

DEPARTMENT OF PUBLIC WORKS

COUNTY OF SAN JOAQUIN

STATE OF CALIFORNIA

**PLANS
AND
SPECIFICATIONS**

(INCLUDING SPECIAL PROVISIONS, NOTICE TO BIDDERS, BID AND CONTRACT)

FOR THE

**MOVABLE SPAN BRIDGES PROJECT
BRIDGE NOS.:**

**BACON ISLAND ROAD BRIDGE 29C-108 over MIDDLE RIVER
TRACY BOULEVARD BRIDGE 29C-022 over GRANT LINE
CANAL**

**EIGHT MILE ROAD BRIDGE 29C-114 over BISHOP CANAL
EIGHT MILE ROAD BRIDGE 29C-219 over HONKER CUT**

FEDERAL AID PROJECT NO. BRLS — 5929(229)

For use in connection with California State Department of Transportation
STANDARD SPECIFICATIONS dated 2018

STANDARD PLANS dated 2018 and REVISED STANDARD PLANS
and LABOR SURCHARGE and EQUIPMENT RENTAL RATES

DATED November 22, 2022

SUBMITTED


FRITZ BUCHMAN, C.E., T.E., CFM
Director of Public Works

**MOVABLE SPAN BRIDGES PROJECT
BRIDGE NOS.:**

**29C-108 over MIDDLE RIVER
29C-022 over GRANT LINE CANAL
29C-114 over BISHOP CANAL
29C-219 over HONKER CUT**

FEDERAL AID PROJECT NO. BRLS — 5929(229)

These special provisions are prepared by or under the direction of
the following engineers:



**Teodor Kostadinov, PE
Hardesty & Hanover, LLC**
**Paul Skelton, PE
Hardesty & Hanover, LLC**

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BRIDGE NOS.:29C-108 over MIDDLE RIVER; 29C-002 over GRANT LINE CANAL; 29C-114 over BISHOP CUT; 29C-219 over HONKER CUT

Federal Aid Project No. BRLS-5929(229)

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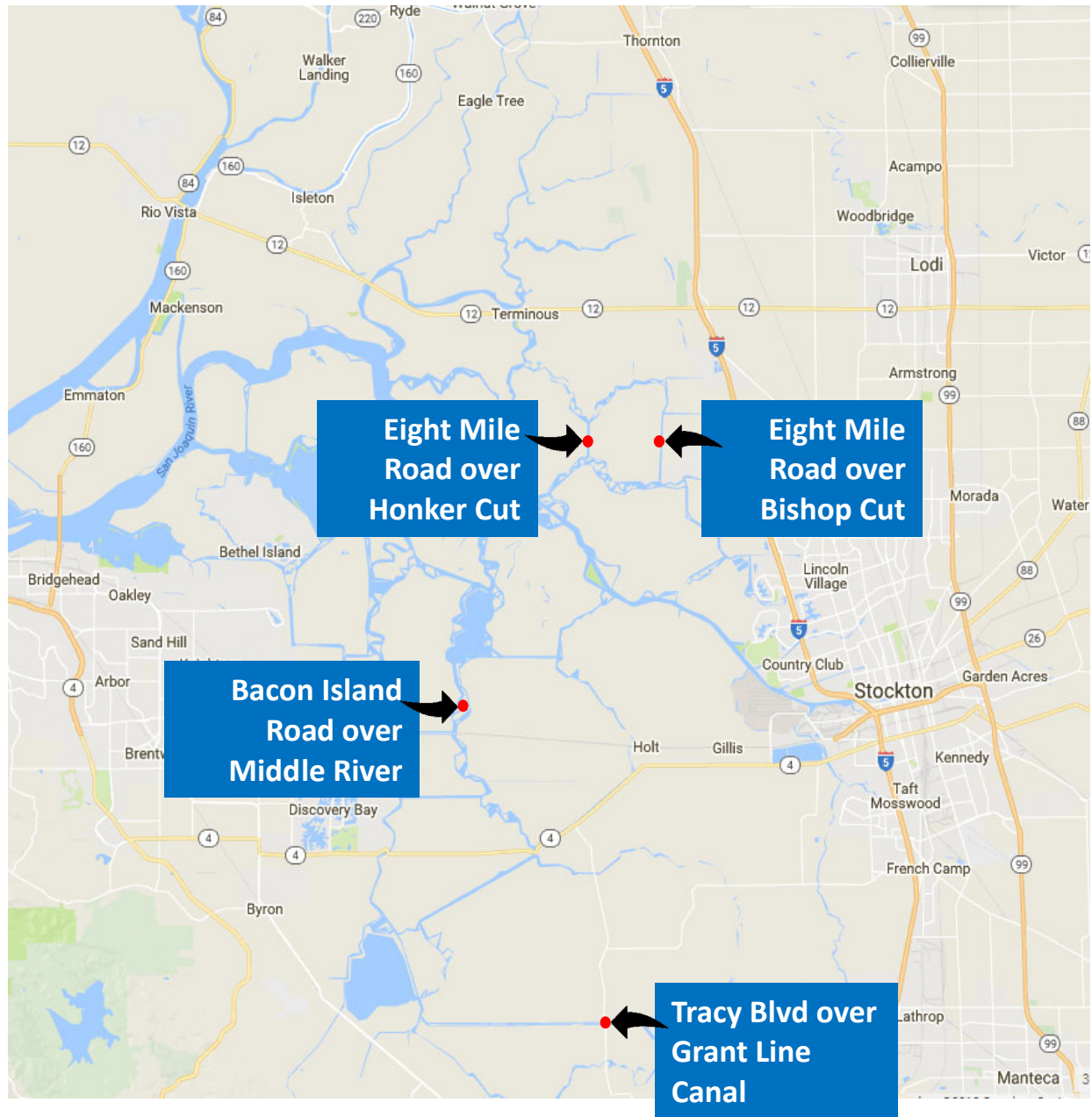
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VICINITY MAP



COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS
NOTICE TO BIDDERS

In accordance with the plans and specifications therefor, the County of San Joaquin provides the following notice for the Movable Span Bridges Project, Federal Aid Project No. BRLS-5929(229).

Bids will be received electronically by the Department of Public Works (Department) via the BidExpress website (www.bidexpress.com), **until 1:30 p.m. on the #^{st/th} day of Month 2023**. The Department will open and publicly read the bids at the Department's office and via webcast at www.youtube.com/channel/UC6cc1m_5WvN283lx6DV_GZA, immediately after the specified closing time for the above-mentioned project.

The work is located in San Joaquin County, California at the following bridges:

Bridge 29C-108, Bacon Island Road over Middle River
Bridge 29C-022, Tracy Boulevard over Grant Line Canal
Bridge 29C-114, Eight Mile Road over Bishop Cut
Bridge 29C-219, Eight Mile Road over Honker Cut

The work, in general, consists of repairing and/or replacing mechanical and electrical equipment at each of the four bridges.

Bridge 29C-108, Bacon Island Road over Middle River:

- Replacing eddy current drive controller
- Furnish and Install new Swing span control switch.
- Furnish and install related logic to eddy current drive.
- Furnish and install new flashing beacon unit.
- Providing interposing relay for Control Relay 12 (CR 12) or replace CR 12 to reduce the amount of current the relay needs to operate
- Furnish and install new twisted shielded pair for MCC
- Furnish and install armored instrumentation cable.
- Replacing the secondary gearboxes
- Replacing Hydraulic Power Units (HPU's) of the east and west rest pier machinery systems
- Replacing all flexible hoses of the east and west rest pier machinery systems
- Replacing the center wedge hydraulic actuators

Bridge 29C-022, Tracy Boulevard over Grant Line Canal:

- Cleaning and painting corroded conduits
- Replacing two severely corroded conduits
- Replacing north and south traffic gates
- Re-shimming the center shear lock bar guides and receiving socket wear plates for the correct RC6 clearance/fit between the lock bars and the wear plates

Bridge 29C-114, Eight Mile Road over Bishop Cut:

- Repairing or replacing the northeast jack motor
- Replacing gate control switches and related logic with momentary type switches
- Replacing the turning machinery HPU
- Repairing the cracked grout at the southwest end jack rest pier bearing plate
- Cleaning and painting all non-moving bridge machinery components including the rim bearing assembly, the center pin assembly, shoe brake assemblies, center rollers, and the end jacks
- Replacing all four end bearing lock actuators
- Replacing all hoses and deteriorated fittings of the turning machinery system
- Rehabilitating the four shoe brakes including replacement of the springs and spring rods
- Replacing the grout under the bearing end lock bearing seats on the rest piers and eliminate rubber shims.

Bridge 29C-219, Eight Mile Road over Honker Cut:

- Adjusting and retiming all center and end wedge crank shafts and connecting rods to provide additional clearance for bridge movement
- Replacing the gasoline engine in kind including new output shaft coupling
- Replacing the balance wheel track mounting plate and true the elevation of the track rail
- Re-shimming the balance wheels to provide clearance with the track when the swing span is in the closed and locked position
- Replacing all shaft bushings of the swing span turning machinery
- Replacing all jaw couplings of the swing span turning machinery
- Replacing all shaft bushings of the wedge drive machinery
- Replacing all jaw couplings and damaged shafts of the wedge drive machinery
- Rebuilding the worm gear reducers of the wedge drive machinery
- Adding solar-powered navigation lights

To bid, all bidders must be registered and create a Digital ID with Bid Express, found at www.bidexpress.com. The bid forms found at that website may only be used to submit an electronic bid. **Paper bids will not be accepted.** Please allow at least five (5) business days to complete the electronic bidding registration process for the first time. It is highly recommended that a Digital ID be active 48 hours in advance of submitting an electronic bid. All costs associated with obtaining a Digital ID and submitting a bid using Bid Express is the sole responsibility of the bidder.

The specifications and plans (Contract Documents) will be available at www.bidexpress.com. Any addenda issued for this project will also be available at this website. A link to the Bid Express Solicitation Page can be obtained at www.bidexpress.com/businesses/23724/home?agency=true. Only one bid per bidder will be accepted.

Bids are required for the entire work described herein.

A bid security of 10% is required from all bidders. The bid security must be in the form of cash, certified or cashier's check, electronic bond (eBond), or a bid bond in favor of the Department. Bid Security other than electronic bond must be received by the Department prior to the bid opening closing time specified above. A payment bond and a performance bond each 100% of the value of the contract are required from the successful bidder.

Bidders are advised that, as required by Federal law, the County of San Joaquin is implementing Disadvantaged Business Enterprise requirements for all Disadvantaged Business Enterprises (DBE). Section 2, "Bidding," under subsection 2-1.12 titled "Disadvantaged Business Enterprises" and Section 5, "Control of Work," under subsection 5-1.13B titled "Disadvantaged Business Enterprises" cover the DBE requirements.

The DBE Contract goal is **19%** percent.

An onsite pre-bid meeting (non-mandatory) for this project is scheduled for **Month Day, 2022, starting at 9:30 a.m.** The purpose of the meeting is to inform bidders of project requirements and subcontractors of subcontracting and material supply opportunities. The meeting will also Bidders can join the non-mandatory meeting at each of the bridge locations, starting at Eight Mile Road Bridge over Honker Cut at 9:30 a.m., Eight Mile Road Bridge over Bishop Cut at 10:45 a.m., Bacon Island Road Bridge at 1:00 p.m., and Tracy Island Boulevard at 2:30 p.m. All pre-bid handout items are available on www.bidexpress.com.

This contract is subject to State contract nondiscrimination and compliance requirements pursuant to Government Code, Section 12990. The contractor, sub-recipient, or subcontractor must comply with federal nondiscrimination requirements pursuant to Section 49 CFR 26.

Inquiries or questions based on alleged patent ambiguity of the plans, specifications or estimate must be communicated as a bidder inquiry prior to bid opening. Any such inquiries or questions, submitted after bid opening, will not be treated as a bid protest.

Submit all bidder inquiries directly through the Department's solicitation page under the section titled "Q&A." All responses to bidder inquiries and addenda will be available at www.bidexpress.com. It is each bidder's responsibility to check the website for these documents.

This project is subject to the "Buy America" provisions of the Surface Transportation Assistance Act of 1982 as amended by the Intermodal Surface Transportation Efficiency Act of 1991.

BID ITEM LIST

PROJECT: **Movable Span Bridges Project, Federal Aid Project No. BRLS-5929(229)**

ITEM NO.	ITEM CODE	ITEM NAME	UNIT OF MEASURE	ESTIMATED QUANTITY
BACON ISLAND ROAD OVER MIDDLE RIVER				
1	070030	Lead Compliance Plan	LS	1
2	120090	Construction Area Signs	LS	1
3	120100	Traffic Control System	LS	1
4	130200	Prepare Stormwater Pollution Control Plan	LS	1
5	130305	Water Pollution Control	LS	1
6	880010	PVC Coated Rigid Galvanized Steel Conduit – 1 inch	LF	50
7	880030	Stainless Steel NEMA 4 Rated Electrical Box – 6 by 6 by 4 inches	EA	20
8	880040	Insulated Conductor No. 12 AWG	LF	450
9	880050	Twisted Shielded Cable	LF	60
10	880060	Ground Wire No. 12 AWG	LF	50
11	880070	Bridge Electrical Equipment	LS	1
12	880080	Bridge System Testing	LS	1
13	880090	Electrical Equipment Demolition	LS	1
14	980000	Bridge Machinery	LS	1
15	999990	Mobilization	LS	1
TRACY BOULEVARD OVER GRANT LINE CANAL				
1	070030	Lead Compliance Plan	LS	1
2	120090	Construction Area Signs	LS	1
3	120100	Traffic Control System	LS	1
4	128651	Portable Changeable Message Sign	EA	2
5	130200	Prepare Stormwater Pollution Control Plan	LS	1

NOTICE TO BIDDERS (01/22)

Federal Aid Project

6	130305	Water Pollution Control	LS	1
7	790000	Center Span Lock Temporary Support	LS	1
8	790010	Modifications to Existing Traffic Gate Foundation on Structure	LS	1
9	790020	On-Grade Traffic Gate Foundation	LS	1
10	880100	Traffic Control Equipment	LS	1
11	880010	PVC Coated Rigid Galvanized Steel Conduit – 1 inch	LF	75
12	880190	PVC Coated Rigid Galvanized Steel Conduit – 1.5 inch	LF	25
13	880110	Stainless Steel NEMA 4 Rated Electrical Box – 12 by 12 by 8 inches	EA	9
14	880120	Cast Iron NEMA 4 Rated Electrical Box – 24 by 24 by 12 inches	EA	1
15	880040	Insulated Conductor No. 12 AWG	LF	7200
16	880130	Insulated Conductor No. 10 AWG	LF	150
17	880060	Ground Wire No. 12 AWG	LF	800
18	880140	Ground Wire No. 10 AWG	LF	50
19	880070	Bridge Electrical Equipment	LS	1
20	880080	Bridge System Testing	LS	1
21	880150	Trenching, Backfilling, and Compacting for Utilities	CUFT	400
22	880090	Electrical Equipment Demolition	LS	1
23	980000	Bridge Machinery	LS	1
24	999990	Mobilization	LS	1

EIGHT MILE ROAD OVER BISHOP CANAL

1	070030	Lead Compliance Plan	LS	1
2	120090	Construction Area Signs	LS	1
3	120100	Traffic Control System	LS	1
4	128651	Portable Changeable Message Signs	EA	2
5	130200	Prepare Stormwater Pollution Control Plan	LS	1

NOTICE TO BIDDERS (01/22)
Federal Aid Project

6	130305	Water Pollution Control	LS	1
7	790030	Rest Pier Jacking Bracket	LS	1
8	880010	PVC Coated Rigid Galvanized Steel Conduit – 1 inch	LF	50
9	880030	Stainless Steel NEMA 4 Rated Electrical Box – 6 by 6 by 4 inches	EA	1
10	880130	Insulated Conductor No. 10 AWG	LF	200
11	880140	Ground Wire No. 10 AWG	LF	50
12	880070	Bridge Electrical Equipment	LS	1
13	880080	Bridge System Testing	LS	1
14	880090	Electrical Equipment Demolition	LS	1
15	980000	Bridge Machinery	LS	1
16	999990	Mobilization	LS	1

EIGHT MILE ROAD OVER HONKER CUT

1	070030	Lead Compliance Plan	LS	1
2	120090	Construction Area Signs	LS	1
3	120100	Traffic Control System	LS	1
4	128651	Portable Changeable Message Signs	EA	2
5	130200	Prepare Stormwater Pollution Control Plan	LS	1
6	130305	Water Pollution Control	LS	1
7	880080	Bridge System Testing	LS	1
8	880090	Electrical Equipment Demolition	LS	1
9	880160	Span Navigation Lights	EA	3
10	880170	Pier Navigation Lights with Integral Solar	EA	6
11	880180	Pier Navigation Lights with Remote Solar	EA	4
12	980000	Bridge Machinery	LS	1
13	999990	Mobilization	LS	1

The Contractor must possess a **Class A** license at the time this contract is awarded.

A contractor or subcontractor will not be qualified to bid on, be listed in a bid, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.

The County of San Joaquin, hereby notifies all Bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, minority business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, sex or national origin in consideration for an award.

This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the County in which the work is to be done have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project are available from the California Department of Industrial Relations' Internet web site at <http://www.dir.ca.gov/oprl/DPreWageDetermination.htm>. The Federal minimum wage rates for this project as predetermined by the United States Secretary of Labor are available from the Department of Labor's internet web site at <https://sam.gov/>. Addenda to modify the Federal minimum wage rates, if necessary, will be issued to holders of "Bid and Contract" books. Future effective general prevailing wage rates, which have been predetermined and are on file with the California Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

Attention is directed to the Federal minimum wage requirements in Section 7-1.02K(2), "Wages," of this book. If there is a difference between the minimum wage rates predetermined by the Secretary of Labor and the general prevailing wage rates determined by the Director of the California Department of Industrial Relations for similar classifications of labor, the Contractor and subcontractors will pay not less than the higher wage rate. The Department will not accept lower State wage rates not specifically included in the Federal minimum wage determinations. This includes "helper" (or other classifications based on hours of experience) or any other classification not appearing in the Federal wage determinations. Where Federal wage determinations do not contain the State wage rate determination otherwise available for use by the Contractor and subcontractors, the Contractor and subcontractors will pay not less than the Federal minimum wage rate which most closely approximates the duties of the employees in question.

The U.S. Department of Transportation (DOT) provides a toll-free hotline to report bid rigging activities. Use the hotline to report bid rigging, bidder collusion, and other fraudulent activities. The hotline number is (800) 424-9071. The service is available 24 hours, 7 days a week, and is confidential and anonymous. The hotline is part of the DOT's effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General.

The Board reserves the right to reject any or all bids and further reserves the right to waive minor irregularities in the bids.

Date _____

COUNTY OF SAN JOAQUIN,
a political subdivision of
the State of California

By: ROBERT RICKMAN
Chairman of the Board of Supervisors

**COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS**

1 GENERAL

1-1.01 GENERAL, add:

The work embraced herein must be done in accordance with the Department of Transportation Standard Specifications dated 2018, hereinafter referred to as the Standard Specifications, and the Department of Transportation Standard Plans dated 2018, hereinafter referred to as the Standard Plans, insofar as the same may apply and in accordance with the following special provisions.

In case of conflict between the Standard Specifications and these special provisions, the Special Provisions must take precedence over and be used in lieu of such conflicting portions.

Revised Standard Specifications set forth in these special provisions must be considered as part of the Standard Specifications for the purposes set forth in Section 5-1.02, "Contract Components."

1-1.05 REFERENCES, replace last paragraph with:

Where in the Standard Specifications, special provisions, Notice to Bidders, bid, contract or other contract documents, the following terms are revised, added or used, the intent and meaning must be interpreted as follows:

Attorney General	County Counsel of San Joaquin
State, or County	County of San Joaquin
Department	County of San Joaquin
Director	Board of Supervisors, County of San Joaquin
District	County of San Joaquin
Department of Transportation State of California	Department of Public Works County of San Joaquin
Engineer and Deputy Director Transportation Engineering	Director of Public Works, County of San Joaquin acting either directly or through properly authorized agent and consultants

1-1.06 ABBREVIATIONS, add the following definitions to Abbreviation Table:

ASTM	American Society for Testing Materials
CFR	Code of Regulations
CONT	Contract
NTP	Notice to Proceed
QA	Quality Assurance
QC	Quality Control

1-1.07 DEFINITIONS

1-1.07B Glossary, revise, add or use the definitions of this section with the following:

Agency: County of San Joaquin

Bid Item List: List of bid items and the associated quantities. The verified Bid Item List with verified prices. The Contract Proposal of Low Bidder is the verified Bid Item List. After Contract award, interpret reference to the Bid Item List as a reference to the verified Bid Item List.

Board of Supervisors: Board of Supervisors of San Joaquin County, State of California.

California Test: Caltrans-developed test for determining work quality. For California Tests, go to the METS website.

Caltrans: California Department of Transportation as defined in the State & Highway Code Section 20 and authorized in State & Highway Code Section 90, and its authorized representatives.

Contract Documents: The Contract Documents consist of: Notice to Bidders, the prevailing rate of per diem wage rates as determined by the California Department of Industrial Relations, the accepted Bid, including, Bid Item List, Non-Collusion Affidavit, Equal Employment Opportunity Certification, Subcontractor List, Bidder's List of subcontractor (DBE and Non-DBE), Construction Contract DBE Commitment (Exhibit 15-G), Proposer/Contractor Good Faith Efforts (Exhibit 15-H), Bidder's List of Subcontractor (DBE and Non-DBE) (Exhibit 12-B), Bidder DBE Trucking Information Form, Form FHWA -1273, Bid Security or Bid Bond, this Contract Agreement, Workers Compensation Certificate, Performance Bond, Labor and Materials Bond, Notice of Award, Notice of Completion, Special Provisions, California 2018 Standard Specifications, California Labor Surcharge and Equipment Rental Rates, Plans, any issued Addenda, Change Orders, and any other applicable documents not listed including modifications incorporated in these documents.

County: County of San Joaquin, a political subdivision of the State of California.

Engineer or Office Engineer: San Joaquin County Director of Public Works, acting either directly or through properly authorized agents, and such agents acting within the scope of the particular duties delegated to them.

Improvement Standards: Improvement Standards of County of San Joaquin, Department of Public Works.

Notice to Contractors: References to Notice to Contractors or Notice to Bidders are the same documents.

Purchasing Agent: The Purchasing Manager, of County, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties delegated to them.

Submittal: When a submittal is identified to be made to METS or to OSD, submit the items to the Engineer unless otherwise directed.

1-1.08 DISTRICTS, delete.

1-1.10 PAVEMENT CLIMATE REGIONS, delete.

1-1.11 WEBSITES, ADDRESSES, AND TELEPHONE NUMBERS, replace the "Website, Address, and Telephone Number" of the Office Engineer in the table with:

Reference or agency or department unit/Name	Website	Address	Telephone No.
Office Engineer	www.bidexpress.com	DESIGN ENGINEER COUNTY OF SAN JOAQUIN DEPARTMENT OF PUBLIC WORKS 1810 EAST HAZELTON AVENUE STOCKTON, CA 95205	(209) 468-3000

1-1.12 MISCELLANY, replace section with:

Make checks and bonds payable to the "County of San Joaquin."

2 BIDDING

2-1.04 PREBID OUTREACH MEETING, replace section with:

Prebid meeting information is shown on the Notice to Bidders.

Replace “2.1.05 RESERVED” with:

2-1.05 CONFLICT OF INTEREST

In conformance with Public Contract Code Section 7106, a Noncollusion Affidavit is included in the bid documents. Signing the bid shall also constitute signature of the Noncollusion Affidavit.

2-1.06 BID DOCUMENTS

2-1.06A General, replace section with:

The State Standard Specifications and State Standard Plans may be viewed at the Caltrans’ website and may be purchased at the Publication Distribution Unit.

Bids and copies of the Plans and Specifications will be available at the Department of Public Works' Solicitation Page at Bid Express, found at www.bidexpress.com/businesses/23724/home?agency=true.

The "Specifications" include the special provisions, Notice to Bidders, bid and contract.

2-1.06B Supplemental Project Information, replace paragraph 3 through 8 with:

Supplemental Project Information, if any, will be available at www.bidexpress.com.

2-1.10 SUBCONTRACTOR LIST, replace item 4 of the list in paragraph 2 with:

4. Portion of work it will perform. Show the portion of the work by:

- 4.1 Bid Item Number(s) for the subcontracted work
- 4.2 Description of subcontracted work
- 4.3 Dollar amount of subcontracted work

2-1.12 DISADVANTAGED BUSINESS ENTERPRISES

2-1.12A General, replace paragraph 2 with:

Under 49 CFR 26.13(b):

The contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR 26 in the award and administration of federal-aid contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as

the recipient deems appropriate, which may include, but is not limited to:

- (1) Withholding monthly progress payments;
- (2) Assessing sanctions;
- (3) Liquidated damages; and/or
- (4) Disqualifying the contractor from future bidding as non-responsible.

2-1.12A General, add after paragraph 3:

The contractor, subrecipient or subcontractor shall take necessary and reasonable steps to ensure that DBEs have opportunity to participate in the contract (49 CFR 26). To ensure equal participation of DBEs provided in 49 CFR 26.5, the Department shows a contract goal for DBEs. The prime contractor shall make work available to DBEs and select work parts consistent with available DBE subcontractors and suppliers.

The prime contractor shall meet the DBE goal shown elsewhere in these special provisions or demonstrate that they made adequate good faith efforts to meet this goal.

It is the prime contractor's responsibility to verify that at date of bid opening the DBE firm is certified as a DBE by using the California Unified Certification Program (CUCP) database and possesses the most specific available North American Industry Classification System (NAICS) codes and work code applicable to the type of work the firm will perform on the contract. Additionally, the prime contractor is responsible to document the record by printing out the California Unified Certification Program (CUCP) data for each DBE firm. A list of DBEs certified by the CUCP can be found at <https://dot.ca.gov/programs/civil-rights/dbe-search>.

2-1.12B DISADVANTAGED BUSINESS ENTERPRISE GOAL

2-1.12B(1) General, replace paragraphs 7 through 9 with:

All DBE participation will count toward the California Department of Transportation's federally mandated statewide overall DBE goal.

Credit for materials or supplies the prime contractor purchases from DBEs counts towards the goal in the following manner:

1. 100 percent counts if the materials or supplies are obtained from a DBE manufacturer.
2. 60 percent counts if the materials or supplies are obtained from a DBE regular dealer.
3. Only fees, commissions, and charges for assistance in the procurement and delivery of materials or supplies count if obtained from a DBE that is neither a manufacturer nor regular dealer. 49 CFR 26.55 defines "manufacturer" and "regular dealer."

The prime contractor receives credit towards the goal if they employ a DBE trucking company that performs a commercially useful function as defined in 49 CFR 26.55(d)(1) as follows:

The DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting DBE goals.

The DBE must itself own and operate at least one fully licensed, insured, and operational truck used on the contract.

The DBE receives credit for the total value of the transportation services it provides on the Contract using trucks it owns, insures, and operates using drivers it employs.

The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the Contract.

The DBE may lease trucks without drivers from a non-DBE truck leasing company. If the DBE leases trucks from a non-DBE truck leasing company and uses its own employees as drivers, it is entitled to credit for the total value of these hauling services.

A lease must indicate that the DBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE. [49 CFR 26.55(d)]

2-1.12B(2) DBE Commitment Submittal, replace paragraph 2 with:

Submit:

- *Construction Contract DBE Commitment (Exhibit 15-G);*
- *Proposer/Contractor Good Faith Efforts (Exhibit 15-H);*
- *Bidder's List of Subcontractor (DBE and Non-DBE) (Exhibit 12-B); and*
- *Bidder DBE Trucking Information Form.*

DBE Commitment may be submitted with the bid, using Bid Express at <https://www.bidexpress.com>, on or before the date and closing time specified in the Notice to Bidders.

The bidder shall complete and sign Exhibit 15-G included in the contract documents regardless of whether DBE participation is reported. The bidder shall provide written confirmation from each DBE that the DBE is participating in the Contract. A copy of a DBE's quote serves as written confirmation.

If DBE Commitment is not submitted with the bid, all bidders must complete and submit the DBE paper documents to the Office Engineer within 5 calendar days after the bid opening. If the bidder does not submit the DBE Commitment form within the specified time, the Department will find the bidder's bid nonresponsive.

2-1.15 DISABLED VETERAN BUSINESS ENTERPRISES, delete.

2-1.18 SMALL BUSINESS AND NON-SMALL BUSINESS SUBCONTRACTOR PREFERENCES, delete.

2-1.27 CALIFORNIA COMPANIES, delete.

2-1.31 OPT OUT OF PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS, delete.

2-1.33 BID DOCUMENT COMPLETION AND SUBMITTAL

2-1.33A General, replace section with:

Complete and submit the bids electronically under the Department of Public Works' Solicitation Page at the BidExpress website, found at www.bidexpress.com/businesses/23724/home?agency=true.

To bid electronically, all bidders must be registered and create a Digital ID with Bid Express. Please allow at least five (5) business days to complete the electronic bidding registration process for the first time. It is highly recommended that a Digital ID be active 48 hours in advance of submitting an electronic bid.

Your authorized digital signature is your confirmation of and agreement to all certifications and statements contained in the Bid. On forms and certifications that you submit through the electronic bidding service, you agree that each form and certification where a signature is required is deemed as having your signature.

Failure to submit the forms and information as specified may result in a nonresponsive bid.

2-1.33B Bid Form Submittal Schedules

2-1.33B(1) General, replace sentence 1 of paragraph 1 with:

Bid forms are included in the advertised project Plans and Specifications and are specific to this contract.

2-1.33B(2)(b)(ii) Non-Informal-Bid Contract, replace the table titled "Bid Form Submittal Schedule for a Non-Informal Bid Federal-Aid Contract with a DBE Goal" with:

**Bid Form Submittal Schedule for a
Non-Informal Bid Federal-Aid Contract with a DBE Goal**

Form	Submittal deadline
Bid to the Department	Time of bid except for the public works contractor registration number
DBE Commitment Submittal	No later than 4 p.m. on the 5th calendar day after bid opening ^a

^aIf the last day for submitting the bid form falls on a Saturday or holiday, it may be submitted on the next business day with the same effect as if it had been submitted on the day specified.

2-1.34 BIDDER'S SECURITY, replace section with:

All bids must be accompanied by cash, a certified check, cashier's check, electronic bond (eBond), or bid bond of a corporate surety made payable to the County of San Joaquin, for a sum of at least 10 percent of the amount of bid. A hard copy bid bond must be signed by both principal and surety with each signature acknowledged before a notary public. The bid bond must also contain the project name and the name, address and telephone number of the local agent of the surety bonding insurance company. Such guarantees must be forfeited to said County should the bidder to whom the contract is awarded fails to enter into a contract.

Electronic bidder's bond by an admitted surety insurer submitted using an electronic registry service approved by the Department is available for submission with bid.

Bid security other than electronic bidder's bond must be received by the Department of Public Works prior to the bid opening date and closing time specified in the Notice to Bidders. The envelope containing Bid Security should be clearly marked on the outside with "Bid Documents for (Project Name)."

Replace "**2-1.37 RESERVED**" with:

2-1.37 BID SUBMITTAL

All bids must be submitted electronically using Bid Express, www.bidexpress.com, on or before the date and closing time specified in the "Notice to Bidders."

No bid must be valid unless signed by the person making the bid. If the party is an individual, the name must be signed by the individual; if the party is a partnership, the name of the partnership must be given and signed by one of the partners; if the name is a corporation, the bid should be signed by the corporation's properly authorized officer or officers. The person signing the bid must also be registered to the Digital ID that submits the bid through the electronic bidding service.

Only one bid per bidder will be accepted.

BID TO THE BOARD OF SUPERVISORS
COUNTY OF SAN JOAQUIN

— — — —

TO THE BOARD OF SUPERVISORS, COUNTY OF SAN JOAQUIN:

This bid is submitted for the **Movable Span Bridges Project**. All work for which this bid is submitted will be in accordance with the special provisions (including the payment of not less than the State general prevailing wage rates or the Federal minimum wage rates set forth herein), the project plans, including any addenda thereto, the contract annexed hereto, and in accordance with the State of California Department of Transportation Standard Plans, dated 2018, the Standard Specifications, dated 2018, and the Labor Surcharge and Equipment Rental Rates in effect on the date the work is accomplished.

The undersigned, as bidder, declares that the only persons or parties interested in this bid as principals are those named herein; that this bid is made without collusion with any other person, firm or corporation. Undersigned further declares that he has carefully examined the location of the proposed work, the proposed form of contract, and the plans and specifications therefore. If this bid is accepted, he will enter into a written contract contained in the Specifications for the project within ten (10) days after being requested to do so, and will provide all necessary bonds and insurance for the **Movable Span Bridges Project** and that he will take in full payment therefore the following unit prices, to wit:

BID ITEM LIST

ITEM NO.	ITEM CODE	ITEM NAME	UNIT OF MEASURE	ESTIMATED QUANTITY	UNIT PRICE (in Figures)	TOTAL (in Figures)
		BACON ISLAND ROAD BRIDGE				
1	070030	Lead Compliance Plan	LS	1		
2	120090	Construction Area Signs	LS	1		
3	120100	Traffic Control Systems	LS	1		
4	130200	Prepare Stormwater Pollution Control Plan	LS	1		
5	130305	Water Pollution Control	LS	1		
6	880010	PVC Coated Rigid Galvanized Steel Conduit – 1 inch	LF	25		
7	880030	Stainless Steel NEMA 4 Rated Electrical Box – 6 by 6 by 4 inches	EA	2		
8	880040	Insulated Conductor No. 12 AWG	LF	50		
9	880050	Twisted Shielded Cable	LF	60		
10	880060	Ground Wire No. 12 AWG	LF	10		
11	880070	Bridge Electrical Equipment	LS	1		
12	880080	Bridge System Testing	LS	1		
13	880090	Electrical Equipment Demolition	LS	1		
14	980000	Bridge Machinery	LS	1		
15	999990	Mobilization	LS	1		

		TRACY BOULEVARD BRIDGE				
1	070030	Lead Compliance Plan	LS	1		
2	120090	Construction Area Signs	LS	1		
3	120100	Traffic Control Systems	LS	1		
4	128651	Portable Changeable Message Signs	EA	2		
5	130200	Prepare Stormwater Pollution Control Plan	LS	1		
6	130305	Water Pollution Control	LS	1		
7	790000	Center Span Lock Temporary Support	LS	1		
8	790010	Modifications to Existing Traffic Gate Foundation on Structure	LS	1		
9	790020	On-Grade Traffic Gate Foundation	LS	1		
10	880100	Traffic Control Equipment	LS	1		
11	880010	PVC Coated Rigid Galvanized Steel Conduit – 1 inch	LF	500		
12	880190	PVC Coated Rigid Galvanized Steel Conduit – 1.5 inch	LF	500		
13	880110	Stainless Steel NEMA 4 Rated Electrical Box 12 by 12 by 8 inches	EA	9		
14	880120	Cast Iron NEMA 4 Rated Electrical Box 24 by 24 by 12 inches	EA	1		
15	880040	Insulated Conductor No. 12 AWG	LF	7200		
16	880130	Insulated Conductor No. 10 AWG	LF	150		
17	880060	Ground Wire No. 12 AWG	LF	800		
18	880140	Ground Wire No. 10 AWG	LF	50		
19	880070	Bridge Electrical Equipment	LS	1		
20	880080	Bridge System Testing	LS	1		

21	880150	Trenching, Backfilling, and Compacting for Utilities	CUFT	400		
22	880090	Electrical Equipment Demolition	LS	1		
23	980000	Bridge Machinery	LS	1		
24	999990	Mobilization	LS	1		
		EIGHT MILE ROAD OVER BISHOP CANAL				
1	070030	Lead Compliance Plan	LS	1		
2	120090	Construction Area Signs	LS	1		
3	120100	Traffic Control Systems	LS	1		
4	128651	Portable Changeable Message Signs	EA	2		
5	130200	Prepare Stormwater Pollution Control Plan	LS	1		
6	130305	Water Pollution Control	LS	1		
7	790030	Rest Pier Jacking Bracket	LS	1		
8	880010	PVC Coated Rigid Galvanized Steel Conduit – 1 inch	LF	50		
9	880030	Stainless Steel NEMA 4 Rated Electrical Box – 6 by 6 by 4 inches	EA	1		
10	880130	Insulated Conductor No. 10 AWG	LF	200		
11	880140	Ground Wire No. 10 AWG	LF	50		
12	880070	Bridge Electrical Equipment	LS	1		
13	880080	Bridge System Testing	LS	1		
14	880090	Electrical Equipment Demolition	LS	1		
15	980000	Bridge Machinery	LS	1		
16	999990	Mobilization	LS	1		

		EIGHT MILE ROAD OVER HONKER CUT				
1	070030	Lead Compliance Plan	LS	1		
2	120090	Construction Area Signs	LS	1		
3	120100	Traffic Control Systems	LS	1		
4	128651	Portable Changeable Message Signs	EA	2		
5	130200	Prepare Stormwater Pollution Control Plan	LS	1		
6	130305	Water Pollution Control	LS	1		
7	880080	Bridge System Testing	LS	1		
8	880090	Electrical Equipment Demolition	LS	1		
9	880160	Span Navigation Lights	EA	3		
10	880170	Pier Navigation Lights with Integral Solar	EA	6		
11	880180	Pier Navigation Lights with Remote Solar	EA	4		
12	980000	Bridge Machinery	LS	1		
13	999990	Mobilization	LS	1		

TOTAL \$ _____.

