for utilities.	\$1,512.61	\$643.55	\$643.55	\$0.00
SYNERGY FAR SUBTOTAL			\$23,741.40	\$18,317.53	\$20,442.40	\$2,124.87
8	PEC QWT	Combined costs for SPM Subcontractor (Phoenix Electric Company) related to Qwest infrastructure additional work	\$12,533.42	\$12,533.42	\$12,533.42	\$0.00
9	PEC TCG	Combined costs for SPM Subcontractor (Phoenix Electric Company) related to TCG infrastructure additional work	\$8,468.15	\$8,468.15	\$8,468.15	\$0.00
PHOENIX ELECTRIC FAR SUBTOTAL			\$21,001.57	\$21,001.57	\$21,001.57	\$0.00

	Synergy Request Amount	SFMTA Current Approved Amount	Forecasted Final Amount	Trended Amount
TOTAL CONTRACT MODIFCATION VALUE	\$44,742.97	\$39,319.10	\$41,443.97	\$45,000.00

CMB Change No.: CMB - 0082

Initial Implementing Change Control Procedure No.: 1251 - CMod Trend #47, 58, 76, and 78

GENERAL		
Proposed Change Sponsor:	M. Acosta	Received by CMB: <u>10/31/2012</u> (Date)
Affected Disciplines:	<u>Utilities</u> <u>Overhead</u>	
Impacts of Change	<ol style="list-style-type: none"> 1. Trend #47 - Enlarge Muni Vault 900A on Stockton between Post and Geary 2. Trend #58 - Additional streetlight conduit on 5th Street between Harrison and Bryant 3. Trend #76 - Adjustment to OCS on Mason Street 4. Trend #78 - Unforeseen conditions encountered during excavation of OCS poles along Mason and 5th Streets 	
Contract(s) Directly Affected by this Proposed Change:		
1250 1 <input type="checkbox"/> (CP01)	1251 2 <input checked="" type="checkbox"/> (CP02)	1252 3 <input type="checkbox"/> (CP03)
1253 4 <input type="checkbox"/> (CP04)	1254 5 <input type="checkbox"/> (CP05)	1255 6 <input type="checkbox"/> (CP06)
1256 7 <input type="checkbox"/> (CP07)		
CONFIGURATION MANAGEMENT BOARD APPROVALS		
<i>Signatures</i>		
	Agree with the Change	Disagree with the Change
Senior Program Manager:		
Deputy Program Manager:		
PM Project Services:		
PM Project Development/Delivery:		
SFMTA O & M Manager:		
SFMTA Safety and Security		
SFCTA PMO		
	Date	
	<u>10-31-12</u>	<u>10/31/12</u>
	<u>31 OCT 12</u>	<u>10/31/12</u>
	<u>31 OCT 12</u>	<u>31 OCT 12</u>
Comments		

TREND NUMBERS 47, 58, 76 AND 78

SFMTA Contract No. 1251
UNION SQUARE/MARKET STREET STATION
UTILITIES RELOCATION

Contractor: Synergy Project Management Inc.
30 Grant Street, Suite 300
San Francisco, CA 94108

SUPPLEMENTAL CHANGE ANALYSIS (FOR CMB APPROVAL)

SCOPE OF WORK:

Trend 47: Enlarge Muni Vault 900A on Stockton between Post and Geary

Trend 58: Additional streetlight conduit on 5th Street between Harrison and Bryant

Trend 76: Adjustment to OCS on Mason Street

Trend 78: Unforeseen conditions encountered during excavation of OCS poles along Mason and 5th Streets

REASON FOR CHANGE:

Trend 47: Contract plan JT-301 calls for an intercept vault to capture 1EA (E) Muni ductbank (DB) and install 2 sets of (N) ductbanks. There was not enough space to intercept and install (N) ductbanks so it was therefor decided to enlarge the intercept vault.

Trend 58: The existing streetlight pullboxes where new cables were supposed to be connected to per contract plan did not have power. New conduit needed to be installed from the power source per responses to RFIs 166 and 167..

Trend 76: Modify bracket arm at existing Pole #511 to alleviate tension load and bending of pole. Realign trolley wire on Mason between Geary and Eddy to smoothen transition when shifting from right lane to left lane. Also, add intermediate guywire to prevent excessive sagging of bracket arms at various locations.

Trend 78: Several obstructions, i.e. buried concrete, boulders, brick, abandoned utilities were discovered during excavation of OCS poles along Mason and 5th Street.

COST SUMMARY TABLE:

Trend Number:	Description of Additional Work Performed:	Contractor's Cost Proposal	Forecasted Cost:	Trended Amount
47	Muni Vault Enlargement	\$16,188.28	\$15,801.90	\$20,000.00
58	Additional Streetlight Conduit	\$17,754.36	\$17,754.36	\$14,740.94
76	Adjustment to OCS on Mason Street	\$14,987.73	\$14,987.73	\$15,000.00
78	OCS Foundations on Mason Street	\$27,644.84	\$27,644.84	\$30,000.00
TOTAL		\$76,575.21	\$76,188.83	\$79,740.94

COST ANALYSIS:

Each of the FARs/invoices submitted by the Contractor was thoroughly reviewed by the SFMTA Resident Engineer. After this comprehensive review it was determined that the final compensation value of these items will be \$76,188.83 as shown in the Cost Summary Table.

Approval of the Contract Modification cost contained herein will allow the Resident Engineer to conduct final negotiations with the Contractor which in turn will facilitate the compilation and execution of a Contract Modification.

SCHEDULE ANALYSIS:

This work does not impact the Substantial Completion Date. There is no time adjustment associated with this Contract Modification.

SUMMARY TABLE FOR TRENDS 47/58/76/78

SFMTA Central Subway Contract Number 1251 - Union Square/Market Street Station Utilities Relocation

Item #	Index #	FA #	Description	Synergy Requested Amount	SFMTA Current Approved Amount	Forecasted Final Amount	Outstanding Cost Differences
	1.1	3198	Excavate for Muni vault 900 A @ Stockton St. Work around (E) utilities not shown on contract drawings.	\$1,550.32	\$1,067.32	\$1,399.91	\$332.59
	1.2	3202	Remove existing sheeting and reinstall due to incorrect USA markings. Muni vault 900A located on Stockton, north of Maiden Lane.	\$4,260.65	\$4,266.84	\$4,266.84	\$0.00
	1.3	3206	Muni vault 900A on Stockton was increased to capture new and existing conduits. The vault was increased by about 50% in width.	\$2,401.67	\$2,159.51	\$2,159.51	\$0.00
	1.4	Muni 900A	Extra work for 2' increase in vault width (includes rebar, concrete, frame/cover, restoration, falsework and steel plates)	\$7,975.64	\$7,975.64	\$7,975.64	\$0.00
<i>Trend No. 47 Subtotal</i>				\$16,188.28	\$15,469.31	\$15,801.90	
	2.1	PEC SL CONDUIT	Additional streetlight conduit on 5th Street between Harrison and Bryant	\$17,754.36	\$17,754.36	\$17,754.36	\$0.00
<i>Trend No. 58 Subtotal</i>				\$17,754.36	\$17,754.36	\$17,754.36	
	3.1	REI OCS ADJUST	Adjustment to OCS on Mason Street	\$14,987.73	\$14,987.73	\$14,987.73	\$0.00
<i>Trend No. 76 Subtotal</i>				\$14,987.73	\$14,987.73	\$14,987.73	
	4.1	PEC OCS POLES	Unforeseen conditions encountered during excavation and installation of OCS poles along Mason and 5th Streets.	\$27,644.84	\$27,644.84	\$27,644.84	\$0.00
<i>Trend No. 78 Subtotal</i>				\$27,644.84	\$27,644.84	\$27,644.84	

	Synergy Request Amount	SFMTA Current Approved Amount	Forecasted Final Amount	Trended Amount
<i>Trend Numer 47 Subtotal</i>	\$16,188.28	\$15,469.31	\$15,801.90	\$20,000.00
<i>Trend Numer 58 Subtotal</i>	\$17,754.36	\$17,754.36	\$17,754.36	\$14,740.94
<i>Trend Numer 76 Subtotal</i>	\$14,987.73	\$14,987.73	\$14,987.73	\$15,000.00
<i>Trend Numer 78 Subtotal</i>	\$27,644.84	\$27,644.84	\$27,644.84	\$30,000.00
TOTAL CONTRACT MODIFCATION VALUE	\$76,575.21	\$75,856.24	\$76,188.83	\$79,740.94

FINDING OF FACTS

Contract No. & Name	1252 - Tunnels	Date	10/24/2012
PCC No & Title	1252-06		
Initiator (Name & Dept)	Jane Wang, SFMTA		

What (Description of PCC) Supplemental instrumentation of BART tunnel lining.
Why (Reason for Requesting PCC) Implement recommendations made by IRP and BART and satisfy BART's design review comment. <ul style="list-style-type: none"> A. BART Requested Bolt Analysis <ul style="list-style-type: none"> 1. CS analysis showed tunneling below BART does not overstress bolts 2. BART requested confirmation of existing loading of bolts before tunnel crossing and stipulated in Cooperative Agreement. (Cooperative Agreement Section 8.3, IRP Recommendation #9 – see attached) 3. SFMTA performed feasibility of test method (Marvin Manufacturing) 4. This change implements test method/procedures B. Independent Review Panel Recommended Bolt Force Sensor at BART Tunnel Crown <ul style="list-style-type: none"> 1. BART and SFMTA jointly commissioned APTA to convene an IRP 2. IRP recommended additional monitoring at locations with concentration at the hogging moment positions (tunnel crown). (IRP Recommendation #34 – see attached) 3. This change implements the IRP Recommendation C. BART Requested Rail Movement under Dynamic Train Loading <ul style="list-style-type: none"> 1. BART requested additional monitoring to measure track deflection under dynamic train loading during the tunnel crossing. (CFR Comment No. CS1 – see attached)
Where (Location, Station) BART Tunnels as shown in Figure 2.
When (Occurrence date, action date, potential time impact) Monitoring instrumentation must be approved by BART, installed, and the bolt pretension load confirmed prior to the commencement of tunnel crossing under BART tubes.
How (Recommendation of Action) To be implemented as part of Tunnel instrumentation work.
Estimate (Summary of Engineer's Estimate w/EE attached) TBD
Spec Ref 31 00 15
Drawing Nos PB-313, BP-316, Figures 2 and 3
The Contractor's proposal in price and time is required on the following proposed contract change to the subject contract in accordance with the General Provisions Section 75.1.B within 14 days after receipt of a PCC.

Prepared by:   

Matthew Fowler / Jane Wang
SFMTA Representative

Date

	IRP DRAFT PEER REVIEW COMMENTS AND RECOMMENDATIONS (Draft Report, August 18, 2011)	IN EFFECT	CONCUR	WILL CONSIDER	NOT FEASIBLE / REJECT	CONCURRENCE OR ACTION BY BART	SFMTA COMMENTS
1	If possible, to increase 7.5 ft separation between tunnels, SFMTA should consider redesign of the vertical alignment to minimize risk. If not consider alternate method of compensation grouting (see below).				X		The current tunnel profile and alignment balances UMS station design considerations (platform depth, escalator placement and concourse layout) with tunnel layout objectives of providing separation to the BART tunnels and keeping vertical curves outside of horizontal curves. Holding the UMS platform depth and introducing vertical curves south of the station to further deepen the tunnels under BART would require vertical curves be placed within the horizontal curves which would make for more difficult TBM steering and increased risk while tunneling under the BART tunnels.
2	Further assessment of soil behavior beneath BART is encouraged relative to the mechanics of soil deformation above the overcut zone. Specific concerns would be the progressive movement of the loosened zone up to the BART tunnels as well as the potential for creation of a small void under the BART tunnels and any consequences therefrom.	X					The FLAC SSI model employs a Mohr Coulomb strength criterion for the soil. Non elastic yielding (loosening) is predicted to develop at the excavation boundary of the Central Subway tunnels as the boundary stresses are released by the TBM excavation process. Moving away from the new tunnel openings the loosening progressively changes to a reduction in compressive stresses. The compensation grouting is designed to arrest the upward propagation of the predicted loosening.
3	Also related to the soil behavior is the potential effect of the installation of the compensation grouting pipes and the potential loss of ground and need for early installation of the BART Tunnel instrumentation. They were also concerned about the soil behavior upon being grouted.		X				Compensation grouting specification (Section 31 43 14) requires pre-treatment grouting through each of the compensation grouting pipes to fill voids and tighten up ground loosened by the pipe installation. Contractor work plan and schedules for grouting and instrumentation placement will be coordinated at time of review to confirm a sequence that results in full instrumentation is installed in BART tunnels before start of compensation grouting pipe placement.
4	Additional 3-D analyses are recommended to assess the bolt loads		X				Additional analyses were previously performed as requested to assess sensitivity of calculated longitudinal stiffness to assumed preload force in bolts and transmitted to BART. Refer to PB Telamon CS-155-1 Transmittal 0608 7/22/2011
5	Further clarification was requested for modeling of the bouyancy effects and how variations in interface slip (between lining and soil) characteristics affect the tunnel.		X				Bouyancy is explicitly considered in FLAC model. Occurs upon excavation when density of material contained within excavation boundary is set to zero density. <u>Information on interface elements used for exterior of BART tunnel lining will be provided.</u>
6	There was request to reconcile the modeling with experience and other constraints existing at this specific site. Recommended getting as-builts and construction records of Powell St Station and the tunnels.	X					Model was calibrated against surface settlement measurements that were obtained during construction of the BART and Muni Metro Tunnels and reported in the 1972 RETC paper by Tom Kuesel.
7	The IRP requested a copy of any BART reports providing any evidence of bolt fatigue for the BART System				X		Comment is for BART to respond.
8	The IRP requested the SFMTA to comment on the likelihood of bolt fatigue occurring over the lifespan of the system		X				Cyclical changes in bolt loads at circumferential joints caused by settlement of tunnel under weight of passing trains that would lead to fatigue in bolts are considered highly unlikely. Properly placed compensation grout under the BART tunnel linings should result in full contact with soil and similar tunnel flexural response to passing trains no different than occurs <u>anywhere else.</u>
9	It was recommended that the load should be determined on a selected sampling of 10 to 12 bolts to check the level of preload to establish initial conditions and confirm assumption made in the analyses.				X		SFMTA does not object to testing bold loads and recommends this effort be performed by the owner of the structure.
10	It was recommended to keep the design overcut to the minimum and it was determined that this should be a high priority early discussion with the contractor	X					TBM Specification (Section 31 71 19 Article 2.01B) requires that minimum overcut be used as required to produce minimum overexcavation. Overcut to be reviewed closely when reviewing contractor submittals for TBM

	IRP DRAFT PEER REVIEW COMMENTS AND RECOMMENDATIONS (Draft Report, August 18, 2011)	IN EFFECT	CONCUR	WILL CONSIDER	NOT FEASIBLE / REJECT	CONCURRENCE OR ACTION BY BART	SFMTA COMMENTS
11	The IRP recommended that extra attention should be given to the shield gap injection system and annular tail void grouting system	X					TBM Specification (Section 31 71 19 Article 2.01L) requires continuous injection of pressurized bentonite outside shield into overcut annulus.
12	It was noted that the design of the TBM should be compatible with changes in operation needed for control at the BART undercrossing	X					TBM capabilities deemed important for BART undercrossing include steering, guidance, thrust control, automated monitoring and logging (torque, thrust, face pressure, etc.), tailskin grouting, and bentonite injection; all are explicitly addressed in the TBM performance specifications.
13	The IRP noted that the TBM guidance system and surveys must be failsafe	X					Concur. Requirements for state of art systems are in place in specifications.
14	It was recommended that all cutter changes and other maintenance be conducted prior to the BART undercrossing	X					Contractor is required in Section 31 71 19 to submit TBM maintenance plan. Jet grouted soil plugs to be installed for Moscone headwalls and Cross passage 5 provide logical locations for planned cutterhead maintenance. CM Team will review contractor TBM excavation and maintenance plans and schedules.
15	With regard to utilities the IRP recommended that we collect and assess data on ages, sizes and types of all water and gas pipelines	X					Condition and pipe material information has been provided for all water-carrying lines. Also, acoustic water main leak detection systems are required to be installed on all major water lines (Section 31 09 13 Geotechnical Instrumentation and Monitoring).
16	They recommended that we perform a condition assessment of water and gas pipelines and implement any identified protective measures. They would like some further clarification as to what protection and monitoring of the MWSS and gas pipelines will be performed.	X					See No. 15 above
17	The IRP recommended a test program for compensation grouting to demonstrate the accuracy and effectiveness of the installation of the grout pipes		X				Contractor will be requested to provide case history proof of other projects in similar ground where grout pipes have been installed to the accuracy required here.
18	They indicated that we will need to precisely control and document the as-built location of the grout pipes	X					Noted and concur. Section 31 43 14 Article 1.06A3j
19	They recommended analyzing and defining the minimum distance from the BART invert for pressurized grouting and also define the max/min pressures	X					Compensation grouting specification (Section 31 43 14) contains criteria to stop grouting if movement in excess of 1/8 inch is detected in structure being protected. Contractor work plan and schedules for grouting
20	The IRP requested that we have a specification section specifically addressing the BART Tunnel compensation grouting		X				Current specification contains requirements expressly intended to address conditions at BART tunnel. Will make BART crossing a specific topic that must be thoroughly addressed in contractor submittal of Operations / Workplan (Article 1.06A4)
21	With regard to instrumentation the IRP identified that smooth operation and controls are needed for the Construction Monitoring Task Force (CMTF)	X					Concur. IRP must define well in advance for CMTF what instruments they want to see reported and how the data should be presented to facilitate the required fast decisionmaking and response from the IRP. See SP-6 and Section 31 09 15 Article 3.01B5.
22	The IRP recommended that the highest level of experience is needed for the owner's rep on the CMTF. Also recommend setting high goals for TBM experience and workmanship.	X					Concur. To be implemented by SFMTA.
23	The IRP recommended that good communications are essential between the owner's rep and the design team on the CMTF	X					Concur. Specifications require CMTF to meet daily while tunneling is underway.

