CONTRACT CHANGE ORDER

Change Requested by: Engineer

CCO: 6	Suppl. No. 0	Contract No. 04 - 0120F4	Road SF-80-13.2/13.9	FED. AID LOC.:

To: **AMERICAN BRIDGE/FLUOR ENTERPRISES INC A JOINT VENT**

You are directed to make the following changes from the plans and specifications or do the following described work not included in the plans and specifications for this contract. ***NOTE: This change order is not effective until approved by the Engineer.***

Description of work to be done, estimate of quantities and prices to be paid. (Segregate between additional work at contract price, agreed price and force account.) Unless otherwise stated, rates for rental of equipment cover only such time as equipment is actually used and no allowance will be made for idle time. This last percentage shown is the net accumulated increase or decrease from the original quantity in the Engineer's Estimate.

Revise Section 10-1.41, TEMPORARY TOWERS, of the Special Provisions as shown on Sheets 2 through 5 of this change order.

By signing this change order, the Contractor agrees this resolves Request For Information (RFI's) ABF-RFI-0004, 0004R1, 0005, 0005R1 and 0005R2.

The Contractor agrees to perform this work at ~~not~~ NO additional cost to the Department.

GP. MO

Estimated Cost: Increase ☐ Decrease ☐ **$0.00**

By reason of this order the time of completion will be adjusted as follows: 0 days

Submitted by

Signature	Resident Engineer	Date
Gary Pursell	Gary Pursell, P.E., Sup.T.E.	2/28/07

Approval Recommended by

Signature	Supervising Bridge Engineer	Date
RC Morrow	Richard Morrow, Sup. BE	3/27/07

Engineer Approval by

Signature	Supervising Transportation Engineer	Date
Gary Pursell	Gary Pursell, Sup. TE	3/14/07

We the undersigned contractor, have given careful consideration to the change proposed and agree, if this proposal is approved, that we will provide all equipment, furnish the materials, except as may otherwise be noted above, and perform all services necessary for the work above specified, and will accept as full payment therefor the prices shown above.

NOTE: If you, the contractor, do not sign acceptance of this order, your attention is directed to the requirements of the specifications as to proceeding with the ordered work and filing a written protest within the time therein specified.

Contractor Acceptance by

Signature	(Print name and title)	Date
Michael D. Flowers	Michael D. Flowers Project Director	3-14-07

TEMPORARY TOWER DESIGN

The temporary tower seismic load resisting structural system shall ~~consist of~~ be ductile. This system shall consist of either a steel braced frame~~s~~ or a steel moment resisting frame with welded or bolted connections used for field erection splices. Isolation may be used as part of the structural system to reduce the seismic demands. However, stoppers shall be used to limit relative displacement beyond the maximum design relative displacement. The isolation shall be designed to carry all other load cases elastically. Welded connections performed in the field or in the Contractor's fabrication facilities shall be designed in accordance with AISC or API RP2A for hot rolled sections and steel tubular sections, respectively. The Contractor shall provide 2 copies of the stated codes to the Engineer. Timber walkways and decks will be permitted.

Cable bracing and tie-rod bracing will not be permitted.

Timber connections shall be designed in conformance with the procedures, stresses and loads permitted in the Falsework Manual as published by the California Department of Transportation, Division of Structures, Division of Structure Construction.

The construction equipment loads shall be the actual weight of the construction equipment, material and personnel, but in no case shall be less than 960 N/m2 of deck surface area and 1100 N/m along the deck edges.

The design of temporary towers shall conform to both the design service load and ultimate limit state criteria set in these special provisions. The service load criteria will be met by the load combinations stated in "Design Load Combinations for Load Factor Design" and the ultimate limit state criteria will be met by the pushover analyses in "Seismic Design Loads".

The following codes shall be used to detail and to establish temporary tower capacities:

Subject	Design Code or Reference	Year
Structural Steel – All Members and Connections except Tubular Members**	~~AISC-LRFD~~ ANSI/AISC 360-05*	~~1999~~ 2005
Structural Steel – Tubular Members and Connections**	API RP2A-LRFD	July 1993
Concrete	AASHTO-LRFD Bridge Construction Specifications	2nd Edition
Falsework	State of California Dept. of Transportation – Falsework Manual	Revision 32, November 2001

* With reference to ~~AISC Seismic Provisions for Structural Steel Buildings, 1997~~ ANSI/AISC 341-05 including Supplement No. 1 and ASCE/SEI 7-05, including Supplement No. 1. Response modification coefficients, when used, shall not be more than 50% of the values allowed by these codes.

** All connections shall comply with applicable codes and be designed to be stronger than the connected members. The requirement for the connections to be stronger than the connected members may be waived by the Engineer if the Contractor demonstrates through calculations that no failure of a connection or connections would occur. These calculations shall include a non-linear static pushover analysis to the deformation state of probable (use of probable properties) collapse of the system, define the probable collapse mechanism, and demonstrate that a connection or connections will not be the cause of collapse.