PUBLIC CONTRACT CODE SECTION 10162 QUESTIONNAIRE

In conformance with Public Contract Code Section 10162, the bidder must complete, under penalty of perjury, the following questionnaire:

Has the bidder, any officer of the bidder, or any employee of the bidder who has a proprietary interest in the bidder, ever been disqualified, removed, or otherwise prevented from bidding on, or completing a federal, state, or local government project because of a violation of law or a safety regulation?

Yes _____ No _____

If the answer is yes, explain the circumstances in the following space.

PUBLIC CONTRACT CODE SECTION 10232 STATEMENT

In conformance with Public Contract Code Section 10232, the Contractor, hereby states under penalty of perjury, that no more than one final unappealable finding of contempt of court by a federal court has been issued against the Contractor within the immediately preceding two year period because of the Contractor's failure to comply with an order of a federal court which orders the Contractor to comply with an order of the National Labor Relations Board.

Note: The above Statement and Questionnaire are part of the Bid. Signing this Bid on the signature portion thereof must also constitute signature of this Statement and Questionnaire.

Bidders are cautioned that making a false certification may subject the certified to criminal prosecution.

NONCOLLUSION AFFIDAVIT
(Title 23 United States Code Section 112 and
Public Contract Code Section 7106)

In accordance with Title 23 United States Code Section 112 and Public Contract Code Section 7106 the bidder declares that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone must refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

Note: The above Noncollusion Affidavit is part of the Bid. Signing this Bid on the signature portion thereof must also constitute signature of this Noncollusion Affidavit.

Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

BUSINESS AND PROFESSIONS CODES SECTION 7028.15 STATEMENT

In conformance with Business and Professions Code Section 7028.15, the Contractor, hereby states that all representations made herein are made under penalty of perjury.

TITLE 49, CODE OF FEDERAL REGULATIONS, PART 29

The bidder, under penalty of perjury, certifies that, except as noted below, he/she or any other person associated therewith in the capacity of owner, partner, director, officer, and manager:

- Is not currently under suspension, debarment, voluntary exclusion, or determination of ineligibility by any federal agency;
- Has not been suspended, debarred, voluntarily excluded or determined ineligible by any federal agency within the past 3 years;
- Does not have a proposed debarment pending; and
- Has not been indicted, convicted, or had a civil judgment rendered against it by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past 3 years.

If there are any exceptions to this certification, insert the exceptions in the following space.

Exceptions will not necessarily result in denial of award, but will be considered in determining bidder responsibility. For any exception noted above, indicate below to whom it applies, initiating agency, and dates of action.

Notes: Providing false information may result in criminal prosecution or administrative sanctions.

The above certification is part of the Bid. Signing this Bid on the signature portion thereof must also constitute signature of this Certification.

Non-Lobbying
Certification for Federal Aid Contracts

The prospective participant certifies, by signing and submitting this bid, to the best of his or her knowledge and belief, that:

- (1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this federal contract, grant, loan, or cooperative agreement, the undersigned must complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification must be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The prospective participant also agrees by submitting his or her bid that he or she must require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such sub recipients must certify and disclose accordingly.

EXHIBIT 10-Q DISCLOSURE OF LOBBYING ACTIVITIES

COMPLETE THIS FORM TO DISCLOSE LOBBYING ACTIVITIES PURSUANT TO 31 U.S.C. 1352

1. Type of Federal Action: <input type="checkbox"/> a. contract <input type="checkbox"/> b. grant <input type="checkbox"/> c. cooperative agreement <input type="checkbox"/> d. loan <input type="checkbox"/> e. loan guarantee <input type="checkbox"/> f. loan insurance	2. Status of Federal Action: <input type="checkbox"/> a. bid/offer/application <input type="checkbox"/> b. initial award <input type="checkbox"/> c. post-award	3. Report Type: <input type="checkbox"/> a. initial <input type="checkbox"/> b. material change For Material Change Only: year _____ quarter _____ date of last report _____
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4. Name and Address of Reporting Entity <input type="checkbox"/> Prime <input type="checkbox"/> Subawardee Tier _____, if known Congressional District, if known	5. If Reporting Entity in No. 4 is Subawardee, Enter Name and Address of Prime: Congressional District, if known
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6. Federal Department/Agency: 8. Federal Action Number, if known: 10. Name and Address of Lobby Entity (If individual, last name, first name, MI) (attach Continuation Sheet(s) if necessary)	7. Federal Program Name/Description: CFDA Number, if applicable _____ 9. Award Amount, if known: 11. Individuals Performing Services (including address if different from No. 10a) (last name, first name, MI) (attach Continuation Sheet(s) if necessary)
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12. Amount of Payment (check all that apply) \$ _____ <input type="checkbox"/> actual <input type="checkbox"/> planned 13. Form of Payment (check all that apply): <input type="checkbox"/> a. cash <input type="checkbox"/> b. in-kind; specify: nature _____ Value _____	14. Type of Payment (check all that apply) <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div> a. retainer b. one-time fee c. commission d. contingent fee e. deferred f. other, specify _____ </div> </div>
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15. Brief Description of Services Performed or to be performed and Date(s) of Service, including officer(s), employee(s), or member(s) contacted, for Payment Indicated in Item 11: (attach Continuation Sheet(s) if necessary)	
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16. Continuation Sheet(s) attached:	Yes <input type="checkbox"/> No <input type="checkbox"/>
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17. Information requested through this form is authorized by Title 31 U.S.C. Section 1352. This disclosure of lobbying reliance was placed by the tier above when his transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to Congress semiannually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.	Signature: _____ Print Name: _____ Title: _____ Telephone No.: _____ Date: _____
--	---

INSTRUCTIONS FOR COMPLETING EXHIBIT 10-Q DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime federal recipient at the initiation or receipt of covered federal action or a material change to previous filing pursuant to title 31 U.S.C. Section 1352. The filing of a form is required for such payment or agreement to make payment to lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress an officer or employee of Congress or an employee of a Member of Congress in connection with a covered federal action. Attach a continuation sheet for additional information if the space on the form is inadequate. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered federal action for which lobbying activity is or has been secured to influence, the outcome of a covered federal action.
2. Identify the status of the covered federal action.
3. Identify the appropriate classification of this report. If this is a follow-up report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last, previously submitted report by this reporting entity for this covered federal action.
4. Enter the full name, address, city, state, and zip code of the reporting entity. Include Congressional District if known. Check the appropriate classification of the reporting entity that designates if it is or expects to be a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the first tier. Subawards include but are not limited to: subcontracts, subgrants, and contract awards under grants.
5. If the organization filing the report in Item 4 checks "Subawardee" then enter the full name, address, city, state, and zip code of the prime federal recipient. Include Congressional District, if known.
6. Enter the name of the federal agency making the award or loan commitment. Include at least one organization level below agency name, if known. For example, Department of Transportation, United States Coast Guard.
7. Enter the federal program name or description for the covered federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans and loan commitments.
8. Enter the most appropriate federal identifying number available for the federal action identification in item 1 (e.g., Request for Proposal (RFP) number, Invitation for Bid (IFB) number, grant announcement number, the contract grant, or loan award number, the application/proposal control number assigned by the federal agency). Include prefixes, e.g., "RFP-DE-90-001."
9. For a covered federal action where there has been an award or loan commitment by the Federal agency, enter the federal amount of the award/loan commitments for the prime entity identified in item 4 or 5.
10. Enter the full name, address, city, state, and zip code of the lobbying entity engaged by the reporting entity identified in Item 4 to influence the covered federal action.
11. Enter the full names of the individual(s) performing services and include full address if different from 10 (a). Enter Last Name, First Name and Middle Initial (MI).
12. Enter the amount of compensation paid or reasonably expected to be paid by the reporting entity (Item 4) to the lobbying entity (Item 10). Indicate whether the payment has been made (actual) or will be made (planned). Check all boxes that apply. If this is a material change report, enter the cumulative amount of payment made or planned to be made.
13. Check all boxes that apply. If payment is made through an in-kind contribution, specify the nature and value of the in-kind payment.
14. Check all boxes that apply. If other, specify nature.
15. Provide a specific and detailed description of the services that the lobbyist has performed or will be expected to perform and the date(s) of any services rendered. Include all preparatory and related activity not just time spent in actual contact with federal officials. Identify the federal officer(s) or employee(s) contacted or the officer(s) employee(s) or Member(s) of Congress that were contacted.
16. Check whether or not a continuation sheet(s) is attached.
17. The certifying official shall sign and date the form, and print his/her name title and telephone number.

Public reporting burden for this collection of information is estimated to average 30-minutes per response, including time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0046), Washington, D.C. 20503. SF-LLL-Instructions Rev. 06-04

PUBLIC CONTRACT CODE SECTION 10285.1 STATEMENT

In conformance with Public Contract Code Section 10285.1 (Chapter 376, Stats. 1985), the bidder hereby declares under penalty of perjury that the bidder has _____, has not _____ been convicted within the preceding three years of any offenses referred to in that section, including any charge of fraud, bribery, collusion, conspiracy, or any other act in violation of any state or federal antitrust law in connection with the bidding upon, award of, or performance of, any public works contract, as defined in Public Contract Code Section 1101, with any public entity, as defined in Public Contract Code Section 1100, including the Regents of the University of California or the Trustees of the California State University. The term "bidder" is understood to include any partner, member, officer, director, responsible managing officer, or responsible managing employee thereof, as referred to in Section 10285.1.

Note: The bidder must place a check mark after "has" or "has not" in one of the blank spaces provided.

The above Statement is part of the Bid. Signing this Bid on the signature portion thereof must also constitute signature of this Statement.

Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

(THE BIDDER'S EXECUTION ON THE SIGNATURE PORTION OF THIS PROPOSAL WILL ALSO CONSTITUTE AN ENDORSEMENT AND EXECUTION OF THOSE CERTIFICATIONS WHICH ARE A PART OF THIS BID)

EQUAL EMPLOYMENT OPPORTUNITY CERTIFICATION

The bidder _____, proposed subcontractor _____, hereby certifies that he has _____, has not _____, participated in a previous contract or subcontract subject to the equal opportunity clauses, as required by Executive Orders 10925, 11114, or 11246, and that, where required, he has filed with the Joint Reporting Committee, the Director of the Office of Federal Contract Compliance, a Federal Government contracting or administering agency, or the former President's Committee on Equal Employment Opportunity, all reports due under the applicable filing requirements.

Note: The above certification is required by the Equal Employment Opportunity Regulations of the Secretary of Labor (41 CFR 60-1.7(b) (1)), and must be submitted by bidders and proposed subcontractors only in connection with contracts and subcontracts, which are subject to the equal opportunity clause. Contracts and subcontracts which are exempt from the equal opportunity clause are set forth in 41 CFR 60-1.5. (Generally only contracts or subcontracts of \$10,000 or under are exempt.)

Currently, Standard Form 100 (EEO-1) is the only report required by the Executive Orders or their implementing regulations.

Proposed prime contractors and subcontractors who have participated in a previous contract or subcontract subject to the Executive Orders and have not filed the required reports should note that 41 CFR 60-1.7(b) (1) prevents the award of contracts and subcontracts unless such contractor submits a report covering the delinquent period or such other period specified by the Federal Highway Administration or by the Director, Office of Federal Contract Compliance, U.S. Department of Labor.

SUBCONTRACTOR LIST

In accordance with the "Subletting and Subcontracting Fair Practices Act" (Public Contract Code Sections 4100-4114, inclusive) each bidder in their Bid must provide the information requested below on each subcontractor that will perform work or labor or render service for the bidder in excess of one-half of one percent of the total bid or \$10,000, whichever is greater.

(If a subcontractor will perform multiple items of work, list each item individually and include required information. Submit additional sheets, if necessary. Example:)

Contractor License #123456 DIR Registration #: 1000000001 Company: <i>Striping Subcontractor, Inc.</i> Address: <i>123 Main Street, Anywhere, CA</i> Email Address: <i>stripingco@yahoo.com</i>	16	4" Paint Traffic Stripe (1-Coat)	\$11,875
	17	8" Paint Traffic Stripe (1-Coat)	\$700
	18	Paint Pavement Markings (1-Coat)	\$7,200

Bidding Firm Name: _____

(SPECS 2018/FED-B-11/12.3.21)

B-14

SUBCONTRACTOR INFORMATION	BID ITEM NUMBER(S)	DESCRIPTION OF WORK	DOLLAR AMOUNT
Contractor License #: *DIR Registration #: Company: Address: Email Address:			
Contractor License # DIR Registration #: Company: Address: Email Address:			
Contractor License #: DIR Registration #: Company: Address: Email Address:			
Contractor License # DIR Registration #: Company: Address: Email Address:			

* Department of Industrial Relations Registration number

Accompanying this bid is _____
(Cash, Cashier's Check, Certified Check, electronic bond (eBond) or

Bidder's Bond

in an amount equal to at least ten percent (10%) of the total bid, made payable to the County of San Joaquin. If the bid is accepted, said guaranty must be retained by said County until the required contract and bonds are executed, or forfeited to said County if said contract and bonds be not executed.

The names of all persons interested in the foregoing bid as principals are as follows:

If bidder or other interested person is a corporation, state legal name of corporation, also names of the president, secretary, treasurer, and manager thereof; if a copartnership, state true name of firm, also names of all individual copartners composing firm; if bidder of interested person is an individual, state first and last names in full. No bid shall be valid unless signed and electronically submitted by the person making the bid.

By my signature on this bid I certify, under penalty of perjury under the laws of the State of California, that the Business and Professions Code Section 7028.15 representations, foregoing questionnaire and statements of Public Contract Code Sections 10162, 10232 and 10285.1 are true and correct and that the bidder has complied with the requirements of Section 8103 of the Fair Employment and Housing Commission Regulations (Chapter 5, Title 2 of the California Administrative Code). By my signature of this bid I further certify, under penalty of perjury under the laws of the State of California and the United States of America, that the Noncollusion Affidavit required by Title 23 United States Code, Section 112 and Public Contract Code Section 7106; and the Title 49 Code of Federal Regulations, Part 29 Debarment and Suspension Certification are true and correct.

Date: _____ Firm Name: _____
 Signature of Bidder: _____ Title: _____
 Print Bidder's Name: _____ Email: _____
 Business P.O. Box: _____
 City, State, Zip: _____
 Business Street Address: _____
 _____ (Please include even if P.O Box used)
 City, State, Zip: _____
 Telephone No.: () _____ FAX No.: () _____
 Contractor's License No.: _____ Expiration Date: _____
 License Classification(s): _____
 Department of Industrial Relations Registration No.: _____

EXHIBIT 15-G CONSTRUCTION CONTRACT DBE COMMITMENT

1. Local Agency: County of San Joaquin 2. Contract DBE Goal: _____
3. Project Description: _____
4. Project Location: _____
5. Bidder's Name: _____ 6. Prime Certified DBE: ☐ 7. Bid Amount: _____
8. Total Dollar Amount for **ALL** Subcontractors: _____ 9. Total Number of **ALL** Subcontractors: _____

10. Bid Item Number	11. Description of Work, Service, or Materials Supplied	12. DBE Certification Number	13. DBE Contact Information (Must be certified on the date bids are opened)	14. DBE Dollar Amount
Local Agency to Complete this Section upon Execution of Award 21. Local Agency Contract Number: _____ 22. Federal-Aid Project Number: _____ 23. Bid Opening Date: _____ 24. Contract Award Date: _____ 25. Award Amount: _____ Local Agency certifies that all DBE certifications are valid and information on this form is complete and accurate. 26. Local Agency Representative's Signature _____ 27. Date _____ 28. Local Agency Representative's Name _____ 29. Phone _____ 30. Local Agency Representative's Title _____			15. TOTAL CLAIMED DBE PARTICIPATION \$ _____ % _____ IMPORTANT: Identify all DBE firms being claimed for credit, regardless of tier. Names of the First Tier DBE Subcontractors and their respective item(s) of work listed above must be consistent, where applicable with the names and items of the work in the "Subcontractor List" submitted with your bid. Written confirmation of each listed DBE is required. 16. Preparer's Signature _____ 17. Date _____ 18. Preparer's Name _____ 19. Phone _____ 20. Preparer's Title _____	

DISTRIBUTION: 1. Original – Local Agency
 2. Copy – Caltrans District Local Assistance Engineer (DLAE). Failure to submit to DLAE within 30 days of contract execution may result in de-obligation of federal funds on contract.
 3. Include additional copy with award package.

ADA Notice: For individuals with sensory disabilities, this document is available in alternate formats. For information call (916) 654-6410 or TDD (916) 654-3880 or write Records and Forms Management, 1120 N Street, MS-89, Sacramento, CA 95814.

INSTRUCTIONS – CONSTRUCTION CONTRACT DBE COMMITMENT**CONTRACTOR SECTION**

- 1. Local Agency** - Enter the name of the local agency that is administering the contract.
- 2. Contract DBE Goal** - Enter the contract DBE goal percentage as it appears on the project advertisement.
- 3. Project Location** - Enter the project location(s) as it appears on the project advertisement.
- 4. Project Description** - Enter the project description as it appears on the project advertisement (Bridge Rehab, Seismic Rehab, Overlay, Widening, etc).
- 5. Bidder's Name** - Enter the contractor's firm name.
- 6. Prime Certified DBE** - Check box if prime contractor is a certified DBE.
- 7. Bid Amount** - Enter the total contract bid dollar amount for the prime contractor.
- 8. Total Dollar Amount for ALL Subcontractors** – Enter the total dollar amount for all subcontracted contractors. SUM = (DBEs + all Non-DBEs). Do not include the prime contractor information in this count.
- 9. Total number of ALL subcontractors** – Enter the total number of all subcontracted contractors. SUM = (DBEs + all Non-DBEs). Do not include the prime contractor information in this count.
- 10. Bid Item Number** - Enter bid item number for work, services, or materials supplied to be provided.
- 11. Description of Work, Services, or Materials Supplied** - Enter description of work, services, or materials to be provided. Indicate all work to be performed by DBEs including work performed by the prime contractor's own forces, if the prime is a DBE. If 100% of the item is not to be performed or furnished by the DBE, describe the exact portion to be performed or furnished by the DBE. See LAPM Chapter 9 to determine how to count the participation of DBE firms.
- 12. DBE Certification Number** - Enter the DBE's Certification Identification Number. All DBEs must be certified on the date bids are opened.
- 13. DBE Contact Information** - Enter the name, address, and phone number of all DBE subcontracted contractors. Also, enter the prime contractor's name and phone number, if the prime is a DBE.
- 14. DBE Dollar Amount** - Enter the subcontracted dollar amount of the work to be performed or service to be provided. Include the prime contractor if the prime is a DBE. See LAPM Chapter 9 for how to count full/partial participation.
- 15. Total Claimed DBE Participation** - \$: Enter the total dollar amounts entered in the "DBE Dollar Amount" column. %: Enter the total DBE participation claimed ("Total Claimed DBE Participation Dollars" divided by item "Bid Amount"). If the total % claimed is less than item "Contract DBE Goal," an adequately documented Good Faith Effort (GFE) is required (see Exhibit 15-H DBE Information - Good Faith Efforts of the LAPM).
- 16. Preparer's Signature** - The person completing the DBE commitment form on behalf of the contractor's firm must sign their name.
- 17. Date** - Enter the date the DBE commitment form is signed by the contractor's preparer.
- 18. Preparer's Name** - Enter the name of the person preparing and signing the contractor's DBE commitment form.
- 19. Phone** - Enter the area code and phone number of the person signing the contractor's DBE commitment form.
- 20. Preparer's Title** - Enter the position/title of the person signing the contractor's DBE commitment form.

LOCAL AGENCY SECTION

- 21. Local Agency Contract Number** - Enter the Local Agency contract number or identifier.
- 22. Federal-Aid Project Number** - Enter the Federal-Aid Project Number(s).
- 23. Bid Opening Date** - Enter the date contract bids were opened.
- 24. Contract Award Date** - Enter the date the contract was executed.
- 25. Award Amount** – Enter the contract award amount as stated in the executed contract.
- 26. Local Agency Representative's Signature** - The person completing this section of the form for the Local Agency must sign their name to certify that the information in this and the Contractor Section of this form is complete and accurate.
- 27. Date** - Enter the date the DBE commitment form is signed by the Local Agency Representative.
- 28. Local Agency Representative's Name** - Enter the name of the Local Agency Representative certifying the contractor's DBE commitment form.
- 29. Phone** - Enter the area code and phone number of the person signing the contractor's DBE commitment form.
- 30. Local Agency Representative Title** - Enter the position/title of the Local Agency Representative certifying the contractor's DBE commitment form.

EXHIBIT 15-H: PROPOSER/CONTRACTOR GOOD FAITH EFFORTS

Federal-aid Project No. _____ Bid Opening Date _____

The County of San Joaquin established a Disadvantaged Business Enterprise (DBE) goal of ____% for this project. The information provided herein shows the required good faith efforts to meet or exceed the DBE contract goal.

Proposers or bidders submit the following information to document their good faith efforts within five (5) calendar days from bid opening. Proposers and bidders are recommended to submit the following information even if the Exhibit 10-O1: Consultant Proposal DBE Commitments or Exhibit 15-G: Construction Contract DBE Commitment indicate that the proposer or bidder has met the DBE goal. This form protects the proposer's or bidder's eligibility for award of the contract if the administering agency determines that the bidder failed to meet the goal for various reasons, e.g., a DBE firm was not certified at bid opening, or the bidder made a mathematical error.

The following items are listed in the Section entitled "Submission of DBE Commitment" of the Special Provisions **please attach additional sheets as needed:**

- A. The names and dates of each publication in which a request for DBE participation for this project was placed by the bidder (please attach copies of advertisements or proofs of publication):

Publications	Dates of Advertisement
_____	_____
_____	_____
_____	_____

- B. The names and dates of written notices sent to certified DBEs soliciting bids for this project and the dates and methods used for following up initial solicitations to determine with certainty whether the DBEs were interested (please attach copies of solicitations, telephone records, fax confirmations, etc.):

Names of DBEs Solicited	Date of Initial Solicitation	Follow Up Methods and Dates
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

- C. The items of work made available to DBE firms including those unbundled contract work items into economically feasible units to facilitate DBE participation. It is the bidder's responsibility to demonstrate that sufficient work to facilitate DBE participation in order to meet or exceed the DBE contract goal.

Items of Work	Proposer or Bidder Normally Performs Item (Y/N)	Breakdown of Items	Amount (\$)	Percentage Of Contract

- D. The names, addresses and phone numbers of rejected DBE firms, the reasons for the bidder's rejection of the DBEs, the firms selected for that work (please attach copies of quotes from the firms involved), and the price difference for each DBE if the selected firm is not a DBE:

Names, addresses and phone numbers of rejected DBEs and the reasons for the bidder's rejection of the DBEs:

Names, addresses and phone numbers of firms selected for the work above:

- E. Efforts (e.g. in advertisements and solicitations) made to assist interested DBEs in obtaining information related to the plans, specifications and requirements for the work which was provided to DBEs:

- F. Efforts (e.g. in advertisements and solicitations) made to assist interested DBEs in obtaining bonding, lines of credit or insurance, necessary equipment, supplies, materials, or related assistance or services, excluding supplies and equipment the DBE subcontractor purchases or leases from the prime contractor or its affiliate:

- G. The names of agencies, organizations or groups contacted to provide assistance in contacting, recruiting and using DBE firms (please attach copies of requests to agencies and any responses received, i.e., lists, Internet page download, etc.):

Name of Agency/Organization	Method/Date of Contact	Results

- H. Any additional data to support a demonstration of good faith efforts:

Exhibit 12-B

Bidder's List of subcontractor (DBE and Non-DBE) - Part 1

As of March 1, 2015 Contractors (and sub-contractors) wishing to bid on public works contracts may be registered with the State Division of Industrial Relations and certified to bid on Public Works contracts. Please register at: <https://www.dir.ca.gov/Public-Works/Contractor-Registration.html>. The local agency will verify registration of all contractors and subcontractors on public works projects at bid and thereafter annually to assure that yearly registration is maintained throughout the life of the project.

In accordance with Title 49, Section 26.11 of the Code of Federal Regulations, and Section 4104 of the Public Contract Code of the State of California, as amended, the following information is required for each sub-contractor who will perform work amounting to more than one half of one percent (0.5%) of the Total Base Bid or \$10,000 (whichever is greater). **Photocopy this form for additional firms.** Federal Project Number: _____

Subcontractor Name and Location	Line Item & Description	Subcontract Amount	Percentage of Bid Item Sub-contracted	Contractor License Number	DBE (Y/N)	DBE Cert Number	Annual Gross Receipts
				DIR Reg Number			
Name:							<input type="checkbox"/> <\$1 million
City, State:							<input type="checkbox"/> <\$5 million
							<input type="checkbox"/> <\$10 million
							<input type="checkbox"/> <\$15 million
							Age of Firm: ____ yrs.
Name:							<input type="checkbox"/> <\$1 million
City, State:							<input type="checkbox"/> <\$5 million
							<input type="checkbox"/> <\$10 million
							<input type="checkbox"/> <\$15 million
							Age of Firm: ____ yrs.
Name:							<input type="checkbox"/> <\$1 million
City, State:							<input type="checkbox"/> <\$5 million
							<input type="checkbox"/> <\$10 million
							<input type="checkbox"/> <\$15 million
							Age of Firm: ____ yrs.
Name:							<input type="checkbox"/> <\$1 million
City, State:							<input type="checkbox"/> <\$5 million
							<input type="checkbox"/> <\$10 million
							<input type="checkbox"/> <\$15 million
							Age of Firm: ____ yrs.
Name:							<input type="checkbox"/> <\$1 million
City, State:							<input type="checkbox"/> <\$5 million
							<input type="checkbox"/> <\$10 million
							<input type="checkbox"/> <\$15 million
							Age of Firm: ____ yrs.
							<input type="checkbox"/> <\$1 million
							<input type="checkbox"/> <\$5 million
							<input type="checkbox"/> <\$10 million
							<input type="checkbox"/> <\$15 million
							Age of Firm: ____ yrs.

Distribution: 1) Original-Local Agency File 2) Copy-DLAE w/ Award Package

Exhibit 12-B Bidder's List of subcontractor (DBE and Non-DBE) - Part 2

In accordance with Title 49, Section 26 of the Code of Federal Regulations, the Bidder shall list all subcontractor who provided a quote or bid but **were not selected** to participate as a subcontractor on this project. **Photocopy this form for additional firms.** Federal Project Number: _____

Subcontractor Name and Location	Line Item & Description	Subcontract Amount	Percentage of Bid Item Sub-contracted	Contractor License Number	DBE (Y/N)	DBE Cert Number	Annual Gross Receipts
				DIR Reg Number			
Name:							<input type="checkbox"/> <\$1 million
City, State:							<input type="checkbox"/> <\$5 million
							<input type="checkbox"/> <\$10 million
							<input type="checkbox"/> <\$15 million
							Age of Firm: ____ yrs.
Name:							<input type="checkbox"/> <\$1 million
City, State:							<input type="checkbox"/> <\$5 million
							<input type="checkbox"/> <\$10 million
							<input type="checkbox"/> <\$15 million
							Age of Firm: ____ yrs.
Name:							<input type="checkbox"/> <\$1 million
City, State:							<input type="checkbox"/> <\$5 million
							<input type="checkbox"/> <\$10 million
							<input type="checkbox"/> <\$15 million
							Age of Firm: ____ yrs.
Name:							<input type="checkbox"/> <\$1 million
City, State:							<input type="checkbox"/> <\$5 million
							<input type="checkbox"/> <\$10 million
							<input type="checkbox"/> <\$15 million
							Age of Firm: ____ yrs.
Name:							<input type="checkbox"/> <\$1 million
City, State:							<input type="checkbox"/> <\$5 million
							<input type="checkbox"/> <\$10 million
							<input type="checkbox"/> <\$15 million
							Age of Firm: ____ yrs.
Name:							<input type="checkbox"/> <\$1 million
City, State:							<input type="checkbox"/> <\$5 million
							<input type="checkbox"/> <\$10 million
							<input type="checkbox"/> <\$15 million
							Age of Firm: ____ yrs.
Name:							<input type="checkbox"/> <\$1 million
City, State:							<input type="checkbox"/> <\$5 million
							<input type="checkbox"/> <\$10 million
							<input type="checkbox"/> <\$15 million
							Age of Firm: ____ yrs.

Distribution: 1) Original-Local Agency File 2) Copy-DLAE w/ Award Package

BIDDER DBE TRUCKING INFORMATION FORM

Project Name: _____

Bidder's Name: _____

*Bidders are required to submit
this Form with Exhibit 15-G & 12-B
only if there is a DBE Trucking
commitment*

DBE TRUCKING INFORMATION	YES	NO
1. Is the subcontractor(s) listed for DBE Trucking performing 100% of DBE committed work? Provide list of available fleet¹ and number of drivers. If Not 100%, Answer 2.		
2. Are all other trucking subcontractors Certified DBE Contractors? List all other subcontractors below. Note if subcontractor is a Certified DBE.		

Contractor intends to secure trucking from the following sources²: (Please Describe)

¹ List Type of Vehicle, Vehicle Number, and California Highway Patrol CA Number

² Contractor's attention is directed to Title 49 CFR 26.55(d)

By my signature on this form I certify, that the information on this form is true and correct.

Signature of Bidder

Date

(Area Code) Telephone Number

3 CONTRACT AWARD AND EXECUTION

3-1.02 CONSIDERATION OF BIDS

3-1.02A General, add:

When more than one schedule of work to be performed is included, the lowest bid will be the lowest total of the bid prices on the Base Contract and those schedules taken in the order they appear in the bid and added to the Base Contract that are less or equal to a funding amount read publicly prior to the opening of bids. If no bids are less than the stated amount, the lowest bid will be the lowest cost base bid submitted.

A responsive, responsible bidder who submitted the lowest bid as determined by this section will be awarded the contract, if it is awarded. This section does not preclude the local agency from adding or deduction from the contract any of the schedules after the lowest responsible bidder has been determined.

3-1.02B Tied Bids, replace section with:

In the extent that two or more bids are the same and the lowest, the County awards the contract to the bidder with greater DBE participation.

3-1.04 CONTRACT AWARD, replace section with:

Bid protests are to be delivered to the following address: San Joaquin County, Office of County Counsel, 44 N. San Joaquin St., Sixth Floor Suite 679, Stockton, California 95202.

The award of the contract, if it be awarded, will be to the lowest responsive, responsible bidder whose bid complies with all the requirements prescribed. The award must be made within 60 days after bid opening. The Department may extend the award period if the bidder agrees.

3-1.05 CONTRACT BONDS (PUB CONT CODE §§ 10221 AND 10222), replace section with:

A surety bond of one hundred percent (100%) of the contract price will be required of the successful bidder to guarantee the faithful performance of said contract, and also required must be a separate "Labor and Materials" surety bond of one hundred percent (100%) of the contract price and in accordance with the requirements of Section 3247-3252, inclusive of the Civil Code of the State of California. A sample of the required Performance Bond verbiage has been provided with the Contract Forms.

3-1.07 INSURANCE POLICIES, replace section with:

The Contractor and subcontractors will be required to obtain all insurance required under this paragraph and no work will be allowed until such insurance has been approved by the County. Copies of insurance certificates evidencing the required coverage must be furnished to the County. Certificates of insurance must indicate that the coverage cannot be reduced or cancelled until thirty days' written notice has been furnished the County.

1. **Compensation Insurance:** The Contractor must take out and maintain, during the life of this contract, workers' compensation insurance for all of his employees employed at the site of the project and, in case any work is sublet, the Contractor must require the subcontractor similarly to provide workers' compensation insurance for all of the latter's employees. If any class of employees engaged in hazardous work under this contract at the site of the project is not protected under the Workers' Compensation Statute, the Contractor must provide and must cause any subcontractor to provide insurance for the protection of employees engaged in hazardous work.
2. **Bodily Injury Liability and Property Damage Liability Insurance:** The Contractor must take out and maintain during the life of this contract such bodily injury liability and property damage liability insurance as must protect him from claims for damages for personal injury, including accidental death as well as from claims for property damage, including coverage on property in the care, custody and control of the Contractor which may arise from his operations under this contract, whether such operations by himself or by any subcontractor or by anyone directly or indirectly employed by either of them, and such insurance must be Public Liability Insurance, in an amount no less than \$1,000,000 (combined single limit) per occurrence.

The above insurance must be of the broad form coverage type, affording coverage on property in the care, custody and control of the Contractor, and it is specifically required that the exclusions commonly referred to, in the insurance industry, as the "XCU Exclusions" must be deleted from the Contractor's insurance. Adequate proof of insurance in compliance with the above requirements must be furnished to the County. An additional insured endorsement to Contractor's liability insurance policy naming the County, its officers and employees as additional insureds, must be furnished to the County. Notwithstanding the above, Contractor's liability insurance policy must be endorsed as primary insurance.

Contractor will indemnify and defend Owner from all claims, demands, or liability arising out of or encountered in connection with this contract or the prosecution of work under it, whether such claims, demands, or liability are caused by Contractor, Contractor's agents or employees, or subcontractors employed on the project, their agents or employees, or products installed on the project by Contractor or subcontractors, excepting only such injury or harm as may be caused solely and exclusively by Owner's fault or negligence. Such indemnification must extend to claims, demands, or liability for injuries occurring after completion of the project, as well as during the work's progress.

3-1.08 SMALL BUSINESS PARTICPATION REPORT, delete.

3-1.11 PAYEE DATA RECORD, delete.

3-1.18 CONTRACT EXECUTION, replace section with:

The contract must be executed by the successful bidder and must be returned with the following to County:

1. Bonds required in Section 3-1.05
2. Insurance Certificates required in Section 3-1.07
3. Form W-9

Contract and above listed documents must be returned to the Agency so that they are received within 10 days, not including Saturdays, Sundays, and legal holidays, after the bidder has received the contract for execution. Failure to do so must be just cause for forfeiture of the bid guaranty. The executed contract documents must be delivered to the following address: San Joaquin County Counsel, 44 N. San Joaquin St., Suite 679, Stockton, California 95202.

A successful bidder must be required to have a current W-9 form on file with the County. If not already on file, the form will be included in the contract documents to be executed by the successful bidder. The form must be completed and returned to the Agency by the successful bidder with the executed contract and contract bonds. A copy of the contract form is included in these special provisions.