	IRP DRAFT PEER REVIEW COMMENTS AND RECOMMENDATIONS (Draft Report, August 18, 2011)	IN EFFECT	CONCUR	WILL CONSIDER	NOT FEASIBLE / REJECT	CONCURRENCE OR ACTION BY BART	SFMTA COMMENTS
24	Panel recommends that in addition to the current required instrumentation that a fiber optic strain measuring system based on Brillouin optical fibre optic time domain reflectometry (BOTDR) be added.			X			Instrumentation for BART tunnels (prisms surveyed by automated theodolite and tilt beams) included in contract as bid are proven methods and are considered adequate for the intended purpose of real-time monitoring of the position and shape of first and foremost, the BART rails, and second, the BART tunnel linings.
25	The IRP recommended two more MPBX's on 4th St near Stevenson and one more at Market and 4th as well as 3 to 4 surface settlement Type B points		X				Likely possible to relocate from other locations.
26	They recommended a revised alert level of 3/8 to 1/2 of an inch for settlement of the BART Tunnels			X			Pay item for grouting allows grouting to be implemented sooner at lesser magnitudes of detected settlement.
27	They said that trigger levels under the current 1 1/2 inch level could result in more leakage into the BART Tunnels but that this could be remedied			X			Noted. Other settlement criteria based on track deformation (mid ordinate offset) will likely govern and take effect before total deformation trigger level is reached. See above comment #26.
28	They recommended a more detailed study of the alert and trigger levels to rationalize the current specified levels			X			Alert and trigger levels are based on deformation tolerances established for Muni Metro Turnaround (MMT) project constructed in 1995. We can follow up with details on relationship between various deformation criteria. See also Comment #26.
29	They recommended continuous tunnel operations at the zone of influence of the BART undercrossing. Any long unavoidable stoppage procedures should be ready to be executed to minimize changes to the stress regime at the face and around the circumference of the tunnel	X					Included in TBM Specification Article 3.03 G. Will be reiterated when reviewing contractor excavation plan and schedules.
30	A contingency plan is required for exceeding the trigger levels	X					Required submittal under TBM Specification 31 71 19 Article 1.07A2o: "Work Plan for tunneling under Market Street Tunnels including contingency measures and interface of tunneling with compensation grouting Contingency plan is a required submittal."
31	They said that it would be highly advantageous to perform soil monitoring through the BART Tunnels inverts to improve decisions on the alert and trigger levels				X		Risks, costs and impacts of drilling through the invert of the BART tunnels solely for soil monitoring purposes are considered to outweigh any benefits of direct reading of deformations or pressures in soil below BART tunnels.
32	There is a need for redundancy in instrumentation in the BART Tunnels	X					Current design calls for prisms (15 arrays of 4 prisms each) in each tunnel read by a motorized total station in each tunnel. Prisms can be read manually if required. Separate system based on tilt beams read by data logger also is required. Redundancy is provided through having the two systems combined with the ability to employ manual surveying methods if required.
33	They recommended that the BART Tunnel instrumentation be installed prior to compensation grouting pipe installation		X				Scheduling matter that likely can be effected in discussions with Contractor
34	We should instrument tunnel bolts in the crown with load washers at 10 to 12 locations with concentration at the hogging moment positions. Further recommend to perform installations and measurements in a lab setting before making measurements in the BART Tunnels			X			Will investigate availability of small diameter load cells that can be placed to measure bolt loads in circumferential joints. Systems would focus on predicted hogging moment locations in crown of each BART tunnel and would be read by same datalogger used for monitoring tilt beams.
35	The IRP recommended that we install a horizontal inclinometer as part of the compensation grouting pipe drilling program				X		Cost of in-place inclinometer is high compared to judged value of deformation information it would provide in vicinity of BART tunnels. Instruments in BART tunnel provide direct reading of position and shape changes that have the potential to affect BART train operations.

IRP DRAFT PEER REVIEW COMMENTS AND RECOMMENDATIONS (Draft Report, August 18, 2011)							SFMTA COMMENTS
		IN EFFECT	CONCUR	WILL CONSIDER	NOT FEASIBLE / REJECT	CONCURRENCE OR ACTION BY BART	
36	Recommend verification of the AMTS readings with a first order survey before and after passage of the TBM's using the same benchmarks		X				Will implement if suspicious or irregular movements are measured.
37	CMTF should provide regular updates to the SFMTA Management	X					Duty of CMTF is to keep owner, engineer and contractor apprised of effectiveness of TBM and TBM operations at minimizing ground settlements
38	An individual on the CM staff should be assigned to lead all components of the CMTF efforts	X					Will be reflected in CM staffing plan.
39	A decision flow chart should be created showing the interrelationships and decisions/actions necessary by the CMTF for a successful crossing. This should include a clear Go/No Go definition		X				Concur. CMTF will develop clear flow diagram for reference and use by all parties.
40	All staff involved in the crossing should be briefed on its criticality and trained and alerted to the potential consequences should problems go unnoticed or improperly corrected. Crews should be trained not just for their routine jobs but also for what to do when unusual circumstances arise.		X				Can be implemented by CM in concert with CMTF.
41	The TBM operations crews during the crossings must have operated the TBM's approach up 4th St		X				Will be implemented through discussions with Contractor and confirmed by CMTF.
42	Implement a systematic risk management approach to the training of crews			X			Will investigate.
43	Provide a quantitative measure of inflow variation and projected flows across the tunneled area for future development				X		Not related to tunnel contract (1252). Issue of blocking groundwater relate to UMS station.
44	Regarding potential effects of UMS Station on groundwater levels near Powell Station and on existing leakage, Panel recommends further evaluations and that BART and SFMTA work collaboratively to minimize impacts on existing and future facilities.				X		Groundwater monitoring has been underway since PE phase. Further monitoring and analyses of groundwater effects are being performed by UMS Station designers (Design Package 2.) Resolution of should be between BART and UMS station designers.
45	Recommend the use of an EPB Machine	X					Specification 31 71 19 requires use of a pressurized-face TBM, slurry or EPB. Latest indications are that the Contractor is planning to use EPB machines. Manufacturer is not yet known.
46	Would like additional sensitivity analyses to understand how variations in transverse and longitudinal stiffness affect BART tunnel performance and ground movement patterns in the vicinity of BART.		X				See comment No 4 above
47	Recommend that BART consider (allowing) compensation grouting through the invert of the existing tunnels					X	Further consideration by SFMTA of this recommendation is contingent on BART willingness for it to be considered.
48	Further explanations of numerical model to the IRP are recommended in regard to why the bolt loads will not exceed 28k and why the deformation loads won't be additive		X				Changes in the bolt load remain small until the external tensile forces in the joint exceed the preload. Additional explanatory information from prior meetings and discussions will be provided.
49	Accuracy of muck weighing methods is critical to minimizing loss of ground issues and said that it may be desirable to add specific instrumentation to enhance the ability to calibrate the muck measurement system	X					Specification 31 71 19 requires TBM be equipped with state-of-the-art weight/volume monitoring devices for real-time reporting of excavated volumes.

	IRP DRAFT PEER REVIEW COMMENTS AND RECOMMENDATIONS (Draft Report, August 18, 2011)	IN EFFECT	CONCUR	WILL CONSIDER	NOT FEASIBLE / REJECT	CONCURRENCE OR ACTION BY BART	SFMTA COMMENTS
50	If an alternate scheme of compensation grouting is adopted, such as grouting through the BART tunnel invert, then alert and trigger levels/BART operation/EPB operation/ and other protection measures will have to be reviewed to assure direct links and a coordinated, real-time response		X				Concur. See 49.
51	IRP would like to review and comment on the Contractor's TBM submittals to verify that they are compatible with analytical assumptions				X		TBM submittals will be thoroughly review by RE and designers for compliance with specifications and agreed recommendations made in the Peer Review Report.
52	IRP endorses the use of compensation grouting as the preferred method of protecting the BART tunnels instead of passive methods such as ground freezeng, underpinning, permeation grouting or forepoling.	X					Noted
53	Strongly recommend that the design team understand the drilling processes proposed for compensation grout tubes and the potential for ground loss and the installed accuracy of the tubes		X				Contractor will be asked to submit evidence/case histories where proposed drilling methods have been successfully applied under similar conditions and distances.
54	IRP would like to review current and future risk registers			X			Risk register for tunnel contract (CN1252) will be reviewed against agreed recommendations made in the Peer Review Report.
55	IRP recommends that once tunneling has started within the zone of influence it should continue on a 24/7 basis regardless if alert and trigger levels are exceeded in order to minimize additional loss of ground.	X					Specification 31 71 19 Article 3.03 currently requires " Tunneling work shall be continuous under Market Street Tunnels and below all buildings for which compensation grouting is specified without stoppage and without planned interventions."
56	Recommend interlocks on TBM equipment, for example between forward thrust and tail void grouting	X					Specification 31 71 19 Article 1.07 currently requires interlock system to prevent shield advance without backfill grouting.
57	During BART undercrossing need to have more than one or two sets of eyes reviewing and evaluating data	X					Noted. There are checks and balances built into the Contract Documents. Multiple members of the CMTF will be continuously monitoring the data. In addition, the IRP will be looking at the data collected at each of the four Tunnel Construction Review Points.
58	As-built elevations of the BART linings should be physically surveyed and checked to the same benchmark being used by the SFMTA.	X					The recently completed Condition Assessment and Survey of the BART Tunnels required the prior placement of survey benchmarks by the PMCM (Towill) on the Powell St Station Platform tied to the project cordinate system. These points were then used to extend survey control into the BART tunnels that confirmed the position of the BART tunnels and will be available for the Contractor's use for instrumentation placement and to verify the final position of the BART tunnels and track.

BART / SFMTA CENTRAL SUBWAY PROJECT COMMENT / RESOLUTION FORM

Category: BART / SFMTA T-Third Street LRT Project Coordination
12/22/10, 3/24/11

Originated by: Pepe Vallenias for BART

Date: 7/10/09, 8/20/09,

Element: BART Closed Items list as of 5/19/11

Primary Party Responsible for Response: SFMTA

Response coordination by: J. Wang for SFMTA

Date: 5/19/11

Reviewer(s)' Comments				Response to Reviewer(s)' Comments				Reviewer's Concurrence w/Response (Initials)	Reviewer's Verification of Incorporation (Initials)	Status ² (by Originator)	Close Date (by Originator)
Comment No.	Comment By	Reference	Comment	Response By	Response	Response Code ¹	Response Date				
CS1	C. Sheppard		Track deflection under dynamic train loading must also be monitored. In addition to survey methods already agreed upon, the rails should be instrumented to continuously monitor track deflection under load. The output from this instrumentation must be available in real time.								
MB1	M Brown		Tunnel Alignment BART as-built information is not reliable, Actual field measurements and not as-builts must be used for design and monitoring program of BART tunnels at the MUNI crossing. An actual site survey of top of rail and alignment, on both rails of both tracks, at 15.5' intervals will need to be performed. Two base line measurements, taken at least one week apart should be done ahead of construction. Please perform survey of	W Neilson	This is the same as item 12 of BART's 5/1/08 letter with the exception that the 5/1/08 letter asked that the survey extend 200' each side of the areas being crossed. In CS Letter No. 0179, 5/30/08, SFMTA agreed to perform the surveys requested in item 12 of BART's 5/1/08 letter. If the desire is to now change the 200' of the 5/1/08 letter to 300', we would like to understand why the change to 300' is being	B		PV		Closed	7/14/2011

¹Response Code:

- A: Agree and will comply
- B: Discussion/clarification required
- C: Will investigate and comment
- D: Disagree for reasons noted; discussion may be required
- E: Other – See Response

²Status (Per Reviewer):

- O: (Open) Under review and/or discussion
- C: (Closed) Reviewer's concurrence with response "A" and/or "D" with Reviewer's verification of incorporation of "A" responses

PROPOSED CONTRACT CHANGE

Contract No.	1252 - Tunnels		Date
PCC No.	1252-06		
PCC Title	Additional BART Tunnel Instrumentation		

Description of PCC

1. Implement additional instrumentation of BART tunnel lining:
 - A. Existing bolt preload force – Determine the actual load in 12 bolts identified in Figure 2 in each tunnel (M1 and M2) for a total of 24 bolts. The bolts removed for testing shall be replaced with the longer bolt and load washer configuration shown in Figure 3.

BIH/WANG shall coordinate bolt load testing with bolt force sensor installation.

The method of measurement shall be as demonstrated in report by Marvin Manufacturing. Implement recommendation to utilize precision dimple instead of parallel, flat bolt end surfaces.
 - B. Bolt force sensor – Install 12 bolt force sensors at bolts identified in Figure 2 in each tunnel (M1 and M2) for a total of 24 bolts. Bolt force sensors shall be added using new A325 bolts, nuts, flat washers. (See Figures 3 and 4 for layout of instrumented bolt and sensor data.) Bolt force sensors shall remain and not be later removed. Wiring from sensors to datalogger shall be affixed securely to tunnel and removed at completion of tunneling for Contract No. 1252 to the limits requested by BART. Monitor the forces in bolts per contract requirements.
 - C. Rail movement under dynamic train loading – Install dynamic strain gauges (2 per rail, 8 per tunnel) at locations shown in Figure 2 in each tunnel (M1 and M2). Trigger for polling strain gauges on rapid cycle shall be automatic and based on detection of passing train. Monitoring shall occur in each of the BART tunnels at one location above each of the two CS tunnels (4 locations total) with monitoring only over the Central Subway tunnel being bored (one datalogger used for two applications).

Spec Ref Specification 31 09 15

Drawing Nos Figure 1 (BP-313, BP-316), Figures 2 and 3


The Contractor's proposal in price and time is required on the following proposed contract change to the subject contract in accordance with the General Provisions Section 75.1 B within 14 days after receipt of a PCC.