For connections between rolled sections and tubular members the most stringent code of ~~AISC-LRFD~~ ANSI/AISC 360-05 and API RP2A-LRFD shall govern.

A single code, specification or recommended practice shall be applied consistently for a specific structure type or load.

Design of temporary towers shall account for any change in the loads imposed on the tower by the bridge superstructure due to the construction sequence of the bridge.

Temporary towers shall be designed to adequately support the superstructure of the bridge without exceeding a demand-to-capacity ratio in the box girder of 1.0 for all design load combinations.

The temporary tower design calculations shall demonstrate that the total design settlement of temporary towers does not exceed 25 mm at the mudline for the governing design load combination.

The twentieth paragraph of Section 51-1.06A "Falsework Design and Drawings," of the Standard Specifications shall not apply.

The design of temporary towers shall be based on assumed loads that are equal to or greater than those described in this section.

The Contractor shall be responsible for the proper evaluation of the falsework materials and design of the falsework to safely carry the actual loads imposed.

The fifth and sixth paragraphs of Section 51-1.06A(1), "Design Loads," of the Standard Specifications shall not apply.

Vertical Loads

Temporary towers and their foundations shall be designed to carry the anticipated total effective tower load.

The total effective tower load shall be determined including, at a minimum, the effects of the following:

A. Tower and foundation, including fenders;
B. Load from supported bridge; and
C. Contractor's equipment and live load.

The vertical loads from the supported bridge shall be calculated by the Contractor for the selected construction method. Vertical loads shown on the plans are for information only.

Seismic Design Loads

Temporary towers shall be designed to be ductile and to resist horizontal seismic loads as defined below in combination with the appropriate vertical loads covering controlling construction stages. The seismic analyses shall consider the interactions of the temporary towers with the bridge superstructure at all appropriate stages. Seismic design loads need not be considered during lifting operations.

The temporary towers shall remain serviceable and capable of carrying the design loads at the peak seismic displacements.

Analysis and design calculations shall correctly incorporate all contributing mass, stiffness, loading and energy dissipation characteristics of the temporary towers including geotechnical and structural components and hydrodynamic added mass. P-delta effects shall be considered in the analyses. Assumed scour depth shall be 0.5 m plus one pile diameter.

Acceleration levels applied to the temporary towers shall be generated using the Acceleration Response Spectrum shown on plan sheet "Construction Sequence 2." The response spectrum can be used for all locations along the length of the self-anchored suspension bridge as input motion. These lateral loadings supersede the 0.02 g lateral load requirement in the California Department of Transportation Falsework Manual.

Modal spectral analysis with sufficient number of modes to capture at least 90% of the mass of the structure shall be used to establish the peak seismic displacements. To establish the ultimate limit state, a longitudinal and transverse static push-over analyses shall be used to verify the stability of the temporary tower and its ductility. Tower vertical load carrying members and connections shall remain elastic. Structural steel bracing members~~, and~~ piles, horizontal members in moment resisting frames, and shear links in an eccentric braced frame may yield. ~~The temporary tower structural system shall have a minimum displacement ductility of 2.~~ Pushover analyses of the temporary towers shall be carried out based upon displaced shapes defined, at a minimum, as the primary transverse and longitudinal mode shapes. The mode shapes shall be determined from modal analyses of the temporary towers and the supported bridge superstructure. The temporary tower, in a non-linear pushover analysis, shall meet the following criteria:

Structural System Ductility (μ) $\geq$ 2.0, i.e. $\Delta_{ult} \geq 2.0\ \Delta y$, where Δ_y = effective yield point of the structural system and Δ_{ult} = the total nominal displacement capacity of the structure. However, at locations where the design wind displacement exceeds the design seismic displacement, the following criteria may be used:

Structural System Ductility (μ) $\geq$ 1.5, i.e. $\Delta_{ult} \geq 1.5\ \Delta_y$; and Deformation Capacity (Δ_{ult}) $\geq$ 3.0 Δ_{sa}, where Δ_{sa} = peak seismic displacement demand.

Seismic demands shall be determined for two independent horizontal loading conditions in perpendicular directions. The directions are defined to be in the longitudinal axis of the bridge and the transverse axis of the bridge. In order to account for directional uncertainty of earthquake motions, the demands resulting from analyses of the two perpendicular seismic loading directions shall be combined into two load cases as follows:

EQ load case 1 1.0 longitudinal and 0.3 transverse
EQ load case 2 0.3 longitudinal and 1.0 transverse

~~Acceleration levels applied to the temporary towers shall be generated using the Acceleration Response Spectrum shown on plan sheet "Construction Sequence 2." The response spectrum can be used for all locations along the length of the self-anchored suspension bridge as input motion. These lateral loadings supersede the 0.02 g lateral load requirement in the California Department of Transportation Falsework Manual.~~