3-1.19 BIDDERS' SECURITIES, replace section with:

The bid guaranties accompanying the bids of the three lowest bidders will be retained until the contract has been awarded by the Board of Supervisors, after which all such guaranties, except the first lowest responsible bidder's guaranty, will be returned to the respective bidders whose bids they accompany. The bid guaranty of the first lowest responsible bidder will be retained until the contract documents have been fully executed and filed with the County Recorder's office.

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1 The prices paid as herein provided must be considered full compensation for
2 furnishing all materials and doing all the work embraced and contemplated in the
3 Contract, and for all risks, loss or damage arising out of the nature of said work, or from
4 the action of the elements or from any unforeseen difficulties or obstructions which may
5 arise or be encountered in the prosecution of the Work until its acceptance by the Owner
6 and for well and faithfully completing the Work according to the Plans and Specifications.

7 (3) The Contractor agrees to prosecute the Work with such diligence that this
8 Contract must be completed on or before the expiration of the working days or
9 completion date specified in the Specifications for the completion of the Work.

10 (4) This Contract consists of the following documents to wit:

- 11 a. Notice to Bidders
- 12 b. Federal Bid
- 13 c. This Contract
- 14 d. The Specifications for the Work
- 15 e. The Plans for the Work
- 16 f. Addenda, if required
- 17 g. Standard Specifications, Department of Transportation, State of
18 California, dated 2018
- 19 h. Standard Plans, Department of Transportation, State of California,
20 dated 2018
- 21 i. General Prevailing Wage Rates, Department of Transportation,
22 State of California
- 23 j. Labor surcharge and equipment rental rates, Department of
24 Transportation, State of California
- 25 k. Federal Minimum Wages Rates

I. Form FHWA-1273

The provisions set forth in the General Prevailing Wage Rates and the Labor Surcharge and Equipment Rental Rates (Items i. and j. above) will take precedence over any conflicting provisions in Contractor's Bid (Item b. above).

In signing this Contract, the Contractor makes the following certification:

"I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this Contract."

IN WITNESS WHEREOF, eight identical counterparts of this Contract, each of which must for all purposes be deemed an original, thereof, have been duly executed by the parties hereinabove named, on the day and year first hereinabove written.

COUNTY OF SAN JOAQUIN,
a political subdivision of
the State of California

By _____
Chairman of the Board of Supervisors
of the County of San Joaquin,
State of California

"OWNER"

ATTEST: RACHÉL DeBORD
Clerk of the Board of Supervisors
of the County of San Joaquin,
State of California

By _____ (SEAL)
Deputy Clerk

Company Name _____

By _____

1 Title _____
2 Contractor's License No. _____
3 Class of License _____
4 Expiration Date _____
5 Federal Employer Identification No. _____

6 "CONTRACTOR"

7 ACKNOWLEDGEMENT BY OBLIGEE/CONTRACTOR

8 A notary public or other officer completing this
9 certificate verifies only the identity of the individual
10 who signed the document to which this certificate is
11 attached, and not the truthfulness, accuracy, or
12 validity of that document.

13
14 State of California
15 County of _____

16 On _____ before me, _____
(Notary)

17 personally appeared _____,
18 who proved to me on the basis of satisfactory evidence to be the person(s) whose
19 name(s) is/are subscribed to the within instrument and acknowledged to me that
20 he/she/they executed the same in his/her/their authorized capacity(ies), and that by
21 his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of
22 which the person(s) acted, executed the instrument.

23
24 I certify under PENALTY OF PERJURY under the laws of the State of California that
25 the foregoing paragraph is true and correct.

26
27 WITNESS my hand and official seal. (Seal)

28

29 Signature _____

30 CONTRACT APPROVED AS TO FORM:

31

32 By _____ Date _____
33 MATTHEW P. DACEY
34 Deputy County Counsel
35 Attorney for Owners

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That WHEREAS, the County of San Joaquin, by Resolution passed _____, 20____, has given to _____, hereinafter designated as the "Principal", a Notice of Intent to Award Contract for the Work described as follows:

WHEREAS, said Principal is required under the terms of said Notice to furnish a Bond for the faithful performance of such Notice.

NOW THEREFORE, we the Principal and _____ as Surety, an admitted Surety insurer pursuant to Code of Civil Procedure Section 995.120, legally doing business in California at _____, are held and firmly bound unto the County of San Joaquin, in the sum of _____ DOLLARS (\$_____), lawful money of the United States of America, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if the above bound Principal, his or its heirs, executors, administrators, successors or assigns, must in all things stand to and abide by and will and truly keep and perform, the covenants, conditions and agreements as defined in the said Contract and any alteration thereof made as therein provided on this or their part, to be kept and performed at the times and in the manner therein specified, and in all respects according to their true intent and meaning, and will indemnify and save harmless the County of San Joaquin, its officers and agents, as therein stipulated, then this obligation will become null and void, otherwise, it must be and remain in full force and virtue.

As a condition precedent to the satisfactory completion of the Contract, the above obligation must hold good for a period of one (1) year after the acceptance of the Work by County, during which time if Principal fails to make full, complete, and satisfactory repair and replacements and totally protect the County from loss or damage made evident during the period of one (1) year from the date of acceptance of the Work, and resulting from or caused by defective materials or faulty workmanship, the above obligation in penal sum thereof must remain in full force and effect. However, nothing in this paragraph will limit the obligation of the Surety and the obligation of the Surety must continue so long as any obligation of Principal remains.

And said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder, or the Specifications accompanying the same, must in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract, or to the Work, or to the Specifications. All terms and conditions as set forth in the General Conditions, as supplemented, to the Contract are incorporated by reference and Surety acknowledges that it is bound thereby, including the disputes clause(s) therein.

In the event suit is brought upon this bond by the County and judgment is recovered, the Surety must pay all costs incurred by the County of San Joaquin in such suit, including a reasonable attorney's fee to be fixed by the court.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety above named, on the _____ day of _____, 20____.

(Corporate Seal)

Principal

By: _____

Typed or Printed Name

Title: _____

(Corporate Seal)

Surety

By: _____

Typed or Printed Name

(Attached Attorney-in-
Fact Certificate)

Title: _____

4 SCOPE OF WORK

4-1.06 DIFFERING SITE CONDITIONS (23 CFR 635.109)

4-1.06B Contractor's Notification, replace paragraph 1 with:

During the progress of the work, if subsurface or latent physical conditions are encountered at the site differing materially from those indicated in the contract or if unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract, are encountered at the site, the party discovering such conditions shall promptly notify the other party in writing of the specific differing conditions before the site is disturbed and before the affected work is performed.

4-1.06C Engineer's Investigation and Decision, replace section with:

Upon written notification, the engineer will investigate the conditions, and if it is determined that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any work under the contract, an adjustment, excluding anticipated profits, will be made and the contract modified in writing accordingly. The engineer will notify the contractor of the determination whether or not an adjustment of the contract is warranted.

No contract adjustment which results in a benefit to the contractor will be allowed unless the contractor has provided the required written notice.

No contract adjustment will be allowed under this clause for any effects caused on unchanged work.

4-1.13 CLEANUP, replace paragraph 2 with:

Do not remove warning, regulatory, or guide signs until directed by the Engineer.

5 CONTROL OF WORK

5-1.01 GENERAL, replace paragraph 9 with:

Unless otherwise directed by the Engineer, use contract administrative forms available at the CA Department of Transportation website.

5-1.02 CONTRACT COMPONENTS, revise item 1 of the list in paragraph 2 as follows:

If a discrepancy exists:

1. Governing ranking of Contract Parts in descending order is:
 - 1.1 Construction Contract
 - 1.2 Special Provisions
 - 1.3 Project Plans
 - 1.4 Caltrans Traffic Manual
 - 1.5 Revised Standard Specifications
 - 1.6 Standard Specifications
 - 1.7 Revised Standard Plans
 - 1.8 Standard Plans
 - 1.9 Supplemental Project Information

5-1.09 PARTNERING

5-1.09A General, replace paragraph 2 with:

For a contract with a total bid over \$2 million and 60 or more working days, professionally facilitated project partnering is encouraged.

5-1.13 SUBCONTRACTING

5-1.13B(1) General, replace section with:

The prime contractor shall use each DBE subcontractor as listed on Exhibit 12-B Bidder's List of Subcontractors (DBE and Non-DBE), and Exhibit 15-G Construction Contract DBE Commitment form unless they receive authorization for a substitution. The prime contractor must:

1. Notify the Resident Engineer or Inspector of any changes to its anticipated DBE participation
2. Provide this notification before starting the affected work
3. Maintain records including:
 - Name and business address of each 1st-tier subcontractor
 - Name and business address of each DBE subcontractor, DBE vendor, and DBE trucking company, regardless of tier

- Date of payment and total amount paid to each business (see Exhibit 9-F Monthly Disadvantaged Business Enterprise Payment)

If the prime contractor is a DBE contractor, they shall include the date of work performed by their own forces and the corresponding value of the work.

Before the 15th of each month, the prime contractor shall submit a Monthly DBE Trucking Verification (LAPM Exhibit 16-Z1) form found at <https://dot.ca.gov/-/media/dot-media/programs/local-assistance/documents/lapm/c16/16z1.pdf>.

If a DBE is decertified before completing its work, the DBE must notify the prime contractor in writing of the decertification date. If a business becomes a certified DBE before completing its work, the business must notify the prime contractor in writing of the certification date. The prime contractor shall submit the notifications. Upon work completion, the prime contractor shall complete a Disadvantaged Business Enterprises (DBE) Certification Status Change, Exhibit 17-O, form and submit the form within 30 days of contract acceptance.

Upon work completion, the prime contractor shall complete Exhibit 17-F Final Report – Utilization of Disadvantaged Business Enterprises (DBE), First-Tier Subcontractors and submit it within 90 days of contract acceptance. The Department will withhold \$10,000 until the form is submitted.

The Department releases the withhold upon submission of the completed form.

After submitting an invoice for reimbursement that includes a payment to a DBE, but no later than the 10th of the following month, the prime contractor shall complete and email the Exhibit 9-F: Disadvantaged Business Enterprise Running Tally of Payments to business.support.unit@dot.ca.gov with a copy to the County Engineer.

5-1.13B(2) Disadvantaged Business Enterprises, replace paragraphs 3 through 6 with:

The prime contractor shall utilize the specific DBEs listed to perform the work and supply the materials for which each is listed unless the contractor obtains the Department's written consent. The prime contractor shall not terminate or substitute a listed DBE for convenience and perform the work with their own forces or obtain materials from other sources without prior written authorization from the Department. Unless the Department's prior written consent is provided, the contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the listed DBE on the Exhibit 15-G Construction Contract DBE Commitment form included in the Bid.

The Department authorizes a request to use other forces or sources of materials if the bidder shows any of the following justifications:

1. Listed DBE fails or refuses to execute a written contract based on plans and specifications for the project.

2. The Department stipulated that a bond is a condition of executing the subcontract and the listed DBE fails to meet your bond requirements.
3. Work requires a contractor's license and listed DBE does not have a valid license under Contractors License Law.
4. Listed DBE fails or refuses to perform the work or furnish the listed materials (failing or refusing to perform is not an allowable reason to remove a DBE if the failure or refusal is a result of bad faith or discrimination).
5. Listed DBE's work is unsatisfactory and not in compliance with the contract.
6. Listed DBE is ineligible to work on the project because of suspension or debarment.
7. Listed DBE becomes bankrupt or insolvent.
8. Listed DBE voluntarily withdraws with written notice from the Contract
9. Listed DBE is ineligible to receive credit for the type of work required.
10. Listed DBE owner dies or becomes disabled resulting in the inability to perform the work on the Contract.
11. The Department determines other documented good cause.

The prime contractor shall notify the original DBE of the intent to use other forces or material sources and provide the reasons, allowing the DBE with 5 days to respond to the notice and advise the prime contractor and the Department of the reasons why the use of other forces or sources of materials should not occur. The prime contractor's request to use other forces or material sources must include:

1. One or more of the reasons listed in the preceding paragraph.
2. Notices from prime contractor to the DBE regarding the request.
3. Notices from the DBEs to the prime contractor regarding the request.

If the Department authorizes the termination or substitution of a listed DBE, the prime contractor must make good faith efforts to find another DBE to substitute for the original DBE. The substitute DBE must (1) perform at least the same amount of work as the original DBE under the contract to the extent needed to meet or exceed the DBE goal, and (2) be certified as a DBE with the most specific available NAICS codes and work codes applicable to the type of work the DBE will perform on the contract at the time of the prime contractor's request for substitution. The prime contractor shall submit their documentation of good faith efforts within 7 days of their request for authorization of the substitution. The Department may authorize a 7-day extension of this submittal period at the prime contractor's request. More guidance can be found at 49 CFR 26 app A

regarding evaluation of good faith efforts to meet the DBE goal.

5-1.13C Disabled Veteran Business Enterprises, delete.

5-1.13D Non-Small Businesses, delete.

5-1.20 COORDINATION WITH OTHER ENTITIES

5-1.20B Permits, Licenses, Agreements, and Certifications

5-1.20B(1) General, add:

When any portion of the work is shown to occur within the right-of-way of railroads, adjoining cities and/or other counties and agencies, you must obtain all of the necessary encroachment permits prior to the start work. Placement of traffic control signs within non-County right-of-way must not occur until the respective encroachment permit has been obtained. Contact information of agencies from which you must acquire permits/agreements will be shown on the plans and/or in the appendix of these specifications.

The Contractor must furnish the Engineer proof of permit application(s) within 5 working days after contract execution, and furnish approved Encroachment Permit(s) 5 working days prior to commencement of any work.

Full compensation for conforming to the requirements in this permit, including the cost of the permits/agreements, must be considered as included in the contract prices paid for the various item or work and no additional compensation will be allowed therefor.

5-1.20C Railroad Relations, replace section with:

The term "Railroad" will be understood to mean the railroad agencies identified on the project plans and/or in the appendix of these specifications.

The Contractor must provide Railroad insurance and enter into agreement with the Railroad.

When an agreement is required by the Railroad, no work will be allowed within their right-of-way until the County has verification of the Railroad's acceptance of the agreement covering work within their right-of-way.

In addition to any other form of insurance or bonds required under the terms of the contract and specifications, the Contractor will be required to carry insurance of the kinds and in the amounts specified by the Railroad.

Such insurance must be approved by the Railroad before any work is performed on Railroad's property and will be carried until all work required to be performed on or adjacent to the Railroad's property under the terms of the Contract is satisfactorily completed as determined by the Engineer, and thereafter until all tools, equipment and materials have been removed from Railroad's property and such property is left in a clean and presentable condition.

The insurance herein required must be obtained by the successful bidder and the Contractor will furnish the Engineer with a completed certificate, signed by the insurance company or its authorized agent or representative before the start of construction.

Payment for complying with these provisions and for any obtaining any and all types of insurances and bonds required by the Railroad, will be considered as included in the contract prices paid for the various items of work involved and no separate payment will be made therefor.

5-1.26 CONSTRUCTION SURVEYS, replace section with:

5-1.26A Department-Performed Construction Survey

Section 5-1.26A only applies when there is no bid item for Construction Survey shown on the Bid Item List.

Upon approval of staking request, the Engineer will provide the following stakes if applicable:

A. Control Stakes:

1. One set of line and grade reference stakes will be set on or adjacent to the right of way line.
2. One set of final grade stakes.
3. One set of curb and gutter stakes.
4. One set of sewer flowline stakes offset from trench centerline. Offset distance is to be determined in the field.
5. One set of culvert flowline stakes when determined necessary by the Engineer.

B. Structure Stakes:

1. Centerline of construction.
2. Exterior lines of Structure.
3. Bent Lines.
4. Bench Mark.

You must provide the Department at least a five-day's notice for all construction staking requests.

5-1.26B Contractor-Performed Construction Survey

Section 5-1.26B applies if a bid item for Construction Survey is shown on the Bid Item List.

The Contractor will provide the staking required for completion of the work.

Staking will consist of furnishing and setting construction stakes and markers by the Contractor to establish the lines and grades required for completion of the work as shown on the plans and as specified in the Standard Specifications and Special Provisions and as necessary for the Engineer to check lines, grades, alignment and elevation.

Construction survey must be performed by a Licensed Land Surveyor in the State of California as necessary to control the work. The Contractor will determine the work and staking required and must be verified by the Engineer. Construction stakes and marks must be furnished and set with accuracy adequate to assure that the completed work conforms to the lines, grades, and section shown on the plans. Contractor must reset any survey monumentation disturbed by construction.

All computations necessary to establish the exact position of the work from control points will be made by the Contractor. All computations, survey notes, and other records necessary to accomplish the work must be neat, legible, and accurate. Copies of such computation notes and other records must be furnished to the Engineer prior to beginning work that requires their use.

Construction stakes damaged from any cause during the progress of the work will be replaced by the Contractor at his expense, as required or at the direction of the Engineer. Construction stakes must be removed from the site of work when no longer needed.

Upon completion of construction staking and prior to acceptance of the contract all computations, survey notes, and other data used to accomplish the work must be furnished to the Engineer and will become the property of San Joaquin County.

The contract lump sum price paid for **Construction Survey** will include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and doing all work involved in performing Construction Survey, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by Engineer.

Full compensation for furnishing and setting all other stakes necessary to construct the project will be considered as included in the prices paid for the various contract items of work, and no additional compensation will be allowed therefor.

5-1.27 RECORDS

5-1.27E Change Order Bills, replace section with:

Maintain Separate records for change order work costs. Change order bills must be submitted on forms approved by County.

5-1.30 NONCOMPLIANT AND UNAUTHORIZED WORK, add:

The Department may reduce payment for noncompliant work left in place.

5-1.32 AREAS FOR USE, replace paragraph 2 with:

If sufficient area is not available within the contract limits, the Contractor is responsible for securing, at the contractor's expense, areas required for plant sites, storage of equipment or material, or for other purposes. Personal vehicles must not be parked on the traveled way or shoulders.

5-1.39 DAMAGE REPAIR AND RESTORATION

5-1.39C Landscape Damage

5-1.39C(1) General, delete paragraph 3.

5-1.43 POTENTIAL CLAIMS AND DISPUTE RESOLUTION

5-1.43A General, add after paragraph 4:

Where not preempted by Federal and/or State law, including but not limited to Public Contract Code 9204, Section 5-1.43, "Potential Claims and Dispute Resolution," of Standard Specifications and the following provisions, as modified herein, will be utilized as the remedy procedures for any disputes or claims arising under or related to performance of the contract.

At any time after the Engineer receives an Initial Potential Claim Record, you and the Department may agree in writing to different time limits than those set forth herein.

5-1.43D Full and Final Potential Claim Record, add after paragraph 4:

If the Full and Final Potential Claim Record is timely submitted to the Engineer and the Engineer fails to furnish a response within the time limits prescribed for issuing a written statement under Public Contract Code, section 9204, subdivision (d)(1), the Engineer shall be deemed to have decided to reject the Full and Final Claim Record in its entirety.

Replace "**5-1.43E ALTERNATE DISPUTE RESOLUTION**" in its entirety with:

5-1.43E CONSTRUCTION CLAIM PROCEDURES

Attention is directed to the following Sections:

5-1.27E Change Order Bills

5-1.43B Initial Potential Claim Record

8-1.04B Standard Start

9-1.17 Payment After Contract Acceptance

9-1.22 Arbitration

The above provisions, as modified herein, will be utilized as the remedy procedures for any disputes or claims arising under or related to performance of the contract.

5-1.43E(1) Dispute Resolution

Submit a request, in writing, for an informal, meet and confer conference if you dispute the Engineer's response to your Full and Final Potential Claim Record. The Engineer's receipt of the request for the meet and confer conference must be evidenced by postal return receipt.

The Engineer will schedule a meet and confer conference within 30 days for settlement of the dispute. Then Engineer will furnish you with a written statement within 10 days following conclusion of the meet and confer conference identifying the portions of the claim that remain in dispute and the portions that are undisputed. Any payment due on undisputed portions of the claim are made within 60 days after the written statement is furnished.

Identify any remaining portions of the claim in writing for submittal to non-binding mediation. Mediation costs shall be shared equally between you and the Department.

If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim.

Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures, or as stated herein.

Claims (demands for monetary compensation or damages) arising under or relating to performance of the contract will be resolved by litigating the claim in a court of competent jurisdiction. Provided, however, if you and the Department mutually agree, in writing, to submit the claim to arbitration, the matter will go directly to arbitration proceedings. The agreement to pursue the matter through arbitration will be the parties' sole legal recourse such that the parties may not subsequently litigate the matter in any court proceeding except as to enforcement of the arbitration award or as otherwise provided in this section.

Arbitration, if expressly agreed upon in writing by the parties, will be pursuant to the provisions of California Code of Civil Procedure Section 1280 et seq., except wherever there are inconsistencies with those provisions and this section, this section will prevail. The arbitrator's award will be decided under and in accordance with the laws of this State, supported by law and substantial evidence and, in writing, contain the basis for the decision, findings of fact and conclusions of law. In addition to vacating an award on the grounds set out in Sections 1286.2 and 1286.4 of the California Code of Civil Procedure, a court will vacate the award if after review of the award it determines either that the award is not properly supported by substantial evidence or that it is based in whole or in part by an error of law.

The arbitrator will have jurisdiction over the procedures and substantive matters relating to the claim as set out in the arbitration submittal agreement executed by the parties.

Arbitration will be initiated by a Complaint in Arbitration made in compliance with the requirements of said regulations. A Complaint in Arbitration by the Contractor will be made not later than 90 days after the date of service in person or by mail on the Contractor of the final written decision by the Department on the claim.

6 CONTROL OF MATERIALS

6-1.04 BUY AMERICA replace section with:

6-1.04 BUY AMERICA

6-1.04A General

Buy America requirements do not apply to the following:

1. Tools and construction equipment used in performing the work
2. Temporary work that is not incorporated into the finished project

6-1.04B Crumb Rubber (Pub Res Code § 42703(d))

Furnish crumb rubber with a certificate of compliance. Crumb rubber must be:

1. Produced in the United States
2. Derived from waste tires taken from vehicles owned and operated in the United States

6-1.04C Steel and Iron Materials

Steel and iron materials must be melted and manufactured in the United States except:

1. Foreign pig iron and processed, pelletized, and reduced iron ore may be used in the domestic production of the steel and iron materials
2. If the total combined cost of the materials produced outside the United States does not exceed the greater of 0.1 percent of the total bid or \$2,500, the material may be used if authorized

Furnish steel and iron materials to be incorporated into the work with certificates of compliance and certified mill test reports. Mill test reports must indicate where the steel and iron were melted and manufactured.

All melting and manufacturing processes for these materials, including an application of a coating, must occur in the United States. Coating includes all processes that protect or enhance the value of the material to which the coating is applied.

6-1.04D Manufactured Products

Iron and steel used in precast concrete manufactured products must meet the requirements of section 6- 1.04C regardless of the amount used.

Iron and steel used in other manufactured products must meet the requirements of section 6-1.04C if the weight of steel and iron components constitute 90 percent or more of the total weight of the manufactured product.

6-1.04E Construction Materials

Buy America requirements apply to the following construction materials unless otherwise specified:

1. Non-ferrous metals
2. Plastic and polymer-based products such as:
 - 2.1. Polyvinylchloride
 - 2.2. Composite building materials
 - 2.3. Polymers used in fiber optic cables
3. Glass
4. Lumber
5. Drywall

Where one or more of these construction materials have been combined by a manufacturer with other materials through a manufacturing process, Buy America requirements do not apply unless otherwise specified.

Furnish construction materials to be incorporated into the work with certificates of compliance with each project delivery. Manufacturer's certificate of compliance must identify where the construction material was manufactured and attest specifically to Buy America compliance.

All manufacturing processes for these materials must occur in the United States.

7 LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

7-1.02 LAWS

7-1.02K Labor Code

7-1.02K(2) Wages, replace paragraph 2 with:

The Contractor is required to pay the higher of the two wage rates published by the sources listed below:

1. Prevailing Wage Rates are available at the Department of Labor Web site, <https://sam.gov/>. Federal Wage rates for the project must be those in effect 10 calendar days prior to bid opening.
2. From the Department of Industrial Relations, general prevailing wage rates are available at <http://www.dir.ca.gov/oprl/DPreWageDetermination.htm> . These wage rates are not included in the Bid and Contract for the project. Changes, if any, to the general prevailing wage rates will be available at the Web site above.

Bidders are advised that a recent Department of Industrial Relation's determination indicates Fabricators are subject to prevailing wage requirements under the following conditions:

Workers employed by contractors or subcontractors are "employed in the execution of a contract for public works" when they are engaged in the off-site fabrication of items produced specially for the public works project and not for sale on the general market.

Where a contractor is producing products both for its own projects and for sale on the general market, the test for whether a pre-fabricated item is specially made for the public works project turns on factors such as whether the item was produced in accordance with the plans and specifications of the architects and/or engineers for that project and/or shop drawings based thereon such that the item differs from a standard, generic item.

Standard items must be considered to be produced specially for the public works project if they were modified to meet the specific requirements of that project.

For the foregoing reasons, prevailing wages must be paid to the employees of contractors and subcontractors engaged in the off-site fabrication or pre-fabrication of items specially produced for public works projects.

Section 7—Legal Relations & Responsibility to the Public
Federal Aid Project

7-1.02K(3) Certified Payroll Records (Labor Code §1776), replace paragraphs 6 through 10 with:

Certified payroll records must be submitted to San Joaquin County Department of Public Works, Attention: Field Engineering, P.O. Box 1810, Stockton, California 95201. Electronic submittal must not be accepted.

All contractors and subcontractors must furnish electronic certified payroll records directly to the Labor Commissioner, also known as Division of Labor Standards Enforcement.

7-1.02K(4) Apprentices, add:

Unless such provision would conflict with a state or federal law or regulation applicable to a particular contract for a public works project, County contracts for public works in excess of \$200,000 will contain provisions pursuant to which each contractor or subcontractor will make a good faith effort to employ apprentices who are enrolled in and participating in a viable apprenticeship program serving the San Joaquin County and approved by the State Department of Apprenticeship Standards. This apprenticeship requirement will apply for each apprenticable craft or trade in which the contractor employs workers in performing any of the work under the contract. A contractor may evidence its good faith effort by complying with California Labor Code Section 1777.5 and the implementing regulations and seeking apprentices from apprenticeship programs serving the San Joaquin County.

A contractor employing apprentices pursuant to this section will employ apprentices in a ratio consistent with the provisions of California Labor Code or Federal requirements as applicable for federal aid contracts.

This section will not be construed to exempt a contractor from any other applicable requirement imposed upon the contractor by federal or state law.

7-1.02K(6) Occupational Safety and Health Standards

7-1.02K(6)(j)(ii) Lead Compliance Plan, replace paragraph 1 with:

Section 7-1.02K(6)(j)(ii) applies when the contract documents require a lead compliance plan.

7-1.02M Public Resources Code

7-1.02M(2) Fire Protection, delete “Reserved” and add:

Cooperate with local fire prevention authorities in eliminating hazardous fire conditions. Obtain the phone numbers of the nearest fire suppression agency. Submit these phone numbers to the Engineer before start of job site activities.

Section 7—Legal Relations & Responsibility to the Public
Federal Aid Project

7-1.06 INSURANCE, replace section with:

Refer to special provision Section 3, "Award and Execution of Contract," for insurance requirements.

7-1.11 FEDERAL LAWS FOR FEDERAL-AID CONTRACTS

7-1.11A General, add between paragraphs 2 and 3:

Each subcontract and any lower-tier subcontract that may in turn be made shall include the "Required Contract Provisions Federal-Aid Construction" in Section 7 of these special provision and referenced 2018 Standard Specifications.

Noncompliance shall be corrected. Payments for subcontracted work involved will be withheld from progress payments due or to become due, until correction is made. Failure to comply may result in termination of the contract.

7-1.11B FHWA-1273, replace FHWA-1273 form with the following pages:

FHWA-1273 -- Revised July 5, 2022

**REQUIRED CONTRACT
PROVISIONS FEDERAL-AID
CONSTRUCTION CONTRACTS**

- I. General
- II. Nondiscrimination
- III. Non-segregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
- XI. Certification Regarding Use of Contract Funds for Lobbying
- XII. Use of United States-Flag Vessels:

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under title 23, United States Code, as required in 23 CFR 633.102(b) (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services). 23 CFR 633.102(e).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider. 23 CFR 633.102(e).

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services) in accordance with 23 CFR 633.102. The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in solicitation-for-bids or request-for-proposals documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract). 23 CFR 633.102(b).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract. 23 CFR 633.102(d).

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. 23 U.S.C. 114(b). The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors. 23 U.S.C. 101(a).

II. NONDISCRIMINATION (23 CFR 230.107(a); 23 CFR Part 230, Subpart A, Appendix A; EO 11246)

The provisions of this section related to 23 CFR Part 230, Subpart A, Appendix A are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR Part 60, 29 CFR Parts 1625-1627, 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR Part 60, and 29 CFR Parts 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR Part 230, Subpart A, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal Employment Opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (see 28 CFR Part 35, 29 CFR Part 1630, 29 CFR Parts 1625-1627, 41 CFR Part 60 and 49 CFR Part 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140, shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR Part 35 and 29 CFR Part 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract. 23 CFR 230.409 (g)(4) & (5).

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, sexual orientation, gender identity, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action or are substantially involved in such action, will be made fully cognizant of and will implement the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable company official.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to ensure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs (i.e., apprenticeship and on-the-job training programs for the geographical area of contract performance). In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. 23 CFR 230.409. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities:

The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established thereunder. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:

The contractor shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors, suppliers, and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required:

a. The requirements of 49 CFR Part 26 and the State DOT's FHWA-approved Disadvantaged Business Enterprise (DBE) program are incorporated by reference.

b. The contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:

- (1) Withholding monthly progress payments;
- (2) Assessing sanctions;
- (3) Liquidated damages; and/or
- (4) Disqualifying the contractor from future bidding as non-responsible.

c. The Title VI and nondiscrimination provisions of U.S. DOT Order 1050.2A at Appendixes A and E are incorporated by reference. 49 CFR Part 21.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

- (1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;
- (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and
- (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women.

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of more than \$10,000. 41 CFR 60-1.5.

As prescribed by 41 CFR 60-1.8, the contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location under the contractor's control where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size), in accordance with 29 CFR 5.5. The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. 23 U.S.C. 113. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. 23 U.S.C. 101. Where applicable law requires that projects be treated as a project on a Federal-aid highway, the provisions of this subpart will apply regardless of the location of the project. Examples include: Surface Transportation Block Grant Program projects funded under 23 U.S.C. 133 [excluding recreational trails projects], the Nationally Significant Freight and Highway Projects funded under 23 U.S.C. 117, and National Highway Freight Program projects funded under 23 U.S.C. 167.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages (29 CFR 5.5)

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

- (i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (ii) The classification is utilized in the area by the construction industry; and
- (iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program. Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding (29 CFR 5.5)

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records (29 CFR 5.5)

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency.

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees (29 CFR 5.5)

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. 23 CFR 230.111(e)(2). The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract as provided in 29 CFR 5.5.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract as provided in 29 CFR 5.5.

9. Disputes concerning labor standards. As provided in 29 CFR 5.5, disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility (29 CFR 5.5)

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

Pursuant to 29 CFR 5.5(b), the following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek. 29 CFR 5.5.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph 1 of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph 1 of this section, in the sum currently provided in 29 CFR 5.5(b)(2)* for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1 of this section. 29 CFR 5.5.

* \$27 as of January 23, 2019 (See 84 FR 213-01, 218) as may be adjusted annually by the Department of Labor; pursuant to the Federal Civil Penalties Inflation Adjustment Act of 1990).

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 2 of this section. 29 CFR 5.5.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs 1 through 4 of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1 through 4 of this section. 29 CFR 5.5.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System pursuant to 23 CFR 635.116.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" in paragraph 1 of Section VI refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions: (based on longstanding interpretation)

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract. 23 CFR 635.102.

2. Pursuant to 23 CFR 635.116(a), the contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. Pursuant to 23 CFR 635.116(c), the contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract. (based on long-standing interpretation of 23 CFR 635.116).

5. The 30-percent self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements. 23 CFR 635.116(d).

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR Part 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract. 23 CFR 635.108.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR Part 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704). 29 CFR 1926.10.

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR Part 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 11, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT (42 U.S.C. 7606; 2 CFR 200.88; EO 11738)

This provision is applicable to all Federal-aid construction contracts in excess of \$150,000 and to all related subcontracts. 48 CFR 2.101; 2 CFR 200.326.

By submission of this bid/proposal or the execution of this contract or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, subcontractor, supplier, or vendor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal Highway Administration and the Regional Office of the Environmental Protection Agency. 2 CFR Part 200, Appendix II.

The contractor agrees to include or cause to be included the requirements of this Section in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements. 2 CFR 200.326.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200. 2 CFR 180.220 and 1200.220.

1. Instructions for Certification – First Tier Participants:

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction. 2 CFR 180.320.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default. 2 CFR 180.325.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances. 2 CFR 180.345 and 180.350.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900-180.1020, and 1200. "First Tier Covered Transactions" refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction. 2 CFR 180.330.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold. 2 CFR 180.220 and 180.300.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. 2 CFR 180.300; 180.320, and 180.325. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. 2 CFR 180.335. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (<https://www.sam.gov>). 2 CFR 180.300, 180.320, and 180.325.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default. 2 CFR 180.325.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

- (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.335;
- (2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property, 2 CFR 180.800;
- (3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification, 2 CFR 180.700 and 180.800; and
- (4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default. 2 CFR 180.335(d).
- (5) Are not a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and
- (6) Are not a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability (USDOT Order 4200.6 implementing appropriations act requirements).

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal. 2 CFR 180.335 and 180.340.

3. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders, and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200). 2 CFR 180.220 and 1200.220.

a. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances. 2 CFR 180.365.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900 – 180.1020, and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated. 2 CFR 1200.220 and 1200.332.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold. 2 CFR 180.220 and 1200.220.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (<https://www.sam.gov/>), which is compiled by the General Services Administration. 2 CFR 180.300, 180.320, 180.330, and 180.335.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment. 2 CFR 180.325.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals:

(a) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.355;

(b) is a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(c) is a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. (USDOT Order 4200.6 implementing appropriations act requirements)

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal.

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000. 49 CFR Part 20, App. A.

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

XII. USE OF UNITED STATES-FLAG VESSELS:

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, or any other covered transaction. 46 CFR Part 381.

This requirement applies to material or equipment that is acquired for a specific Federal-aid highway project. 46 CFR 381.7. It is not applicable to goods or materials that come into inventories independent of an FHWA funded-contract.

When oceanic shipments (or shipments across the Great Lakes) are necessary for materials or equipment acquired for a specific Federal-aid construction project, the bidder, proposer, contractor, subcontractor, or vendor agrees:

1. To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels. 46 CFR 381.7.

2. To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b)(1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Office of Cargo and Commercial Sealift (MAR-620), Maritime Administration, Washington, DC 20590. (MARAD requires copies of the ocean carrier's (master) bills of lading, certified onboard, dated, with rates and charges. These bills of lading may contain business sensitive information and therefore may be submitted directly to MARAD by the Ocean Transportation Intermediary on behalf of the contractor). 46 CFR 381.7.

12. FEMALE AND MINORITY GOALS

To comply with Section II, "Nondiscrimination," of "Required Contract Provisions Federal-Aid Construction Contracts," the following are for female and minority utilization goals for Federal-aid construction contracts and subcontracts that exceed \$10,000:

The nationwide goal for female utilization is 6.9 percent.