Recommended by

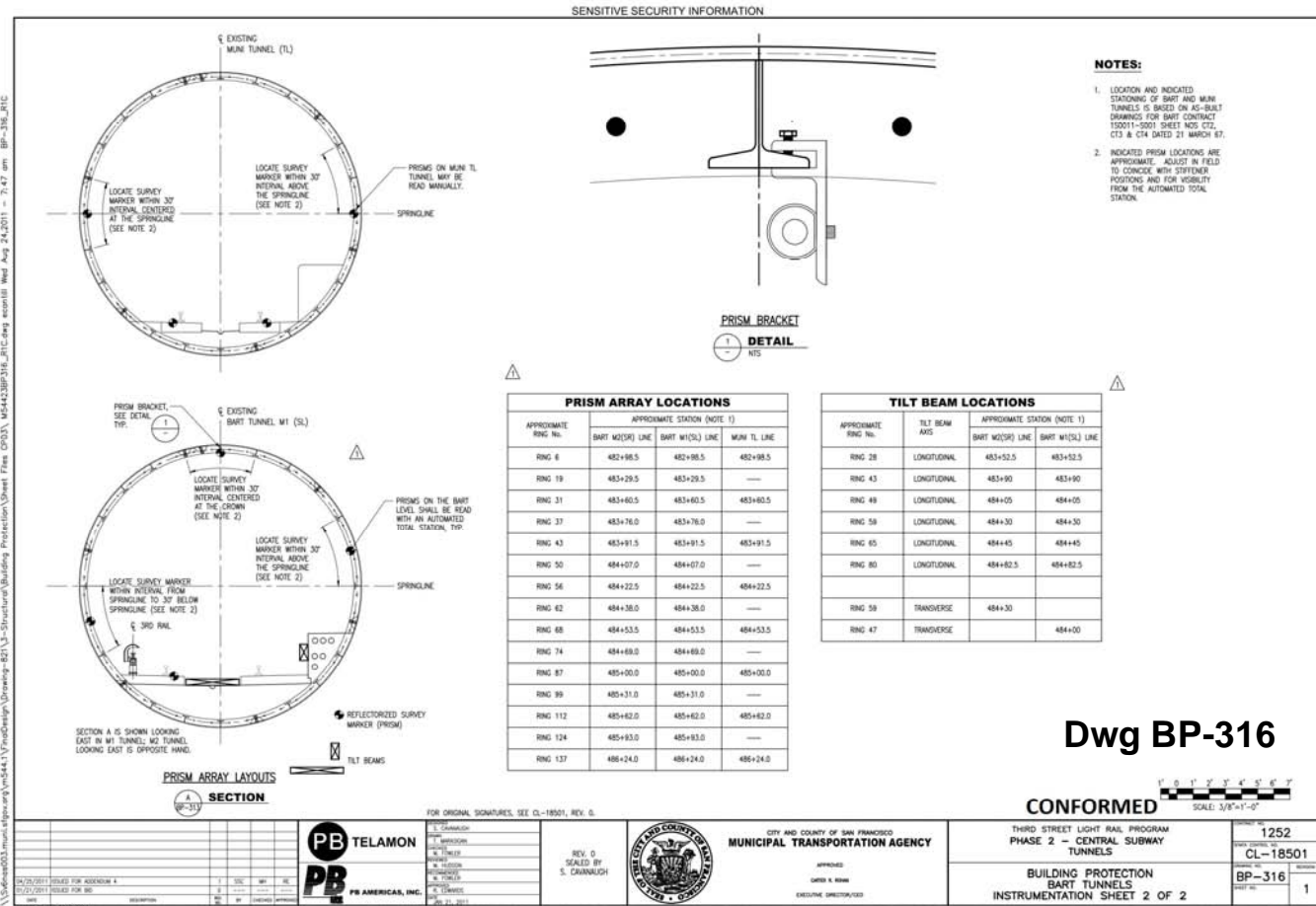
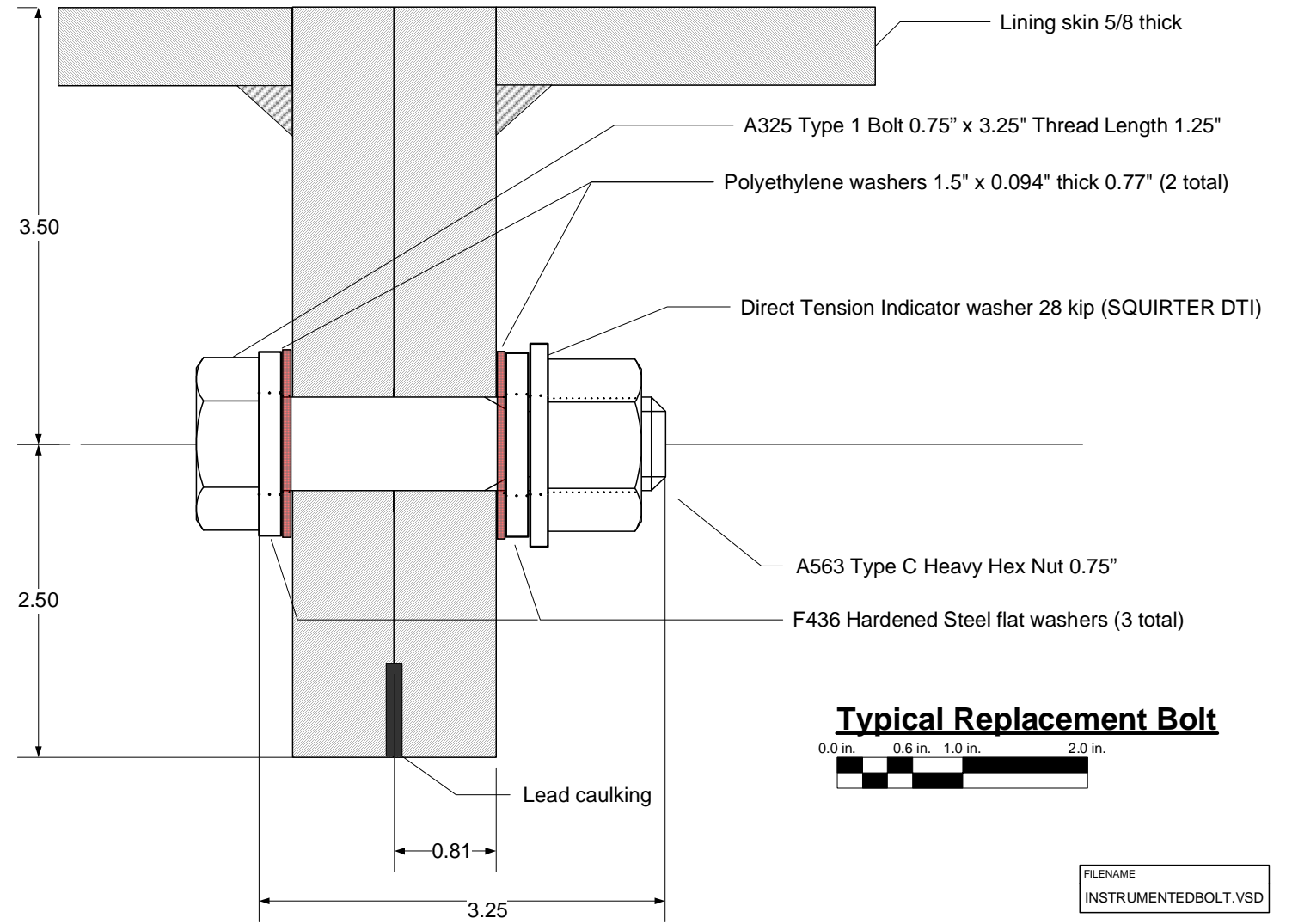
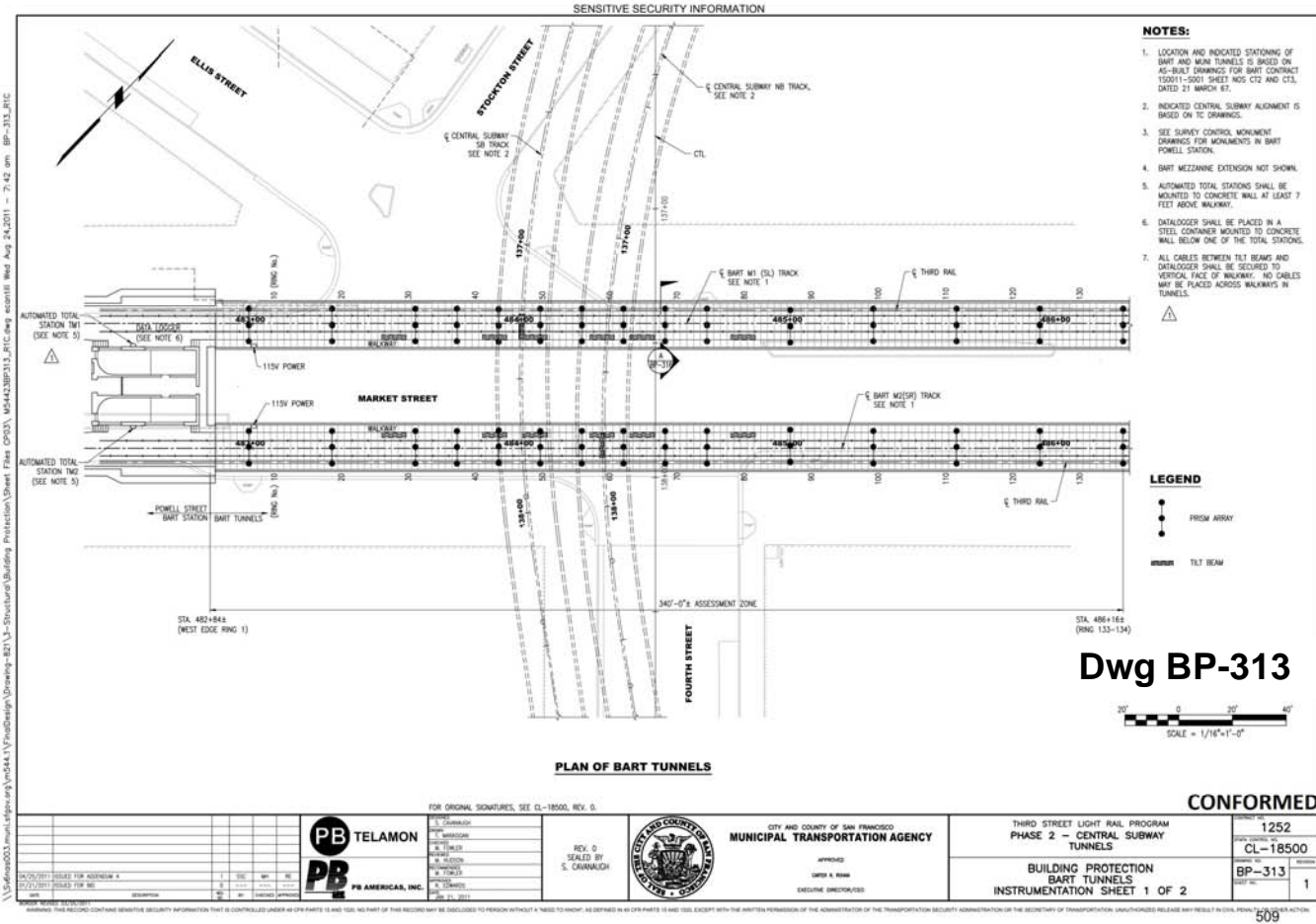

 Matthew Fowler, Jane Wang
 SFMTA Representative

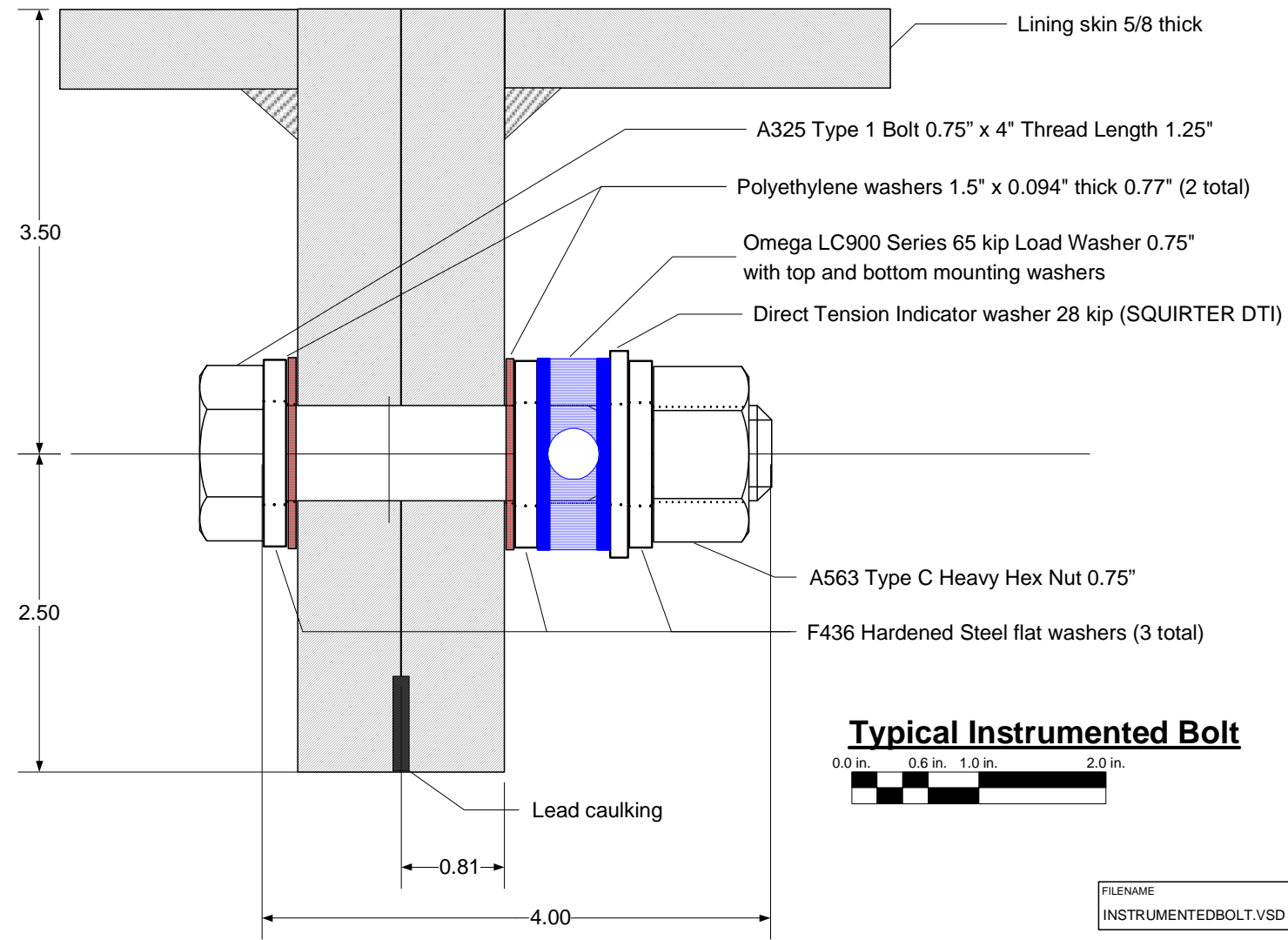
11/1/12
Date

Concur in Principle:


 Mark Benson, Construction Manager
 SFMTA Representative

11/1/12
Date





Notes:

1. Load washers to remain after completion of tunneling.
2. All wiring for load washers to be run to datalogger during tunneling and be removed (cut off at sensor or designated location) or preserved for future use, as directed by BART.

SFMTA Central Subway Project
Contract CN1252
Figure 3 — Instrumented Bolt Layout

BOLT SENSORS WITH MOUNTING WASHERS

STANDARD AND METRIC MODELS

LC900/LCM900 Series

Compression
 0-2000 lb to 0-100,000 lb
 0-10,000 N to 0-500,000 N

1 Newton = 0.2248 lb
 1 daNewton = 10 Newtons
 1 lb = 454 g
 1 t = 1000 kgf = 2204 lb



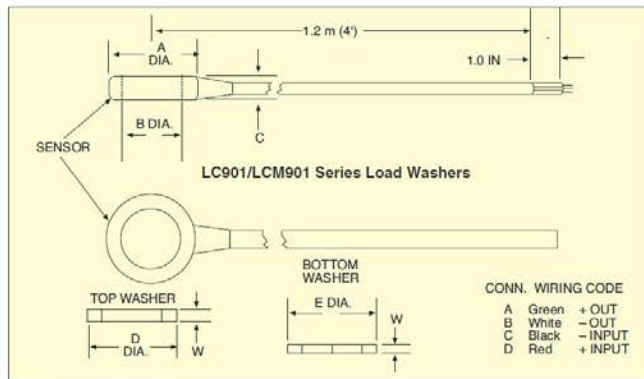
Starts at
\$290



OMEGA's LC900/LCM900 Series bolt force sensors are compression load cells designed to measure the clamping force of a bolt. With excellent long-term stability and all stainless steel construction, the LC900/LCM900 Series delivers high reliability in severe industrial environments. These units are designed to operate by mounting on a flat surface between 2 mounting washers (included).

SPECIFICATIONS

Excitation: 5 Vdc (10V max)
Output: 2 mV/V nominal
Accuracy: ±3.5% FSO linearity, hysteresis and repeatability combined
Zero Balance: ±4% FSO
Operating Temp Range: -54 to 93°C (-65 to 200°F)
Compensated Temp Range: 16 to 71°C (60 to 160°F)
Thermal Effects:
 Zero: ±0.018% FSO/°C
 Span: ±0.036% rdg/°C
Safe Overload: 130% of capacity
Ultimate Overload: 150% of capacity
Bridge Resistance: 120 Ω nominal
Construction: Stainless steel
Electrical Connection: 1.2 m (4') insulated shielded cable



Dimensions: mm (in)

SIZE	CAPACITY	BOLT SENSOR			WASHERS		
		A	B	C	D	E	W
STANDARD MODELS							
1/4"	2000 lb	25.4 (1.000)	6.76 (0.266)	4.75 (0.187)	19.1 (0.750)	25.4 (1.000)	1.57 (0.062)
1/2"	5000 lb	25.4 (1.000)	6.76 (0.266)	4.75 (0.187)	19.1 (0.750)	25.4 (1.000)	1.57 (0.062)
3/8"	10,000 lb	19.1 (0.750)	10.1 (0.396)	4.75 (0.187)	16.7 (0.658)	19.1 (0.750)	1.57 (0.062)
1/2"	30,000 lb	25.4 (1.000)	13.1 (0.517)	6.35 (0.250)	21.4 (0.844)	25.4 (1.000)	1.98 (0.078)
3/4"	50,000 lb	28.6 (1.125)	16.4 (0.644)	6.35 (0.250)	24.6 (0.968)	28.6 (1.125)	1.98 (0.078)
1"	65,000 lb	38.1 (1.500)	19.6 (0.770)	9.53 (0.375)	30.9 (1.218)	38.1 (1.500)	2.36 (0.093)
1 1/2"	100,000 lb	66.7 (2.625)	38.9 (1.533)	22.2 (0.875)	63.5 (2.500)	66.7 (2.625)	3.18 (0.125)
METRIC MODELS							

BOLT SENSORS WITH MOUNTING WASHERS

STANDARD AND METRIC MODELS

MOST POPULAR MODELS HIGHLIGHTED!

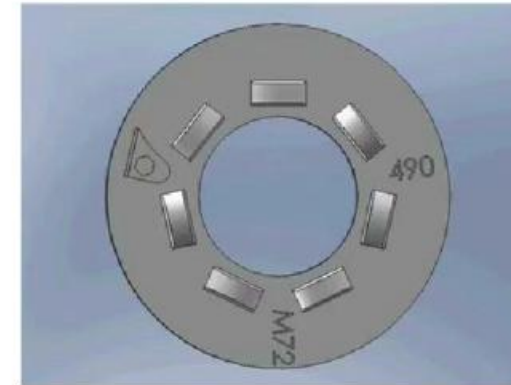
BOLT SIZE	CAPACITY lb	CAPACITY N	MODEL NO. STRIPPED ENDS	PRICE	MODEL NO. CONNECTOR END	PRICE	COMPATIBLE METERS**
STANDARD MODELS							
1/4"	2000	8897	LC901-1/4-2K	\$290	-	-	DP41-S, DP25B-S, DPIS
1/2"	5000	22,242	LC901-1/4-5K	290	-	-	DP41-S, DP25B-S, DPIS
3/8"	10,000	44,484	LC901-3/8-10K	290	-	-	DP41-S, DP25B-S, DPIS*
1/2"	30,000	133,452	LC901-1/2-30K	310	LC911-1/2-30K	\$335	DP41-S, DP25B-S, DPIS*
3/4"	50,000	222,420	LC901-5/8-50K	340	LC911-5/8-50K	365	DP41-S, DP25B-S, DPIS*
1"	65,000	289,146	LC901-3/4-65K	390	LC911-3/4-65K	415	DP41-S, DP25B-S, DPIS*
1 1/2"	100,000	444,840	LC901-1.5-100K	425	-	-	DP41-S, DP25B-S, DPIS*
METRIC MODELS							
6 mm	2248	10,000	LCM901-6-10KN	\$290	-	-	DPIS, DP41-S, DP25B-S
6 mm	4496	20,000	LCM901-6-20KN	290	-	-	DPIS, DP41-S, DP25B-S
10 mm	11,240	50,000	LCM901-10-50KN	290	-	-	DPIS, DP41-S, DP25B-S
13 mm	29,225	130,000	LCM901-13-130KN	310	LCM911-13-130KN	\$335	DPIS, DP41-S, DP25B-S
16 mm	44,962	200,000	LCM901-16-200KN	340	LCM911-16-200KN	365	DPIS, DP41-S, DP25B-S
19 mm	67,443	300,000	LCM901-19-300KN	390	LCM911-19-300KN	415	DPIS, DP41-S, DP25B-S*
38 mm	112,405	500,000	LCM901-38-500KN	425	-	-	DPIS, DP41-S, DP25B-S*
ACCESSORY							
MODEL NO.	PRICE	DESCRIPTION					
PT01F10-6P	\$24.50	Mating connector for LC911/LCM911 series load cells					

Comes complete with 2-point NIST-traceable calibration and 59 kΩ shunt data. * 4-digit meter. ** See section D for compatible meters.
Ordering Examples: LC901-3/8-10K, 10,000 lb capacity bolt sensor for a 3/8" Dia. bolt, with stripped ends on the leads, \$290.
 LCM901-10-50KN, 50 kN capacity bolt sensor for 10 mm bolt, with stripped ends on the leads, \$290.
 LC911-1/2-30K, 30,000 lb capacity bolt sensor for a 1/2" Dia. bolt with a connector installed on the cable, \$335. PT01F10-6P, mating connector (sold separately), \$24.50.
 LCM911-13-130KN, 130 kN capacity bolt sensor for 13 mm bolt with a connector installed on the cable, \$335. PT01F10-6P, mating connector (sold separately), \$24.50.



US & Canada: 1. 800. 552. 1999
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Squirter® DTIs



SQUIRTER® DTIs are DTIs with a flexible silicone embedded in the depressions under the bumps. To use them, simply ... Tighten the bolt until the calibrated amount of orange silicone appears from under the DTI's squirt locations, then stop tightening. **That's all there is to it.**

Now you can see when you're done.

SQUIRTER® DTI FEATURES:

- Easier & Better than Turn-of Nut**
 You don't have to remember to stop turning at 1/3rd, 1/2, or 2/3rds turn. No match marking necessary.
- Better than a Twist-Off Bolt**
 • Tension control rather than torque control.
- No splined end to twist off and become a safety hazard.
- No problems caused by the splined end shearing off in torsion before the plies are together.
- **Easier & Better than Calibrated Wrench**
 • You don't have to establish and then check the torque resistance of bolts daily and for each lot and when your wrench condition changes.
- **Works with All Bolt Lengths**
 • Even when the bolts are extremely short or long, SQUIRTER® DTIs show you when the correct tension has been achieved.
- **Saves Erector Time**
 • Enables correct tensioning as fast as the wrench can be moved to the next bolt, because the operator can see when to stop.
- **Establishes A Good Snug Point**
 • With SQUIRTER® DTIs, snug is partial bolt tightness without any or much silicone showing. The snug criteria becomes no squirt. The tight criteria becomes squirt.
- **Visual Low Tech Tension Indicator**
 • The orange silicone is easy for erectors to see. No feeler gage except during calibration.
- **Safe for Inspectors**
 • Once calibrated, because inspectors can easily see the orange squirts, they don't have to climb out to all the connections or lug around a torque wrench to know the connection has been completed. And instead of sampling only some of the DTI's with a feeler gage, Squirter® DTIs allow virtually 100% inspection.
- **Squirter® DTI's Approved**
 • SQUIRTER® DTIs are still made and certified to ASTM F959. FHWA pre-installation verification procedures, Research Council tests, and State DOT Quality Assurance procedures are unaffected.
- **Extremely High Bolt Tension Avoided**
 • Erectors know when to stop tightening. Some applications prefer bolts tightened over a minimum, but not too far over. SQUIRTER® DTIs enable previously unavailable control.

SFMTA Central Subway Project
Contract CN1252
Figure 4— Bolt Load Sensor Data Sheets



Report: Study of Bolt Test Specimen, Lab Procedures and Results

Central Subway Project.

Attn: Jenny Vodvarka, Finance Manager, CSP

References:

P. O. NO. : 2012.04.030

Specification for Feasibility Study of Bolt Test Specimen
Preparation Rev 1

Summary

The study proved that the machining and tension testing procedure can predict the tension force in existing high-strength bolt installations. Outlined below are background, test procedures and results, and recommendations for the execution of bolt pretension measurement.

Background

Special tools and procedures were developed to machine the bolt faces. Preparation of the mock up assembly, machining of bolt surfaces and measurement of bolt length was performed at Marvin Manufacturing in Concord, CA on 6/29/2012. Additional bolt testing was performed at the ISI materials lab in Berkeley, CA on 7/18/12.

Reference:

Report: List of machinery, tools and equipment and procedures used to prepare the bolt test specimen.

Test Procedures

Marvin Manufacturing, Concord, CA

1) The mock up assembly was prepared in accordance with the Specification. A $\frac{3}{4}$ " X $3\frac{3}{4}$ " A325 bolt, flat washers and 2H nut were installed at 3 locations under 28,000 lbs tension using a calibrated torque wrench. The bolt lengths were measured after machining at loaded and static conditions. **See Figures 1 and 2.**



Figure 1. Mock up assembly with installed bolt and machining fixture



Figure 2. Bolt length measured under load

See Table 1 for the summary of testing performed at Marvin Manufacturing.

Test Procedures

ISI, Berkeley, CA

1) Prior to the test, ISI discovered that the standard tensile test machine could not be used, even with modified tooling to hold the bolt assembly. The issue was that the extensometer, while having 50 millionths resolution, could not be reliably attached to the specimen. Under load, it became clear that some elongation was lost due to flex at the attachment points.

2) After deliberating on the subject, the team decided that the best approach was to use the Skidmore to measure the load, and tension the bolt with a wrench as done previously. A special caliper was constructed to fit around the body of the Skidmore to measure Delta L, the change in length of the bolt between loaded and static conditions. See Figures 3 and 4.

See Table 2 for the summary of testing performed at ISI.



Figure 3. Bolt tensioning using wrench, tension read by technician



Figure 4. Measuring bolt length under load using special caliper

3) The testing was successful. The specimens behaved predictably under load. Increased tension resulted in increased elongation approximately along a straight line plot.

Test Results

Table 1 Results of Testing at Marvin Manufacturing

Bolt ID	Bolt Load, P	Length, L1 (Loaded)	Length, L2 (Static)	Elongation, ΔL	Time when L2 at Measure
A	28 kips	4.1567 inch	4.1501 inch	0.0066 inch	12:00 pm
B	28 kips	4.1310 inch	4.1235 inch	0.0075 inch	11:00 am
C	28 kips	4.1498 inch	4.1424 inch	0.0074 inch	10:00 am

Note: All test specimens were installed in the mockup assembly at 9:00 AM

Table 2 Results of Testing at ISI

Bolt ID	Length, L1 (Static)	Length, L2 (Loaded)	Elongation, ΔL	Bolt Load, P
A	4.1484 inch	4.1550 inch	0.0066 inch	25.0 kips
B	4.1229 inch	4.1303 inch	0.0074 inch	27.0 kips
C	4.1203 inch	4.1278 inch	0.0075 inch	28.0 kips

Analysis

The initial data from the mockup test performed on 6/29/12 showed a deviation in Delta L from the mathematical model. Delta L decreased from bolt "B" to bolt "A" as the work commenced. During the course of testing, the ambient temperature increased from approximately 65 to 85 degrees F. ISI advised that any changes in environmental conditions can change the load on the bolts. While the exact mechanism involved is unclear, the consensus is that the deviations are primarily the result of a rise in temperature.

Fortunately, the issue has been addressed indirectly by developing tooling and procedures that will allow all mechanical testing to be done on site. Since the tunnel temperature does not vary more than a few degrees over a work shift, these thermally induced deviations will be a minimum.

Recommendations

The procedures and tooling developed for this project were sufficient to demonstrate proof of concept and meet the Specification; however, some further development is advised prior to deployment in the field.

Refine means and methods

1) The current methods work, but estimates indicate that only 3 bolts can be machined, removed, measured and replaced per shift (assuming 5 work hours per shift). Further development of means and methods of machining the bolt ends will expedite field bolt preparations. While a portion of the work is mobilization, it is possible to process more bolts per shift using improved tooling, or perhaps machining a different feature like a precision dimple instead of a flat.

Refine tooling

1) The prototype caliper for measuring bolt length was sufficient in a lab environment. The tools and methods of determining Delta L in the Skidmore need further development for field use because the mass and bulk of the caliper make measurements and calibration painstaking and consequently slow. The field tools should be light, stiff, and ergonomic, easily calibrated, and provide consistent, repeatable measurements,

2) A mobile work station is necessary to perform the mechanical testing functions on site. Development and construction of the station would be required prior to field deployment.



Report: List of machinery, tools and equipment and procedures used to prepare the bolt test specimen.

Central Subway Project.

Attn: Jenny Vodvarka, Finance Manager, CSP

References:

P. O. NO.: 2012.04.030

Specification for Feasibility Study of Bolt Test
Specimen Preparation Rev 1

Mockup Preparation

The mockup was fabricated according to the specifications, utilizing steel plate to create the features and simulated obstructions. Brackets were attached to allow positioning at points "A", "B", and "C".



Simulated shell plate, structural Tees and floor at location "C"

The bolts used were $\frac{3}{4}$ " X $3\frac{3}{4}$ " A325, black finish with standard washers and 2H nuts (Note: The bolt shown in the photos is not an actual test specimen. It is used solely for illustrative purposes.)

Prior to installation, a new bolt was installed in a Skidmore calibrator. The Skidmore is a precision hydraulic device which directly converts applied torque into lbs force tension on a direct-reading dial.



Skidmore calibrator

Follow these links for more information on the Skidmore.

[product manual](#)

[instruction manual](#)

A new unused test specimen was installed in the Skidmore. Using a precision click-type torque wrench, the bolt was tightened until 28KIPs was recorded on the dial. The expected torque required was approximately 350ft lbs. The torque wrench was incrementally adjusted over several attempts so that the “click” feature occurred on average at 28KIPs.

Note that while the torque wrench itself is calibrated, the actual torque required is not important, only the repeatability of the tool. Once the wrench is calibrated to the Skidmore at 28KIPs, the operator locks the wrench at that setting. Bolts are tightened until the wrench “clicks”, indicating that the wrench is applying the predetermined torque.

The bolts, washers and nuts were subsequently installed without lubrication at locations “A”, “B” and “C” using the calibrated wrench. The bolt heads were engraved prior to installation to aid in identification later.

Machining

Starting at position “C”, a precision bearing block was installed on the flange, aligned and secured using an array of set screws.