The goals for minority utilization (45 Fed Reg 65984 (10/3/1980)) are as follows:

MINORITY UTILIZATION GOALS

	Economic Area	Goal (Percent)
174	Redding CA: Non-SMSA (Standard Metropolitan Statistical Area) Counties: CA Lassen; CA Modoc; CA Plumas; CA Shasta; CA Siskiyou; CA Tehama	6.8
175	Eureka, CA Non-SMSA Counties: CA Del Norte; CA Humboldt; CA Trinity	6.6
176	San Francisco-Oakland-San Jose, CA: SMSA Counties:	28.9
	7120 Salinas-Seaside-Monterey, CA	
	CA Monterey	25.6
	7360 San Francisco-Oakland	
	CA Alameda; CA Contra Costa; CA Marin; CA San Francisco; CA San Mateo	
	7400 San Jose, CA	19.6
	CA Santa Clara, CA	
	7485 Santa Cruz, CA	14.9
	CA Santa Cruz	
177	7500 Santa Rosa	9.1
	CA Sonoma	
	8720 Vallejo-Fairfield-Napa, CA	17.1
	CA Napa; CA Solano	
	Non-SMSA Counties:	23.2
	CA Lake; CA Mendocino; CA San Benito	
	Sacramento, CA: SMSA Counties:	16.1
	6920 Sacramento, CA	
	CA Placer; CA Sacramento; CA	14.3
178	Yolo Non-SMSA Counties	
	CA Butte; CA Colusa; CA El Dorado; CA Glenn; CA Nevada; CA Sierra; CA Sutter; CA	
	Yuba	
	Stockton-Modesto, CA: SMSA Counties:	12.3
	5170 Modesto, CA	
	CA Stanislaus	24.3
	8120 Stockton, CA	
	CA San Joaquin	19.8
	Non-SMSA Counties	
179	CA Alpine; CA Amador; CA Calaveras; CA Mariposa; CA Merced; CA Tuolumne	
	Fresno-Bakersfield, CA SMSA Counties:	19.1
	0680 Bakersfield, CA	
	CA Kern	26.1
	2840 Fresno, CA	

	CA Fresno Non-SMSA Counties: CA Kings; CA Madera; CA Tulare	23.6
180	Los Angeles, CA: SMSA Counties: 0360 Anaheim-Santa Ana-Garden Grove, CA	11.9
	CA Orange	28.3
	4480 Los Angeles-Long Beach, CA	
	CA Los Angeles	21.5
	6000 Oxnard-Simi Valley-Ventura, CA	
	CA Ventura	19.0
	6780 Riverside-San Bernardino-Ontario, CA	
	CA Riverside; CA San Bernardino	19.7
	7480 Santa Barbara-Santa Maria-Lompoc, CA	
	CA Santa Barbara	24.6
181	Non-SMSA Counties	
	CA Inyo; CA Mono; CA San Luis Obispo	
	San Diego, CA: SMSA Counties	16.9
	7320 San Diego, CA	
	CA San Diego	18.2
	Non-SMSA Counties	
	CA Imperial	

For the last full week of July during which work is performed under the contract, the prime contractor and each non material-supplier subcontractor with a subcontract of \$10,000 or more must complete Form FHWA PR-1391 (Appendix C to 23 CFR 230). Submit the forms by August 15.

13. TITLE VI ASSURANCES

The U.S. Department of Transportation Order No.1050.2A requires all federal-aid Department of Transportation contracts between an agency and a contractor to contain Appendix A and E. Appendix B only requires inclusion if the contract impacts deeds effecting or recording the transfer of real property, structures, or improvements thereon, or granting interest therein. Appendices C and D only require inclusion if the contract impacts deeds, licenses, leases, permits, or similar instruments entered into by the recipient.

APPENDIX A

During the performance of this Agreement, the contractor, for itself, its assignees and successors in interest (hereinafter collectively referred to as CONTRACTOR) agrees as follows:

- a. Compliance with Regulations: CONTRACTOR shall comply with the regulations relative to nondiscrimination in federally assisted programs of the Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the REGULATIONS), which are herein incorporated by reference and made a part of this agreement.
- b. Nondiscrimination: CONTRACTOR, with regard to the work performed by it during the AGREEMENT, shall not discriminate on the grounds of race, color, sex, national origin, religion, age, or disability in the selection and retention of sub-applicants, including procurements of materials and leases of equipment. CONTRACTOR shall not participate either directly or indirectly in the discrimination prohibited by Section 21.5 of the Regulations, including employment practices when the agreement covers a program set forth in Appendix B of the Regulations.
- c. Solicitations for Sub-agreements, Including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by CONTRACTOR for work to be performed under a Sub- agreement, including procurements of materials or leases of equipment,

each potential sub-applicant or supplier shall be notified by CONTRACTOR of the CONTRACTOR'S obligations under this Agreement and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.

- d. Information and Reports: CONTRACTOR shall provide all information and reports required by the Regulations, or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the recipient or FHWA to be pertinent to ascertain compliance with such Regulations or directives. Where any information required of CONTRACTOR is in the exclusive possession of another who fails or refuses to furnish this information, CONTRACTOR shall so certify to the recipient or FHWA as appropriate, and shall set forth what efforts CONTRACTOR has made to obtain the information.
- e. Sanctions for Noncompliance: In the event of CONTRACTOR's noncompliance with the nondiscrimination provisions of this agreement, the recipient shall impose such agreement sanctions as it or the FHWA may determine to be appropriate, including, but not limited to:
 - i. withholding of payments to CONTRACTOR under the Agreement within a reasonable period of time, not to exceed 90 days; and/or
 - ii. cancellation, termination or suspension of the Agreement, in whole or in part.
- f. Incorporation of Provisions: CONTRACTOR shall include the provisions of paragraphs (1) through (6) in every sub-agreement, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto.

CONTRACTOR shall take such action with respect to any sub-agreement or procurement as the recipient or FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance, provided, however, that, in the event CONTRACTOR becomes involved in, or is threatened with, litigation with a sub-applicant or supplier as a result of such direction, CONTRACTOR may request the recipient enter into such litigation to protect the interests of the State, and, in addition, CONTRACTOR may request the United States to enter into such litigation to protect the interests of the United States.

APPENDIX B

CLAUSES FOR DEEDS TRANSFERRING UNITED STATES PROPERTY

The following clauses will be included in deeds effecting or recording the transfer of real property, structures, or improvements thereon, or granting interest therein from the United States pursuant to the provisions of Assurance 4:

NOW THEREFORE, the U.S. Department of Transportation as authorized by law and upon the condition that the recipient will accept title to the lands and maintain the project constructed thereon in accordance with Title 23 U.S.C., the regulations for the administration of the preceding statute, and the policies and procedures prescribed by the FHWA of the U.S. Department of Transportation in accordance and in compliance with all requirements imposed by Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation pertaining to and effectuating the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42 U.S.C. § 2000d to 2000d-4), does hereby remise, release, quitclaim and convey unto the recipient all the right, title and interest of the U.S. Department of Transportation in and to said lands described in Exhibit A attached hereto and made a part hereof.

(HABENDUM CLAUSE)

TO HAVE AND TO HOLD said lands and interests therein unto the recipient and its successors forever, subject, however, to the covenants, conditions, restrictions and reservations herein contained as follows, which will remain in effect for the period during which the real property or structures are used for a purpose for which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits and will be binding on the recipient, its successors and assigns. The recipient, in consideration of the conveyance of said lands and interest in lands, does hereby covenant and agree as a covenant running with the land for itself, its successors and assigns, that (1) no person

will on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination with regard to any facility located wholly or in part on, over, or under such lands hereby conveyed [,] [and]* (2) that the recipient will use the lands and interests in lands and interest in lands so conveyed, in compliance with all requirements imposed by or pursuant to Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations and Acts may be amended[, and (3) that in the event of breach of any of the above-mentioned non-discrimination conditions, the Department will have a right to enter or re-enter said lands and facilities on said lands, and that above described land and facilities will thereon revert to and vest in and become the absolute property of the U.S. Department of Transportation and its assigns as such interest existed prior to this instruction].*

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary in order to make clear the purpose of Title VI.)

APPENDIX C

CLAUSES FOR TRANSFER OF REAL PROPERTY ACQUIRED OR IMPROVED UNDER THE ACTIVITY, FACILITY, OR PROGRAM

The following clauses will be included in deeds, licenses, leases, permits, or similar instruments entered into by the recipient pursuant to the provisions of Assurance 7(a):

A. The (grantee, lessee, permittee, etc. as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree [in the case of deeds and leases add "as a covenant running with the land"] that:

1. In the event facilities are constructed, maintained, or otherwise operated on the property described in this (deed, license, lease, permit, etc.) for a purpose for which a U.S. Department of Transportation activity, facility, or program is extended or for another purpose involving the provision of similar services or benefits, the (grantee, licensee, lessee, permittee, etc.) will maintain and operate such facilities and services in compliance with all requirements imposed by the Acts and Regulations (as may be amended) such that no person on the grounds of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities.

B. With respect to licenses, leases, permits, etc., in the event of breach of any of the above Non-discrimination covenants, the recipient will have the right to terminate the (lease, license, permit, etc.) and to enter, re-enter, and repossess said lands and facilities thereon, and hold the same as if the (lease, license, permit, etc.) had never been made or issued.*

C. With respect to a deed, in the event of breach of any of the above Non-discrimination covenants, the recipient will have the right to enter or re-enter the lands and facilities thereon, and the above described lands and facilities will there upon revert to and vest in and become the absolute property of the recipient and its assigns.*

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

APPENDIX D**CLAUSES FOR CONSTRUCTION/USE/ACCESS TO REAL PROPERTY ACQUIRED UNDER THE ACTIVITY, FACILITY OR PROGRAM**

The following clauses will be included in deeds, licenses, permits, or similar instruments/agreements entered into by the recipient pursuant to the provisions of Assurance 7(b):

A. The (grantee, licensee, permittee, etc., as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree (in the case of deeds and leases add, "as a covenant running with the land") that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishings of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits or, or otherwise be subjected to discrimination, (3) that the (grantee, licensee, lessee, permittee, etc.) will use the premises in compliance with all other requirements imposed by or pursuant to the Acts and Regulations, as amended, set forth in this Assurance.

B. With respect to (licenses, leases, permits, etc.) in the event of breach of any of the above of the above Non-discrimination covenants, the recipient will have the right to terminate the (license, permits, etc., as appropriate) and to enter or re-enter and repossess said land and the facilities thereon, and hold the same as if said (license, permit, etc., as appropriate) had never been made or issued.*

C. With respect to deeds, in the event of breach of any of the above Non-discrimination covenants, the recipient will there upon revert to and vest in and become the absolute property of the recipient and its assigns.

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

APPENDIX E

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following non-discrimination statutes and authorities, including, but not limited to:

Pertinent Non-Discrimination Authorities:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), prohibits discrimination on the basis of sex;
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability); and 49 CR Part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 U.S.C. § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);

- Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 – 12189) as implemented by Department of Transportation regulations 49 C.F.R. parts 37 and 38;
- The Federal Aviation Administration's Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

14. USE OF UNITED STATES-FLAG VESSELS (CARGO PREFERENCE ACT)

The CONTRACTOR agrees:

1. To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.
2. To Furnish within 20 days following the date of loading for shipments originating within the United State or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated "on-board" commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.
3. To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract.

15. PROHIBITION OF CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE EQUIPMENT AND SERVICES

In response to significant national security concerns, the agency shall check the prohibited vendor list before making any telecommunications and video surveillance purchase because recipients and subrecipients of federal funds are prohibited from obligating or expending loan or grant funds to:

- Procure or obtain;
- Extend or renew a contract to procure or obtain; or
- Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

The prohibited vendors (and their subsidiaries or affiliates) are:

- Huawei Technologies Company;
- ZTE Corporation;
- Hytera Communications Corporation;
- Hangzhou Hikvision Digital Technology Company;
- Dahua Technology Company; and
- Subsidiaries or affiliates of the above-mentioned companies.

In implementing the prohibition, the agency administering loan, grant, or subsidy programs shall prioritize available funding and technical support to assist affected businesses, institutions and organizations as is reasonably necessary for those affected entities to transition from covered communications equipment and services, to procure replacement equipment and services, and to ensure that communications service to users and customers is sustained.

The contractors should furnish telecommunications and video surveillance equipment with a certificate of compliance. The certificate must state telecommunications and video surveillance equipment was not procured or obtained from manufacturers identified in the above list.

8 PROSECUTION AND PROGRESS

8-1.04 START OF JOB SITE ACTIVITIES

8-1.04B Standard Start, replace section with:

Do not enter the work site or initiate construction operations until you have submitted to the County in proper form all contract, surety bonds, evidences of insurance and all other documents required of you in connection with the contract and all such documents have been approved and/or executed, as appropriate, by County. Written notice to proceed must be issued by the Department.

When traffic signal materials are part of the contract, you must furnish material submittals to the Engineer within 15 calendar days after the contract is awarded and must show the estimated date of delivery for traffic signal materials, which include, but not limited to:

- Traffic signal standards or lighting standards (e.g., poles and/or mast arms)
- Traffic signal head/housing modules
- Traffic signal controller cabinets and/or service pedestals

Once material submittals are approved by the Engineer, provide a statement from the traffic signal vendor indicating that all of the necessary traffic signal material has been ordered and accepted by said vendor. Written evidence, indicating that the necessary traffic signal equipment is in your possession, must be provided to the Engineer prior to entering the work site or initiating construction operations.

After the execution of the contract, the Contractor must furnish material submittals to the Engineer within 10 working days and when the estimated date of delivery for all required mechanical and electrical components. This applies to planning, shop submittal, procurement, and any other tasks that do not include work at the bridge sites. Working days in the field at the bridge sites must begin no earlier than **November 1, 2023**, contingent upon prior receipt of notice to proceed. If the notice is not received before the specified date, working days must begin on the first working day of the week following the date of the notice to proceed.

The beginning of working days may be rescheduled by mutual agreement between the Contractor and the Department by written correspondence.

When the plans indicate that Public Outreach is necessary for this project, the Contractor must arrange an informational meeting for the general public two weeks prior to the start of construction concerning the project scope and timing. Meeting site must be in a public location (i.e.: school, park, fire house...) within three blocks of project site unless otherwise approved by the Engineer. A public address (PA) system will be required for the meeting. Location and time of the meeting must be approved by the Engineer. The Contractor must perform public outreach by advertising the meeting in the local newspaper and sending written notifications to the residents located within project limits. Full compensation for performing this meeting, including acquiring meeting site, supplying PA system, advertising, notifying residents, and all other incidentals, must be considered as included in the prices paid for various contract items of work and no separate payment will be made therefor. **If COVID-19 restrictions prevent an in-person public meeting, said meeting shall be conducted online using a video-telephony program such as Zoom or approved equal.**

8-1.05 TIME, replace paragraphs 1 through 3 with:

The Contractor must complete all work in the field at the bridge sites before the expiration of **120** working days across 2 construction seasons, between November 1st and January 31st. The Contractor must complete all work on at least two of the bridge sites during the first construction season. The Contractor must ensure that at the end of each construction season that any and all bridges worked on are fully operable.

9 PAYMENT

9-1.02 MEASUREMENT

9-1.02C Final Pay Item Quantities, add:

Final Pay Quantities are identified by the letter “(F)” in the bid item lists of the Notice to Bidders and Bid in the “Item No.” column.

9-1.03 PAYMENT SCOPE, add:

The prime contractor or subcontractor shall pay to any subcontractor, not later than **seven days** after receipt of each progress payment, unless otherwise agreed to in writing, the respective amounts allowed the contractor on account of the work performed by the subcontractors, to the extent of each subcontractor’s interest therein. In the event that there is a good faith dispute over all or any portion of the amount due on a progress payment from the prime contractor or subcontractor to a subcontractor, the prime contractor or subcontractor may withhold no more than 150 percent of the disputed amount. Any violation of this requirement shall constitute a cause for disciplinary action and shall subject the licensee to a penalty, payable to the subcontractor, of 2 percent of the amount due per month for every month that payment is not made. In any action for the collection of funds wrongfully withheld, the prevailing party shall be entitled to his or her attorney’s fees and costs. The sanctions authorized under this requirement shall be separate from, and in addition to, all other remedies, either civil, administrative, or criminal. This clause applies to both DBE and non-DBE subcontractors.

9-1.07 PAYMENT ADJUSTMENT FOR PRICE INDEX FLUCTUATIONS, delete.

9-1.16 PROGRESS PAYMENTS

9-1.16A General, replace paragraph 2 with:

The Engineer's Monthly Estimate Period must begin on the first Monday following the 15th day of the month. Payment must be due the month following the Engineer’s Monthly Estimate Period.

9-1.16F Retentions, replace section with:

No retainage will be held by the Department from progress payments due to the prime contractor. Prime contractors and subcontractors are prohibited from holding retainage from subcontractors. Any delay or postponement of payment may take place only for good cause and with the Department’s prior written approval.

Section 9—Payment
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Any violation of these provisions Prompt Progress Payment and Prompt Payment of Withheld Funds to Subcontractors shall subject the violating contractor or subcontractor to the penalties, sanctions, and other remedies specified in Section 7108.5 of the California Business and Professions Code and Section 10262 of the California Public Contract Code. This requirement shall not be construed to limit or impair any contractual, administrative or judicial remedies, otherwise available to the contractor or subcontractor in the event of a dispute involving late payment or nonpayment by the contractor, deficient subcontractor performance and/or noncompliance by a subcontractor. This clause applies to both DBE and non-DBE subcontractors.

10 GENERAL

10-1 GENERAL

10-1.02 WORK SEQUENCING

10-1.02B Traffic Elements, add before paragraph 1:

When the work includes the installation of underlying conduits or loop detectors, do not place the uppermost layer of new pavement until all underlying conduits and loop detectors are installed.

10-1.02E Excavation, add before paragraph 1:

Excavation within 6 feet of the existing traveled way must not precede the paving operation by more than 5 working days unless:

1. Authorized
2. Material is placed and compacted against the vertical cuts within 2 feet of the existing traveled way. During excavation operations, native material may be used for this purpose except once the placement of the structural section starts, structural material must be used. Place the material up to the top of the existing pavement and taper at a slope of 4:1 (horizontal: vertical) or flatter to the bottom of the excavation. Do not use treated base for the taper.

Replace “**10-1.05 RESERVED**” with:

10-1.05 RELATIONS WITH LOCAL SCHOOLS

Schools/educational centers within the vicinity of the project must be provided a 72-hours advance notice prior to commencement of any work. Due to the unforeseen possibility of the presence of students at schools/educational centers, any work obstructing direct access to schools/educational centers must be performed on the weekend. Weekday work near schools may be performed before or after pickup/drop off hours if written approval is obtained by the School District and the Resident Engineer. Written approval must indicate permissible work (time) windows. There will be no exceptions without these prior approvals. No extra or additional compensation is implied for performing work during weekends.

10-4 WATER USAGE, replace item 4 of paragraph 3 with:

4. Dust palliative for dust control requires preapproval by the Engineer.

10-5 DUST CONTROL, replace item 1 of paragraph 2 with:

1. Applying non-potable water under Section 10-6, "Watering," of the Standard Specifications and these Special Provisions.

10-5 DUST CONTROL, add after paragraph 2:

No separate payment will be made for any work performed or materials used to control dust resulting from the Contractor's operations either inside or outside the right-of-way, or for controlling dust caused by public traffic during Contractor's working hours. Full compensation for such dust control will be considered as included in the prices paid for the various items of work involved and no additional compensation will be allowed therefor.

When the Engineer orders the application of water for the purpose of controlling dust caused by public traffic during non-working hours after the Contractor has shut down operations for overnight, for a weekend, for a holiday or for temporary suspension of work, in accordance with Section 8-1.06, "Suspensions," of the Standard Specifications, such work will be paid for at the contract unit price for **Dust Control (Non-working Hours)**.

Payment quantity of Dust Control (Non-working Hours) must be measured and paid for as follows:

After working hours.....1 each Dust Control (Non-working Hours) per day

Saturday or non-working day..... 2 each Dust Control (Non-working Hours) per day

Sunday or Holiday..... 3 each Dust Control (Non-working Hours) per day

No adjustment of compensation will be made for the unit item of Dust Control (Non-working Hours) for any increase or decrease in the hours of work or the quantity of water required, regardless of the reason for such increase or decrease.

10-6 WATERING, replace sentence 1 of paragraph 3 with:

Water for dust control on this project must be non-potable.

If non-potable water is unavailable, use of potable water for dust control is permissible with the approval of the Engineer. When non-potable water is permissible, it must either be recycled water or non-potable water developed from other sources. Contractor must obtain a permit for potable water usage and pay all applicable fees from San Joaquin County Public Works Community Infrastructure Engineering Division or to any other outside agency for obtaining their potable water.

Provide written notification to the Engineer of the intended source(s) to be used, prior to starting work on the project.

10-6 WATERING, add after paragraph 11:

When the contract does not include a contract pay item for **Develop Water Supply**, full compensation for Develop Water Supply must be considered as included in the contract prices paid for the various items of work involved.

12 TEMPORARY TRAFFIC CONTROL

12-1 GENERAL

12-1.01 GENERAL, add:

Submit a construction area Traffic Control Plan, for approval by the Engineer, at least 10 working days prior to start of work.

12-1.04 PAYMENT, add:

Payment for transportation of flaggers is limited to transportation necessary within the job site.

When you and the Engineer mutually agree that a pilot car is warranted for public safety and convenience, the cost of furnishing and operating the pilot car must be considered as part of the flagging costs, equally shared by you and the Department.

Hourly wage rates, that are to be equally shared by you and the Department, are limited to the governing California Prevailing Wage or Federal Minimum Wage rates.

12-3 TEMPORARY TRAFFIC CONTROL DEVICES

12-3.11 CONSTRUCTION AREA SIGNS

12.3.11A General

12-3.11A(1) Summary, replace paragraph 1 with:

Section 12-3.11 includes specifications for placing, installing, maintaining, and removing construction area signs.

Unless otherwise described, advance warning and detour signs (when applicable) outside of the construction zone will be furnished, installed, and maintained by County forces. Detour Plan will either be available in the appendix of these Project specifications or as supplemental information on www.bidexpress.com. Applicable Advanced Warning Signs will be available upon request to the awarded contractor.

12-3.11B Materials

12-3.11B(5) General Information Signs, replace “Reserved” with:

When the plans or specifications indicate that construction funding identification or other general information signs are to be installed by County forces, you must maintain and relocate said signs as necessary, or as directed by the Engineer.

After project completion, salvage the signs and deliver them to the Department's Corporation Yard located at 1810 East Hazelton Avenue, Stockton, California. Contact Public Works' Dispatch at (209) 468-3074 to make arrangements to have County personnel receive the salvaged materials.

12-3.11D Payment, replace "Not Used" with:

Full compensation for maintaining, relocating, salvaging, and delivering signs will be considered as included in the **Traffic Control System** bid item and no separate payment will be made therefor.

12-3.32 PORTABLE CHANGEABLE MESSAGE SIGNS

12-3.32A(1) Summary, replace paragraph 1 with:

Section 12-3.32 is applicable when the contract includes a bid item for portable changeable message signs. Said section includes specifications for placing, maintaining, and removing portable changeable message signs.

12-3.32C Construction, add between paragraphs 10 and 11:

Display portable changeable message signs 7 calendar days prior to commencement of work. Traffic Control Plan must indicate the proposed locations of advanced warning portable changeable message signs.

12-3.32D Payment, replace "Not Used" with:

Payment quantity for **Portable Changeable Message Sign** is measured by the unit from actual count.

12-4 MAINTAINING TRAFFIC

12-4.01 GENERAL

12-4.01C Construction, replace paragraph 1 with "Not Used."

12-4.02 TRAFFIC CONTROL SYSTEMS

12-4.02A(1) Summary, replace paragraph 1 with:

Section 12-4.02 includes specifications for providing traffic control systems to close traffic lanes with stationary and moving lane closures.

12-4.02A(3)(d) Traffic Break Schedule, delete.

12-4.02C(2) Lane Closure System

12-4.02C(2)(a) General, delete.

12-4.02C(3) Closure Requirements and Charts

12-4.02C(3)(a) General, replace section with “Reserved.”

Revise **Section 12-4.02C(3)(k)** title to “**Conventional Highway Lane Requirements**,” and add:

Unless otherwise described, a minimum of 1 paved traffic lane, not less than 10 feet in width, must be open for use by public traffic at all times. When construction operations are not actively in progress, not less than 2 such lanes must be open to public traffic.

Only streets receiving an application of slurry seal are allowed to be closed to traffic for a maximum of four hours. To avoid inconveniencing an entire area, streets to be slurry sealed must not be closed simultaneously.

On roadways with 2 or more traffic lanes in each direction, conduct traffic operations with at least 1 paved traffic lane open in each direction at all times.

Under one-way reversing traffic control operations, you may stop traffic in one direction for periods not to exceed 10 minutes. After each stoppage, all accumulated traffic for that direction must pass through the work zone before another stoppage is made.

Revise **Section 12-4.02C(3)(m)** title to “**Road Closure Requirements**,” and add:

When road closure is indicated on the plans, divert through traffic around the project. Unless specific restrictions are indicated on the plans, or elsewhere within these special provisions, local traffic must be permitted to pass through construction operations at all times with as little inconvenience and delay as possible.

12-4.02C(7) Traffic Control System Requirements

12-4.02C(7)(a) General, replace paragraph 1 with:

When placing traffic stripes and pavement markers, control traffic with stationary or moving lane closures. During other activities, control traffic using stationary lane closures.

12-4.02C(7)(b) Stationary Closures, add after paragraph 2:

For traffic under one-way control on unpaved areas, the cones shown along the centerline need not be placed.

If the pilot car is used for traffic control, the cones shown along the centerline need not be placed. The pilot car must have radio contact with personnel in the work area. Operate the pilot car through the traffic control zone at a speed not greater than 25 miles per hour.

12-4.02D Payment, replace section with:

Traffic Control System, other than work considered as flagging costs, is paid for at the contract lump sum price.

The requirements in section 4-1.05, "Changes and Extra Work," for payment adjustment do not apply to Traffic Control System. Adjustments in compensation for Traffic Control System will be made for an increase or decrease in traffic control work if ordered and will be made on the basis of the cost of the necessary increased or decreased traffic control. The adjustment will be made on a force account basis for increased work and estimated on the same basis in the case of decreased work.

A traffic control system required by change order work is paid for as a part of the change order work.

12-6 TEMPORARY PAVEMENT DELINEATION

12-6.01 GENERAL, replace paragraph 1 with:

Section 12-6 includes specifications for placing, applying, maintaining, and removing temporary pavement delineation.

12-6.03 CONSTRUCTION

12-6.03A General, replace sentence 2 of paragraph 1 with:

Temporary pavement delineation must consist of a lane line, centerline, and pavement markings for traveled ways open to traffic.

12-6.03B Temporary Lane Line and Centerline Delineation, add between paragraphs 2 and 3:

Cement the markers to the surfacing with the adhesive recommended by the manufacturer, except do not use epoxy adhesive to place pavement markers in areas where removal of the markers will be required.

Temporary lane line delineation placed on portland cement concrete pavement must consist of a white traffic stripe supplemented by a black-contrast traffic stripe and clear retroreflective pavement markers. Place the temporary lane line and clear retroreflective pavement markers longitudinally at intervals not exceeding 48 feet. The black contrast stripe and clear retroreflective pavement markers may remain in place at locations where you will be placing permanent pavement delineation.

12-6.03C Temporary Edge Line Delineation, replace lines 1.1 and 2.1 of paragraph 1 with:

1.1 Solid traffic stripe tape of the same color and detail as the stripe being replaced

2.1 Solid traffic stripe tape of the same color and detail as the stripe being replaced

12-6.03C Temporary Edge Line Delineation, replace paragraph 2 with:

You may apply temporary traffic stripe paint of the same color as the stripe being replaced instead of solid temporary traffic stripe tape where the removal of the temporary traffic stripe is not required.

12-6.03C Temporary Edge Line Delineation, add to start of paragraph 4:

Channelizers used for temporary edge line delineation must be one of the 36-inch, orange surface-mounted types, and on the Authorized Material List.

12-6.03D Temporary Traffic Stripe, Pavement Marking, and Pavement Markers

12-6.03D(1) General, replace “Reserved” with:

If pavement markings are obliterated and temporary pavement delineation to replace the markings is not shown, apply temporary pavement markings prior to opening traveled ways to traffic.

12-6.03D(4) Temporary Pavement Marking Tape, add to end of paragraph 1:

Temporary pavement marking tape must be the same color and dimensions as the pavement marking detail being replaced, or as superseded by a subsequent traffic pattern or new striping detail.

12-6.03D(5) Temporary Pavement Marking Paint, add to end of paragraph 1:

Temporary pavement marking paint must be the same color and dimensions as the pavement marking detail being replaced, or as superseded by a subsequent traffic pattern or new striping detail.

12-6.04 PAYMENT, add between paragraphs 1 and 2:

In Section 84, “Markings,” references made to 6-inch stripe must be revised to 4-inch stripe unless otherwise indicated on the plans. Application rates defined for materials placed per linear foot under Section 84 must be revised based on the width of the striping and marking as defined on the project plans.

13 WATER POLLUTION CONTROL

13-1 GENERAL

13-1.01 GENERAL

13-1.01A Summary, add:

This project is anticipated to disturb less than 1 acre of soil.

13-1.01B Definitions, add:

Department: When used in reference to manuals and General Permits, Department must mean San Joaquin County Department of Public Works.

13-3 STORMWATER POLLUTION PREVENTION PLAN

13-3.01C Submittals

13-3.01C(2)(a) General, replace paragraph 1 with:

Within 7 days of Contract approval:

1. Submit 3 copies of your SWPPP for review. You may assign a QSD other than the WPC manager to develop the SWPPP. Allow 5 days for the Department's review. The Engineer provides comments and specifies the date when the review stopped if revisions are required.
2. Change and resubmit a revised SWPPP within 5 days of receiving the Engineer's comments. The Department's review resumes when a complete SWPPP has been resubmitted.
3. When the Engineer authorizes the SWPPP, submit an electronic copy and 4 printed copies of the authorized SWPPP.
4. If the RWQCB requires review of the authorized SWPPP, the Engineer submits the authorized SWPPP to the RWQCB for its review and comments.
5. If the Engineer requests changes to the SWPPP based on the RWQCB's comments, amend the SWPPP within 5 days.

Upon approval of SWPPP by Engineer, Contractor must submit Permit Registration Documents (PRDs) on the State's online "SMARTS" system for any project that will disturb one acre or more of earth, or any projects that involve a smaller disturbance, but is part of a larger project plan. The Contractor must register with the State as a data submitter and must submit online the required PRDs including: the online NOI form; risk level determination information; a Storm Water Pollution Prevention Plan (SWPPP); a site map; and a vicinity map. The County will be the Legally Responsible Person (LRP) and will establish an LRP-account and certify the PRD submittals once they have been uploaded by the Contractor.

Contractor must provide payment of fees. Fees are calculated per acre of disturbed area as determined by the SWRCB. The SWPPP must comply with the requirements of the Construction General Permit. Further information regarding filing a NOI, calculating fees and preparing a SWPPP can be obtained from the SWRCB. Call the SWRCB at 916-341-5536 and 1-(866)-563-3107 or visit the website at http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml for more information on the General Permit and associated requirements.

13-3.04 Payment, add:

When there are no separate bid items for **Rain Event Action Plan**, **Storm Water Sampling and Analysis Day**, and **Storm Water Annual Report**, payment for said items will be considered as included in the various items of work involved and no additional payment will be made therefor.

Payment for preparing the PRD and PRD fees must all be considered as included in the contract lump sum price paid for **Prepare Storm Water Pollution Prevention Plan**.

Implementation of said plan must be considered as included in the contract lump sum price paid for **Water Pollution Control**.

For each failure to submit a completed storm water annual report, the Department withholds \$10,000. This withhold is in addition to other performance failure withholds.

13-4 JOB SITE MANAGEMENT

13-4.04 Payment, replace “Not Used” with:

Unless there is a separate bid item, **Job Site Management** must be considered as included in the contract lump sum price paid for **Water Pollution Control**.

13-7.03D Payment, replace section with:

Installation, relocation, and maintenance of construction entrances or roadways is borne by the Contractor.

15 EXISTING FACILITIES

15-1.03 CONSTRUCTION

15-1.03B Removing Concrete, add before paragraph 1:

Existing concrete must be cut in neat lines where new asphalt concrete or concrete is to join existing concrete.

15-1.03B Removing Concrete, replace paragraph 8 with:

Removal of concrete includes the below-ground portion and steel reinforcement.

Concrete, including any reinforcement, must be disposed of outside of the right-of-way.

Replacement of a concrete gutter or curb facility abutting the existing pavement must include the removal of a section of adjacent pavement, equal to the length of replaced concrete. Pavement to be removed will be as shown on the plans. Said pavement section must be replaced with HMA in accordance with Section 39, "Hot Mix Asphalt."

15-1.04 PAYMENT, replace "Not Used" with:

15-1.04B Payment

Remove Concrete is paid for at the contract lump sum price, length, area, or volume of removed concrete, whichever is designated on the Bid Item list.

When the plans require the removal of adjacent pavement as part of the concrete removal, full compensation for removing the pavement section will be considered as included in the Remove Concrete bid item. Structural material and placement of new hot mix asphalt will be considered as included in the contract unit price paid for the type of hot mix asphalt used to reconstruct the removed pavement section.

When the contract does not include a separate bid item for removing concrete, as described, full compensation for removing concrete and any required adjacent pavement must be considered as included in the contract prices paid for the various items of work involved.

19 EARTHWORK

19-3 STRUCTURE EXCAVATION AND BACKFILL

19-3.03 CONSTRUCTION

19-3.03E Structure Backfill

19-3.03E(1) General, replace sentence 3 of paragraph 1 with:

Backfill layers must be at most 0.67 foot thick.

19-3.03E(1) General, replace paragraphs 5 and 6 with:

Ponding and jetting will not be permitted.

19-3.03E(1) General, add between paragraphs 7 and 8:

Compaction and Material Requirements: Unless otherwise shown on the plans, the compaction and material requirements within the limits of structure backfill for pipes and arches must be as follows:

- (a) From the bottom of the trench to one-half of the outside diameter of the pipe must be no less than 95 percent relative compaction.
- (b) From one-half the outside diameter of the pipe to 3 feet below finish grade must be no less than 85 percent relative compaction. Backfill material must be selected material from structure excavation.
- (c) From 3 feet below finish grade to the finish grade of pavement must be no less than 95 percent relative compaction.
- (d) From 3 feet below finish grade to the finish grade outside of pavement must be no less than 90 percent relative compaction.

Unless otherwise specified, structure backfill outside of the paved portions of the roadway must be native material selected for its resistance to erosion.

19-3.04 PAYMENT, add:

When the contract does not include a separate bid item for **Structure Excavation and Backfill**, full compensation for performing structure excavation and backfill must be considered as included in the contract prices paid for the various items of work involved.

SPECIAL PROVISIONS
BRIDGE 29C-108
BACON ISLAND ROAD
over
MIDDLE RIVER

DEPARTMENT OF PUBLIC WORKS

COUNTY OF SAN JOAQUIN

STATE OF CALIFORNIA

88 BRIDGE ELECTRICAL SYSTEMS

88-1 CONDUIT AND ACCESSORIES

88-1.01 GENERAL

88-1.01A General

Section 88-1 consists of furnishing and installing a conduit system. The Contractor must provide all labor, materials, plant, equipment and incidentals required to furnish and install a functioning conduit/raceway system according to the Plans, Specifications and the Engineer's order.

Follow the materials section for new conduit installations and where existing couplings, fittings, and conduit bodies are not in compliance with the ANSI Standard C80.1 and UL Standard UL6.

The work consists of furnishing, installing, terminating, and connecting the conduits for equipment and for interconnections between equipment, fixtures, and devices according to the Contract Documents and the Engineer's order. Necessary accessories, supports, fittings, raceways, attachments, and hardware must be provided to complete the conduit system.

Incidental apparatus, appliance, material, or labor not mentioned that is needed to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor at no additional cost.