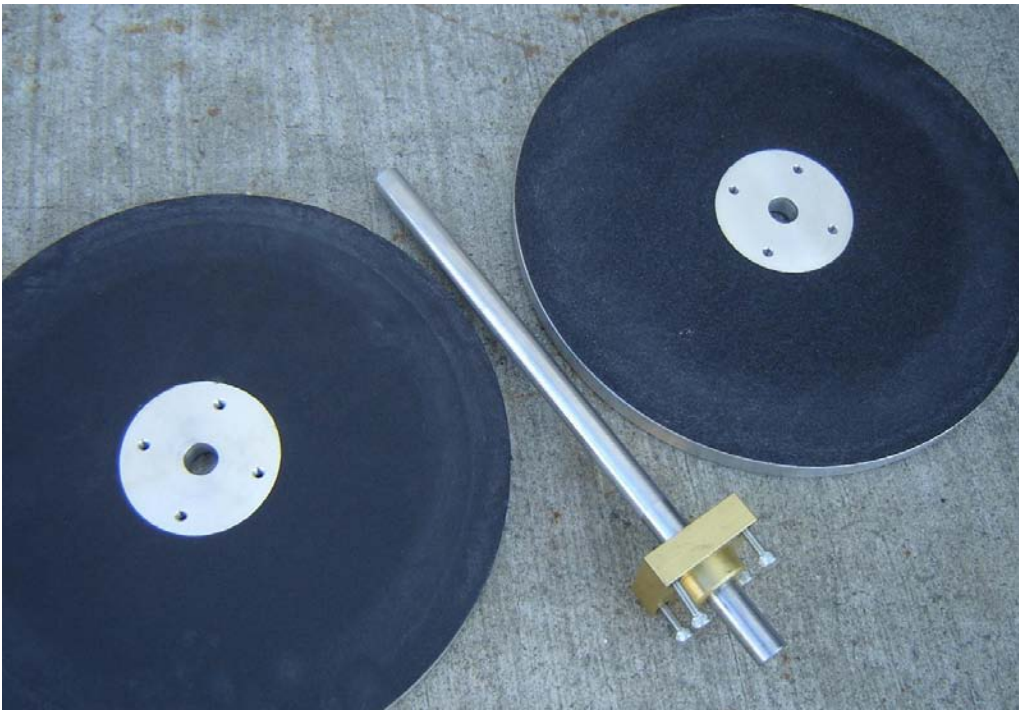
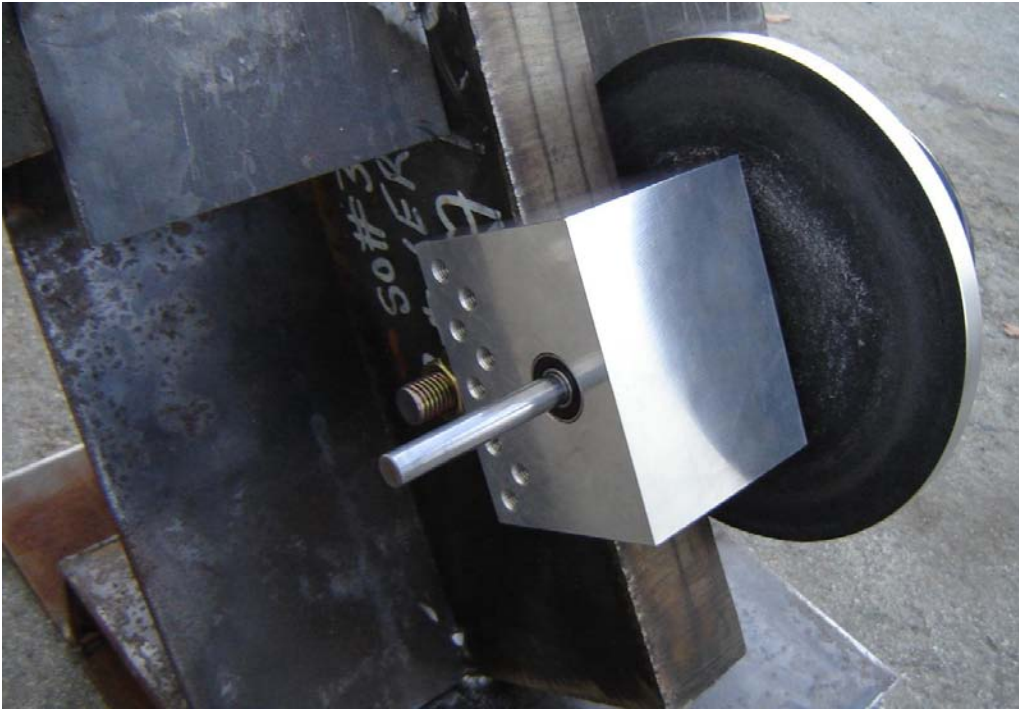


The bolts were initially prepared by flat filing by hand both the bolt head and threaded end to remove excess material.



Files, hones and wrenches

A precision arbor assembly with grinding disc was then installed.



Precision arbor assembly and discs



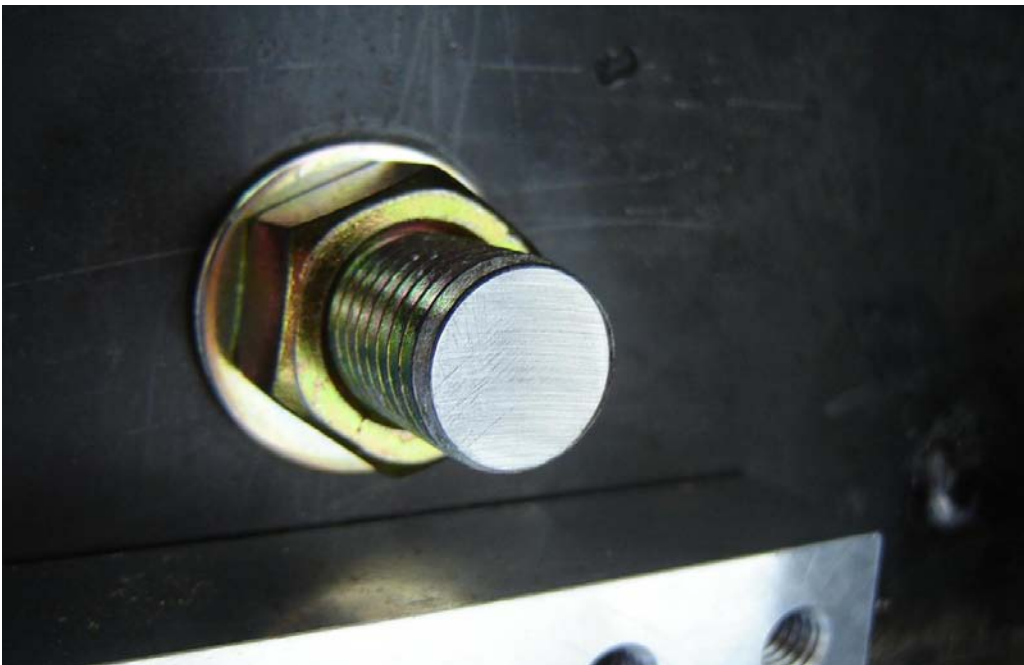
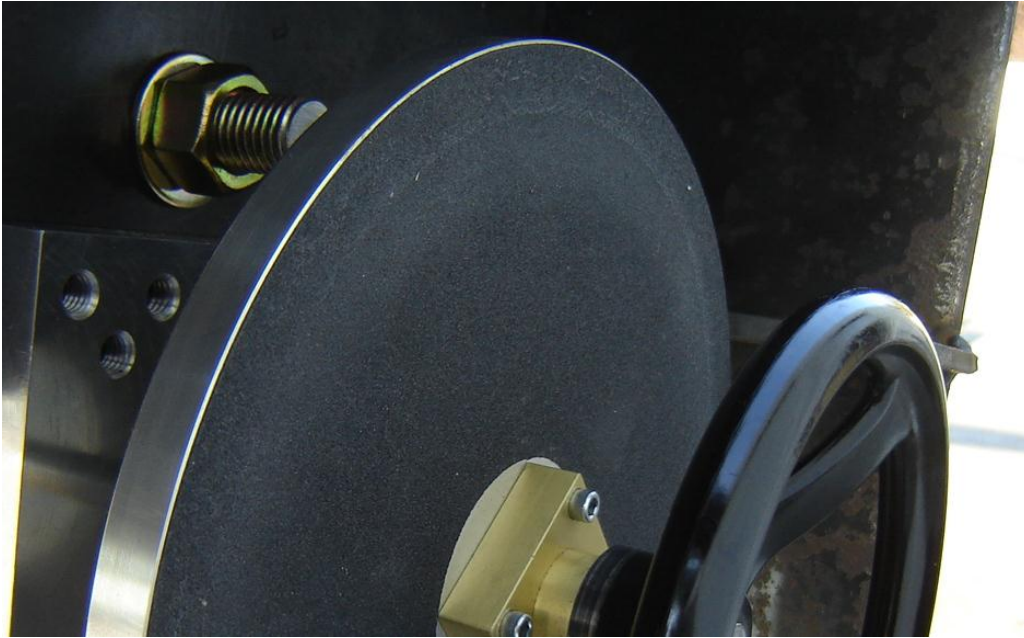
The disc was rotated by hand, removing material from the bolt head. Progress was monitored by periodically removing the arbor assembly for inspection. High spots were removed by flat filing to speed progress of the work.



High area indicated by metallic surface. Low spots are black

Once the high spots were eliminated, the grinding disc was reversed or exchanged for a finer grit to improve the surface finish.

The arbor was then removed and installed on the opposite side



Bolt end, mid process

The machining process is repeated, filing and exchanging discs until the surface meets the specification for finish. After passing a visual inspection, the arbor and bearing block were removed. Final dressing was done by hand using a diamond hone.

Gaging

A precision micrometer was used to measure the overall length of each bolt before and after removal.



The bolt length was recorded in place. The bolt was then removed and the length again gaged and recorded.



Micrometer being used to measure bolt length prior to removal

The procedure was then repeated at locations "B" and "A" to simulate work done in semi-overhead and overhead positions.



Bolt location "B"



Bolt location "A"

Conclusion

The machining fixtures, tooling, and machinist procedures produced results that met the test specifications for surface size, finish, and parallelism. Accurate measurements were achieved using the precision gages.

The time require to prepare a bolt (not including mobilization or gaging) is approximately 30-60 minutes. Additional equipment such as power drives and additional tooling and machinists could be used to speed work in a field environment.

Preliminary calculations indicate the measured change in length (approximately .007") is within range of mathematical models for elongation for a $\frac{3}{4}$ " A325 bolt under a load of 28KIPs. No compensation was made for thermal expansion due to changes in ambient conditions.

Exact data and additional lab work is the subject of a future report.

Grant Street Two-Way Conversion					
No.	Activity Name	DPT	BIHJV	Delta (BIHJV-DPT)	Explanation for Delta
1	Striping Installation (LME)	\$ 3,200.00	\$ 8,868.73	\$ 5,668.73	DPT Estimate does not identify removal or the striping being temporary
2	Traffic Signals (Labor)	\$ 24,160.00	\$ 16,189.80	\$ (7,970.20)	The differential between the appropriation of cost for labor versus material and equipment between activities No. 2 & 3 is most likely due to the lower cost that DPT can obtain signal equipment and material due to volume purchase in the city of San Francisco. DPT on the other hand may required more labor to perform the installation due to union work rules and practices.
3	Traffic Signals (Material / Equipment)	\$ 4,740.00	\$ 19,537.41	\$ 14,797.41	The differential between the appropriation of cost for labor versus material and equipment between activities No. 2 & 3 is most likely due to the lower cost that DPT can obtain signal equipment and material due to volume purchase in the city of San Francisco. DPT on the other hand may required more labor to performthe installation due to union work rules and practices.
4	Traffic Signs	\$ 1,200.00	\$ -	\$ (1,200.00)	Not identified seperately in BIHJV scope
5	Parking Meters	\$ 3,468.00	\$ -	\$ (3,468.00)	Not identified seperately in BIHJV scope
6	Engineering	\$ 2,216.00	\$ -	\$ (2,216.00)	The engineering costs of for new traffic control plans is excluded from the BIHJV estimate but noted as an option inclusion at \$350/sheet plus markup from the 1st Tier Contractor Level
	Total	\$ 38,984.00	\$ 44,595.95	\$ 5,611.95	Overall scope versus cost analysis indicates DPT can perform the same scope for a lower cost.

Ward, Beverly

From: Benson, Mark
Sent: Wednesday, July 18, 2012 11:01 AM
To: Ward, Beverly
Subject: Fwd: FW: COR #019
Attachments: 019 - COMPLETE package 120716.pdf

Include this with the 1252 Headwalls also.
Sent from my Verizon Wireless Phone
Mark,

The attached quote to perform the Grant Ave 2-way conversion was provided by BIH today per our request. I have performed only a cursory review due to the time sensitive nature of getting this issue before CMB on Wednesday. The total is \$44,600.

BIH did advise that should we wish to have City forces perform the traffic signal work instead of Phoenix Electric, they would be willing to cover the \$8,300 plus markup for striping as quoted (paint).

Regards,
Sarah

From: Jack Sucilsky [jack.sucilsky@barnard-inc.com]
Sent: Monday, July 16, 2012 5:27 PM
To: Wilson, Sarah H (SFMTA)
Cc: Hembd, Matthew; 'Ben Campbell'; 'Alessandro Tricamo'
Subject: COR #019

Sarah,

Attached is COR #019 – “UMS - Grant street 2 way conversion”. A hard copy of this COR was dropped off on Marlon’s desk earlier today and I also informed Matt H. that the COR was ready for his review. Earlier today Wilson informed me that some of the traffic materials carried a 2-3 week lead time which will make the decision of this COR critical to our schedule. Can you please expedite, to your best ability, a response to this COR so we can place the order for long lead materials as needed. Please let me know if you have any questions.

Thanks,



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Thanks,



PO BOX 78270
San Francisco, CA 94107

Phone: 415-546-0799
Fax: 415-546-3822

PROJECT: Contract 1252 - Tunnels

DATE: 7/16/2012

TO: SF Municipal Transportation Agency
821 Howard Street
San Francisco, CA 94103

REF: COR #019
UMS - Grant street 2 way
conversion

ATTN: Sarah H. Wilson

WE ARE SENDING:	SUBMITTED FOR:	ACTION TAKEN:
<input type="checkbox"/> Shop Drawings	<input checked="" type="checkbox"/> Approval	<input type="checkbox"/> Approved as Submitted
<input type="checkbox"/> Letter	<input type="checkbox"/> Your Use	<input type="checkbox"/> Approved as Noted
<input type="checkbox"/> Prints	<input checked="" type="checkbox"/> As Requested	<input type="checkbox"/> Returned After Loan
<input type="checkbox"/> Change Order	<input type="checkbox"/> Review and Comment	<input type="checkbox"/> Resubmit
<input type="checkbox"/> Plans		<input checked="" type="checkbox"/> Submit
<input type="checkbox"/> Samples	SENT VIA:	<input type="checkbox"/> Returned
<input type="checkbox"/> Specifications	<input checked="" type="checkbox"/> Attached	<input type="checkbox"/> Returned for Corrections
<input type="checkbox"/> Other:	<input type="checkbox"/> Separate Cover Via	<input type="checkbox"/> Due Date:

ITEM NO.	COPIES	DATE	ITEM NUMBER	REV. NO.	DESCRIPTION	STATUS
1	1	7/16/2012			BIH cover page	NEW
2	1	7/16/2012			BIH narrative	NEW
3	1	7/16/2012			Synergy Change Order Request	NEW
4	1	7/16/2012			Phoenix Change Order Request	NEW
5	1	7/16/2012			Phoenix - Traffic Signal Equipment Quotation	NEW
6	1	7/16/2012			CMC traffic quotation (Striping)	NEW
7	1	7/16/2012			SFMTA / DPT provided packet of drawings for estimating	NEW

Remarks: Attached is one (1) hard copy of Change Order Request (COR) #019 - UMS Grant Street 2 way conversion.