88-1.01B Definitions

Certified test reports are reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

Factory tests are tests performed on the actual materials or equipment proposed for use. Results of the tests must be submitted in accordance with the provisions of this Specification for laboratory test results.

88-1.01C Submittals

88-1.01C(1) General

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for Engineer's acceptance. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification, any other applicable references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete, and a legend provided to decipher the manufacturer model number codes.

If any departures from the Contract Documents are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted to the Engineer in writing as soon as possible for his acceptance. No departures from the Plans are made without the Engineer's acceptance.

If the Contractor has any objections to the requirements on the Plans and/or Specifications, he must state

his objection in writing to the Engineer before or when submitting shop drawings; otherwise, his objection is not considered if offered later as an excuse for malfunctioning, defective or broken machinery.

Manufacturer's data and/or shop drawings must be submitted for all conduits.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted to the Engineer for acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings are accepted by the Engineer, will be rectified by the Contractor at no additional cost.

88-1.01C(2) Shop Drawings

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted to document and perform the work, or obtain the Engineer's authorization to perform the work.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of the Caltrans Standard Specification and must in addition meet the following:

Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans are not be used as base sheets for assembly or erection plans and are not acceptable as shop drawings.

Where shop drawings are for materials that replace existing materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

Materials and material specifications must be stated for each component. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.

For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part and the manufacturer's part number assigned to each part. The plans or diagrams must show enough to disassemble and reassemble the assemblies covered. If any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.

Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary materials on which the manufacturer or supplier states mounting dimensions, ratings, and any other details for use on this specific project. The certified prints must identify and describe each part in addition to the following:

1. Dimensions of all principal parts comprising the assembly.
2. Certified external dimensions affecting clearances and required for installation.
3. Capacity ratings.
4. Location of mounting holes.
5. Electrical operating characteristics.
6. Location of conduit/cable entries, dimensioned and sized.
7. Gross weight.

Certified prints must be signed by an officer of the manufacturing company.

Shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance as specified for the shop drawings.

The weight of each piece of equipment must be stated on the shop plans on which it is detailed or billed.

Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

The Contractor must PDF files of all shop drawings for the Engineer's acceptance. Hard copies are not required. The Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs, which may result from ordering materials before acceptance of the shop drawings. No work must be done until the shop drawings have been accepted. After acceptance of the shop drawings, the Contractor must submit up to three (3) prints of the shop drawings as ordered by the Engineer.

88-1.01C(3) Certificates

Where materials are specified to comply with requirements of the standards of an organization or standard listings by applicable codes, such as NEMA, NFPA, and UL, that use a label or listing indicating compliance, proof of such conformance must be submitted and accepted. The label or listing of the specified organization will be acceptable evidence. Instead of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and accepted by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

88-1.01C(4) Operating and Maintenance Manual Supplement

Final Operating and Maintenance Manual Supplement submittal must include a CD-ROM of the complete supplemental manual materials in PDF format. Four (4) copies of the approved hard copy supplemental manual materials and four (4) copies of the CD-ROM must be delivered to the Engineer.

The supplemental manual materials must be assembled in a separate volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches, 20 lb. paper with accurately punched holes. The paper must be acid free and suitable for archival use. The holes for binding must be 5/16 inches diameter and be reinforced with plastic or cloth, spaced at the standard for three holes spacing.

Foldout drawings, diagrams, and illustrations must have 5/16 inches minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

The supplemental operating and maintenance manual materials must include as-built, revised, and updated; drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of

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the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility and capacity to be capable of reproduction as required San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the supplemental manual materials including the method of binding and the text must be submitted for Engineer's acceptance.

All printed matter, data, drawings, diagrams, etc. must be produced by methods to result in permanence and durability, including paper that is water and grease resistant. No materials must be used which adversely affect this permanence and durability.

The supplemental manual materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-1.01D Quality Assurance

88-1.01D(1) Qualifications, Personnel and Facilities

Materials used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified materials.

The Contractor must provide enough skilled, trained, and experienced tradesmen familiar with the requirements and methods for the properly executing the specified work.

The Contractor must submit proof of manufacturer training and certification for all workers that install PVC coated conduit through the Shop Drawing process.

The Contractor must provide enough plant and necessary tools and instruments required for the proper performance of the personnel executing the specified work.

88-1.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable Federal, State and local rules, regulations, and ordinances.

When a conflict between the Specification and the mentioned codes, standards, rules, regulations and

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ordinances occurs, the most stringent requirement applies.

Work must comply with applicable requirements of the latest edition of codes and standards issued by, but not limited to, the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American Society for Testing and Materials	ASTM
A 653 – Standard Specification for steel Sheet, Zinc-Coated (Galvanized) or Zinc Alloy-Coated (Galvannealed) by the Hot-Dip Process.	
A 525 – Sheet Steel, Zinc Coated (Galvanized) by the Hot Dip Process, General Requirements	
American National Standards Institute	ANSI
C80.1 - Rigid Steel Conduit, Zinc Coated	
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additionally, the work must comply with the requirements of any local rules, regulations, ordinances, and other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it does not mean that other codes and standards are to be omitted if not mentioned.

88-1.01D(3) Measurements and Verification

Dimensions shown on the Plans are nominal and are intended for guidance only. Variations from dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits before bid. Variances between plan and field conditions are not a basis for claim.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It is the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits prior to bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new

component can be finished to obtain the prescribed fit.

88-1.01D(4) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in the Specification allow the Contractor to substitute other manufacturers and model numbers of materials of equal quality and rating for those specified.

Before the Contractor orders substitute material, the Engineer's acceptance of the equivalence of the substitute material must be obtained in writing. The acceptance of the substitute material is at the discretion of the Engineer who establishes the basis for equivalence and reviews the quality of the materials described in detail on the submitted shop drawings and material data.

The Engineer indicates "Accepted" or "Revise and Resubmit" of substitute material. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified product. Rejection must not result in additional cost. Approval by the Engineer of any substitute products submitted by the Contractor must not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that product.

If departures from the Plans or these Specifications are deemed necessary by the Contractor, details of the departures and the reasons therefore must be submitted as soon as practicable for acceptance. No departures may be made without the Engineer's authorization. All necessary changes required by the substitution in related machinery, structural, architectural and electrical parts, must be made by the Contractor at no additional cost.

88-1.01D(5) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer is not a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work is not the basis of a claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County reserves the right to make corrections with its own forces and charge the resulting costs to the Contractor.

88-1.01D(6) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed are completely compatible with the existing equipment, and that original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who must have the discretion regarding acceptance of the alternate methods. Where accepted by the Engineer, the alternate methods are for the Contractor's benefit, and the Contractor does not receive additional payment for the changes in work performed. Costs for integration of the proposed work/equipment to existing systems, so that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-1.01D(7) Guarantees and/or Warranties

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon acceptance of the Contract, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such material furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical material and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-1.02 MATERIALS

88-1.02A General

All furnished equipment and materials must be brand new. Equipment, materials and workmanship must be first class in every way and must be manufactured and installed to the Engineer's satisfaction.

Work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, ordered, and easily identified.

88-1.02B Hot Dipped Rigid Galvanized Steel Conduit

All conduits must be standard weight, threaded, rigid steel conduit complying with ANSI Standard C80.1 and UL Standard UL6. All conduits must be hot-dip galvanized inside and out. All conduit couplings and fittings must be made of malleable iron or steel and hot-dip galvanized.

All conduits and fittings used in any single continuous conduit run must be the material of a single manufacturer.

88-1.02C PVC Coated Rigid Galvanized Steel Conduit

All conduits must meet the requirement for Hot Dipped Rigid Galvanized Steel Conduit in addition to the following:

All conduits must have factory-applied, polyvinyl-chloride (PVC) exterior coating with a nominal 40 mil

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thickness. The galvanized surfaces of the conduit and fittings must be coated with an epoxy-acrylic primer before plastic coating. A urethane coating must be applied to the interior with a nominal 2-mil thickness. The urethane interior coating must have enough flexibility to permit field bending without cracking or flaking of the interior coating. Conduit clamps, U-bolts, couplings, fittings, and elbows used with PVC coated conduits must have the same coating as the conduit.

Conduit bodies, pulling elbows and couplings must have flexible PVC sleeves which extend to overlap the PVC coating on the conduit. Sleeves must be 40-mil, nominal thickness.

The plastic coating must have an 85+ Shore A Durometer rating and comply with ASTM D746, and Federal Specifications LP406b, Method 2051, Amendment 1 of 25 September 1952. A two-part urethane, chemically cured coat must be applied to the interior of all conduit and fittings. This internal coating must be at the nominal 2-mil thickness and be flexible enough to permit field bending without cracking or flaking. The PVC coated, hot-dip galvanized steel conduit must be UL labeled and listed.

All hollow conduit and fittings, which serve as part of a raceway, must be coated with the same exterior PVC coating and interior urethane coating. The plastic exterior coating and the interior urethane coating must be factory applied by the same manufacturer who produces the hot-dip galvanized conduit.

Unions to connect sections of conduit that cannot be joined to each other or to boxes/enclosures in the regular manner must be Myers type, of malleable iron or steel, hot-dip galvanized, and PVC coated.

88-1.02D PVC Schedule 80 Conduit

All underground conduits must be PVC Schedule 80. Conduit must be rated for 90 degrees C conductors, UL Listed or accepted equal. Material must comply with NEMA Specification TC-2 (Conduit) and TC-3 (Fittings) and UL Standards 651 (Conduit) and 514b (Fittings). The conduits and fitting must carry a UL label (Conduit – on every 10 feet length; Fittings – stamped or molded on each fitting). Conduit and fittings must be identified for type and manufacturer and must be traceable to location of plant and date manufactured. The markings must be legible and permanent. The conduit must be made from polyvinyl chloride compound (recognized by UL) which includes inert modifiers to improve weatherability and heat distortion. Clean rework material, generated by the manufacturer's own conduit production, may be used by the same manufacturer, provided end products meet the requirements of this specification. The conduit and fittings must be homogeneous plastic free from visible cracks, holes or foreign inclusions. The conduit bore must be smooth and free of blisters, nicks or other imperfections which could mar conductors or cables.

88-1.02E Liquid Tight Flexible Metallic Conduit

Conduit must conform to UL Standard UL 360. Conduit must have a hot-dipped galvanized steel core with PVC jacket. All conduit couplings and fittings must be made of malleable iron or steel and hot-dip galvanized.

All conduit and fittings used in any single continuous conduit run must be the product of a single manufacturer. Connections must be made with Myers type hubs.

88-1.02F Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the new conduit/raceway components must be submitted for inclusion as an Appendix to the existing bridge operating and maintenance manuals.

The Contractor must review the existing O&M Manuals as part of this work to identify items that need to be changed, added and/or require supplemental information.

The supplemental manual materials must include the following as a minimum for new and rehabilitated equipment:

1. New, updated and/or revised maintenance instructions for all new and rehabilitated equipment, including warnings and precautions observed during maintenance actions. All preventative maintenance procedures are outlined and a chart listing all maintenance procedures in chronological order must be provided.
2. New, updated, or revised listings of all parts suppliers' local representatives, including suppliers' and representatives' names.
3. New, updated and/or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.
4. New, updated and/or revised description of the proper theoretical approach to installing and testing new equipment.
5. All relevant As-Built Shop Drawings. Drawings must be certified.
6. New, updated and/or revised instructions for annual cursory inspections and bi-annual in-depth inspections.
7. Manufacturer's literature describing each piece of new equipment furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.
8. Material or information which in the opinion of the Engineer is desirable to include in order to assist in maintaining the bridge functional systems and subsystems.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor must apply to the overall bridge system described in the supplemental manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-1.03 CONSTRUCTION

88-1.03A Summary

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work and structural work, as well as navigational and vehicular traffic closures and restrictions.

It is the Contractor's responsibility to manufacture and install suitable functioning conduit and wireway systems. Review and acceptance of shop drawings by the Engineer does not relieve the Contractor of this responsibility.

The Contractor must coordinate the work of the conduit and wireway manufacturers where components interface. The Contractor must review and accept all shop drawings to coordinate the proper assembly of components prior to submission for the Engineer's acceptance.

88-1.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's plant. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not possible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities, so their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-1.03C Installation

All conduits, and fittings must be carefully examined before being installed, and all pieces having defects must be removed from the site and be replaced by the Contractor at no additional cost. All conduit bends must be made with standard size conduit elbows. Conduits and fittings must be assembled per manufacturer instruction. All cuttings and threading must be performed under conduit manufacturer's instructions. All conduits, enclosures, and fittings must be mechanically joined together to form a continuous electrical conductor to provide effective electrical continuity.

The interior surfaces must have a smooth finish and be free of burrs or projections. All conduits must be free from blisters, cracks, or injurious defects and must be reamed at each end after being threaded. Sections must be connected to each other with screw couplings made up so that the ends of both conduits will butt squarely against each other inside of the coupling. Conduits must be installed to be continuous and watertight between boxes/enclosures and equipment.

Conduit bends and offsets must be made by cold bending using approved methods and equipment. The use of a pipe tee or vise for bending conduit is not permitted. Conduit, which is crushed or in any way deformed, must be discarded. All bends must be long sweep, free from kinks, and with easy curvatures to permit the drawing of conductors without injury. Conduit runs must be made with as few couplings as standard lengths permit, and the total angle of all bends between any two boxes/enclosures or cabinets must not exceed 270 degrees, unless otherwise authorized by the Engineer. The radii of curvature of pipe bends must not be less than eight times the inside diameter of said conduit. Long running threads are not permitted. Pull boxes must be used as per NEC Article 314 to facilitate the installation of the wire where authorized by the Engineer.

All conduit joints must be threaded, using standard taper thread. Straight or clamp joints must not be used. All thread cuts after galvanizing must be thoroughly cleaned, degreased and coated with an approved compound to provide cold galvanizing of the threaded area. A clear urethane coating must be applied to all conduit joints and threads after installation.

Where a conduit crosses an expansion joint longitudinally or where movement between adjacent sections of conduit can be expected, conduit expansion fittings must be installed. The fittings must be bronze expansion fittings and must be provided with flexible bonding jumpers to maintain the electrical continuity across the joints. The fittings must permit a total conduit movement of 8.0 inches or as required for expected movement.

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Where a conduit crosses a joint laterally or where an offsetting type movement between adjacent sections of conduit can be expected, expansion and deflection fittings must be installed. The fittings must be bronze expansion fittings and must be provided with flexible bonding jumpers to maintain the electrical continuity across the joints. The fittings must permit a movement of 3/4 inches or as required for movement expected from the normal in any direction.

Conduit ends must be well protected and sealed to prevent entrance of water or any other foreign matter during construction, work suspensions and overnight. Ends of abandoned conduits, spare conduits, and empty conduits and stubs must be capped during and after construction, and care must be taken to ensure that no moisture or other foreign matter is in or enters the conduits.

All conduits must be pitched not less than 1 inch in 10 feet. Where conduits cannot be drained to box or enclosure, a drain "T" with drain fitting must be installed at the low point. Submit details to the Engineer for review. Do not perform installation without accepted details.

Burrs on conduit ends must be removed and terminated. The termination of all conduits must be provided with bronze insulated grounding bushings. The insulated portion must be molded phenolic compound, and each fitting must have a screw type combination lug for bonding. All bushings in any box or enclosure must be bonded together with No. 8 AWG bare copper wire min or as required by largest upstream overcurrent protection device.

All conduits must be carefully cleaned both before and after installation with special attention being provided to conduits being reused. On completion of the conduit and box installation, the Contractor must clear each conduit by snaking with a mandrel of a diameter 90 percent or more of the nominal inside diameter of the conduit and with a wire brush of the same diameter as the conduit, before drawing in the cables. Any conduits that fail or get damaged must be replaced by the Contractor at no additional cost.

Both ends of each conduit run must be provided with a brass tag that has the same number stamped thereon in accordance with the existing as-built drawings, and these tags must be securely fastened to the conduit ends with No. 20 AWG brass wire. New or additional conduits, not part of the existing as-builts must be clearly identified and numbers must not be redundant to the existing conduit numbers. Conduit diagrams for inclusion in the O&M manual must be clearly identified with legend and plans must be submitted for acceptance during the shop drawing process.

All conduits projecting into boxes/enclosures must be provided with water tight, weather proof, and insulated throat conduit hubs.

The final connection of the rigid steel conduit to the electrical equipment subject to vibration must be made with liquid-tight, flexible metal conduit and with suitable liquid-tight connectors. Flexible conduits are used, only where final connection to equipment with rigid conduit is not practicable in the Engineer's opinion, or where equipment is subject to vibration, such as equipment with adjustable mountings or to all machinery.

Liquid-tight unions must be installed where standard threaded couplings cannot be used. All nicks, cuts, exposed surfaces of conduit joints and abrasions to PVC coating on the rigid conduit must be repaired with the factory-supplied repair compound. The compound must form uniform coating and adhere to the original coating.

Conduit supports must be provided on each side of the conduit bends or elbows not more than 5 feet on each side of each outlet panel, pull box or other conduit termination. Conduit supports and hardware must be PVC coated or type 316 stainless steel.

Conduit runs exposed on the steel structure must be securely clamped to the steelwork. The conduit clamps, in general, must consist of U-bolts attached to structural steel supports bolted to the members. The clamps, in general, must consist of manufacturer instructed stainless steel bracket hangers attached to

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structural steel supports bolted to the members. Supports must be arranged so that conduits rest on top of the support and conduit U-bolts rest on top of the conduits. The use of J-bolts to fasten structural supports or to clamp conduits are not permitted.

All U-bolts and bracket hangers must be provided with medium-series lock washers and double hexagonal nuts. The bolts, nuts, and washers must be stainless steel complying with the requirements of the Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes, ASTM Designation A276, Type 316.

88-1.04 PAYMENT

Conduit is measured by the linear foot along the axis of the conduit, of the type and size specified, installed as per the Contract Documents and Specifications.

Conduit measurement includes all conduits, couplings, fittings, adaptors, expansion joints, bends and mounting hardware.

The work listed under this section does not include installation of junction boxes and pull boxes as they will be listed under other sections.

88-1.04A BASIS OF PAYMENT

The unit price for conduit per linear foot of each conduit size must include the cost of all labor, materials, expansion and connection fittings and equipment necessary to satisfactorily complete installation and perform the work. Excavation and backfill for conduit, if required, must be paid for separately under the item for conduit excavation and backfill under earthwork.

Liquid tight flexible metallic conduit is not paid separately. Where it is not paid under other electrical pay items, it is included as incidental to cost of conduit size and type or other pay item to which it is connected.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The progress payments for the work herein must be made in accordance with the following:

1. Upon completion and acceptance of the installation of conduit and wireway in accordance with the Contract Documents, the Contractor is paid 90 percent of the item bid price.
2. Upon completion, acceptance and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor is paid the remaining 10 percent of the item bid price.

Removal of components is not included in the final system and is paid under Item 88-7 "Electrical Equipment Demolition."

Payment is made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 880010	PVC Coated Rigid Galvanized Steel Conduit – 1 inch	Linear Feet

88-2 ELECTRICAL BOXES

88-2.01 GENERAL

88-2.01A General

Section 88-2 consists of furnishing and providing all labor, materials, equipment and incidentals required to complete the installation of the stainless-steel electrical boxes, including junction, pull and terminal boxes complete with internal components, in accordance with the Plans, Specifications and the Engineer's authorization.

Any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor as if specifically mentioned in these Specifications at no additional cost.

88-2.01B Definitions

As used herein, certified test reports are reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

As used herein, factory tests are tests required to be performed on the actual materials or equipment proposed for use. Results of the tests must be submitted in accordance with the provisions of this Specification for laboratory test results.

88-2.01C Submittals

88-2.01C(1) General

If the Contractor has any objection to any requirements by the Plans and/or Specifications, he must state his objection in writing to the Engineer before or submitting shop drawings; otherwise his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted as soon as practicable for approval. Departures must not be made without the Engineer's acceptance. All necessary changes required by the substitution in related machinery, structural, architectural and electrical parts, must be made by the Contractor at no additional cost.

Materials and material specifications must be stated for each component. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification and any other applicable references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete, and a legend provided to decipher the manufacturer model number codes.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted for the Engineer's

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acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings are approved by the Engineer, will be rectified by the Contractor at no additional cost.

88-2.01C(2) Shop Drawings

The Contractor must coordinate the work of the component manufacturers where components interface. The Contractor must review and accept all shop and shop drawings to coordinate the proper assembly of the various machinery components before submission for the Engineer's acceptance.

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for review and acceptance by the Engineer. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which result from ordering materials prior to shop drawing acceptance; and no work must be done until the shop drawings are accepted. After shop drawing acceptance, the Contractor must supply the Engineer with up to three (3) prints of the shop drawings the Engineer's order.

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted for the purposes of documenting and performing the work, or obtaining Engineer's authorization to perform the work.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings complying with the requirements of San Joaquin County and must meet the following:

1. Manufacturer's data and/or shop drawings must be submitted for all electrical items.
2. Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be base sheets for assembly or erection plans and will not be accepted as shop drawings.
3. Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.
4. For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The plans or diagrams must show enough to disassemble and reassemble the assemblies covered. If any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.
5. Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary material on which the manufacturer or supplier states mounting dimensions, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they must show:
 - a. Dimensions of all principal parts comprising the assembly.
 - b. Certified external dimensions affecting clearances and required for installation.
 - c. Capacity and normal operating ratings.
 - d. Location of mounting holes.
 - e. Electrical operating characteristics.

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- f. Locations of conduit/cable entries, dimensioned and sized.
- g. Gross weight.
- h. Certified prints must be signed by an officer of the manufacturing company.

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance in the same manner as specified for the shop drawings.

The weight of each piece of equipment must be stated on the shop plan on which it is detailed or billed.

Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Connection to existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

Where shop drawings are for equipment/materials that replace existing equipment/materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

88-2.01C(3) Certificates

Where equipment or materials are specified to comply with requirements of organization standards, such as NEMA, NFPA, and UL, that use a label or listing indicating compliance, proof of compliance must be submitted and accepted. The label or listing of the specified organization will be acceptable evidence. Instead of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and accepted by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's standard or code.

88-2.01C(4) Operating and Maintenance Manual Supplement

Final Operating and Maintenance Manual Supplement submittal must include a CD-ROM of the complete supplemental manual materials in PDF format. Four (4) copies of the accepted hard copy supplemental manual materials and four (4) copies of the CD-ROM must be delivered to the Engineer.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

The supplemental manual materials must be assembled in a separate volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit all materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches, 20 lb. paper with accurately punched holes. The paper must have acid free quality suitable for archival use. The holes for binding must be 5/16 inches in diameter and be reinforced with plastic or cloth, spaced at the standard for three holes spacing.

Foldout drawings, diagrams, and illustrations must have 5/16 inches minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout

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drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

The supplemental operating and maintenance manual materials must include as-built, revised, and updated; drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility and capacity to be capable of reproduction as required San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the supplemental manual materials including the method of binding and the text must be submitted for approval by the Engineer.

All printed matter, data, drawings, diagrams, etc. must be produced by methods to result in permanence and durability, including paper that is water and grease resistant. No used materials will adversely affect this permanence and durability.

The supplemental manual materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Additionally, replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-2.01D Quality Assurance

88-2.01D(1) Qualifications, Personnel and Facilities

Material used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified material.

Under this item, the Contractor must use enough skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide enough plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-2.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable Federal, State and local rules, regulations, and ordinances.

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In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement applies.

Work must comply with all applicable requirements of the latest edition of codes and standards issued by, but not limited to, the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

The work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it does not mean that any other codes and standards are assumed to be omitted if not mentioned.

88-2.01D(3) Measurements and Verification

Dimensions indicated on the Plans are nominal and are for guidance only. Variations from the dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits before bid. Variance between plan and field conditions is not considered a basis for claim.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It is the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits prior to bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new component can be finished to obtain the prescribed fit.

88-2.01D(4) Substitution

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in the Specification are to allow the Contractor to substitute other manufacturers and model numbers of materials

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of equal quality and rating for those specified.

Before the Contractor orders any substitute material, the Engineer's acceptance of the substitute material must be obtained in writing. The acceptance of the substitute materials at the discretion of the Engineer who will establish the basis for equivalence and will review the quality of the materials and materials described in detail on the submitted shop drawings and material data.

The Engineer will indicate "Approved" or "Revise and Resubmit" substitute material. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified material. Rejection must not in any way result in any additional cost. Acceptance by the Engineer of any substitute materials submitted by the Contractor must not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that material.

88-2.01D(5) Defective Materials and Workmanship

The Engineer's acceptance of any material or finished parts is not a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work is not the basis of a claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County may make necessary correction with its own forces and charge the resulting costs to the Contractor.

88-2.01D(6) Compatibility with Existing Equipment

Under this item, new/rehabilitated items are connected to existing components. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed are completely compatible with the existing equipment, and that all original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who has the discretion of accepting the alternate methods. Where approved by the Engineer, the alternate methods are for the Contractor's benefit, and the Contractor will not receive additional payment for the changes in work performed. Any costs associated with ensuring integration of the proposed work/equipment to existing systems, such that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-2.01D(7) Guarantees and/or Warranties

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon acceptance of the Contract, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such material furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical material and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-2.02 MATERIALS

88-2.02A General

All equipment and materials furnished under the items specified herein must be brand new. All new equipment, materials and workmanship must be first class in every way and must be manufactured and installed to the Engineer's satisfaction.

Boxes must be designed, laid out, fabricated to match existing holes on a case by case basis. The Contractor is alerted that this may require multiple designs for a single box site.

It is the Contractor's responsibility to manufacture and install suitable functioning electric box assemblies. The Engineer's review and acceptance of shop drawings does not relieve the Contractor of this responsibility.

88-2.02B Electrical Boxes

88-2.02B(1) Surface Mounted Boxes

All surface mounted pull, junction, and terminal boxes must be minimum 14 gauge stainless steel, and must be provided with full length hinged gasketed, covers held with stainless steel fast operating clamps to provide NEMA 4 Rated watertight construction. No hardware is removable to prevent loss. They must be Engineer accepted equal to Hoffman Bulletin A51S or equivalent by Weigmann or Hammond.

Interior and exterior boxes must be provided with external mounting lugs and must be fastened in position with stainless steel through bolts. Stainless steel boxes must be provided with stainless steel conduit hubs. No box is drilled for more conduits or cables than enter it. Exterior boxes are provided with drain fittings of the same type as specified for conduit drains. Boxes with extra holes must be removed and replaced at no additional cost.

Electrical boxes containing terminals or equipment must have enough space to provide ample room for the interior wiring and terminal strips for the installation of conduit terminations and multi conductor cable fittings. Terminal boxes must be provided with a backpanel as required to mount terminals or equipment.

Interior mounting buttons with tapped holes must be provided for mounting the pull blocks where necessary.

88-2.02B(2) Flush Mounted Boxes

All flush mounted (sidewalk or roadway) pull, junction, and terminal boxes must be cast-iron, hot-dip galvanized inside and out, and must be provided with gasketed flat covers to provide NEMA-4X watertight construction, and AASHTO H-20 live load rated for full deliberate traffic. The boxes must be O.Z. Gedney Type YF, Spring City Type HP, Appleton Type WHF, except with stainless steel cover screws, or equal for Engineer's acceptance.

88-2.02C Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the new electrical box and internal components must be submitted for inclusion as an Appendix to the existing bridge operating and maintenance manuals.

The contractor must review the existing O&M Manuals as part of this work to identify items that need to be

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changed, added and/or require supplemental information.

The supplemental manual materials must include the following as a minimum for new and rehabilitated equipment:

1. New, updated and/or revised maintenance instructions for all new and rehabilitated equipment, including warnings and precautions to be observed during maintenance actions. All preventative maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order must be provided.
2. New, updated, or revised listings of all parts suppliers' local representatives, including suppliers' and representatives' names.
3. New, updated and/or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.
4. New, updated and/or revised description of the proper theoretical approach to installing and testing new equipment.
5. All relevant As-Built Shop Drawings. Drawings must be certified.
6. New, updated and/or revised instructions for annual cursory inspections and bi-annual in-depth inspections.
7. Manufacturer's literature describing each piece of new equipment furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.
8. Any other material or information which in the opinion of the Engineer may be desirable to include in order to assist in maintaining the bridge functional systems and subsystems.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor applies to the overall bridge system described in the supplemental manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-2.03 CONSTRUCTION

88-2.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work and structural work, as well as navigational and vehicular traffic closures and restrictions.

All work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, ordered, and easily identified. Not all boxes are shown on the Contract documents and the Contractor must provide additional boxes as required to meet his means and methods of installation, including but not limited to junction/pull boxes as required for conduit runs.

88-2.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's plant. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not feasible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

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Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities such that their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-2.03C Installation

Install boxes as required to facilitate conduit and cable installation. Do not reduce headroom or interfere with space required for passageways or other trades. Install internal components such as grounding, back panels, terminals, etc. as required and shown on the Contract Plans.

All boxes must be sized per requirements of the National Electrical Code (NEC) for wire pulling based upon the size of conduits entering/exiting the box. All supports, attachments and fastening hardware must be stainless steel. Contractor must drill box to receive conduits and must attach box to structure with approved supports as detailed on the Contract Plans and as specified in Section 88-5 "Bridge Electrical System".

Existing mounting/support holes must be re-used where possible if the size of the new electrical box matches the size of the replaced box.

88-2.04 PAYMENT

The electrical box is measured as number of complete stainless-steel or cast iron electrical box assemblies installed in accordance with the Contract Documents and Specifications.

Measurement must include all hardware and supports required for a complete installation.

88-2.04A BASIS OF PAYMENT

The unit price for this item includes the cost of labor, equipment, materials, mounting, terminal blocks, internal components, hardware, connections and other incidentals as necessary to satisfactorily complete installation and perform the work described herein and shown on the Plans.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The progress payments for the work herein must comply with the San Joaquin County standard payment practices and must be made as follows:

1. Upon completion and acceptance of the installation of electrical boxes in accordance with the Contract Documents, the Contractor will be paid 90 percent of the item bid price.
2. Upon completion, acceptance and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the item bid price.

Removal of all components not included in the final system is be paid under Section 88-7 "Electrical Equipment Demolition."

Payment for boxes that do not match the nominal dimensions included herein will be paid under the item

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with the closest equivalent cubic volume.

Boxes not shown on Contract Plans but required to comply with installation, NEC, or Contract requirements must have Engineer's acceptance before ordering, or they will not be paid.

Payment is made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 880030	Stainless Steel NEMA 4 Rated Electrical Box - 6 by 6 by 4 inches	Each

88-3 INSULATED CONDUCTORS

88-3.01 GENERAL

88-3.01A General

The work consists of furnishing and installing new insulated conductors. The Contractor must provide all labor, materials, plant, equipment and incidentals required to furnish and install a functioning wire and cable system complying with the Plans, Specifications and the Engineer's order.

Any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor just as if specifically mentioned in these Specifications at no additional cost.

Any cables and wiring not specifically called out herein and are required to perform the work under this Contract must be paid under Item 88-5 "Bridge Electrical System".

88-3.01B Definitions

Certified test reports refer to reports of tests conducted on previously manufactured materials identical to that proposed for use.

Factory tests refer to tests required to be performed on the actual materials proposed for use. Results of the tests must be submitted in accordance with the provisions of this Specification for laboratory test results.

88-3.01C Submittals

88-3.01C(1) General

If any departures from the Contract Documents are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted to the Engineer in writing as soon as possible for his approval. No departures from the Plans must be made without the Engineer's approval.

If the Contractor has any objections to the requirements on the Plans and/or Specifications, he must state his objection in writing to the Engineer before or when submitting shop; otherwise his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.

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The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted for Engineer's acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings the Engineer's acceptance, will be rectified by the Contractor at no additional cost.

The Contractor must coordinate the work of the conductor, cable, conduit and wireway manufacturers where components interface. The Contractor must review and approve all shop drawings to coordinate the proper assembly of all components prior to submission to the Engineer for approval.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification and any other applicable references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete, and a legend provided to decipher the manufacturer model number codes.

Materials and material specifications must be stated for each component. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for review and Engineer's acceptance. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

88-3.01C(2) Shop Drawings

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which result from ordering materials prior to the shop drawing acceptance, and no work must be done until the shop drawings are accepted. After shop drawing acceptance, the Contractor must supply the Engineer with up to three (3) prints of the accepted shop drawings per the Engineer's order.

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted for the purposes of documenting and performing the work, or obtaining approval from the Engineer to perform the work.

Shop drawings must conform to the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County and must in addition meet the following:

1. Manufacturer's data and/or shop drawings must be submitted for all conductors.
2. Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans

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must not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.

3. Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.

4. For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The plans or diagrams must show enough to enable complete disassembly and reassembly of the assemblies covered. If any part is modified in any way from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.

5. Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary materials on which the manufacturer or supplier states mounting dimensions, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they must show:

- a. Dimensions of all principal parts comprising the assembly.
- b. Certified external dimensions affecting clearances and required for installation.
- c. Capacity ratings.
- d. Location of mounting holes.
- e. Electrical operating characteristics.
- f. Location of conduit/cable entries, dimensioned and sized.
- g. Gross weight.
- h. Certified prints must be signed by an officer of the manufacturing company.

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for approval in the same manner as specified for the shop drawings.

The weight of each piece of equipment must be stated on the shop plans upon which it is detailed or billed.

Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

Where shop drawings are for materials that replace existing materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

88-3.01C(3) Certificates

Where materials are specified to conform to requirements of the standards of an organization or are required to conform to standard listings by applicable codes, such as NEMA, NFPA, and UL, that use a label or listing as method of indicating compliance, proof of such conformance must be submitted and approved. The label or listing of the specified organization will be acceptable evidence. In lieu of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and approved by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

88-3.01C(4) Operating and Maintenance Manual Supplement

The supplemental manual materials must be assembled in a separate volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit all materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches 20 lb. paper with accurately punched holes. The paper must be acid free quality suitable for archival use. The holes for binding must be 5/16 inch in diameter and be reinforced with plastic or cloth, spaced at the standard for three holes spacing.

Foldout drawings, diagrams, and illustrations must have 5/16 inch minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

Final submittal must include a CD-ROM of the complete supplemental manual materials in PDF format. Four (4) copies of the accepted hard copy supplemental manual materials and four (4) copies of the CD-ROM must be delivered to the Engineer.

The supplemental operating and maintenance manual materials must include but not limited to as-built, revised, and updated; drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility and capacity to be capable of reproduction as required San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the supplemental manual materials including the method of binding and the text must be submitted for Engineer's acceptance.

All printed matter, data, drawings, diagrams, etc. must be produced by methods to result in permanence and durability, including paper that is water and grease resistant. No materials must be used which will adversely affect this permanence and durability.

The supplemental manual materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Additionally, replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Also, include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-3.01D Quality Assurance

88-3.01D(1) Qualifications, Personnel and Facilities

Material used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified material.

For all the work required under this Item, the Contractor must use enough skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide adequate plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-3.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable Federal, State and local rules, regulations, and ordinances.

Work must comply with all applicable requirements of the latest edition of codes and standards issued by the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
B 3 - Soft or Annealed Copper Wire	
B 8 - Stranded Copper Wire, Specter Conductors, Hard, Medium Hard, or Soft	
B 33 - Tinned Soft or Annealed Copper Wire for Electrical Purposes	
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA

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NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it does not mean that any other codes and standards must be assumed to be omitted if not mentioned.

All work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, ordered, and easily identified.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement applies.

88-3.01D(3) Measurements and Verification

Dimensions indicated on the Plans are nominal and are for guidance only. Variations from the dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits before bid. Any variance between plan and field conditions is not considered a basis for claim.

The Contract Documents, insofar as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It must be the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new component can be finished to obtain the prescribed fit.

88-3.01D(4) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in these Specifications are to allow the Contractor to substitute other manufacturers and model numbers of

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materials of equal quality and rating for those specified.

Before the Contractor orders of any substitute material, the Engineer's acceptance of the substitute material must be obtained in writing. The acceptance of the substitute materials is at the sole discretion of the Engineer who will establish the basis for equivalence and will review the quality of the materials and materials described in detail on the submitted shop drawings and material data.

The Engineer will indicate "Approved" or "Revise and Resubmit" substitute material. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified material. Rejection must not in any way result in any additional cost. Approval by the Engineer of any substitute materials submitted by the Contractor must not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that material.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted as soon as practicable for approval. Departures must not be made without acceptance by the Engineer. All necessary changes required by the substitution in related machinery, structural, architectural and electrical parts, must be made by the Contractor at no additional cost.

88-3.01D(5) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County may make necessary correction with its own forces and charge the resulting costs to the Contractor.

88-3.01D(6) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components to remain. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed will be completely compatible with the existing equipment to remain, and that all original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components to remain. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who must have the discretion regarding acceptance of the alternate methods. Where accepted by the Engineer, the alternate methods are for the Contractor's benefit, and the Contractor must not receive additional payment for the changes in work performed. Any costs associated with ensuring integration of

the proposed work/equipment to existing systems, such that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-3.01D(7) Guarantees and/or Warranties

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon acceptance of the Contract, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such material furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical material and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-3.02 MATERIALS

88-3.02A General

All equipment and materials furnished under the items specified herein must be brand-new. All new materials and workmanship must be first class in every way and must be manufactured and installed to the Engineer's satisfaction.

88-3.02B Conductors

The conductors must be annealed uncoated or tinned copper stranded in accordance with ASTM B 8, class B stranded, type XHHW-2 and cross-linked polyethylene, XLPE insulated. The thickness of the conductor insulation must comply with NEMA WC-70. The insulated conductors must be rated 90 degrees Celsius, 600 volts.

88-3.02C Twisted Shielded Cable

Quantity of twisted pairs and size of conductors must be as indicated on the Contract Drawings; tinned-copper conductors; color-coded, polyvinyl chloride (PVC) insulation; overall aluminum/polyester shield and 22 AWG tinned-copper drain wire; PVC jacket.

88-3.02D Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the conductor components must be submitted for inclusion as an Appendix to the existing bridge operating and maintenance manuals.

The contractor must review the existing O&M Manuals as part of this work to identify items that need to be changed, added and/or require supplemental information.

The supplemental manual materials must include the following as a minimum for new and rehabilitated equipment:

1. New, updated and/or revised maintenance instructions for all new and rehabilitated material, including warnings and precautions to be observed during maintenance actions. All preventative maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order must be provided.
2. New, updated, or revised listings of all parts suppliers' local representatives, including suppliers' and

representatives' names.

3. New, updated and/or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.
4. New, updated and/or revised description of the proper theoretical approach to installing and testing new material.
5. All relevant As-Built Shop Drawings. Drawings must be certified.
6. New, updated and/or revised instructions for annual cursory inspections and bi-annual in-depth inspections.
7. Manufacturer's literature describing each piece of new material furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.
8. Any other material or information which in the Engineer's opinion may be desirable to include in order to assist in maintaining the bridge functional systems and subsystems.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor must apply to the overall bridge system described in the supplemental manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-3.03 CONSTRUCTION

88-3.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work and structural work, as well as navigational and vehicular traffic closures and restrictions.

It is the Contractor's responsibility to furnish and install suitable conductors and cables. Review and approval of shop drawings by the Engineer does not relieve the Contractor of this responsibility.

88-3.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not feasible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities such that their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-3.03C Installation

The Contractor must furnish, install and test the conductors in conformance to AASHTO and NETA ATS standards.

Conductors must be color-coded for phase identification, under NEC Section 210-5 and the California Electrical Code. The white neutral conductor must be 100 percent rated. Conductors which have the insulation removed for termination or for splicing must be marked with appropriately colored insulating tape for phase identification. In addition, the name of the manufacturer, insulation type, voltage rating and wire size must be clearly and permanently imprinted throughout the length of each conductor.

Contractor must use existing wiring numbers from the existing as-built drawings as closely as possible. New or additional conductors/wires, not part of the existing as-built drawings must be clearly identified, and numbers must not be redundant to the existing wire numbers. Wiring/schematic diagrams for inclusion in the O&M manual must be clearly identified with legend and plans must be submitted for acceptance during the shop drawing process.

Both ends of every single length of conductor must be permanently and clearly tagged under the same numbers or designations appearing on the accepted wiring diagrams. Wire tags for marking the conductors must be heavy duty, waterproof, permanently marked, and resistant to ultraviolet light deterioration. Numbers and letters must be black on a white background. Each tag must be either pre-marked or blank and marked using self-laminating markers with legends added with permanent ink as required. The Contractor must submit the proposed wire marking system and a sample of the wire markers to be installed for the Engineer's acceptance. Each conductor, except control and instrument conductors, must be color coded with colored insulation.

88-3.04 PAYMENT

This work under this item will be measured as number of linear feet of the conductor, of the type and size specified, installed, tested and accepted under the Contract Documents and Specifications.

The work listed under this Pay Item does not include installation of junction boxes, pull boxes, conduit and wireway as they are listed under other Pay Items.

All other cables not listed under this Pay Item and not paid elsewhere but required for the work under this Contract will be paid under Section 88-5 "Bridge Electrical System".

88-3.04A BASIS OF PAYMENT

The unit price for conductor per linear foot of each conductor size must include the cost of all labor, materials, equipment, connecting, splicing and support of conductors and all other incidentals necessary to satisfactorily complete installation and perform the work described herein and as shown on the Plans.

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The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon completion and acceptance of the installation of conductors and cables in accordance with the Contract Documents, the Contractor will be paid 90 percent of the bid price for this item.
2. Upon completion, acceptance and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced material for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the bid price for this item.

Removal of all components not included in the final system will be paid under Section 88-7 "Electrical Equipment Demolition."

Payment is made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 880040	Insulated Conductor No. 12 AWG	Linear Feet
Item 880050	Twisted Shielded Cable	Linear Feet

88-4 GROUND WIRE AWG

88-4.01 GENERAL

88-4.01A General

The work under this item consists of furnishing and installing new grounding conductors. The Contractor must provide all labor, materials, plant, equipment and incidentals required to furnish and install a functioning ground wire and grounding system under the Plans, Specifications and the Engineer's order.

Incidental apparatus, appliance, material, or labor not mentioned that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor no additional cost.

88-4.01B Definitions

As used herein, certified test reports refer to reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

As used herein, factory tests refer to tests required to be performed on the actual materials or equipment proposed for use. Results of the tests must be submitted under the provisions of this Specification for laboratory test results.

88-4.01C Submittals

The Contractor must coordinate the work of the conductor, cable, conduit and wireway manufacturers where components interface. The Contractor must review and accept all shop drawings to coordinate the proper assembly of all components before submission for the Engineer's acceptance.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification, any other applicable references and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete and a legend provided to decipher the manufacturer model number codes.

Materials and material specifications must be stated for each component. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

If the Contractor has any objections to the requirements on the Plans and/or Specifications, he must state his objection in writing before or when submitting shop drawings for the Engineer's acceptance; otherwise his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted for the Engineer's acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings are accepted by the Engineer, will be rectified by the Contractor at no additional cost.

88-4.01C(1) Shop Drawings

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for review and Engineer's acceptance. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from ordering materials prior to the acceptance of the shop drawings; and no work must be done until acceptance of the shop drawings. After acceptance of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings per the Engineer's order.

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted for the purposes of documenting and performing the work, or obtaining the Engineer's authorization to perform the work.

Where shop drawings are for materials that replace existing materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County and must in addition comply with the following:

1. Manufacturer's data and/or shop drawings must be submitted for all ground conductors.
2. Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.

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3. Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.
4. For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The plans or diagrams must show enough to enable complete disassembly and reassembly of the assemblies covered. If any part is modified in any way from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.
5. Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary materials on which the manufacturer or supplier states mounting dimensions, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they must show:
 - a. Dimensions of all principal parts comprising the assembly.
 - b. Certified external dimensions affecting clearances and required for installation.
 - c. Capacity ratings.
 - d. Location of mounting holes.
 - e. Electrical operating characteristics.
 - f. Location of conduit/cable entries, dimensioned and sized.
 - g. Gross weight.
 - h. Certified prints must be signed by an officer of the manufacturing company.

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance in the same manner as specified for the shop drawings.

The weight of each piece of equipment must be stated on the shop plans on which it is detailed or billed.

Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

88-4.01C(2) Certificates

Where materials are specified to comply with requirements of the standards of an organization or are required to conform to standard listings by applicable codes, such as NEMA, NFPA, and UL, that use a label or listing as method of indicating compliance, proof of such conformance must be submitted and accepted. The label or listing of the specified organization will be acceptable evidence. Instead of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and approved by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's standard or code.

88-4.01C(3) Operating and Maintenance Manual Supplement

The supplemental manual materials must be assembled in a separate volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit all materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches 20 lb. paper with accurately punched holes. The paper must be acid free quality suitable for archival use. The holes for binding must be 5/16 inch in diameter and be reinforced with plastic or cloth, spaced at the standard for three holes spacing.

Foldout drawings, diagrams, and illustrations must have 5/16 inch minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout

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drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

Final submittal must include a CD-ROM of the complete supplemental manual materials in PDF format. Four (4) copies of the accepted hard copy supplemental manual materials and four (4) copies of the CD-ROM must be delivered to the Engineer.

The supplemental operating and maintenance manual materials must include as-built, revised, and updated; drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility and capacity to be capable of reproduction as required San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the supplemental manual materials including the method of binding and the text must be submitted for Engineer's acceptance.

All printed matter, data, drawings, diagrams, etc. must be produced by methods to result in permanence and durability, including paper that is water and grease resistant. No materials must be used which will adversely affect this permanence and durability.

The supplemental manual materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Additionally, replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Also, include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-4.01D Quality Assurance

88-4.01D(1) Qualifications, Personnel and Facilities

Materials used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified materials.

For all the work required by the Ground Wire Pay Item, the Contractor must use adequate numbers of skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide adequate plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-4.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable requirements of the latest edition of codes and standards issued by, but not limited to, the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it is not meant that any other codes and standards must be assumed to be omitted if not mentioned.

Work must comply with all applicable Federal, State and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

88-4.01D(3) Measurements and Verification

Dimensions indicated on the Plans are nominal and are intended for guidance only. All variations from the nominal dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits prior to bid. Any variance between plan and actual field conditions must not be considered as a basis for claim.

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new component can be finished to obtain the prescribed fit.

88-4.01D(4) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in these Specifications allow the Contractor to substitute other manufacturers and model numbers of materials of equal quality and rating for those specified.

Before the Contractor orders any substitute material, the Engineer's acceptance of the equivalence of the substitute material must be obtained in writing. The acceptance of the substitute materials is at the sole discretion of the Engineer who will establish the basis for equivalence and will review the quality of the materials and materials described in detail on the submitted shop drawings and material data.

The Engineer will indicate "Approved" or "Revise and Resubmit" substitute material. Upon return of a shop drawing showing rejection, the Contractor must resubmit the shop drawing showing the specified material. Rejection must not in any way result in any additional cost. Approval by the Engineer of any substitute materials submitted by the Contractor must not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that material.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted as soon as practicable for approval. Departures must not be made without the Engineer's acceptance. All necessary changes required by the substitution in related machinery, structural, architectural and electrical parts, must be made by the Contractor at no additional cost.

88-4.01D(5) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County reserves the right to make necessary correction with its own forces and charge the resulting costs to the Contractor.

88-4.01D(6) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components to remain. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed will be completely compatible with the existing equipment to remain, and that all original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components to remain. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who must have the sole discretion regarding approval of the alternate methods. Where accepted by the Engineer, the alternate methods are for the Contractor's benefit, and the Contractor does not receive additional payment for the changes in work performed. Any costs associated with ensuring integration of the proposed work/equipment to existing systems, such that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-4.01D(7) Guarantees and/or Warranties

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon acceptance of the Contract, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such materials furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical materials, and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-4.02 MATERIALS

88-4.02A General

All equipment and materials furnished under the items specified herein must be brand new. All new equipment, materials and workmanship must be first class in every way and must be manufactured and installed to the satisfaction of the Engineer.

It is the Contractor's responsibility to furnish and install suitable conductors and cables. Review and acceptance of shop drawings by the Engineer does not relieve the Contractor of this responsibility.

88-4.02B Ground Wire

All conductors must be insulated unless the Engineer accepted otherwise. The Engineer's discretion must be binding. The conductor and any other materials required, must be of the size indicated in the Plans and must consist of 7 strands for cable size less than 2/0 and 19 strands for size 2/0 or greater of soft-drawn copper wire complying with ASTM B-3 and ASTM B-8. The ground wire must be Underwriters Laboratories approved.

88-4.02C Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the ground wire components must be submitted for inclusion as an Appendix to the existing bridge operating and maintenance manuals.

The contractor must review the existing O&M Manuals as part of this work to identify items that need to be changed, added and/or require supplemental information.

The supplemental manual materials must include the following as a minimum for new and rehabilitated equipment:

1. New, updated and/or revised maintenance instructions for all new and rehabilitated equipment, including warnings and precautions to be observed during maintenance actions. All preventative maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order must be provided.
2. New, updated, or revised listings of all parts suppliers' local representatives, including suppliers' and representatives' names.
3. New, updated and/or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.
4. New, updated and/or revised description of the proper theoretical approach to installing and testing new equipment.
5. All relevant As-Built Shop Drawings. Drawings must be certified.
6. New, updated and/or revised instructions for annual cursory inspections and bi-annual in-depth inspections.
7. Manufacturer's literature describing each piece of new equipment furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be

provided to facilitate the ordering of replacement parts from the original manufacturer.

8. Any and all other material or information which in the opinion of the Engineer may be desirable to include in order to assist in maintaining the bridge functional systems and subsystems.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor must apply to the overall bridge system described in the supplemental manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-4.03 CONSTRUCTION

88-4.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work and structural work, as well as navigational and vehicular traffic closures and restrictions.

All work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, ordered, and easily identified.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It must be the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

88-4.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not feasible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities such that their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-4.02C Installation

The Contractor must furnish, install and test the conductors under AASHTO and NETA ATS standards.

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The ground conductors must be of the size specified, where shown on the Contract Plans. Where ground conductors are not provided in the existing system but are required to comply with NEC and/or AASHTO and to provide a complete bonded ground system, the Contractor must submit additional sizes and/or quantities for the Engineer's acceptance.

88-4.04 PAYMENT

The work under this item will be measured as the number of linear feet of ground wire, of the type and size specified, installed, tested and accepted in accordance with the Contract Documents and Specifications.

The work listed under this Pay Item does not include installation of junction boxes, pull boxes, conduit and wireway as they will be listed under other Pay Items.

88-4.04A Basis of Payment

The unit price for conductor per linear foot of each conductor size must include the cost of all labor, materials, equipment, connecting, splicing and support of conductors and all other incidentals necessary to satisfactorily complete installation and perform the work described herein and as shown on the Plans.

The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon completion and acceptance of the installation of conductors and cables in accordance with the Contract Documents, the Contractor will be paid 90 percent of the bid price for this item.
2. Upon completion, acceptance and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10percent of the bid price for this item.

Removal of all components not included in the final system will be paid under Section 88-7 "Electrical Equipment Demolition."

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 880060	Ground Wire No. 12 AWG	Linear Feet

88-5 BRIDGE ELECTRICAL EQUIPMENT

88-5.01 GENERAL

88-5.01A General

Section 88-5 includes furnishing and providing all labor materials, equipment and incidentals required to complete the installation of all the items listed herein and in accordance with the Plans, Specifications and the Engineer's order. The new components and work include:

1. Bridge Control Equipment
2. Power Distribution Equipment
3. Instrumentation
4. Control Apparatus

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5. Nameplates
6. Bridge Control System
7. Instrumentation Flexible Cables
8. Hardware Supports
9. Miscellaneous Work

Any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor as if specifically mentioned in these Specifications and without extra cost.

The alignment and fastening of electrical equipment incorporated into the bridge machinery, such as motors, brakes, rotary limit switches, and position encoders, must be done under the machinery item(s).

Where new or replaced components require additional modifications to the existing structure, machinery or electrical devices than what is specified or due to existing field conditions, the Contractor must make the modifications at no additional cost.

88-5.01B Definitions

Certified test reports refer to reports of tests conducted on previously manufactured materials identical to that proposed for use.

Factory tests refer to tests required to be performed on the actual materials proposed for use. Results of the tests must be submitted in accordance with the provisions of this Specification for laboratory test results.

88-5.01C Submittals

88-5.01C(1) General

The Contractor must coordinate the work of the electrical component manufacturers where components interface, both with other electrical components and with components of other trades. The Contractor must review and accept all shop drawings to coordinate the proper assembly of the various machinery components prior to submission to the Engineer for approval.

Name and written qualifications of the proposed Control System Vendor must be submitted to the Engineer and must be subject to acceptance by the bridge owner's Engineering Department.

If any departures from the Plans or the Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefor must be submitted for acceptance as soon as possible. Departures must not be made nor work started without Engineer's acceptance.

If the Contractor has any objection to any feature of the electrical system as designed or required by the Plans and/or Specifications, he must state his objection in writing to the Engineer before or when submitting shop drawings; otherwise his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted for the Engineer's acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings are Engineer accepted, will be rectified by the Contractor at no additional cost.

The Contractor must submit for inspection and test, if the Engineer orders, samples of any apparatus or device, which the Contractor proposes to use as a part of the electrical installation.

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Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification and any other applicable references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete and a legend provided to decipher the manufacturer model number codes.

88-5.01C(2) Shop Drawings

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for Engineer's review and acceptance. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

The Contractor must submit PDF files of all shop drawings for Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from ordering materials before the acceptance of the shop drawings; and no work must be done until the shop drawings have been accepted. After acceptance of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings as Engineer ordered.

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted for the purposes of documenting and performing the work, or obtaining the Engineer's acceptance to perform the work.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County and must in addition comply with the following:

1. Manufacturer's data and/or shop drawings must be submitted for all electrical items.
2. Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.
3. Materials and material specifications must be stated for each component. Where ASTM or any other Standard Specifications are used, the applicable numbers of such specifications must be given.
4. Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.
5. For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The plans or diagrams must be enough to enable complete disassembly and reassembly of the assemblies covered. If any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.
6. Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary materials on which the manufacturer or supplier states mounting dimensions, ratios, speeds, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they must show:
 - a. Dimensions of all principal parts comprising the assembly.
 - b. Certified external dimensions affecting clearances and required for installation.
 - c. Capacity and normal operating ratings.

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- d. Location of mounting holes.
 - e. Electrical operating characteristics.
 - f. Locations of conduit/cable entries, dimensioned and sized.
 - g. Gross weight.
 - h. Certified prints must be signed by an officer of the manufacturing company.
7. Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for approval in the same manner as specified for the shop drawings.
8. The weight of each piece of equipment must be stated on the shop plan upon which it is detailed or billed.
9. An installation plan must be provided. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.
10. Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.
11. Where shop drawings are for materials that replace existing materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.
12. The following specific items must be included in the shop drawing submittals for this pay item as applicable:
- a. Certified dimension prints of all motors, span brake motors, limit switches, control panels, instrumentation flexible cables, motor starters, drives, disconnect switches junction and pull boxes, motor control centers and other miscellaneous equipment in either machinery rooms, catwalks, fenders, counterweight pits, movable spans or power distribution room/s.
 - b. Revised schematic wiring diagram, including power, control, and lighting connections modified from existing. Both electrical devices and each wire between devices must be identified by an individual designation of letters, numbers, or a combination of both, and such designations must be used wherever the devices or wires appear on other drawings. Existing designations must be used and new additions must be clearly defined. A complete set of catalog cuts for materials furnished must be included for review at the time of schematic submittal.
 - c. Layout drawings and internal connection diagrams of the control and distribution panelboards, and terminal cabinets.
 - d. A schedule of electrical apparatus which must list each electrical device by its designation as shown on the schematic wiring diagram and must state for each device its rating, number of poles or contacts, function, catalog number, and location.
 - e. A complete interconnection diagram(s) for all electrical apparatus and equipment used in the operation of the movable span and its auxiliaries. The diagram(s) must be of the point-to-point type and must show the external connections of all devices and equipment. Computer-generated interconnection lists will not be acceptable instead of a true interconnection diagram.
 - f. Outline drawing, details, and connection diagram for distribution switches, its components, and assembly on bridges, if required to be replaced under this Contract.
 - g. A complete schematic conduit and cable diagram or diagrams showing the interconnection of all replaced devices and equipment, including ducts and junction boxes, and showing all multi conductor cables. The size of each replaced with new conduit, the wire number of each replaced with new conductor in multi conductor cables, must be shown on the diagrams. Each conduit and multi conductor cable must be suitably numbered or lettered and percent wire fill must be shown. The numbering system must be compatible with the original numbering system.
 - h. A complete set of layout and installation drawings for the electrical work under this Contract showing the location and installation, including support and mounting details, of all electrical apparatus and equipment. These drawings must be made to scale and must show the exact location of all conduits, cables, wiring ducts, boxes, motors, brakes, limit switches, disconnect switches, and other electrical equipment and the method of supporting them on the structure. All original layout and installation drawings must be shown as a background.

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- i. Outline drawings and mounting details of all navigation lights.
- j. Catalog cuts of lighting fixtures, switches, outlets, and electric heating equipment.
- k. Arrangement of service light wiring and fixtures, including service outlets, showing all conduits, boxes (including their support), and wiring.
- l. Material listing and specifications for controller, if replaced with new, and equipment for interfacing.
- m. Riser diagrams, wiring diagrams, details and catalog cuts of the replaced with new electrical equipment, including outdoor enclosure and mounting brackets, monitor controls, and cabling.
- n. Any other drawings, which the Engineer orders, necessary to show the electrical work required under this Contract.
- o. All layout and installation drawings for the electrical work must be submitted for acceptance so provision is made for mounting of conduits, cables, and other electrical equipment. In most cases the existing holes either drilled in the existing concrete wall or steel structure will be used, unless the existing supports spacing violates current NEC criteria for conduit and cable supports.
- p. Certified dimension prints of the apparatus must state in the certification the name of the job, bridge name, application of the apparatus, device designation, number required, right-hand or left-hand assembly, electrical rating, number of poles or contacts, material, finish, and any other pertinent data to show that the apparatus meets the specified requirements.

88-5.01C(3) Certificates

Where equipment or materials are specified to conform to requirements of the standards of an organization, such as NEMA, NFPA, and UL, that use a label or listing as method of indicating compliance, proof of such conformance must be submitted and accepted. The label or listing of the specified organization will be acceptable evidence. Instead of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and Engineer accepted, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

88-5.01C(4) Operating and Maintenance Manual Supplement

The manual supplemental materials must be assembled in a volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit all materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches 20 lb. paper with accurately punched holes. The paper must be acid free quality suitable for archival use. The holes for binding must be 5/16 inches in diameter and be reinforced with plastic or cloth, spaced at the standard for three hole spacing.

Foldout drawings, diagrams, and illustrations must have 5/16 inches minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

Final submittal must include a CD-ROM of the complete manual supplement materials in PDF format. Four copies of the approved hard copy supplemental manual materials and four copies of the CD-ROM must be delivered to the Engineer.

The supplemental operating and maintenance manual materials must include as-built, revised, and updated drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of

the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility and capacity to be reproduced as required by San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reproduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the manual supplemental materials including the method of binding and the text must be submitted for acceptance by the Engineer.

All printed matter, data, drawings, diagrams, etc. must be produced by methods resulting in permanence and durability, including paper that is water and grease resistant. No materials must be used which will adversely affect this permanence and durability.

The manual supplemental materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Additionally, replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Also, include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-5.01D Quality Assurance

88-5.01D(1) Qualifications, Personnel and Facilities

88-5.01D(1.1) General

Materials used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified materials.

The Contractor must provide enough plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

For all the work required by this Section, the Contractor must use enough skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

88-5.01D(1.2) Control System Vendor

The Contractor must retain the services of a qualified control system vendor who must have complete system responsibility for the detailed integration of all system components, to ensure a complete operating system is provided at the completion of the Contract. The control system vendor must ensure total

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compatibility of all equipment and devices furnished and installed and must provide supervisory assistance in the selection, installation and integration of all bridge span drive and associated equipment. Components associated with bridge span drive operations include span drive control, limit switches, motor controls and controllers, and associated devices.

The control system vendor must review shop drawings, prior to submission to the Engineer, to ensure that all components of the bridge operating system submitted for use are compatible in every respect and that all components meet or exceed the specific requirements and intent of the project. The total bridge operating system must be subject to the Engineer's acceptance, based on the specified project requirements.

The control system vendor must ensure maximum reliability and ease of maintenance for all operating system components and must train the bridge operator and maintenance staff and supervise all training operations.

The control system vendor must have confirmed skill in providing electrical control systems for movable bridges of various types, particularly swing type, but including vertical lift and bascule type bridges. Such experience must be demonstrated by identifying a minimum of (3) three movable bridges for which the control system vendor has provided complete systems within the past five years.

The control system vendor must make available a field service staff with the capability of providing services for field coordination of construction and final adjustments to the drive system to the Engineer's satisfaction. Field staff must be capable of responding, at the site, to an emergency within six (6) hours. The control system vendor shall be required to respond to emergencies for the construction period and for a period of one (1) year following final acceptance.

The Control System Vendor must additionally be responsible for:

1. Determination of all required control cables and routing for control system.
2. Selection of types and sizes of equipment to meet requirements shown on the Plans and included herein.
3. Verification and determination of quantity and type of all control system devices such as relays, I/O, switches, ports, etc.
4. Fabrication, integration, testing, and installation of the Control System and associated devices.
5. The Control System Vendor must specify and select all materials not specifically stated herein or noted on the Plans to provide a uniform and integrated system that provides seamless operation of the bridge and its associated electrical appurtenances.
6. Configuration of existing systems and devices (such as motor controllers) that are indicated to remain in part or whole, but that will be connected to new devices which may have different characteristics than the existing.

88-5.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable Federal, State and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

The Contractor must obtain any required permits and approvals of all Departments or Agencies having jurisdiction.

Work must comply with all applicable requirements of the latest edition of codes and standards issued by, the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American Association of State Highway and Transportation Officials

AASHTO

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American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Code of Federal Regulations	CFR
29CFR1910.147 – The Control of Hazardous Energy (Lockout/Tagout)	
29CFR1926.24 – Fire Protection and Prevention	
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
AB-1 Standards for Circuit Breakers	
ST-20 Dry Type Transformers for General Applications	
PB-1 Standards for Panelboards	
NFPA 70 – National Electrical Code	NEC
NFPA 780 – National Fire Protection Code	NFPA
California Electrical Code	CAEC
National Electrical Safety Code	NESC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additional specific requirements include:

1. Title 33, Code of Federal Regulations 33 CFR, Part 118.80: Lighting on Bascule Bridges
2. Lightning Protection Institute Installation Code LPI 175

Instrumentation Flexible Cables must meet the following Industry Standards:

1. 110 Degree C Temperature Rating
2. American Bureau of Shipping (ABS)
3. UL Listed as Marine Shipboard Cable
4. United States Coast Guard Approved

Where codes and standards are mentioned for any pay item, it is to call attention to them, it is not that any other codes and standards must be assumed to be omitted if not mentioned.

88.5.01D(3) Measurements and Verification

Dimensions indicated on the Plans are nominal and are for guidance only. All variations from the dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits before bid. Any variance between plan and field conditions must not be considered as a basis for claim.

The Contract Documents, relating to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It must be the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected

must be fabricated with enough allowance so that once the existing dimension is measured, the new component can be finished to obtain the prescribed fit.

88-5.01D(4) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in these Specifications are to allow the Contractor to substitute other manufacturers and model numbers of materials of equal quality and rating for those specified.

Before the Contractor orders any substitute material, the Engineer's acceptance of the equivalence of the substitute material must be obtained in writing. The acceptance of the substitute materials is at the sole discretion of the Engineer who establishes the basis for equivalence and will review the quality of the materials and materials described in detail on the submitted shop drawings and material data.

The Engineer marks as "Accepted" or "Revise and Resubmit" substitute material. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified material. Rejection must not in any way result in any additional cost. Engineer's acceptance of any substitute materials submitted by the Contractor does not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that material.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted as soon as practicable for acceptance. Departures must not be made without Engineer's acceptance. All necessary changes required by the substitution in related machinery, structural, architectural and electrical parts, must be made by the Contractor at no additional cost.

88-5.01D(5) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County may make necessary correction with its own forces and charge the resulting costs to the Contractor.

88-5.01D(6) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components to remain. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed will be completely compatible with the existing equipment to remain, and that all original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components to remain. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who must have the sole discretion regarding approval of the alternate methods. Where Engineer accepted, the alternate methods are for the Contractor's benefit, and the Contractor must not receive additional payment for the changes in work performed. Any costs associated with ensuring integration of the proposed work/equipment to existing

systems, such that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-5.01D(7) Guarantees and/or Warranties

The Contractor must warrantee the in-service working of the electrical installations for one-year following project acceptance.

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon Contract acceptance, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such materials furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical materials and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-5.02 MATERIALS

88-5.02A General

All equipment and materials furnished under the items specified herein must be brand-new. All new equipment, materials and workmanship must be first class in every way and must be manufactured and installed to the Engineer's satisfaction.

No spare materials will be provided.

88-5.02B Materials

Each piece of electrical equipment and apparatus must have a corrosion-resisting metal nameplate on which is stamped the name of the manufacturer and the rating or capacity of the equipment or apparatus.

All metal parts of the installation, except structural steel, if applicable, must be of corrosion-resisting material, such as aluminum, bronze, or stainless steel. Cast-iron, malleable iron, or steel with a hot-dip galvanized finish must be used where specified herein. Structural steel must conform to the requirements given under County Standard Specifications.

All mounting hardware and all wire and cable terminals must be vibration proof and must use double nuts on all movable parts and flanking spans of bridges under this Contract.

88-5.02C Components

88-5.02C(1) Instrumentation

In general, for each device that replaces an existing device, the new instrumentation device must be identical in model and function. If an exact replacement is not available, then the following specifications for furnishing and installing a replacement for the damaged instrumentation must be used.

If space is a limiting factor or the instrumentation does not meet current NEC standards, then the Engineer must be informed prior to proceeding with the work.

Limit switches must be furnished in accordance with the Contract Drawings. Switches must be specified according to the operation required, including the number of switches, contacts, cams, circuits, degree of motion for operators, number of rated operations, and environmental ratings. Where limit switches will be installed to replace existing switches and/or interface with existing equipment, care must be taken to ensure the proper materials are ordered. The Contractor must perform all field investigation necessary to order all proper parts and accessories to ensure that the limit switches perform in the exact manner as the existing

switches that they replace.

88-5.02C(2) Control Equipment

Control apparatus must conform to the applicable requirements of NEMA Publication No. ICS, latest revision, Industrial Control and Systems rated.

88-5.02C(2.1) Controllers

Controllers that are indicated to be replaced must be replaced by new in their entirety.

Wiring diagrams must be provided for each controller. The diagrams must show the exact layout of the unit and must not be a generic diagram.

88-5.02C(2.2) Motor Starters and Magnetic Contactors

The continuous current rating of contactors and starters must be adequate for the connected loads, and starters must not be smaller than NEMA Size 1.

All starters must be full voltage type, 600 VAC, 60 Hertz, rated with 120 VAC operating coils.

All contact poles must be provided with arc chutes, and contactors rated 150 amperes and above must be equipped with magnetic blowouts.

Three-element, automatic reset, overload relays must be provided for motor protection.

Reversing contactors must be electrically and magnetically interlocked.

88-5.02C(2.3) Standalone Overload Relays

Three-element overload relays shall be provided for motor protection. Overload relays shall be of the automatic reset type unless otherwise specified. Overload relays shall be provided with the required auxiliary contacts as shown on the Contract Plans a minimum of two N.O./N.C. auxiliary contacts must be provided. Heater elements are to be selected based on motor full load running current.

88-5.02C(2.4) Control Relays

Auxiliary control relays must be multi contact magnetic relays with contacts rated at 15 amperes, 240 volts, on a continuous basis.

Relays known to meet the specified requirements are the Square D class 8501 type X, Allen-Bradley bulletin 700 type P, and the General Electric CR1208.

88-5.02C(2.5) Phase Failure and Reversal Relay

This relay must prevent energizing the bridge controls in the event of reversed phase sequence, loss of one phase, or low voltage.

Equipment known to meet the specified requirements must be as manufactured by, General Electric, Allen-Bradley or the Engineer approved equal.

88-5.02C(2.6) Selector Switches and Pushbuttons

Pushbuttons and control switches must be heavy-duty, oil-tight, contact blocks operated by glove handle selector knobs and push-button operators as indicated on the Plans.

Contacts must be fine silver, capable of interrupting 6 amperes at 120 volts AC, and of 10 ampere continuous duty.

88-5.02C(2.7) Indicating Lights

Indicating lights mounted at the control cabinets must be full voltage, heavy-duty, oil-tight sockets provided with LED lamps rated at 120 volts.

Indicating lights on the control consoles must be provided with group test contacts.
All lenses must be glass, with color and marking as shown on the Plans.

88-5.02C(3) Power Distribution System

88-5.02C(3.1) Transformers

Electrical ratings:

Number of phases: 3

Frequency: 60 Hertz

*KVA Rating: XX KVA

*Primary Voltage: XXX Volts Δ

*Secondary Voltage: XXX / XXX volts Y

Minimum Efficiency: As per DOE 2016 Requirements

* As required to match existing or as shown on plans.

Noise levels must be warranted by the manufacturer and must not exceed 40 decibels for transformers 0 - 9 KVA, 45 decibels for transformers 10 - 50KVA, 50 decibels for transformers 51 - 150 KVA, 55 decibels for transformers 151 - 300 KVA, 60 decibels for transformers 301 - 500KVA, 62 decibels for transformers 501 - 700 KVA, and 64 decibels for transformers 701 - 1000 KVA.

Transformer windings must be of copper, must be of continuous wound construction, and must be impregnated with non-hygroscopic, thermosetting varnish.

Transformers must feature an electrostatic shield.

Transformer insulation must be a UL recognized minimum 180 degrees C system with 80 degrees C temperature rise. Neither the primary nor the secondary temperature must exceed 180 degrees C at any point in the coils while carrying their full rating of sinusoidal or non-sinusoidal load.

All cores to be constructed with low hysteresis and eddy current losses. The core flux density must be well below the saturation point to prevent core overheating caused by harmonic voltage distortion. Transformers must be common core construction. Transformers using more than one core, or Scott T connections, will not be acceptable.

All insulation materials must be flame-retardant and must not support combustion as defined in ASTM Standard Test Method D635.

All transformers must be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure must not exceed 105 degrees C. The core of the transformer must be grounded to the enclosure.

The enclosure construction must be encapsulated, totally enclosed, non-ventilated, NEMA 4X 316 stainless steel.

The transformers must be Hammond Power Solutions, Cutler-Hammer, General Electric or Engineer

accepted equal.

88-5.02C(3.2) Service Disconnect Switches

The switches must be fusible, heavy-duty, safety switches in watertight and dust-tight NEMA 4X, stainless-steel enclosures. Each disconnect switch must be furnished with two normally open. auxiliary contacts and phenolic nameplate to identify the switch. The switches must be rated at a minimum 240 volts AC for 208 volts AC, or 600 volts AC for 480 volts AC incoming voltages.

88-5.02C(3.3) Motor Disconnect Switches

The switches must be tag out lockable, fusible, heavy-duty, safety switches, rated as shown on the Contract Drawings, in waterproof, NEMA 4X, stainless steel enclosures. Each span motor and brake disconnect switch must be furnished with a normally open/normally closed auxiliary contact and phenolic nameplate to identify corresponding motor or brake.