CC:

Signed:


Jack William Sucilsky



BARNARD IMPREGILO HEALY JOINT VENTURE

420 Fourth Street San Francisco, CA 94107, PH (415) 546-0799, FX (415) 546-3822

Third Street Lightrail Program Phase 2 - Central Subway Project
CONTRACT 1252

7/16/2012

COR 019: UMS - Grant Street 2 way conversion

AWSS Conflict - T&M Mark-up Summary

Direct Costs	Total
Labor	\$0.00
Labor Markup at Specified 15%	\$0.00
Equipment	\$0.00
Equipment Markup at Specified 15%	\$0.00
Materials	\$0.00
Materials Markup at Specified 15%	\$0.00
Other Items And Expenditures	\$0.00
Other Items And Expenditures Markup at Specified 15%	\$0.00
Subcontractors (Synergy/Phoenix)	\$33,436.11
Subcontractors (CMC Traffic Control)	\$8,300.00
Contractors Markup at Specified 5%	\$2,086.81
Total Project Costs	\$43,822.92
BIHJV Payment & Performance Bonds & Builder's Risk Insurance (1.68%)	\$736.22
Contractors Markup at Specified 5%	\$36.81
Total Bonds & Insurance costs	\$773.04
Total Amount	\$44,595.95



BARNARD IMPREGILO HEALY JOINT VENTURE

420 Fourth Street San Francisco, CA 94107, PH (415) 546-0799, FX (415) 546-3822

CHANGE ORDER REQUEST

**Third Street Light Rail Phase 2 – Central Subway Project
Contract No. 1252**

COR: 019

DATE: July 16, 2012

TITLE: UMS – Grant street 2 way conversion

Issues:

BIH and the SFMTA agreed that a full Stockton street closure at the UMS/Market street headwall work would benefit the 1252 project and ultimately the entire Central Subway program. In order for Stockton Street to be shut down completely, the DPT recommended that Grant Street be converted from an existing one-way street to a two-way street for vehicular traffic.

Impacts:

Synergy, Phoenix Electric and CMC Traffic Control Specialists (CMC Construction) will be required to perform traffic signal and striping work in order to convert Grant Street to a two-way traffic street. The SFMTA provided BIH with a packet of five (5) drawings that depict the scope of work required for this conversion. Synergy and Phoenix utilized this drawing package for estimating purposes. The packet of drawings is also included in this COR.

Scope:

This COR includes costs incurred to perform the additional work outlined above. A detailed breakdown of these costs includes:

- 1.) Scope of work as depicted on the attached five (5) drawings complete.

Time Impact Analysis (TIA):

A TIA will not be submitted for this COR as this differing site condition didn't impact the critical path of the project's CPM baseline schedule.

Exclusions:

This COR includes costs for only those items specifically described in the Scope section above.

Change Order Requ

Synergy Project Management, Inc.

30 Grant Avenue, Suite 300
 San Francisco, CA 94108
 Phone (415) 467-3000
 Fax (415) 467-3001
 www.SynergyPM.com



SFMTA 1252 Utilities Relocation Project

Date: July 16, 2012

COR Title: Grant Street 2 way conversion and traffic signal work

COR #019 - UMS Grant steet 2 way conversion

Cost Summary	Direct Cost	Subtotal	Overhead & Profit	Total
Labor	\$0.00		15%	\$0.00
Material	\$0.00		15%	\$0.00
Equipment	\$0.00		15%	\$0.00
Unit priced items	\$0.00		0%	\$0.00
Permits & Fees	\$31,176.73		5%	\$1,558.84
Subtotal	\$31,176.73			\$32,735.57
Bonds & Insurance	\$32,735.57		2.140%	\$700.54
Total				\$33,436.11
Time Extension Requested (in working days):				TBD

1. Spec. Reference:	Per Glenn Strid email of 7/12/12
2. Drawing Reference:	Per Glenn Strid email of 7/12/12
3. What (Description):	Grant Street 2-way conversion per attached quote and drawings from Phoenix Electric. This work was requested by BIH on 7/12/12 in order to complete traffic signal work so that Stockton can be closed by 7/30/12.
4. Where (Location):	Multiple locations (per attached drawings)

No.	Materials	Days	Qty	Unit	Unit Price	Extension
1						
2						
3						
4						
5						
	Sub-total 1					\$ -
	Sales Tax @ 8.5%					\$ -
	Sub-total 2					\$ -
	Total					\$ -
Unit priced items / Force Account			ITEM	RATE	QTY	Extension
1						\$ -
2						\$ -
3						\$ -
4						\$ -
5						\$ -
6						\$ -
7						\$ -
8						\$ -
9						\$ -
10						\$ -
	Additional overhead Costs for Time Extension			\$ -		\$ -
	Total					\$ -
Permits and Fees/ Subcontractors		Times	Qty	Unit	Unit Price	Extension
1						
2	Phoenix Electric quote		1.00	LS	\$ 31,176.73	\$ 31,176.73
3						
4						
5						
	Total					\$ 31,176.73

Cal Signal Corp

Traffic Signal & Video Equipment

890 Cowan Road, Suite J, Burlingame, CA 94010

Tel: 650-343-6100, Fax: 650-343-6126

California Small Business (SBE #1038380)

Traffic Signal Equipment Quotation

Quote to: Phoenix Electric
Attention: Wilson Lew
Sent Via: Email
Project: Central Subway Tunnel
Intersections: Grant @ Three Intersections
Location: City and County of San Francisco
Notes: Traffic Signal Equipment(a)(b)(c)

Quote #: 2412B
Quote Date: 07/13/12
Bid Date: n/a

#	Description	Units	Quantity	Extension
1	Traffic Signal Equipment: - 14 each 3x12" Peek Vehicle Signal Head w/ Tunnel Visors - 2 each 4x12" Peek Vehicle Signal Head w/ Tunnel Visors - 14 sets 3x12" RYG Dialight ITE LED Ball Indications - 2 sets 4x12" RYGGA Dialight ITE LED Ball Indications - 3 each SV-1-T Bronze Vehicle Signal Mounts - 3 each SV-2-TA Bronze Vehicle Signal Mounts - 1 each TV-1-T Bronze Vehicle Signal Mounts - 3 each TV-2-T Bronze Vehicle Signal Mounts - 6 sets Bronze Hubs & "Dog Ear" Clamp Mounts - 12 each U-Bolts	ls	1	\$9,985.00
Total Quote:				\$9,985.00

Notes:

(a) Quote is based on a review of a emailed Plans; no Specifications provided.

(b) Quote does not include sales tax.

(c) Equipment lead time upon request. Quote is valid for thirty (30) days.

CMC Traffic Control Specialists dba CMC Construction

3450 3rd St, Suite 3G
San Francisco, CA 94124
Phone: (415) 206-1700
Fax: (415) 206-1711

Contractor License No. 792059 (A, C-31)
SF Business Tax Reg. No. 356339
SF Vendor No. 68165
FEIN No. 01-0620791

WBE/UDBE/SBE/LBE Certified
SFHRC Cert No. 021413710
CUCP Firm ID No. 33473
CA DGS ID No. 61410

Fax

To: Glenn Strid (Barnard Impregilo Healy JV) **From:** Phil Mieszkowski, (415) 760-1441, phil@cmctrffic.com

Phone: (307) 689-4399 **Pages:** 1

Fax: glenn.strid@barnard-inc.com **Date:** 7/16/2012 1:58 PM

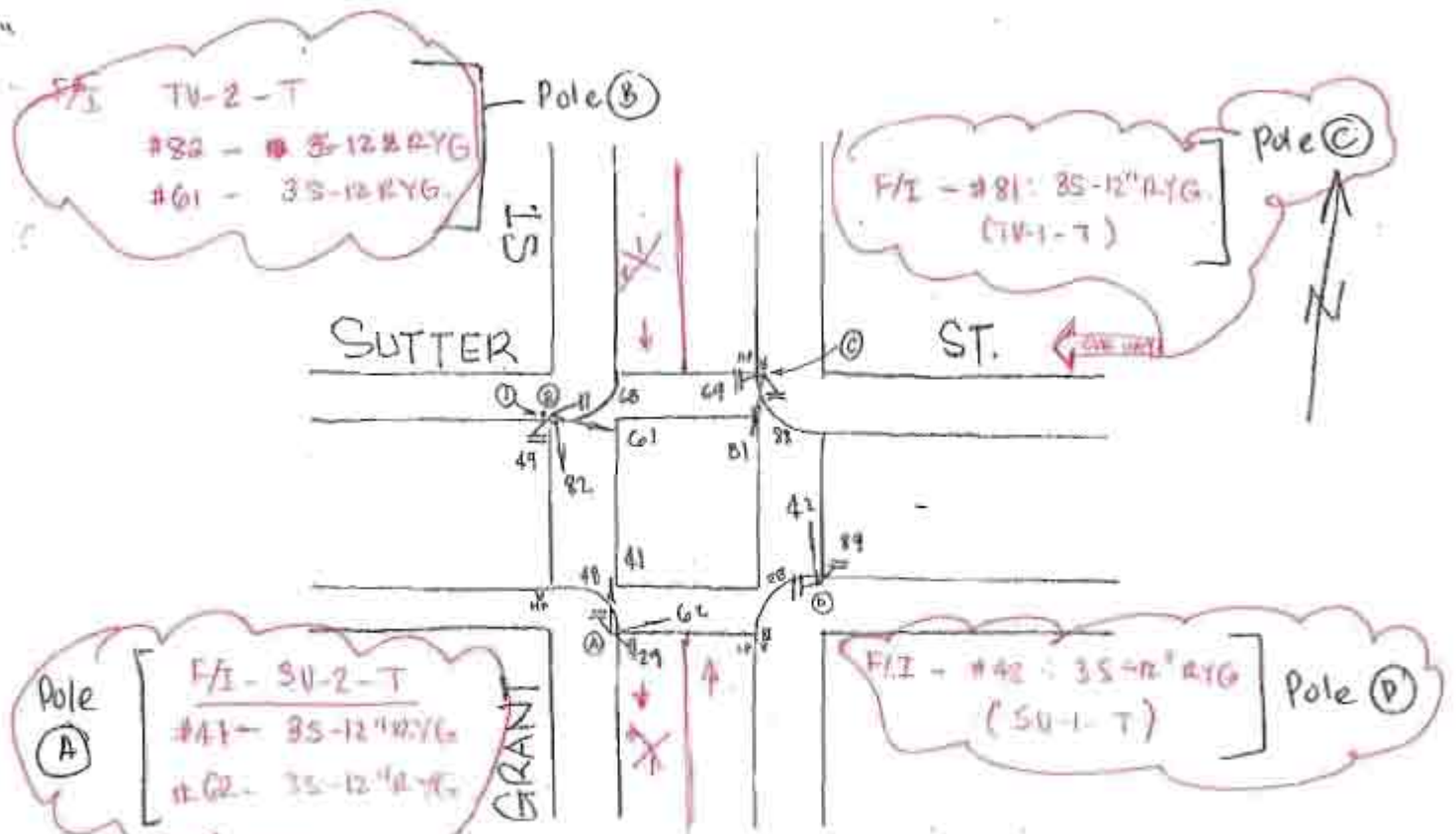
Re: Central Subway Tunnel – Grant St striping proposal **CC:**

Urgent **For Review** **Please Comment** **Please Reply** **Please Recycle**

CMC Construction proposes to perform the striping work on Grant St from Market to Bush St as shown in the sketch sent on 7/13/12 to turn Grant St into a 2 way street for the lump sum price of \$8,300.

Inclusions/Exclusions/Clarifications:

- All signage and signal work is excluded.
- All striping to be done with a single coat paint system.
- Striping removal will be done with black paint or grinding at CMC's option.
- Traffic control plans are excluded but can be provided at \$350/sheet if required.
- Basic traffic control is included for our work (signs, cones, arrow board). Flaggers are excluded.
- Posting of tow away / no stopping signs is included. Permit # to register the signs to be provided by GC.
- It is expected that we can complete our work in a single unimpeded mobilization starting Friday night and finishing after the Saturday night shift.
- Sunday/double time work is excluded.
- All permits costs are excluded (STP, night noise, etc).
- Bonds are excluded from our price.
- Payment due net 30 days. 1.5% interest per month added to overdue invoices.
- No retention to be held on our work.
- This quote must become a binding part of any contract and items cannot be split without prior permission
- We are a UDBE/WBE/LBE certified firm (SF-HRC Vendor # 021413710)



REPLACE EXISTING 8" INCH VEHICULAR TRAFFIC SIGNAL HEADS ~~WITH~~ TO 12" INCH.

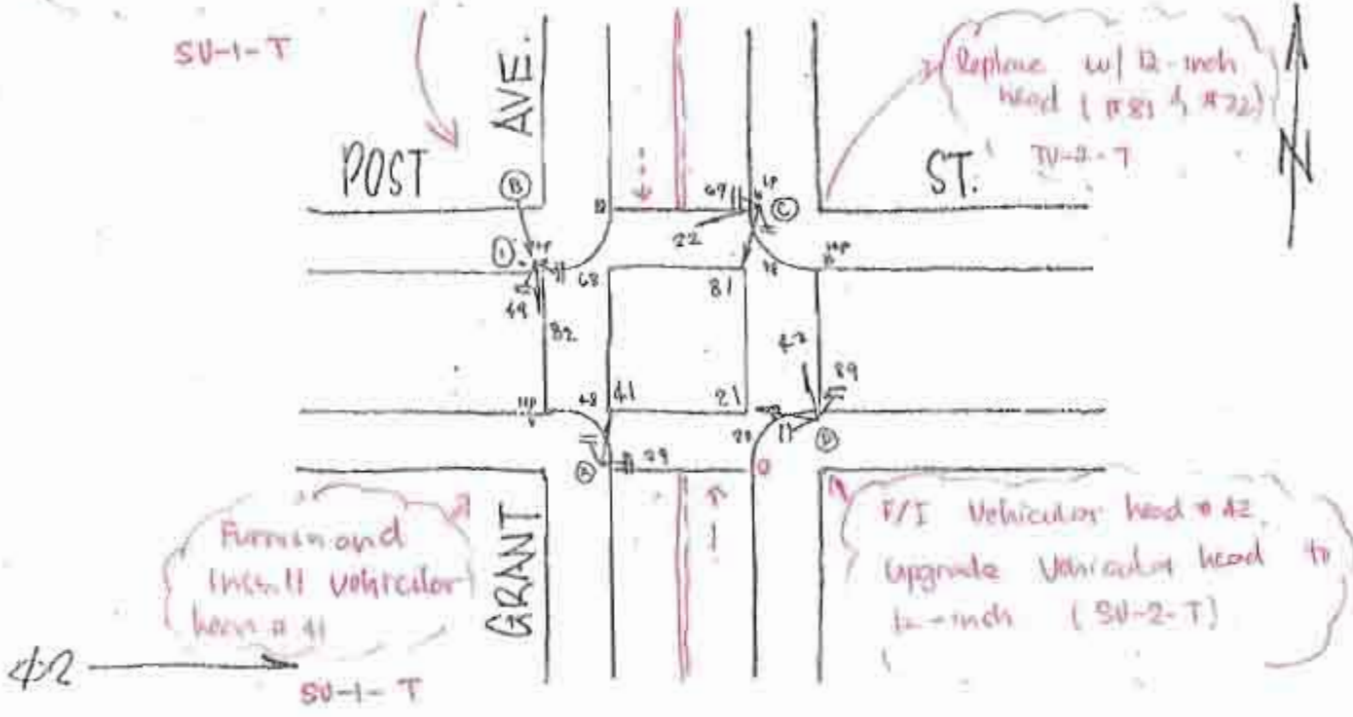
8-22-79

POLE	FUNC.	MAT'L	SIGNAL NO.	MAKE	NO. OF SECT.	SIZE	VISOR	B.P. OR LOUVERS	MOUN'T	PED SIGNAL NO.	LEGEND	MESSAGE		MAKE	MOUN'T	
												ELEMENT	COLOR			
A	S	S	62	EC	3	8"	FC 8"	NO	T	29	W/PW	GRD	W/OR	ED	S	
B	S	S	41	EC	3	8"	FC 8"	NO	T	48	W/PW	GRD	W/OR	ED	S	
C	S	S	82	EC	3	8"	FC 8"	NO	T	49	W/PW	GRD	W/OR	ED	S	
D	L	O	61	EC	3	8"	FC 8"	NO	T	68	W/PW	GRD	W/OR	ED	S	
			81	EC	3	8"	FC 8"	NO	T	69	W/PW	GRD	W/OR	ED	S	
I	M	S	42	EC	3	8"	FC 8"	NO	S	88	W/PW	GRD	W/OR	ED	S	
											89	W/PW	GRD	W/OR	ED	S
												28	W/PW	GRD	W/OR	ED

CONTROLLER CABINET SIZE : ORDINARY BASE CABINET : NO

COMMENTS : ^{EXISTING} # 82 — 4 SECTION 4RYG ← (8"RYG, 12"GR) } EXISTING
~~# 62 —~~
 # 41 — 4 SECTION 4RYG ← (8"RYG, 12"GR)