88-5.02C(3.4) Circuit Breakers

All breakers must have quick-make and quick-break contacts, and the mechanism must be trip-free and trip indicating. Frame sizes must not be less than 100 amperes and as shown on the plans.

The breakers must be equipped with thermal-magnetic trips or adjustable, instantaneous, magnetic trip units, with trip rating as shown on the Plans or as required.

Molded-case circuit breakers must meet the requirements of the latest revision of NEMA Publication No. AB1.

The service entrance circuit breakers must be of frame size as the original frame size, 600 volt rated, with Contract Drawings specified ampere electronic trip setting with independently adjustable short time pick-up and time delay. Interrupting capacity must not be less than 100,000 amperes interrupting current.

Circuit breakers must be, as manufactured by General Electric or Square D Company or Engineer approved equal.

88-5.02C(3.5) Terminal Blocks

Terminal blocks for conductors of Size No. 8 AWG and smaller must be one-piece blocks of phenolic material recognized under the UL Component Recognition Program.

Barriers must not be less than 1/2 inch high and 1/8 inch thick and must be spaced 5/8 inch center-to-center. Straps and screws must be of brass; nickel plated for use in highly corrosive atmospheres and must be rated for 50 amperes minimum.

The blocks must provide a withstand voltage rating of 750 volts per IEEE switchgear standards.

The terminal blocks must provide strap screws suitable for use with ring tongue wire connectors.

Corrosion resistant marking strips must be provided for conductor identification.

At least ten percent spare terminals must be provided.

Terminal blocks must be Buchanan Type 2B112, ABB RGW25-M5 series, Marathon 1500 Series, or Engineer accepted equal.

88-5.02C(3.6) Power Distribution Blocks

Power distribution blocks, for all conductors larger than No. 8 AWG, must be constructed from a single piece of hard-drawn copper, machined, and electro-tinned.

All blocks must be mounted on heavy-duty phenolic material and furnished with safety cover kits.

Number and size of primary and secondary wire openings will be selected by the Contractor/Vendor and must be the MPDB66 series blocks as manufactured by Mersen, 140 Series as manufactured by Marathon Special Materials, or Engineer accepted equal manufactured by Allen-Bradley or Square D.

88-5.02C(3.7) Terminal Connectors

Connectors must be seamless, heavy-duty compression ring tongue terminals manufactured from pure electrolytic copper tubing. Terminals must be tin plated and provided with a double-thick tongue and insulation grip. Terminals and compression tools must be approved by the Engineer.

88-5.02C(3.8) Lighting Panelboards

Each lighting panelboard must be the dead-front type and must be provided with quick-make, quick-break, thermal-trip, E-frame, branch circuit breakers. Each breaker must trip free of the operating handle, and the handle must indicate the position of the breaker.

Each panelboard must be provided with a circuit breaker in the mains and with a full-sized neutral bar.

All branch circuits must be numbered, and a typewritten directory must be provided on the inside of each door.

Circuit breakers must meet the requirements of UL Standard 489.

All lighting panelboards must be either 208/120 volts or 240/120 volts, 3-phase, 4-wire panels surface or flush mounted as called out on the Plans. Panelboard enclosures must be code gauge galvanized steel with ANSI 61 light gray enamel finish. Panel boards must be NEMA 4X rated, with copper lugs and tin-plated copper busses.

Panelboards must be Engineer accepted equal to Siemens P2, Cooper Crouse-Hinds XLPB series or Square-D Type QO.

88-5.02C(3.9) Nameplates

Nameplates must be provided for all devices and must be made of laminated phenolic plastic with white front and back and black core and must be not less than 0.09 inches thick. The lettering must be etched through the front layer to show black engraved letters on a white background. Lettering must be not less than 6 millimeters high, unless otherwise detailed on the Plans. Nameplates must be securely fastened to the equipment with stainless steel screws.

88-5.02C(3.10) Instrumentation Flexible Cables

Flexible instrumentation cable must be heavy duty extremely flexible marine/shipboard rated cable. Instrumentation cable must at a minimum contain 4 twisted shield pairs each of No.18AWG. Pairs must be individually shielded and the cable must have an overall armor. Cable to be rated for 1KV and 110 Degrees C.

The instrumentation cable insulation for the individual conductors must be cross-linked flame retardant polyolefin, meeting the requirements for Type P of IEEE 1580 and Type X110 of UL 1309/CSA 245.

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Each twisted pair must have a dedicated bare tinned drain wire. Each pair must be shielded with polyester-backed aluminum foil tape to afford 100 percent coverage.

Individual conductors must be soft annealed flexible stranded tinned copper per IEEE 1580 Table 11.

Cable jacket must be black, arctic grade, flame retardant, oil, abrasion, chemical and sunlight resistant thermosetting compound complying with UL1309/CSA 245 and IEEE 1580.

Cable must have a bronze basket weave wire armor per IEEE 1580 and UL 1309/CSA 245.

The overall cable must utilize a black, arctic grade, flame retardant, oil, abrasion, chemical and sunlight resistant thermosetting compound sheath complying with UL 1309/CSA 245 and IEEE 1580.

88-5.02C(3.11) Hardware Supports

Supports for conduits, wireways, cables, boxes, cabinets, disconnect switches, small limit switches, and other separately mounted items of electrical equipment must be fabricated from structural steel not less than ¼ inches thick. Clip angles and other supporting members, which are fabricated from structural steel plates and shapes and bolted to the structural members, must be included under the Bridge Electrical System Item.

Structural steel brackets, boxes, and other equipment mounted on concrete surfaces must be provided with a full neoprene gasket not less than 0.05 inches thick between the equipment and the surface of the concrete.

Expansion anchors for fastening equipment or brackets to concrete surfaces must be wedge type anchor bolts, which must be locked in place by an expansion wedge as the nut is tightened. All parts of the expansion anchors must be of Type 303 stainless steel. Holes for the anchors must be drilled to the manufacturer instructed size and depth using carbide tipped masonry drills.

Mounting bolts, nuts, washers, and other detail parts used for fastening boxes, disconnect switches, small limit switches, conduit clamps, cable supports, brackets, and other electrical equipment must be of stainless steel complying with the requirements of ASTM Designation A276, Type 316. Bolt heads and nuts must be hexagonal and must be provided with medium-series lock washers. Bolts smaller than 1/2 inches in diameter must not be used, except as may be necessary to fit the mounting holes in small limit switches, boxes, and similar standard devices.

Using beam clamps for supporting conduits, boxes, or other equipment is not acceptable without prior Engineer's acceptance.

Preformed elongated holes metal framing channels, such as Kindorf, Unistrut, Superstrut, etc., are not acceptable for mounting or supporting electrical equipment or boxes.

88-5.02D Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the 'Bridge Electrical System' components must be submitted for inclusion in the existing operating and maintenance manuals.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor must apply to the overall bridge system described in the supplemental manual materials.

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A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

The manual supplemental materials must include the following as a minimum for new and rehabilitated equipment:

1. New, updated or revised maintenance instructions for all equipment, including warnings and precautions to be observed during maintenance actions. All preventative maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order must be provided.
2. Listings of all parts suppliers' local representatives, including suppliers' and representatives' names.
3. New, updated or revised schematics indicating what items should be cleaned and painted on a regular basis.
4. New, updated or revised troubleshooting procedures, flowcharts and checklists for anticipated possible breakdowns of equipment.
5. New, updated or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.
6. New, updated or revised description of the proper theoretical approach to installing and testing new equipment.
7. All relevant as-built shop drawings. Drawings must be certified.
8. New, dated or revised instructions for annual cursory inspections and bi-annual in-depth inspections.
9. Manufacturer's literature describing each piece of new equipment furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.
10. Any and all other material or information which in the Engineer's opinion may be desirable to include to assist in maintaining the bridge functional systems and subsystems.
11. Preventative maintenance procedures, including how often the various procedures should be done. All safety precautions that are required to be observed for proper operation and maintenance must be included in a separate section in addition to wherever noted in the manuals.
12. Maintenance testing and procedure equipment lists.
13. Schematic indicating what items should be cleaned and painted on a regular basis.
14. Troubleshooting procedures, flowcharts and checklists which must include a troubleshooting flow chart for troubleshooting the bridge electrical system and instructions for diagnosing control system malfunctions and for detecting failures in external controls connected thereto.
15. Operating current, equipment, and criteria for drive and motors.
16. Repair procedures and repair procedure equipment lists, including suggested procedures for installation and removal of items provided under the Contract.
17. Description of the proper theoretical approach to installing and testing electrical and control systems.
18. Anticipation of possible breakdowns and development of trouble-shooting procedures and identification of corrective actions.
19. As-Built Shop Drawings which must include schematic wiring diagrams, control desk and control panel layouts, connection diagrams as listed under "Bridge Electrical System"
20. Conduit and electrical layout and installation drawings, including mounting details.
21. Control desk, Control panels, Relay panels and wiring diagrams.
22. Schematic wiring diagrams.
23. Certified drawings.
24. Steps for cursory inspection that should be carried out annually
25. Steps for in depth inspection that should be carried out every two years
26. Manufacturer's literature describing each piece of equipment and giving complete identification including manufacturers' model number and drawing number. A set of descriptive leaflets, bulletins and plans covering all approved items of equipment furnished and installed, including any suggested installation, alignment, maintenance, troubleshooting and repair procedures. The catalog number of each piece must be given to be used when it becomes necessary to order replacement parts from the original manufacturer.
27. A detailed and complete description of the As Left height settings of the span rotary limit switches and corresponding height set points of the selsyn position indicator (if applicable). The description must include

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detailed instructions about setting each point of the rotary limit switch and a troubleshooting flow chart for diagnosing and correcting malfunctions. The rotary limit switch must be kept accurate within 0.25 inch of lift position.

28. Any and all material or information which in the Engineer's opinion be desirable to include in order to assist in maintaining the bridge functional systems and subsystems.

Electrical wiring diagrams must be furnished, framed and installed in the machinery, switchgear and operator's rooms or at locations the Engineer assigns.

Each framed diagram must conform to the following requirements:

1. No single diagram must show more than one system or parts thereof.
2. Diagrams must be reproduced by photographic process to the San Joaquin County Standard Drawing size and format as required and must be complete and legible in all respects. Systems must be subdivided into portions, which are operable from locations where diagrams are installed. Diagrams must be black on white paper and vacuum sealed in a transparent plastic, chemically inert, material of minimum 5 mil thickness, impervious to moisture and oil and resistant to abrasion. The plastic material must not affect the legibility of the Contract Plans.
3. Other formats which are equal in clarity, sharpness, durability and permanence will be considered. Contractor must submit proposed method with specific details to the Engineer for review and approval.
4. All printed matter, test, data and other matter must be clear and legible, accurate and distinct, and must be produced by methods to be permanent, as approved by and in the sole discretion and Engineer's opinion.

A complete copy of the manual supplemental materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-5.03 CONSTRUCTION

88-5.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work and structural work, as well as navigational and vehicular traffic closures and restrictions.

It is the Contractor's responsibility to manufacture and install suitable functioning electrical equipment. Review and acceptance of shop drawings by the Engineer does not relieve the Contractor of this responsibility.

All work must be performed and delivered in a workmanlike manner as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, orderly, and easily identified.

88-5.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not feasible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities such that their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-5.03C Installation

88-5.03C(1) General

Work under this Contract requires installation of numerous control and power devices that will be interfaced to an existing bridge control system that will remain in operation throughout and after the construction work under this Contract.

References in the Contract Documents to the bridge control system (or similar identifiers) include all aspects of the existing interconnected devices which operate the bridge machinery, including relays, motor control equipment, motors, switches, instrumentation, wiring and cabling, control console, operators, and indicator lights.

The Contractor must perform work necessary to ensure that the components installed under this and other pay items are fully interfaced and connected to the portions of the Bridge Control System that will remain and will not be replaced under the Contract Work.

The Contractor must deliver a complete operating bridge control system at the Contract completion. However, should modification be necessary due to changes in available equipment or other circumstances beyond the control of San Joaquin County, the Contractor (through his subcontracted Control System Vendor) must interpret the intent of the original equipment and propose edits to accommodate the new equipment provided under this Contract. The Engineer must review proposed edits and must make a binding order to the Contractor.

88-5.03C(2) Bacon Island Rd (29C-108) Scope

The electrical Contractor must modify the existing bridge control system and drive system.

The operation of Control Relay CR12 must be modified by inserting an interposing relay such that the input to the relay coil minimum required latching current must be able to be supplied by the aligned position sensor. The new CR12 interposing relay must subsequently actuate/energize the existing CR12 relay.

The existing knob autotransformer eddy current drive controller must be removed and replaced with a three-position spring return to center selector switch and with the EC2000 Digital Controller as manufactured by Dynamic as shown on plans. Contractor must route a new 18 AWG Twisted Shielded pair cable for the tachometer input to the controller as shown on plans. The Contractor must program/install the controller to accommodate the following functions:

1. EC2000 controller must be programmed into the Speed Mode. Controller must automatically raise/lower speed by increasing or decreasing engagement of the eddy current drive to maintain the operating speed set point. This set point must be determined in the field.
2. Controller must have 2 custom inputs and 2 standard inputs. Custom inputs must be programmed to adjust the speed reference of the controller. Custom Input 1 must set the controller to 100 percent full speed and custom input 2 must set the controller to 10 percent full speed. Standard inputs must be start and stop inputs. Controller must also have an Estop input.
3. The start input must begin the operation and accelerate the bridge from 0 RPM to full speed with the programmed acceleration rate. If the operator releases the start input, the stop input will automatically

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energize and the bridge will enter a programed deceleration rate to 0 RPM. If the operator releases the deadman switch, the system will engage the Estop condition.

4. Controller must be equipped with the Mutuatrol Feature. Controller must be programmed to supply the adjustable brake torque required by the application.

5. At the nearly open and nearly closed positions the second preset speed must be engaged, this is the 10 percent of full speed setting.

6. At the full open and full closed positions the drive must be placed in the "ESTOP" mode as the parking setting and the machinery brake must be set to park the bridge.

7. The eddy current drive tachometer/generator must be wired to the eddy current drive controller. Current feedback must not be required.

All control components, including the flasher controller, impacted by the replacement of the eddy current controller, must be replaced with a new device/system of equal or better performance as shown on plans.

Detailed elementary control diagram must be provided with the shop drawings including sequence of operations (closely following the original span open/close sequence) for Engineer's acceptance.

88-5.03C(3) Components

88-5.03C(3.1) Limit Switches

Limit switches must be furnished and installed in accordance with the Contract Drawings. Where limit switches will be installed to replace existing switches and/or interface with existing equipment, care must be taken to ensure the proper materials are installed.

The Contractor must perform all adjustments, modifications to mounting, etc. to ensure that each switch operates in a manner consistent with the existing Bridge Control System.

Furnish all equipment, conduits, wiring and supports required to extend the instrumentation connections to the control/terminal cabinets. Cost of conduits, conductors with supports must be included in each individual conduit, conduit support and conductor item numbers.

88-5.03C(3.2) Controllers

All equipment installed in the existing MCC compartments as shown and listed on the Contract Drawings to be removed must be disconnected and removed.

Power to the existing controllers must be turned off by disconnecting the main circuit breaker feeding the controller.

The existing Motor Starters and Magnetic Contactors where shown on the Contract Drawings must be removed and replaced by new motor starters and magnetic contactors.

New or accepted equal starters and other miscellaneous electrical components must be installed at appropriate locations as original and as shown on the Contract Drawings.

Inspection, troubleshooting and testing of the newly wired equipment together with the existing compartment equipment must be performed.

Equipment and wiring must be tested for continuity.

88-5.03C(3.3) Utility Power

The feeders from the utility power source and standby power sources (if applicable) must be connected to new power distribution equipment through disconnect switches and an automatic transfer switch if an engine generator is used to feed the distribution panel circuit breakers.

If a generator is part of the existing electrical system and in the event of failure of the preferred source, the automatic transfer switch must operate automatically to connect the standby engine generator power supply to the power distribution bus.

88-5.03C(3.4) Service Disconnect Switches

Fused safety switches, for use as disconnect switches, must be installed where shown on the plans.

Fused safety switches for use as disconnect switches must be installed within the range of view of each span motor, brake motor, tail lock motor, span lock motor and sump pump motor if Contract Drawings call for motor replacement on affected bridges.

88-5.03C(3.5) Circuit Breakers

All branch circuits from the power buses must be protected by molded-case circuit breakers mounted on the control panels.

88-5.03C(3.6) Lighting Panelboards

All branch circuits must be numbered, and a typewritten directory must be provided on the inside of each door.

88-5.03C(3.7) Nameplates

Nameplates must be provided for all devices. Nameplates must be securely fastened to the equipment with stainless steel screws.

88-5.03C(3.8) Hardware Supports

Structural steel brackets, boxes, and other equipment mounted on concrete surfaces must be provided with a full neoprene gasket not less than 0.05 inches thick between the equipment and the surface of the concrete.

Expansion anchors for fastening equipment or brackets to concrete surfaces must be wedge type anchor bolts, which must be locked in place by an expansion wedge as the nut is tightened. Holes for the anchors must be drilled to the manufacturer instructed size and depth using carbide tipped masonry drills.

Mounting bolts, nuts, washers, and other detail parts used for fastening boxes, disconnect switches, small limit switches, conduit clamps, cable supports, brackets, and other electrical equipment must be of stainless steel complying with the requirements of ASTM Designation A276, Type 316. Bolt heads and nuts must be hexagonal and must be provided with medium-series lock washers. Bolts smaller than 1/2 inch in diameter must not be used, except as may be necessary to fit the mounting holes in small limit switches, boxes, and similar standard devices.

Using beam clamps for supporting conduits, boxes, or other equipment is not acceptable without prior Engineer's acceptance.

Preformed elongated holes metal framing channels, such as Kindorf, Unistrut, Superstrut, etc., are not acceptable for mounting or supporting electrical equipment or boxes.

88-5.03C(4) Bridge System Diagnostic Testing

The following must be completed after all Contract installation work is complete:

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1. Bridge System Diagnostic Testing

The Contractor must follow the below described procedure to complete diagnostic testing to confirm integrity of the existing bridge system:

- a. Acquire original acceptance testing script for bridge system diagnostic testing from San Joaquin County.
- b. Modify the testing procedure script to match the installations under this Contract and submit for review & acceptance.
- c. Perform complete diagnostic testing as specified in the accepted testing script under witness of the Engineer and San Joaquin County. Document results.
- d. List failed bridge system components. Perform diagnostic services necessary to identify the cause of failures. Submit for Engineer's review and acceptance.
- e. If failed components or systems are specified for replacement under part of this Contract, sequentially complete the work as specified under this Contract.
- f. If failed components are not included for replacement as part of this Contract, submit to the Engineer the cost as an additional work. Cost must be only for new installation work. All diagnostic costs must be included in this pay item, and no additional compensation will be made for diagnostic time or materials.
- g. Follow the Engineer's orders to complete the failed system work.

88-5.03C(5) Miscellaneous

All other materials and equipment (conduit, cables, etc.) that are not mentioned herein or specifically called out in other Pay items but required for the complete operation of the bridge and the system outlined in the Contract Documents must be included in the work for this Section.

88-5.04 PAYMENT

Payment for "Bridge Electrical System" must be made on a lump sum basis and must include all work specified herein and all work that is not paid elsewhere.

88-5.04A Basis of Payment

The lump sum price bid for "Bridge Electrical Equipment" must include the cost of furnishing all labor, materials, plant, training, equipment and all necessary incidentals required to satisfactorily complete installation and perform the work described herein and shown on the Plans.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item.

The Engineer must evaluate this breakdown and must have the authority to revise the breakdown as, in his judgment, may be required to make the various components of work conform to their true values.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The Contractor must agree that the detailed breakdown must not become effective until it has Engineer's acceptance.

The total lump sum value for this item must be broken down in detail.

The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

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1. Upon submission and approval of shop drawings by San Joaquin County authorized representative; the Contractor will be paid 5 percent of the distributed bid price.
2. Upon complete installation of the equipment described herein, the Contractor will be paid 40 percent of the distributed bid price.
3. Upon completion of Item 88.6.1 – Bridge System Testing, and demonstration of the proper operation of the bridge under all modes available under the original system design, the Contractor will be paid 30 percent of the distributed bid price.
4. Upon completion of all punch list items, the Contractor will be paid 15 percent of the distributed bid price
5. Upon completion, acceptance and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the distributed bid price.

Removal of all components not included in the final system will be paid under Section 88-7 "Electrical Equipment Demolition"

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
880070	Bridge Electrical Equipment	Lump Sum

88-6 BRIDGE SYSTEM TESTING

88-6.01 GENERAL

88-6.01A General

Section 88-6 includes furnishing all labor, materials, plant, and equipment required to perform all work necessary, such as adjustments or corrective measures, to properly test all systems included in the field testing and final acceptance testing.

The Contractor must prepare and submit all acceptance testing procedures for the Engineer's acceptance 20 days before the scheduled start of any required testing.

The Contractor must submit a testing sequence operation based on the included test designated tabulations under Field Testing sub-heading. This test sequence of operation must be used for the testing described herein and approved by the Engineer and San Joaquin County, before testing.

88-6.01B Definitions

Not Used

88-6.01C Submittals

The instrument/meter calibration documents must be submitted for the Engineer's review and acceptance.

The Contractor must submit a detailed testing procedure for use in performing the Field Testing. The procedure must be submitted for review and approval at least 20 days before the anticipated completion of electrical systems.

The Contractor must submit a detailed testing procedure for use in performing the Final Acceptance Testing. The procedure must be submitted for review and acceptance at least 1 month before the anticipated completion of electrical systems for above listed bridges.

The results of the system Final Acceptance Tests must be presented in a matrix form on a Test Report Data Sheet. The proposed format of these sheets must be submitted for the Engineer's acceptance before the actual testing.

88-6.01D Quality Assurance

88-6.01D(1) Qualifications, Personnel and Facilities

Included with furnishing the major items of electrical equipment, the manufacturer must furnish all necessary field supervisory start-up time by the manufacturer's designated representative to facilitate proper adjustment of all necessary equipment.

The manufacturer's field service engineering personnel must be experienced in the adjustment and functioning of the control equipment furnished by the manufacturer. The personnel must be capable of locating and correcting faults or defects and of obtaining from the manufacturer, without delay, new parts or replacements for apparatus that, in the opinion of the Engineer, does not perform satisfactorily.

During the field testing period, the Contractor must arrange to have representatives of the manufacturer of all major pieces of equipment at the site, if applicable, such as main span motors, brakes, transformer, etc. The representatives must be capable of supervising all adjustments to the equipment, of locating faults or defects and correcting them if possible, and of obtaining from the manufacturers, without delay, new parts or replacements for any apparatus which, in the Engineer's opinion, does not perform satisfactorily.

88-6.01D(2) Rules, Regulations and Ordinances

All meters must be calibrated per National Institute of Standards and Technology (NIST) guidelines within 6 months before testing.

88-6.02 MATERIALS

Equipment Required For Field and Final Acceptance Testing

The testing of the bridge electrical equipment necessitates the use of the following recording and testing devices:

1. Recording Ammeter/Voltmeter
2. Portable multimeter.
3. Amp-probe.
4. Infrared scanner.
5. Measuring tape.
6. Stopwatch (timer).
7. All other necessary instrumentation and tools to monitor, adjust, or replace items during the bridge testing procedure.

88-6.03 CONSTRUCTION

88-6.03A Field Testing

The bridge field tests are to confirm each major sub-component and subsystem within the scope is operational. Confirmation of correct operation of components or sub-components must be demonstrated through successful operation of the component or assembly.

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Nameplate legends, conductor identifications, instrument scales, escutcheon plate engraving, and all other details of construction must be checked for conformity with specified requirements.

The Field Testing must include running all functions of the bridge, including electrical equipment within the scope. It must include a schedule for opening the bridge on different combinations of drive equipment (main, backup, auxiliary, etc.) as well as a schedule for manual operation on the generator (if applicable).

The Field Testing Procedure must include a detailed method to test all functions built into the control system.

The Contractor must arrange for and provide all the necessary field tests, as defined in the accepted test procedures below and by the Engineer's orders, to demonstrate that the portions of the mechanical, and electrical systems that were repaired are in proper working order and comply with the Plans and Specifications within the scope of this contract. The tests must include operational testing of the operating machinery, warning gates, and electrical system, as shown below.

Continuity Test - Submarine Cables: After approval of the insulation resistance test of the reinstalled but unconnected submarine cables, the Contractor shall test the continuity of the individual conductors within submarine cable. The test is performed by tying together all conductors on the source side and on the destination side, except but one conductor on the destination side by isolating it and measuring the resistance between the destination side and the isolated conductor with all conductors tied together on the source side. The same procedure is followed for all conductors one at a time. This will verify the continuity of all conductors from source to destination within the submarine cable. The contractor shall submit detailed procedure to the engineer for approval. Upon completion of the continuity test the Contractor shall connect the submarine cables and test the energized installation as directed by the Engineer.

Megger Test - Submarine Cables: The test methods for measuring insulation resistance of cables installed in the field shall be in accordance with the specified NEMA Publications. The test equipment shall include a megohm meter capable of generating a constant 1,000-volt D.C. source, calibrated in a range legible from 0 to 1,000 megohms and up to infinity, with heavy-duty, rubber-insulated, alligator-clip leads, and a guard-circuit terminal available for use if required. Polarity for connecting the megohm meter to the cable under test and the duration of time for electrifying the cable before taking the resistance reading shall be in accordance with NEMA Publication. The insulation resistance of each conductor in the installed wire-armored, multi-conductor submarine cables shall be measured between the conductor and all the wires in the armor, all of which shall be bonded together and grounded. The measured values of insulation resistance for each conductor in the submarine cables shall be recorded for record.

Phase sequence: Test must include verifying line side phase sequence A B C and load side phase sequence A B C for compatibility and accuracy. Test must be performed for new transformer (or rewired), new motors (or rewired or if work was performed on their controllers), and on bridges with High leg delta services. Where high leg delta services are installed, phase B must be the high leg. All equipment that is installed must be tested to assure that no equipment unintentionally receives the high phase voltage.

Replace/Refurbish cabinets, terminal strips, and lugs: Inspect refurbished cabinet and new secured terminal strips. Test all individual terminals for any loose connections or over torquing. Test cabinet grounding connection. Test for conductors shorting consecutive terminal strips.

Short Circuit between new conductors: Test new conductors for conductor to conductor and conductor to ground

Should the tests show that any system, piece of equipment, electrical cable or wiring connection (which was installed/modified/damaged by the Contractor), in the Engineer's judgment, is defective or functions

improperly, such adjustments and/or replacements must be made by the Contractor as to make the installation satisfactory to the Engineer at no extra cost to San Joaquin County.

88-6.03B Bridge Final Acceptance Testing

Results and observations must be carefully recorded throughout the tests. Before performance of these tests, all temporary bypasses, jumpers, switches, etc., installed during any previous testing must be removed. The control circuits must be in the state presented in the original as-built control wiring diagrams or as required to be modified and shown on plans. All tests and verifications must be for equipment for bridge leaves, lift span or swing spans. In addition to all devices listed below, all associated devices must also be tested.

After all bridge systems are operating to the satisfaction of the Engineer, the Contractor and the manufacturers' representatives, an operational test period of not less than one week must begin, during which time all aspects of the electrical system will be tested and observed by the Engineer, San Joaquin County personnel and representatives for the Bacon Island Rd Bridge (Middle River, 29C-108).

During this period, the Contractor must make any repairs necessary as a result of equipment failure due to faulty equipment or workmanship. Should preliminary checks or operational tests show that any piece of equipment furnished by the Contractor, in the Engineer's judgment, is defective or functions improperly, such adjustments and/or replacements must be made by the Contractor as to make the installation completely acceptable to the Engineer, and at no extra cost to San Joaquin County.

The Final Acceptance Testing must include running all functions of the bridge, including all electrical equipment. It must include a schedule for opening the bridge on different combinations of drive equipment (main, backup, auxiliary, etc.) as well as a schedule for manual operation on the generator if applicable.

The Final Acceptance Testing procedure must include a detailed method to test all system interlocks, and test all functions built into the control system.

The acceptance test demonstrates that the normal operating systems, including mechanical systems, and electrical control and power systems are operational, trouble free, operating with all interlocks for systems within scope of the contract properly functioning, and complies with the requirements of the contract plans and specifications.

Confirmation of correct operation of sub-components must be demonstrated through successful operation of the total mechanical, and electrical control systems. However, the Contractor is still responsible for performing the field and other tests through acceptance as required per contract specifications prior to final bridge acceptance testing.

The recommended values of various device parameters can be found in the existing plans, specifications, and original O&M Manuals and manual supplements prepared by the Contractor. Correct operation of the subcomponents, and control circuit wiring connections will be verified through the successful completion of the entire bridge control and power systems tests. This testing procedure will evaluate performance and confirm correct operation of all major subsystems and devices. Visual inspections and physical measurements of some equipment are required for the purpose of recording valid parameter values. During bridge operation, parameters as defined below must be recorded for each test and kept for the record together with all other recorded data.

The San Joaquin County must be in possession of the final new mechanical and electrical maintenance manual supplements at least 20 days before acceptance testing may begin in accordance with the requirements specified in Contract Specifications. There must be 10 consecutive days of nominal bridge operation using the new permanent systems, with a minimum of five (5) successful openings per day, before the final acceptance test must be scheduled for above listed bridges.

88-6.03C Final Acceptance Test Data

All test parameters, data and results specified herein to be recorded must be presented in a legible, tabular format, listing associated parameters and conditions. For example, performance and motor currents must reference speed (rpm), span angle (degrees), raise or lower mode, "Utility" or "Standby Generator" power system, etc. The results of the system tests must be presented in a matrix form on a Test Report Data Sheet. The proposed format of these sheets must be submitted for the Engineer's acceptance before the actual testing. Any parameter value which falls beyond the recommended range will require the readjustment or replacement of the defective device.

The name of the person who will perform the test, instruments used with calibration data if required, and the exact date, time and weather conditions, must be recorded.

Some devices such as the transfer switch, lamps, control desk indicator lights, brake function indicator lights, control console controlled lighting, navigation lighting and horn can be easily tested without performing a bridge opening operation.

The bridge main parameters must also be observed and visually compared to the control desk indicating meters. Any discrepancy between results must be recorded. The major bridge systems must be monitored while the bridge operates. All monitored parameters must be downloaded to the laptop computer, printed, and kept for future reference. A printout copy must be attached to the appropriate Maintenance Manual supplement for reference. Another printout copy must be provided to the Engineer.

88-6.03D Final bridge Acceptance Tests to be Performed

After reaching substantial completion of the work on the bridges listed under Final Bridge Acceptance Testing, San Joaquin County Bridge Operations will test operate the movable spans ten (10) times using normal operation to determine if the spans are operating as required. The Contractor along with the Resident Engineer must be present for these test openings. During the testing, the Contractor must arrange to have at the site qualified personnel capable of supervising adjustments to equipment, of locating faults or defects and identifying them if possible. If a malfunction is present, San Joaquin County will notify the Contractor to investigate and determine the cause of the malfunction.

If the malfunction is not the result of the work performed by the Contractor, San Joaquin County will authorize, in writing, the Contractor to develop a detailed scope of the work to correct the malfunction. The scope will detail the work required to place the system, component and/or components back into serviceable condition or replace the components based on the Contractor's recommendation and to the satisfaction of the Engineer and San Joaquin County. Cost for the correction must be paid for elsewhere in the Contract.

If the malfunction is the result of work performed by the Contractor on the bridge, the Contractor must correct the malfunction at no additional cost to San Joaquin County.

In addition to the above testing the following bridge specific tests must be performed:

1. Control Console

The control console devices such as switches, pilot lights, and recording multi-meters will be used throughout the tests, and all irregularities observed must be noted during and after the tests from the notes and printouts. Each individual gate selector switch must be operated in the lower operation as well as in the raise operation. Mid way through each operation the selector switch must be released from operation. Each gate must immediately come to a stop.

2. Machinery Brakes Function, Eddy Current Drive Brake, and Status Indication

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- a. The normal automatic set and released operation of the brakes must be visually recorded during the span open and close operations.
- b. The brakes must be hand released, each brake, and the permissive relay must be monitored.
- c. With the span in non-permissive operation mode (drives not energized), the brake set and release limit switches can be activated manually and their set/released indication monitored on the control desk.
- d. The variable control module of the drive system must be tested and confirmed that it is fully operational and controlling the application of the brake.

4. Span Operation

Several bridge openings may be required to demonstrate that all the operational parameters are acceptable and interlock functions safe. Subsequent runs will be required to simulate failures, and to test interlocking and bypass functions. The normal sequence of operation as described in the pre-approved "Sequence of Operation" as part of the original Operations and Maintenance (O&M) Manuals and must be followed up to the indicated operational step of the equipment to be tested.

5. Normal Operation

Set the system to operate on the utility power. Follow the full accepted "Sequence of Operation". During the span "Open" and "Close" operation, the following parameters must be monitored and manually recorded:

- a. Span position (degrees),
- b. Near motor power (kilowatt).
- c. 3-phase current (amperes).
- d. 3-phase voltage (volts).
- e. Motor speed (RPM).
- f. Manually record maximum opening during the "Open", of the movable span.
- g. Manually record "Open" time and "Close" time.

These parameters must also be manually recorded at the fully closed, nearly closed, nearly open and fully open position for each leaf as indicated at the control desk by the span switches.

Verify that the movable span operated normally within the permissible position limits.

Verify that the limit switches indicated position are equal or within the set design tolerances with the readings at the control desk.

Normal Stop:

- a. With the span running at full speed during a "Open" operation, put the control switch in the "stop" position. The span should slow and stop smoothly within a minimum of 3 to 5 seconds and a maximum of 8-10 seconds deceleration.
- b. Repeat the test during a "Close" operation.

Interlock Checks:

- a. Verify that the span cannot be operated electrically if any motor or machinery brake has been released by hand.
- b. Verify that the span cannot be operated electrically if any one of the warning gates is not in the closed position.
- c. Verify any and all other interlocks in original design cannot be performed without bypass that is not described above.

Bypass Checks:

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- a. Verify that when any of the interlock bypass switches is enabled, the given interlock is overridden.

Emergency Stops:

- a. Under each opening procedure, push the "Emergency Stop" red mushroom head button.
- b. Verify that all motor and brake contactors drop out and the span brakes set immediately.

88-6.03E Bridge Operators and Maintenance Personnel Training

1. The Contractor's personnel must provide training and instruction for a period of one (1) working day after the construction of the permanent control system has been completed, fine-tuned, field tested, and utilized for span operations. Instructors must include representatives from manufacturers of the major equipment and a Control Engineer.
2. The Contractor's personnel must be skilled persons competent to operate the bridge and familiar with the operating equipment of the bridge and its auxiliaries, such as the communications system. They must be able to make any adjustments required to the electrical and mechanical equipment.
3. During the one (1) day period specified above, the Contractors personnel must be at the bridge for the normal working period of 8 hours per day.
4. Included in the one (1) day training and instruction period, there must be an on-site training of San Joaquin County bridge operators, electronic technicians, electricians, maintenance workers, and other personnel as indicated by San Joaquin County on subjects such as all modes of bridge operation, troubleshooting, repair of electronic motor controls, drive circuit logic, maintenance and adjustment of all electrical equipment, and other items required for full bridge operation and maintenance. Two (2), each four (4) hour sessions must be devoted to operator training. One (1) session must be devoted to hardware and maintenance related topics. The Contractor must furnish all necessary instruction sheets, training aids, books, paper, and booklets to supplement training. The Contractor must submit to San Joaquin County, a minimum of three weeks prior to training session, a schedule and syllabus for review and approval. It must be the Contractor's responsibility to coordinate with San Joaquin County the location where training sessions will be held. Supplying of visual aid equipment and other miscellaneous items required for training must be the responsibility of the Contractor.
5. Training of the designated bridge operational and maintenance personnel must commence four weeks before the official bridge opening date.