Replace w/ 12-inch head (82)

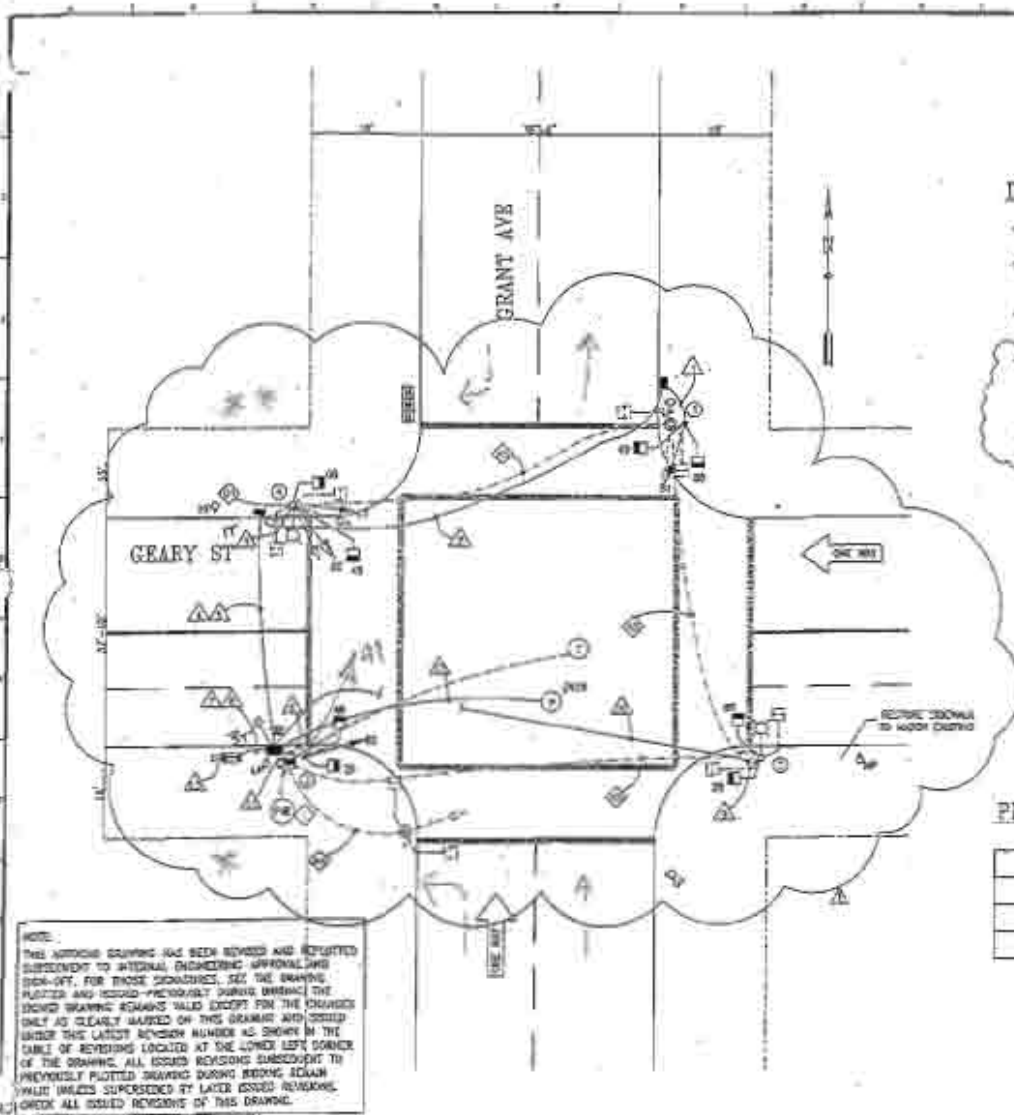


8-16-79

POLE	FUNC.	MAT'L	SIGNAL NO.	MAKE	NO. OF SECT.	SIZE	VISOR	B.P. OR LOUVERS	MOUN'T	PED SIGNAL NO.	LEGEND	MESSAGE		MAKE	MOUN'T	
												ELEMENT	COLOR			
A	S	S	41	EC	3	8"	FL 8"	NO	T		29	W/DW	GRD	W/OR	ED	S
B	S	S	82	GA	3	8"	FL 8"	NO	T		48	W/DW	GRD	W/OR	ED	S
C	S	S	22	EA	3	8"	FL 8"	NO	T		49	W/DW	GRD	W/OR	ED	S
D	L	O	81	EA	3	8"	FL 8"	NO	T		68	W/DW	GRD	W/OR	ED	S
			42	EC	3	8"	FL 8"	NO	S		69	W/DW	GRD	W/OR	ED	S
I	L	O	21	EC	3	8"	FL 8"	NO	S		88	W/DW	GRD	W/OR	ED	S
					3	8"	FL	NO			89	W/DW	GRD	W/OR	ED	S
					3	8"	FL	NO			88	W/DW	GRD	W/OR	ED	S

CONTROLLER CABINET SIZE : ORDINARY BASE CABINET : No

COMMENTS :



Pole #3 → * F/E - TN-2-T, #G2-3512" RYG
 #41-4512" RYG, 68

Pole #4 → ** F/A - S4-2-T, #82-4512" RYG, 68
 #81-3512" RYG

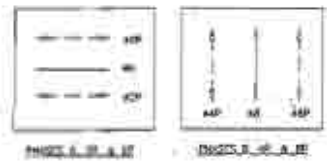
DETAIL NOTES:

- ◇ R/C OF WIRE AND CONDUIT. REFER DRAWING TO WORK ON.
- ◇ DI SIGNAL AND WIRE. R/C OF WIRE. SIX CONDUIT CLASH TO FULL 800 SHALL BE 1" SLOPE. CAP COVERED. REMOVED CONDUIT IN PLACE.
- ◇ CON. IS FOUNDATION CONCRETE TO BEING CONCRETE AND BASE OF SIGNALS OR CONTROLLER CABINET AND FOUND AFTER INSTALLATION.
- ◇ EXTEND 1/2" INTERCONNECT TO NEW LOCATION. SPACE TO EXISTING 1/2" TO MAINTAIN INTERCONNECT EXTRA.

SPECIAL NOTES
 ALL CONDUITS IN EXISTING SHALL BE COULDED WITH STEEL CONDUIT.

SWITCHOVER TRUNKS 3-3-65 0920
 SIGNAL SUP: GG, PN
 ENGR: ET

PHASE DIAGRAM



PHASE SEQUENCE:

C		Y		R		GRANT ST	
R		C		Y		GRANT AVE	
W	TH	RT		TH		PED AND GRANT AVE	
RT		TH		RT		PED AND GRANT ST	



NOTE:
 THIS INTERIOR DRAWING HAS BEEN REVISED AND REPLACED SUBSEQUENT TO INTERNAL ENGINEERING APPROVALS AND SIGN-OFF. FOR THOSE SIGNATURES, SEE THE DRAWING. PLATTER AND ISSUED PREVIOUSLY DURING PREPARE THE ISSUED DRAWING REMAINS VALID EXCEPT FOR THE CHANGES ONLY AS CLEARLY MARKED ON THIS DRAWING AND CIRCLED UNDER THIS LATEST REVISION NUMBER AS SHOWN IN THE TABLE OF REVISIONS LOCATED AT THE LOWER LEFT CORNER OF THE DRAWING. ALL ISSUED REVISIONS SUBSEQUENT TO PREVIOUSLY PLOTTED DRAWING DURING REVISIONS SHALL BE SUPERSEDED BY LATER ISSUED REVISIONS. CHECK ALL ISSUED REVISIONS OF THIS DRAWING.

DATE	DESCRIPTION	BY	CHK
11/1/50	ISSUED FOR CONSTRUCTION	ET	ET

REVISION INFORMATION
 & PLAN NO. OF SHEETS



BUREAU OF ENGINEERING
 DEPARTMENT OF PUBLIC WORKS
 CITY AND COUNTY OF SAN FRANCISCO

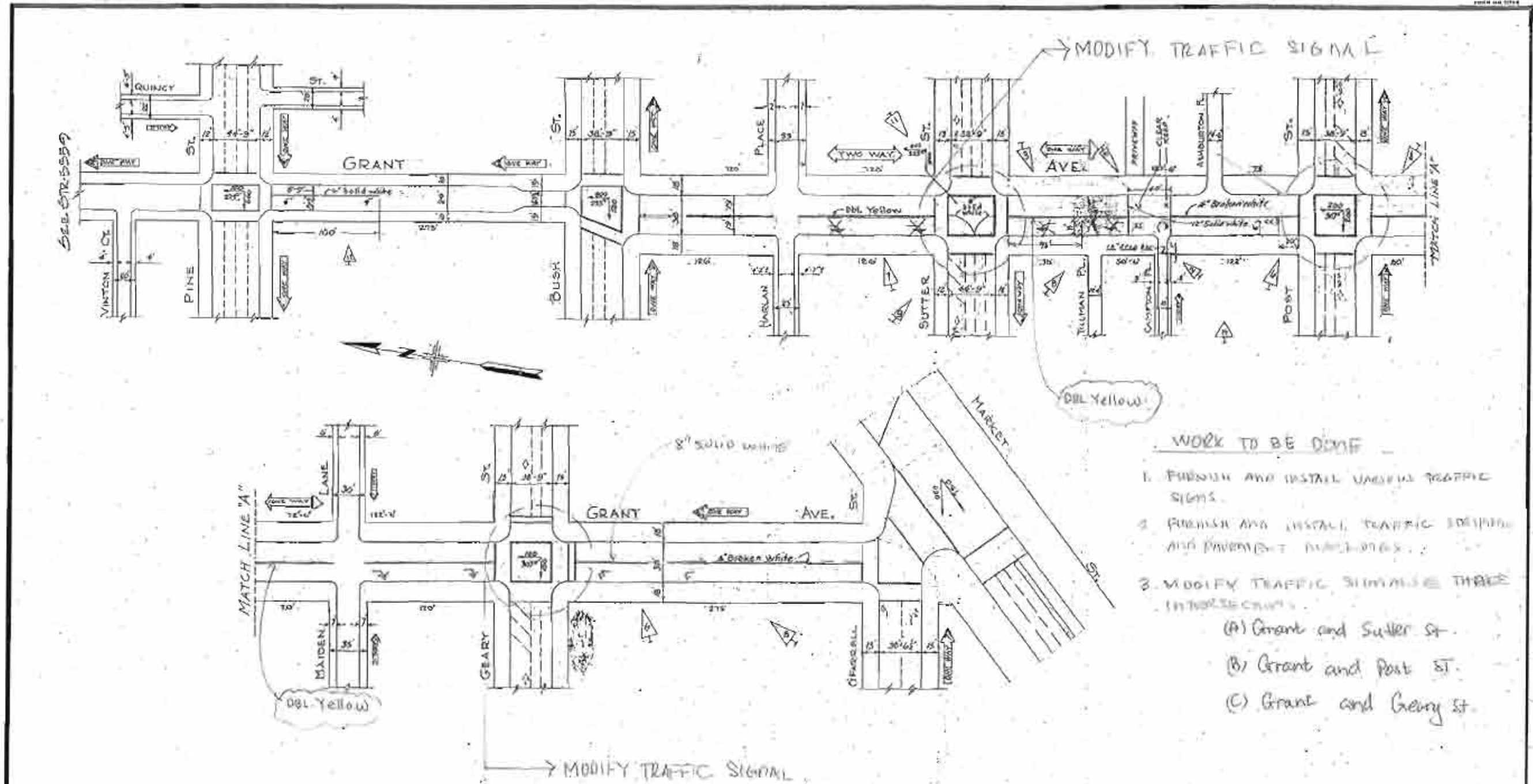


DESIGNED BY	APPROVED	SCALE
DATE	DATE	1" = 10' MAX
PROJECT NO.	DATE	SHEET NO. OF SHEETS

O'FARRELL STREET AND GEARY STREET
 PAVEMENT RENOVATION AND
 SEWER REPLACEMENT
 TRAFFIC SIGNAL PLAN
 GEARY ST AND GRANT AVE INTERSECTION

PROJECT NO.	0122
SCALE	E-1.0
DATE	11/1/50
BY	ET

ALL CITY ENGINEERING AND SURVEYING IS A REGISTERED PROFESSIONAL ENGINEERING FIRM LICENSED BY THE STATE OF CALIFORNIA. LICENSE NO. 10000.



- WORK TO BE DONE**
1. FURNISH AND INSTALL VARIOUS TRAFFIC SIGNS.
 2. FURNISH AND INSTALL TRAFFIC SIGNALS AND PAVEMENT MARKINGS.
 3. MODIFY TRAFFIC SIGNALS AT THREE INTERSECTIONS:
 - (A) Grant and Sutter St.
 - (B) Grant and Post St.
 - (C) Grant and Geary St.

NO.	DATE	DESCRIPTION	BY	CHKD.
11	10-10-10	ADD SIGNAGE FOR TRAFFIC SIGNAL	DKL	EE
12	11-10-10	ADD SIGNAGE FOR TRAFFIC SIGNAL	DKL	SF
13	11-10-10	LEFT HAND STRIPING AT BUS	DKL	RO
14	11-10-10	ADD TURN STRIPING AT OTHER END	DKL	RO
15	11-10-10	ADD TRAFFIC SIGNALS AT INTERSECTIONS	DKL	TK
16	11-10-10	ADD TRAFFIC SIGNALS AT INTERSECTIONS	DKL	TK
17	11-10-10	CHANGED STRIPING AT INTERSECTIONS	DKL	TK
18	11-10-10	ADDED SIGNAGE AT INTERSECTIONS	DKL	TK
19	11-10-10	ADDED SIGNAGE AT INTERSECTIONS	DKL	TK
20	11-10-10	ADDED SIGNAGE AT INTERSECTIONS	DKL	TK
21	11-10-10	ADDED SIGNAGE AT INTERSECTIONS	DKL	TK
22	11-10-10	ADDED SIGNAGE AT INTERSECTIONS	DKL	TK
23	11-10-10	ADDED SIGNAGE AT INTERSECTIONS	DKL	TK
24	11-10-10	ADDED SIGNAGE AT INTERSECTIONS	DKL	TK
25	11-10-10	ADDED SIGNAGE AT INTERSECTIONS	DKL	TK
26	11-10-10	ADDED SIGNAGE AT INTERSECTIONS	DKL	TK
27	11-10-10	ADDED SIGNAGE AT INTERSECTIONS	DKL	TK
28	11-10-10	ADDED SIGNAGE AT INTERSECTIONS	DKL	TK
29	11-10-10	ADDED SIGNAGE AT INTERSECTIONS	DKL	TK
30	11-10-10	ADDED SIGNAGE AT INTERSECTIONS	DKL	TK

DESIGNED BY	DATE	APPROVED	DATE
DRAWN BY	DATE	CHECKED	DATE
CHECKED BY	DATE	APPROVED	DATE
DATE			

CITY AND COUNTY OF SAN FRANCISCO
 DEPARTMENT OF PUBLIC WORKS
 BUREAU OF ENGINEERING

TRAFFIC STRIPING
GRANT AVENUE
 FROM PINE ST. TO MARKET ST.

SCALE 1" = 50.0'

SHEET OF SHEETS
 STR. 2762 14

Ward, Beverly

From: Benson, Mark
Sent: Wednesday, July 18, 2012 1:13 PM
To: Ward, Beverly
Subject: Fwd: RE: Grant Avenue Conversion

Please add this to the 1252 agenda item.
Sent from my Verizon Wireless Phone
Hi mark,

1) Here is the one requirement from the UMS Contract:

“Contractor shall convert Grant Avenue between Post Street and Geary Street from ONE-WAY to TWO-WAY Street and modify the traffic signal at Grant Avenue and Geary Street intersection. The Contractor shall submit a temporary traffic signal plan layout for approval prior to traffic signal modification.”

The above requirement is for one block only, but at the TASC meeting; one of the member requested to extend the TWO-WAY conversion to one block north (between Post and Sutter) to increase traffic circulation at this vicinity and north of Sutter is already a TWO-WAY Street.

Al H

From: Benson, Mark
Sent: Wednesday, July 18, 2012 12:21 PM
To: Herce, Al
Subject: Re: Grant Avenue Conversion

Al

Was this work needed for the 1253 UMS contract?

Mark

Sent from my Verizon Wireless Phone

"Herce, Al" wrote:

Hi Mark,

I spoke too early with the cost estimate; for the last two days I am working with our operations and their cost estimates. Signal shop did not realize the work needed and gave me a cost estimate for their work that was too low.

Below is a preliminary cost estimate of various shops to make Grant Street a TWO-WAY Street.

1. *Paint Shop: Thermoplastic striping and pavement markings, parking meter stalls reconfiguration and color curb re-painting. COST---- \$5,000.00 (Paint material proposed by the Contractor is NOT acceptable)*

2. *Sign SHOP: Removal and Installation of various Traffic signs and adjustments of sign on the parking meter poles. COST----\$3,300.00*
3. *Signal Shop: Due further investigation that includes field wiring of traffic signals COST ----- \$30,000.00*
4. *Parking Meter Shop: Recon-figure parking meter heads..... COST-----\$1,200.00*

TOTAL.....\$39,500.00 (City's prefer to implement both the Traffic Sign and Pavement marking installation to meet the City standard.

If you have any further questions, please call me at 701-4552.

Al Herce

NOTE: 4th and Folsom Streets: our Signal Shop investigated the existing conduits at this intersection and the conduit on the south side of the intersection was damaged and cannot relocate the traffic signal field wiring around the other side of the intersection. To facilitate the on-going work, the Contractor can provide a temporary re-route of the conduit and wiring. The permanent re-route can be implemented as part of the MOS Contract.

Edwin M. Leo | Mayor
 Tom Nolan | Chairman
 Cheryl Brinkman | Vice-Chairman
 Leona Bridges | Director
 Malcolm Hainicka | Director
 Jerry Lee | Director
 Joel Ramos | Director
 Edward D. Nelskin | Director of Transportation

July 19, 2012

TO: Albert Hoe,
 Deputy Program Manager
 Central Subway Project

THRU: *[Signature]*
 Brian Dusseault, Senior Engineer
 Section Head-Traffic Routing

FROM: Al Herce *[Signature]*
 Transportation Engineer

SUBJECT: Third Street Light Rail Project, Phase 2 (Central Subway)
 1252-Tunnels: Grant Street TWO-WAY conversions
 Implementation Cost Estimate

*CMB
 - 7/18*

Attached is a copy of the modify detail cost estimate to implement the changes on traffic signals, traffic striping and pavement markings, traffic signs and removal and re-installation of parking meters to make Grant Street between Sutter Street and Geary Boulevard a TWO-WAY Street. Sustainable Streets Division will provide support to the implementation of the above works prior to the closure of Stockton Street to vehicular traffic.

Please issue a work authorization an amount of \$38,984.00 to Sustainable Streets Division (Traffic Engineering Section) to support the subject project.

Below is summary of estimate for each section within our Division:

A-1. TRAFFIC PAINT SHOP	\$ 3,200.00
A-2. TRAFFIC SIGN SHOP	\$ 1,200.00
A-3. PARKING METER SHOP	\$ 3,468.00
A-4. TRAFFIC SIGNAL SHOP	\$ 28,900.00
E-0. ENGINEERING	\$ 2,216.00
TOTAL	\$ 38,984.00 39,000-

Thank you for your cooperation. If you have any questions, please call me at 701-4552.

Copy: 1. Arthur Wong
 2. Roger Nguyen
 File: 1252-Tunnels_Grant Street two_way

San Francisco Municipal Transportation Agency
 One South Van Ness Avenue, Seventh Fl. San Francisco, CA 94103
 Tel: 415.701.4500 | Fax: 415.701.4430 | www.sfmta.com



FURNISH AND INSTALL TRAFFIC STRIPING & MARKINGS

SPEC: 1261

PROJECT: (CP-1) Tunnel Contract: Grant Avenue TWO-WAY Conversion

Computed by: Al Herce
Checked By: B. Dusseault

Reference Plans: Grant Avenue Striping

ITEM #	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENSION
1	12" Crosswalk Lines / Stop Bars		Ln Ft	\$5.26	\$0
2	4" Broken White or Yellow		Ln Ft	\$1.50	\$0
3	4" Solid White or Yellow		24	\$2.63	\$0
4	8" Broken White	200	Ln Ft	\$2.96	\$592
5	8" Solid White	75	Ln Ft	\$3.61	\$271
6	Double Yellow	275	24	\$5.16	\$1,419
7	Two Way Left Turn Lanes (ea line)		Ln Ft	\$3.43	\$0
8	Raised Pavement Markers (White or Yellow)	36	Each	\$12.06	\$432
9	6" Solid White (bike lanes)		Ln Ft	\$3.29	\$0
10	Per Block Fees		Each	\$834.00	\$0
11	Messages (see page 2)	44	Sq Ft	\$10.00	\$440
12	Parking Stalls (T or Angle Parking)		Each	\$29.00	\$0
13	Bus Zones		Ln Ft	\$6.38	\$0
14	a. Ped Ramp Painting (inside Metro Dist.)		Int.	\$315.00	\$0
15	b. Ped Ramp Painting (outside Metro Dist.)		Int.	\$211.00	\$0
16	Color Curb Painting		Ln Ft	\$0.40	\$0
17	Wheel Stops (4" x 6" x 48" - Rubber)		Each	\$265.00	\$0
18	3.5" x 5.5" x 18" Pavement Bars (concrete)		Bar ft	\$51.00	\$0
19	White/Yellow Ladder Crosswalk Lines		Intersection	\$2,318.00	\$0

Labor: \$2,660
Mats: \$640

Total: \$3,200 ✓

Labor: 80%, Materials: 20%

CALCULATION FOR RAISED PAVEMENT MARKERS

	Spacing,ft	Qty/Spacing	Total Qty
for 4" Broken White/Yellow	48	2	0
for 4" Solid White	24	1	0
for 8" Broken White	30	1	7
for 8" Solid White	24	2	6
for Double Yellow	24	2	29
for 2-Way Left Turn Lanes (ea line)	48	3	0
			36

PAVEMENT MESSAGES

ITEM #	MESSAGE or ARROW	QUANTITY	Ea. In Sq. Ft.	Total Area
1	Type I Straight Arrow (10')	1	14	14
2	Type IV Left/Right Arrow (8')	2	16	30
3	Type III Left/Right Arrow (24')		42	0
4	Type VII Straight+L/RI Arrow (13')		27	0
5	Type V Straight Arrow (24')		33	0
6	Type VI Merge Arrow (10')		24	0
7	HOV (Diamond) Symbol (12')		11	0
8	Handicap Parking Symbol (4')		4	0
9	Bike Lane Symbol (78")		7	0
10	STOP (8')		22	0
11	LANE (8')		24	0
12	NO		5	0
13	LEFT		19	0
14	RIGHT		20	0
15	TURN (THRU)		24	0
16	SIGNAL		32	0
17	DO / coach (metal, black letters on yellow)		5	0
18	NOT		18	0
19	ENTER		31	0
20	YIELD		24	0
21	ONE		20	0
22	WAY		20	0
23	AHEAD		31	0
24	KEEP		24	0
25	CLEAR		27	0
26	Bike SHAR-ROW Symbol		35	0
27	SLOW		23	0
28	SCHOOL		35	0
29	XING		21	0
30	PED		18	0
31	BUS		20	0
32	ONLY		22	0
33	STREET		35	0
34	BUS STOP (6')		23	0
35	Rollroad Xing (R X R)		10	0

Total Area of Messages (In square feet)

---->

44
sq ft

Cost of Thermoplastic Messages

1	Less than 100 sq ft	\$10.00 / sq ft
2	Between 100 and 200 sq ft	\$7.00 / sq ft
3	More than 200 sq ft	\$5.00 / sq ft

FURNISH AND INSTALL TRAFFIC SIGNS

PROJECT: (CP-1) Tunnel Contract: Grant Avenue TWO-WAY Conversion
Reference Plans:

Sign Code	Message/Size	Size (Sq. Ft.)	Quantity	Total Area	Cost/Sq. ft.	Cost	REMARKS
Reference Plans:							
R1	STOP (30" x 30")	9.0000		0.00	\$ 7.75	\$ -	
R37	Tow-Away No Stopping (18" x 20.5")	12.8125		0.00	\$ 4.25	\$ -	
R39	Yield Sign (30" x 30")	9.0000		0.00	\$ 6.00	\$ -	
R81	Bike lane symbol (24" x 18")	3.0000		0.00	\$ 6.00	\$ -	
G99	Bike Route (24" x 18")	3.0000		0.00	\$ 6.00	\$ -	
R18-2 (LT)	Left Lane Must Turn Left (30" x 30")	9.0000	1	9.00	\$ 6.25	\$ 56.25	
W47	Railroad Xing (36" x 36")	9.0000		0.00	\$ 6.10	\$ -	
W11	Lane reduction symbol (30" x 30")	9.0000		0.00	\$ 6.00	\$ -	
R-18-2(R)	Right lane must turn right (30" x 30")	9.0000	1	9.00	\$ 6.25	\$ 56.25	
W10	RR Advance Warning Crossroad (36" x 36")	9.0000		0.00	\$ 6.10	\$ -	
W48 (2)	2 tracks Crossing (36" x 36")	9.0000		0.00	\$ 6.10	\$ -	
R85	Do Not Stop on Tracks (36" x 36")	9.0000		0.00	\$ 5.10	\$ -	
R13	No Turn on Red (30" x 30")	9.0000		0.00	\$ 6.00	\$ -	
R34	No U-Turn Symbol (30" x 30")	9.0000		0.00	\$ 7.80	\$ -	
R32	No Right/Left Turn Symbol (30" x 30")	9.0000		0.00	\$ 7.90	\$ -	
R30	Street Cleaning Signs (18" x 18")	2.2500		0.00	\$ 6.00	\$ -	
	Blocks #s (12" x 5")	1.0000		0.00	\$ 3.00	\$ -	
G-7	Advance "Street Name" (80" x 18")	7.6000		0.00	\$ 10.00	\$ -	
G-7	Advance "Street Name" (40" x 18")	6.0000		0.00	\$ 10.00	\$ -	
G-8	Street Guide Sign (<48" x 30")	10.0000		0.00	\$ 8.25	\$ -	
G-8	Street Guide Sign (>48" x 36")	16.0000		0.00	\$ 8.25	\$ -	
	Street Name (36" x 8")	2.0000		0.00	\$ 4.60	\$ -	
G78	Directional Sign (36" x 30")	7.6000		0.00	\$ 8.00	\$ -	
R10	ONE-Way Signs (48" x 18")	5.8400	2	11.68	\$ 8.00	\$ 93.44	
R11	Do NOT Enter (30" x 30")	9.0000		0.00	\$ 8.00	\$ -	
R41	Right Turn Only (30" x 30")	9.0000		0.00	\$ 5.00	\$ -	
R80.B.1	Lane Designation (<36" x 30")	7.6000		0.00	\$ 8.25	\$ -	
R81.B.1	Lane Designation (>36" x 30")	10.0000		0.00	\$ 8.25	\$ -	
R86	Do Not Block Intersection (24" x 30")	6.0000		0.00	\$ 6.10	\$ -	
R73.8	LA Symbol only/NO-U Turn (30 x 36")	7.6000		0.00	\$ 6.10	\$ -	
R80(L)	Stop Here on Red (24" x 36")	6.0000		0.00	\$ 6.10	\$ -	
R114	Except MUNI (30" x 24")	6.0000		0.00	\$ 6.00	\$ -	
W64	Pedestrian Symbol (30" x 30")	9.0000		0.00	\$ 8.50	\$ -	
W64	Left Arrow Symbol (18" x 18")	2.2500		0.00	\$ 8.50	\$ -	
W74	Thru Traffic Merge Right (36" x 36")	9.0000		0.00	\$ 6.00	\$ -	
R47C	No Littering Symbol (18" x 18")	2.2500		0.00	\$ 6.25	\$ -	
R7	Keep Right symbol (24" x 30")	6.0000		0.00	\$ 6.00	\$ -	
R99	Crosswalk Closed (48" x 18")	6.0000		0.00	\$ 10.00	\$ -	
	Disabled Parking Only (18" x 20.5")	12.8125		0.00	\$ 4.25	\$ -	
	TOTAL		4.00			\$ 147.94	

Traffic Sign Supports and Hardware..... \$ 314.23

Items	Quantity	Cost	Total Cost
2-Inches diameter x 10.5 ft. high Pipe	2.00	\$ 38.00	\$ 76.00
2-Inches diameter x 12 ft. high Pipe		\$ 44.00	\$ -
Strap (Linear Fl.)	28.00	\$ 6.75	\$ 188.75
Brace (34 signs with canton mount)	8.00	\$ 11.81	\$ 94.48
Carriage Bolt Set (2 1/4") (2 bolts/signs) 80x2		\$ 7.00	\$ -
2 Inch Cap (# of poles)		\$ 1.50	\$ -
Mast Arm Brackets (2 arms/sign)		\$ 195.00	\$ -
Cement Mix		\$ 1.75	\$ -
			\$ 314.23

LABOR..... \$ 644.00

Position	Rate/hr.	Hours	Labor Cost
1844 Management Assistant	\$ 66.00	2.00	\$ 132.00
5302 Sign Survey Technician	\$ 60.00	2.00	\$ 120.00
5303 Sign Supervisor 1	\$ 80.00	2.00	\$ 160.00
7457 Sign Installer	\$ 58.00	4.00	\$ 232.00
			\$ 644.00

Traffic Sign Sub-total Cost \$ 1,109.17

TOTAL \$1,200 ✓

PROJECT: (CP-1) Tunnel Contract: Grant Avenue TWO-WAY Conversion
 Parking Meter Shop

LABOR COST				
TASK	Parking Meter Supervisor	Parking Meter Technician	Engineering Associate	
Remove and re-Install Parking Meter Head (Grant Avenue, west side, between Sutter Street and Geary Blvd.)	0	8		
Program Parking Meter (Cost and time of operation)				
Install Parking Meter Post and foundation.	4	16		
Update Parking Meter Drawings			4	
	HOURS	4	24	4
	RATE/Hr.	\$ 85.00	\$ 75.00	\$ 82.00
		\$ 340.00	\$ 1,800.00	\$ 328.00
				Labor Cost
				\$ 2,468.00

MATERIAL AND EQUIPMENT COST				
	Unit	Quantity	Unit Cost	Total
Parking Meter Post	each	20	50.00	\$1,000.00
Cement	each	0	7.50	\$0.00
Parking Meter Head	each	0	360.00	\$0.00
Parking Meter Sensor	each	0	150.00	\$0.00
				Total Material Cost
				\$1,000.00

TOTAL COST \$ 3,468.00 ✓

PROJECT: (CP-1) Tunnel Contract: Grant Avenue TWO-WAY Conversion
Traffic Signal Shop

LABOR COST				Consultant	
TASK	Traffic Signal Manager	Traffic Signal Supervisor	Traffic Signal Electrician	Signal Engineer	
Vehicular traffic signal framework assembly	2	4	56		
Field Installation of the traffic signal	2	4	64		
Traffic signal Programming and Testing		2	24		
Timing Signal Implementation		2	8		
Traffic signal operation field adjustments					
	HOURS	4	12	162	
	RATE/Hr.	\$ 210.00	\$ 170.00	\$ 140.00	
		\$ 840.00	\$ 2,040.00	\$ 21,280.00	\$
				Labor Cost	\$ 24,180.00

MATERIAL AND EQUIPMENT COST				Unit Cost	Total
2-Way, 3 section, 12 inch pole top with framework	each	4	\$ 300.00	\$1,200.00	
1-Way, 3 section, 12 inch side mount	each	3	\$ 150.00	\$450.00	
1-Way, 3 section, 12 inch Pole Top	each	3	\$ 150.00	\$450.00	
1-Way, 3 Section, 12 inch side mount	each	4	\$ 450.00	\$1,800.00	
Miscellaneous Framework and Fillings	each	14	\$ 60.00	\$840.00	
				Total Material Cost	\$4,740.00

TOTAL COST \$ 28,900.00