88-6.04 PAYMENT

Payment for "Bridge System Testing" must be made on a lump sum basis and must include all specified Field and Final Acceptance Testing as described herein.

88-6.04a Basis of Payment

The lump sum bid for "Bridge System Testing" must include the cost of all labor, materials, plant, training, equipment and all necessary incidentals required to satisfactorily complete the bridge system testing as described herein.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item.

The Engineer must evaluate this breakdown and must have the authority to revise the breakdown as, in his judgment, may be required to make the various components of work conform to their true values.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

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The Contractor must agree that the detailed breakdown must not become effective until it has approved the Engineer's acceptance.

The total lump sum value for this item must be broken down in detail.

The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made as follows:

1. Upon submission and approval of all required testing procedures by San Joaquin County authorized representative; the Contractor will be paid 20 percent of the distributed bid price.
2. Upon completion of Field Testing as described and outlined herein, and upon acceptance by an authorized San Joaquin County representative, the Contractor will be paid 30 percent of the distributed bid price.
3. Upon completion of Bridge Final Acceptance Testing in as described and outlined herein, resolution of all associated punch list items, required training, and upon acceptance by an authorized San Joaquin County representative, the Contractor will be paid 40 percent of the distributed bid price.
4. Upon completion, acceptance and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the distributed bid price.

Supplements to the Operating and Maintenance Manual must be paid under Item 88-5 "Bridge Electrical Equipment."

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
880080	Bridge System Testing	Lump Sum

88-7 BRIDGE ELECTRICAL DEMOLITION

88-7.01 GENERAL

88-7.01A General

Section 88-7 includes the removal and disposal of equipment where shown on the Plans, described in the Specification or the Engineer's orders.

The work under this item includes the removal and salvage of the temporary electrical equipment provided by the Contractor as part of this Contract, and includes materials and equipment installed by San Joaquin County maintenance for temporary operation of the bridge, during interim period and construction stages complying with the Plans and Specifications.

Any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included that may be found necessary to comply with the requirements of the Contract Documents and referenced

standards or codes must be furnished by the Contractor just as if specifically mentioned in these Specifications at no additional cost.

88-7.01B Definition

Not Used

88-7.01C Submittals

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit a schedule of equipment for removal and salvage for acceptance during the shop drawing process.

For any items requiring a demolition sequence, demolition plans signed and sealed by a licensed Professional Engineer must be submitted for the Engineer's acceptance before work.

Before the commencement of any work, the Contractor must submit a comprehensive staging plan in accordance with the requirements of these plans, which must clearly define specific milestone dates for electrical work for the Engineer's acceptance. The Contractor must document and verify all temporary electrical work at the bridge and must submit to the Engineer detailed plans documenting such work, in conjunction with the staging plan.

The Contractor must submit proposed detailed demolition/salvage plan including materials and equipment to be used for the Engineer's review and acceptance. The plan must indicate the sequence of work, required interconnections, and milestones where testing is required. A detailed schedule of equipment for removal and salvage must be submitted for the Engineer's review and acceptance.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. In case of correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from the commencement of work before the acceptance of the shop drawings; and no work must be done until the shop drawings therefore have been approved. After approval of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings as ordered by the Engineer.

88-7.01D Quality Assurance

88-7.01D(1) Qualifications, Personnel and Facilities

Materials used in the work under this item must be produced by manufacturers regularly engaged in the work required for removal, salvage and disposal of the work specified herein.

For all the work required by the work under these Pay Items, the Contractor must use enough of skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide enough plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-7.01D(2) Rules, Regulations and Ordinances

All removal, disposal and temporary work must comply with all applicable requirements of the latest edition of codes and standards issued by the following organizations and publications, whose abbreviations used

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in the Contract Documents must be as shown:

American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications.

Where codes and standards are mentioned for any pay item, it is intended to call attention to them, it is not intended that any other codes and standards must be assumed to be omitted if not mentioned.

All work must be performed and delivered in a workmanlike manner as shown on the Contract Documents and must follow industry-accepted standard practices.

Work must comply with all applicable Federal, State and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

88-7.01D(3) Measurements and Verification

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. The Contractor must verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

88-7.02 MATERIALS

The Contractor must provide all the necessary tools and equipment required to safely disconnect, remove and dispose of all equipment that is slated for removal, replacement or salvage.

88-7.03 CONSTRUCTION

88-7.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work and structural work, as well as navigational and vehicular traffic closures and restrictions.

88-7.03B Delivery and Storage

This section applies to all electrical equipment that must be tagged for salvage and delivered to the San Joaquin County.

The Contractor is responsible for storage of equipment until date of delivery and coordinating date of delivery with the San Joaquin within 120 days of execution of contract.

All electrical equipment that is tagged for salvage must be inspected and accepted by an authorized representative of the San Joaquin County before shipping and after delivery.

Protection for Shipment:

1. Protective wrappings must be provided for all equipment and materials that are to be salvaged and delivered. Materials must be packed and delivered to the pre-determined San Joaquin County locations in the state that they left from the bridge as accepted by the Engineer.
2. Damage caused to the materials due to improper storage, transportation, or delivery regardless of cause, must be repaired by the Contractor.
3. Materials must be completely protected from weather, dirt, and all other injurious conditions during removal, shipment, and storage. Materials must be stored in climate-controlled facilities.
4. Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-7.03C Removal of Existing Materials and Equipment

The Contractor must remove and dispose of the existing equipment and components that are not re-used in the final electrical system. Unless otherwise noted, all items must be removed, not abandoned.

Where removal of materials and equipment is called for on the Plans, such materials and equipment must become the property of the Contractor, unless stated otherwise elsewhere in the Specifications, must be legally disposed of away from County property. Under no circumstances must material be dropped in the waterway or abandoned on site. The Contractor must take care, during removal operations, to prevent damage to adjoining parts and components that are to be reused. All components damaged by the Contractor, unless scheduled to be discarded, must be replaced, as ordered by the Engineer, at no additional cost.

The Contractor is hereby notified that existing components such as motors, switches, disconnects, terminal/junction boxes, electrical cabinets, panelboards, etc. must be salvaged and must be protected for shipment by the Contractor and delivered to a San Joaquin County facility as directed by the Engineer. Before shipment, if any components, as determined by the Engineer, are not to be salvaged, such materials and equipment must become the property of the Contractor and must be legally disposed of away from County property as part of this item at no additional cost.

88-7.03D Temporary Electrical Work Removal

The Contractor must salvage all temporary electrical equipment components shown on the shop drawing and any temporary system provided by the Contractor as a part of this project. Scope of temporary electrical work must be field verified by the Contractor prior to bid, any removal or salvage work, or before using temporary electrical work for operation of the bridge during construction. No additional payment will be made for work not shown on the shop drawing, but at the bridge at the time of bid.

Coordinate with the Engineer for construction of all other disciplines that may affect operations, schedule or functional requirements of the bridge.

Where removal of materials and equipment for the temporary electrical system is called for in the Plans,

such materials and equipment must become the property of San Joaquin County, where directed. The Contractor must coordinate directly with the San Joaquin County for identification and verification of items that must be salvaged and delivered to San Joaquin County. All identified items must be removed, packaged and delivered to anywhere in San Joaquin County as pre-determined with the San Joaquin County. Prior to shipment, if any components, as determined by the Engineer, are not to be salvaged, such materials and equipment must become the property of the Contractor and must be legally disposed of away from County property as part of this item at no additional cost.

The County may direct the Contractor to dispose of temporary electrical system equipment. If directed, the Contractor must do so at no additional cost.

88-7.03D(1) Disconnect

Power must be turned off prior to disconnecting any equipment.

All equipment that is slated for replacement which includes: conduits, conductors, junction boxes, pull and/or terminal boxes, motors (including accessories), transformer, panelboards, instrumentation and other miscellaneous incidental equipment as shown on the Contract Documents must be disconnected without damage to any adjacent equipment or connections which are to remain.

Disconnect all temporary equipment (either hydraulic machinery or electrical) during various phases of construction as the space occupied by the temporary equipment will be required for permanent installation of new equipment. Equipment must be disconnected to not interrupt regular operation of the bridge.

88-7.03D(2) Removal

Removal of junction pull and/or terminal boxes, conduits, wiring and other miscellaneous damaged equipment must be done in such a manner as to protect the existing bridge structure and other machinery and electrical components and associated hardware which are to remain.

The Contractor must take care, during removal operations, to prevent damage to adjoining parts and components that are to be reused. All components damaged by the Contractor, unless scheduled to be discarded, must be repaired or replaced, as ordered by the Engineer, at no additional cost. All work must be coordinated with the accepted staging plan to keep bridge running and operational.

88-7.03D(3) Disposal

All removed equipment with associated hardware and miscellaneous damaged equipment must become property of the Contractor as determined and accepted by the Engineer and must be promptly removed from the site and disposed of in a legal manner as ordered by the Engineer.

88-7.03D(4) Patching

All openings which are not to be reused must be sealed in a watertight manner approved by the Engineer. All areas where equipment is removed must be cleaned and delivered in a tidy manner after removal.

88-7.04 PAYMENT

Payment for 'Electrical Equipment Demolition' must be made on a lump sum basis.

88-7.04A Basis of Payment

The lump sum bid price for the Item 'Electrical Equipment Demolition' must include the cost of furnishing all labor, materials, plant, equipment, and all necessary incidentals required to satisfactorily perform and complete the work described herein and perform the work described herein and shown on the plans. All

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removal/salvage operations and work must be included in this item.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item.

The Engineer must evaluate this breakdown and must have the authority to revise the breakdown as, in his judgment, may be required to make the various components of work conform to their true values.

The Contractor must agree that the detailed breakdown must not become effective until it has the Engineer's acceptance.

The total lump sum value for this item must be broken down in detail.

The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

Item 'Electrical Equipment Demolition'

1. Upon completion and acceptance of the San Joaquin County of the comprehensive staging plan for the Electrical Equipment Demolition and documentation the temporary electrical operating system, Contractor will be paid 10 percent of the distributed bid price.
2. Upon removal and disposal of all equipment and materials slated for removal or replacement and upon inspection and acceptance by a representative of the San Joaquin County, Contractor will be paid 50 percent of the distributed bid price.
3. Upon delivery of the materials and equipment to the San Joaquin County anywhere in San Joaquin, inspection by a representative of San Joaquin County that it is in good working condition, and acceptance of the items, the Contractor will be paid 40 percent of the distributed bid price after submitting a signed receipt from the representative of San Joaquin County for the Engineer's review and acceptance of the payment.

Before beginning any work, the Contractor must submit to the Engineer a detailed schedule of work operation. This schedule must be complete and include the expected percentage of work to accomplish within specific time frames. The Contractor must prepare and submit an updated work schedule due to unforeseen issues. Failure by the Contractor to present such a document upon request will cause the progress payment procedure to terminate immediately.

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
880090	Electrical Equipment Demolition	Lump Sum

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98-1 GENERAL MACHINERY

98-1.01 GENERAL

98-1.01A General

This section gives the general requirements which apply to all bridges and their machinery. Also, this section applies to the installation of electric motors, brakes, instrument drives and limit switches to be mounted with the machinery but supplied under separate items.

The cost of work required by this "General Machinery" is included in the bridges' machinery pay items.

98-1.01B Definitions

Certified Test Reports: As used herein, certified test reports refer to reports of tests conducted on previously manufactured materials or equipment proposed for use. Results of the tests shall be submitted in accordance with the provisions of this Contract for laboratory test results.

Factory Tests: As used herein, factory tests refer to tests required to be performed on the actual materials or equipment proposed for use. Results of the tests shall be submitted in accordance with the provisions of this Contract for laboratory test results.

98-1.01C Submittals

98-1.01C(1) General

Manufacturer's data and/or shop drawing data shall be submitted for all manufactured and purchased items of bridge machinery. Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 60 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

Submittals for each manufactured item shall be manufacturer's descriptive literature, drawings, diagrams, performance and characteristic curves, and catalog cuts, and shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, applicable Federal and Military Specification references and all other information necessary to establish Contract compliance.

Temporary means needed to complete machinery items shall be developed by the contractor and submitted to the engineer for review. Submittals shall include all necessary information to illustrate and confirm safe operation and support of the machinery and/or span. Submittals should include shop and working drawings, installation and erection drawings, catalog and specification sheets, and checked calculations. Submittals shall be signed and sealed by a Professional Engineer licensed in the appropriate discipline by the State of California.

98-1.01C(2) Shop Drawings

Shop drawings shall conform to San Joaquin County Standards and as supplemented and amended elsewhere herein and to the special requirements specified hereinafter.

Shop drawings shall show all parts completely detailed and dimensioned. The grade and amount of finish machining, with all tolerances and allowances, shall be stated for each part for which a specific fit is required. Finished surfaces shall be defined by the ANSI B46.1, "Surface Texture", and fits shall be defined

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by the ANSI B4.1, "Preferred Limits and Fits for Cylindrical Parts", unless otherwise stated herein or on the Plans. ANSI B4.1 shall also apply to fits for non-cylindrical parts.

All proprietary items shall be shown in outline on the drawings, which shall also indicate the method and sequence to be employed in assembly of bridge machinery and installation of necessary utilities support and service facilities. Shop drawings shall show all external dimensions and clearances necessary for installation and operation of each item of machinery in the bridge. All catalog cuts are considered as shop drawings. After approval, all catalog cuts are to conform to shop drawing for requirements and scanned as a PDF file format in accordance with the requirements of San Joaquin County.

For all bridge machinery shown on the Plans or listed herein, the Contractor shall furnish complete assembly diagrams showing each part contained within the item and the manufacturer's part number assigned to each part. The diagram shall be sufficient to enable complete disassembly and reassembly of the item covered. In the event that any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor shall deliver a drawing that details each modification; and the part shall be assigned a unique part number to preclude the supply of replacement parts not modified in similar fashion. The assembly drawings of each item shall, in addition to identifying and describing each internal part, contain dimensions of all principal elements within the item; certified external dimensions affecting interfaces or installations; gross weight capacity and normal operating ratings; method and recommended types of lubrication, including location and type of fittings and provisions for adding, draining, and checking the level of each lubricant employed; inspection openings, seals and vents; and details of all fasteners used to mount the equipment to its foundation.

Complete shop bills of materials shall be made for all machinery parts. If the bills are not shown on the shop drawings, prints of the bills shall be furnished for approval in the same manner as specified for the shop drawings.

The material and material specifications shall be stated for each part. Where American Society for Testing and Materials Specifications or any other Standard Specifications are used, the designating numbers of such Specifications shall be given. The following abbreviations will be used herein, and on the Plans to designate Standard Specifications for materials and workmanship:

American Association of State Highway and Transportation Officials, AASHTO

American Bearing Manufacturers Association, ABMA

American Gear Manufacturers Association, AGMA

American Iron and Steel Institute, AISI

American National Standards Institute, ANSI

American Railway Engineering and Maintenance-of-Way Association, AREMA

American Society for Testing and Materials, ASTM

National Lubricating Grease Institute, NLGI

National Electrical Manufacturers Association, NEMA

Society of Automotive Engineers, SAE

Complete assembly and erection drawings shall be furnished. These drawings shall give identifying marks and essential dimensions for locating each part or assembled unit with respect to the bridge structure or foundation. Use of mirror image or opposite hand erection drawings will not be allowed.

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Each shop drawing shall be given a suitable title to describe the parts detailed thereon and shall state by whom shop inspection will be made. The Contractor shall allow the County or their authorized inspectors to audit their facilities prior to start of any fabrication, casting, machining, etc. in order to expedite inspection procedures by all inspection agencies and authorized personnel.

Standard Compliance: Where equipment or materials are specified to conform to requirements of the standards of an organization, such as American Society for Mechanical Engineers (ASME), Underwriters Laboratories (UL), American Gas Association (AGA), and American Refrigeration Institute (ARI), that use a label or listing as method indicating compliance, proof of such conformance shall be submitted and approved. The label or listing of the specified organization will be acceptable evidence. In lieu of the label or listing, the Contractor shall submit a certificate from an independent testing organization adequately equipped and competent to perform such services and approved by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 60 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor shall submit to the Engineer for his approval all shop drawings. In case of correction or rejection, the Contractor shall resubmit until each drawing is approved. The Contractor shall bear all costs for damages, which may result from the ordering of any materials prior to the approval of the shop drawings. After approval of the shop drawings, the Contractor shall supply the Engineer with copies of the approved shop drawings.

The Contractor shall update shop drawings digitally upon completion of installation to reflect the final condition and submit updated shop drawings as as-builts.

98-1.01D Operating and Maintenance Manuals

Operating and maintenance manuals shall be provided by the Contractor as per Item "Operating and Maintenance Manual Supplement" as described in Section 88.

98-1.01E Posted Operating Instructions

Operating instructions approved by the Engineer shall be provided for the system and each principal piece of equipment for the use of operation and maintenance personnel. The operating instructions shall include diagrams showing the complete layout of the entire system, and shall be framed under glass or in approved laminated plastic and posted where directed by the Engineer; printed or engraved operating instructions for each principal piece of equipment including proper adjustment, operating, lubrication, safety precautions, procedure in the event of equipment failure, and any other necessary items of instruction as recommended by the manufacturer of the unit shall be attached to or posted adjacent to the piece of equipment or as directed by the Engineer. Operating instructions exposed to the weather shall be made of weather-resisting materials or shall be suitably enclosed to be weather protected. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

98-1.01F Quality Assurance

98-1.01F(1) General

Standard Products. Materials and equipment shall be essentially the standard catalogued products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest standard design that complies with the specification requirements. Materials and equipment shall essentially duplicate items that have been in satisfactory commercial or industrial use at least two years prior to bid opening. Where two units of the same class of equipment are required, these units shall be

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products of a single manufacturer; however, the component parts of the system need not be the products of the same manufacturer. Each major component of equipment shall have the manufacturer's name and address and the model and serial number on a nameplate, securely affixed in a conspicuous place. The name plate of the distributing agent will not be acceptable.

Manufacturer's Recommendations. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material. The Contractor shall provide as part of the work all special machining and installation required by the component manufacturer.

Code and Standards. Work under bridge machinery pay items shall comply with all applicable requirements of the latest edition of codes and standards issued by, but not limited to, the following organizations and publications, whose abbreviations used in this Specification shall be as shown:

American Association of State Highway and Transportation Officials, AASHTO

American Bearing Manufacturers Association, ABMA

American Gear Manufacturers Association, AGMA

American Iron and Steel Institute, AISI

American National Standards Institute, ANSI

American Society for Testing and Materials, ASTM

American Welding Society, AWS

National Lubricating Grease Institute, NLGI

Society of Automotive Engineers, SAE

San Joaquin County Standard Specifications

The design of new machinery conforms to the 1988 Standard Specifications for Movable Highway Bridges published by the American Association of State Highway and Transportation Officials, 1992 and 1993 Revisions (hereinafter referred to as the AASHTO Standard), except as otherwise noted on the Plans or otherwise specified herein.

98-1.01F(2) Qualifications, Personnel, and Facilities

For the fabrication, installation, aligning, cleaning, lubricating, testing and all other work required by bridge machinery pay items, the Contractor shall use adequate numbers of skilled, trained, and experienced mechanics, millwrights and service personnel who are thoroughly familiar with the requirements and methods specified for the proper execution of work.

Mechanics, millwrights, and service personnel shall be properly equipped with all necessary instruments to assure that related components have been provided within acceptable tolerances and to make all necessary adjustments for attaining the specified ratings.

98-1.01F(3) Rules, Regulations, and Facilities

Work shall comply with all applicable Federal, State, and Local rules, regulations, and ordinances.

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In the event of a conflict between these Specifications and the above-mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement shall apply.

98-1.01F(4) Measurements and Verification

Dimensions indicated on the Plans are nominal and are intended for guidance only. All variations from the nominal dimensions on the Plans shall be noted on the shop drawings.

98-1.01F(5) Substitutions

The terms “approved equal”, “of equal quality” and “or equal” which appear on the Plans and in these Specifications are intended to allow the Contractor to substitute other manufacturers and model numbers of products of equal quality and rating for those specified.

Prior to the Contractor’s ordering of any substitute product, the Engineer’s approval of the equivalence of the substitute product shall be obtained in writing. The acceptance of the substitute products is at the sole discretion of the Engineer who will establish the basis for equivalence and will review the quality of the materials and products described in detail on the submitted shop drawings and product data.

The Engineer will “Approved” or “Revise and Resubmit” substitute material. Upon return of a shop drawing showing rejection, the Contractor shall resubmit the shop drawing showing the specified product. Rejection shall not in any way result in any extra cost.

Approval by the Engineer of any substitute products submitted by the Contractor shall not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that product.

Where a manufacturer’s name and catalog part number, in this Specification or on the Plans, specifies a particular product it is so specified to establish quality, configuration, and arrangement of parts. An equivalent product made by another manufacturer may be substituted for the specified product subject to the approval of the Engineer; however, all necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, shall be made by the Contractor at no additional cost.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted as soon as practicable for approval. No such departures shall be made without approval by the Engineer.

98-1.02 MATERIAL

98-1.02A Castings and Forgings

98-1.02A(1) General

Before any work is started on castings and forgings, the manufacturer shall communicate with the Engineer to arrange for inspections and tests. The Engineer shall be notified not less than five (5) working days prior to the start of work so that a representative of the Engineer may be present.

All necessary precautions shall be taken to fabricate the castings true to pattern in form and dimensions, free of pouring faults, cracks, cold shuts, blow holes and other defects in positions affecting their strength and value for the service intended.

All castings shall be cleaned free of loose scale and sand; all fins, seams, gates, risers and other irregularities shall be removed. All unfinished edges of castings shall be neatly cast with rounded corners and all inside angles shall have ample fillets.

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98-1.02A(2) Required Testing

All castings shall be visually examined in accordance with ASTM A802, meeting visual inspection acceptance criteria Level II. Castings that do not pass this test may be rejected. Test results, whether positive or negative, shall be submitted to the Engineer. Test records meeting Level III may be considered for weld repair, provided the manufacturer submits a procedure to the Engineer for review and approval.

All castings that have solid sections 2-inches thick or greater in the as-cast condition and all fracture critical members shall be ultrasonically tested in accordance with ASTM A609, Method A, meeting Quality Level 2. Castings that do not pass this test may be rejected. Test results, whether positive or negative, shall be submitted to the Engineer. Test records meeting Quality Level 3 may be considered for weld repair, provided the manufacturer submits a procedure to the Engineer for review and approval.

All casting surfaces shall be magnetic particle examined in accordance with ASTM E125, meeting the following acceptable levels of discontinuities:

i. Type I	Cracks/Hot Tears	1/4-inch max
ii. Type II	Shrinkage	Degree 3
iii. Type III	Inclusions	Degree 3
iv. Type IV	Chaplets	Degree 2
v. Type V	Porosity	Degree 1

Test results, whether positive or negative, shall be submitted to the Engineer. All surface discontinuities may be considered for weld repair, provided the manufacturer submits a procedure to the Engineer for review and approval.

All repair procedures shall include details of the areas to be repaired and a means to qualify the repair method. Approved repair procedures shall be performed prior to final heat treatment, so that no weld repairs will be needed after final machining. In addition, all surface defects removed by rough machining shall be performed prior to final heat treatment.

All castings that fail to meet the established acceptance criteria and considered rejected shall be replaced, at the Contractors expense, with new castings.

All carbon and alloy steel forgings shall meet the requirements of AASHTO Specification M102 (ASTM A668) unless otherwise indicated or approved by San Joaquin County.

All forgings shall be reduced to size from a single bloom or ingot until homogeneity is secured. The blooms or ingots, from which shafts or pins are to be made, shall have a cross-sectional area at least three times that required after finishing. No forging shall be done at less than a red-heat.

All finish machined forging surfaces shall be magnetic particle examined in accordance with ASTM A275. The maximum permissible indication on any surface shall be 1/4-inch. Indications greater than 1/4-inch may be cause for rejection. Test results, whether positive or negative, shall be submitted to the Engineer.

98-1.02A(3) Independent Testing

Independent inspection and testing, destructive and/or non-destructive, may be performed by a representative of the Engineer and shall be paid for by the Contractor. The tests would be in addition to and independent of tests being performed by the Contractor as per the plans and specifications.

The Contractor shall furnish, i.e. make available for use, all facilities at the foundry, forge shop and/or machine shop for independent inspection and testing, destructive and/or non-destructive, required by the Engineer.

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The previously noted acceptance criteria shall apply to any independent testing. In addition, the independent testing may include radiographic testing to help isolate areas, which in the opinion of the Engineer, may require further investigation. Acceptance or rejection will not depend solely on the radiographic test results but rather they will help define any flaws, which may be of concern to the Engineer.

98-1.02A(4) Bronze Castings

All bronze castings shall meet the requirements of AASHTO Specification M107 (ASTM B22) and be Copper Alloy UNS No. C91100 unless otherwise indicated.

98-1.02B Shafting and Pins

All shafts shall conform to tolerances in ASTM A29 unless otherwise indicated. Turned, ground and polished shafting straightness tolerances shall be 0.002 inch per foot for shafts up to and 1 1/2 inches in diameter and 0.003 inch per foot for shaft over 1 1/2 inches in diameter.

All shafts and pins shall be accurately finished, round, smooth, and straight; and when turned to different diameters, they shall have rounded fillets at the shoulders. Each shaft or pin having a uniform of more than 8 inches and each shaft or pin having several diameters, of which the smallest is more than 8 inches, shall be bored lengthwise through the center to a diameter approximately one-fifth the smallest body diameter.

Each end of all shafts, when finished to the required lengths, shall have a 60-degree lathe center, with clearance hole, at the exact center of the shaft. Shafts that have a hole bored lengthwise through their centers shall have their ends prepared for the attachment of a centering device equivalent to the lathe center. All such devices shall be furnished as part of the work.

Where it is required on the Plans that stepped shafts shall have fillets blended in smoothly to adjacent surfaces without tool marks or scratches, the surfaces shall have an ANSI maximum roughness of 63 micro inches, unless otherwise required herein or on the Plans to have a finer finish.

All cold-finished shafting shall be steel of the type and grade shown on the Plans and shall be tested for its mechanical properties, and a test certificate shall be furnished to the Engineer. Each cold-finished shaft shall be free from camber and shall run without vibration, noise, or chatter at all speeds up to and including the maximum rated speed.

All hubs mounted on the ends of cold-finished shafts shall have the fit specified herein of on the Plans. To obtain the required fit between hub and shaft, the Contractor may furnish the cold-finished shaft 1/16 inch larger than the nominal diameter specified and shall turn the ends to the required dimension for the hub. The Contractor may, at his option, furnish any cold-finished shaft of one diameter end to end; but such shaft shall have tolerances selected from the normal manufacturing range, which will provide the specified fit. The selected tolerances shall be shown on the shop drawings.

Turned, ground, and polished commercial shafting of the grade specified shall be used where shown on the Plans.

98-1.02C Fasteners

All bolts, either for connecting machinery parts to each other or to supporting members are categorized as one of the following types:

- High-strength bolts
- Finished body
- Turned bolts, and studs

All high-strength bolts shown on the plans shall be ASTM F3125 type A325, high-strength bolts unless otherwise noted and tightened to slip critical criteria.

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Finished body bolts are to meet the requirements of ASTM A449 or SAE J429 GR5 cap screws. Bolts shall have finished bodies and regular hexagonal heads. Holes for finished body bolts are to be individually reamed for a clearance of not more than 0.010 inch (0.25 mm) larger than the actual diameter of individual bolts for that hole. Finished body bolts shall be tightened to slip critical criteria.

Turned bolts, and studs are to be provided with turned shanks, cut threads, and finished washer-faced hexagonal heads. For the finished shank of all turned bolts, and studs, use 1/16 inch (1.6mm) larger in diameter than the diameter of the thread. Determine the head and nut dimensions based on the thread diameter unless otherwise noted. For the shanks of all turned fasteners, use a Class LC6 fit in the finished holes in accordance with ANSI B4.1. The material for the turned fasteners shall meet the requirements of ASTM A449 unless otherwise noted. Turned bolts shall be tightened between 50% and 70% proof strength.

Dimensions of all bolt heads, nuts, and hexagonal head cap screws are to conform to ANSI/ASME B18.2.1, Square and Hex Bolts and Screws, and ANSI/ASME B18.2.2, Square and Hex Nuts.

Provide heavy series heads and nuts for turned bolts, cap screws, and turned studs.

Dimensions of socket-head cap screws, socket flat-head cap screw, and socket-set screws are to conform to ANSI B18.3, Socket Cap, Shoulder, and Set Screws. Unless otherwise called for on the plans or specified herein, make the screws of heat-treated alloy steel, cadmium-plated, and furnish with a self-locking nylon pellet embedded in the threaded section. Set screws are to be of the headless, safety type with threads of the coarse thread series and having cup points. Do not use set screws to transmit torsion nor as the fastening or stop for any equipment that contributes to the stability or operation of the bridge.

Fabricate all threads for bolts, nuts, and cap screws to conform to the coarse thread series having a Class 2 tolerance for bolts and nuts or Class 2A tolerance for bolts and Class 2B tolerance for nuts in accordance with the ANSI/ASME B1.1, Unified Inch Screw Threads.

Spot face all bolt holes through unfinished surfaces for the head and nut, square with the axis of the hole.

Unless otherwise called for or required to account for fabrication tolerances, sub drill all bolt holes in the machinery parts for connecting these parts to the supporting steel work at least 1/32 inch (0.8 mm) smaller in diameter than the bolt diameter and ream assembled for the proper fit at assembly or at erection with the steel work after the parts are correctly assembled and aligned.

Furnish positive locks of an approved type for all nuts for any fastener which may be tightened below slip critical. Use of double nuts, jam nuts, and lock wire are preferred.

Furnish a hardened plain washer at each end of finished body high-strength bolts meeting the requirements of ASTM F436.

Provide cotters conforming to the SAE standard dimensions and made of half-round stainless steel wire, ASTM A276, Type 316.

Use only fasteners manufactured in the United States with the property class and source identification appearing on the top of head.

98-1.02D Keys and Keyways

Keys and keyways shall conform to the dimensions and tolerances for square and rectangular keys of the ANSI Standard B17.1, Keys and Keyseats, unless otherwise specified. All keys shall be effectively held in place, preferably by setting them into closed-end keyways milled into the shaft. The ends of all such keys shall be rounded to a half circle equal to the width of the key. Keyways shall not extend into any bearing. If

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two keys are used in a hub, they shall be located 120 degrees apart and in line with wheel arms where practicable.

Unless otherwise specified herein or on the Plans, keys shall be machined from alloy-steel forgings, ASTM A668 M, Class K.

98-1.02E Bearings and Bushings

All split bearings shall have one half fitted to the other half as shown on the Plans. The surface between the cap and the base shall be accurately machined. All caps shall be securely bolted to the bases with turned bolts and double nuts. All caps and bases shall be provided with double-flanged bushings securely held against changing position under load by hexagonal-head, steel cap screws, unless otherwise shown on the Plans. All bushings shall fit the inside bore and end faces of the base and cap, with an ANSI Class LC1 clearance and location fit, and shall fit the shaft journals, with an ANSI Class RC6 running fit. All caps shall be provided with a tapped hole for lifting eyebolt, which shall be furnished for the purpose.

Bushings for split bearings shall be finished-bored with the caps in place and with 1/4-inch thick rolled bronze or brass liners. At least 1/8-inch of the liner thickness shall be of laminated construction capable of adjustment in increments of 0.003 of an inch. The edges of the liners toward the shaft journal shall be cut to fit the shaft shoulder fillets where they occur and shall be cut square and flush with the bushing flange if there is no change in shaft diameter. Except for a short distance from each end, the inside edges of the liners shall be cut back to form a grease groove along the shaft. All bolt holes shall be drilled through the liners.

For split bearings, each half bushing shall have machined double oval grease grooves connecting with the ends of the liner grooves and intersecting at the center of each half bushing, unless otherwise shown on the Plans. All grease grooves shall be precision machine-cut and smooth. The corners of all grooves shall be rounded to a radius of not more than half the width of the groove.

Anti-friction bearings shall be sized for a B-10 life of 40,000 hours as defined by ABMA for the ratings shown on the Plans.

Pillow block bearings shall be, adapter mounted, self-aligning expansion and non-expansion types as called for on the drawings. Housings shall be cast steel and capable of withstanding the design radial load in any direction, including uplift. Bases shall be cast without mounting holes. Mounting holes shall be drilled from the solid at assembly with the supporting steel work. Seals shall retain the lubricant and exclude water and debris. Cap bolts on pillow blocks shall be high-strength steel. The cap and cap bolts shall be capable of resisting the rated bearing load as an uplift force.

98-1.02F Shaft Journals

All journal bearing areas on shafts and pins shall be accurately turned, ground and polished with no trace of tool marks or scratches on the journal surface or adjoining shoulder fillets. Burnishing of the shaft journal areas and adjoining shoulder fillets will be acceptable in lieu of grinding and polishing, provided the burnishing is done with a Stellite roller or equal which has been finished to a mirror surface. Journal diameters shall be finished to the limits of an ANSI Class RC6 running fit.

98-1.02G Open Gearing

Spur gears shall have 20-degree full-depth, involute cut teeth in accordance with the proportions of the ANSI/AGMA 201.02, Tooth Proportions for Coarse-Pitch Involute Spur Gears, unless otherwise specified herein or shown on the Plans.

The teeth of all gears shall be cut from solid rims or blanks. The sides and peripheries of all gears and pinions shall be finished, and the pitch circle shall be scribed on both sides not less than 0.02-inch-deep

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with a V-pointed tool. The working surfaces of all gear teeth shall be true to the proper outline, accurately spaced on the true pitch circle, exceptionally smooth, and free from planing or milling-cutter ridges. Cutter burrs shall be removed from all edges of the teeth, and the top edges of all teeth shall be rounded to a 1/32-inch radius.

Except as otherwise provided herein or on the Plans, all gears shall be cut and mounted to meet the requirements for accuracy of ANSI/AGMA Standard 2000-A88, Gear Classification and Inspection Handbook. The AGMA quality number shall be stated on the applicable shop drawings. Open gearing shall conform to AGMA Quality No. 7 or higher.

Bevel gears shall have 20-degree full-depth, involute cut teeth in accordance with the proportions of the ANSI/AGMA 2005-B88, Design Manual for Bevel Gears.

98-1.02H Enclosed Speed Reducers

Speed reducers shall be standard models from one manufacturer, with sizes, ratios and construction details as shown on the Plans.

Speed reducers shall be designed to meet all requirements of ANSI/AGMA Standard 6010, manufactured in accordance with the requirements of AGMA and given nameplates with the following information:

Size

Ratio

Service Power Rating

High Speed Shaft RPM

Service Factor

Lubrication Specification

Gear teeth shall be through hardened and conform to AGMA Quality No. 8 or higher. Casehardened gears shall not be used to drive bridge machinery.

Gears shall have spur, helical, herringbone or bevel teeth, bearings shall be antifriction type, and housings shall be steel castings or welded steel plate, which shall be stress relieved. The inside of the housings shall be sandblast cleaned prior to assembly and be protected from rusting. Exact ratios shall be furnished where specified.

Speed reducers shall be able to withstand a momentary overload equal to three (3) times the rated full load torque of the driving motor(s) without any component reaching 75 percent of its yield strength.

Lubrication of the gears and bearings shall be automatic when the unit is in operation.

It is preferable that a bath lubrication system be utilized. In a bath lubrication system, all components in the speed reducer, which require lubrication, are partially submerged in an oil bath.

When the configuration of gears and bearings prevent bath lubrication, a splash lubrication system should be used. Splash lubrication systems shall continuously lubricate all gears and bearings properly. Oil feed troughs may be used to supply oil to bearings and gears, which are above the bath. Splash lubrication systems shall be designed such that equal lubrication is supplied to each internal component for both directions of operation.

If a pressurized lubrication system is required for the reducer, a redundant secondary lubrication system shall be provided. The secondary system shall operate at all times when the primary system is functioning.

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Inspection ports on reducers shall provide for inspection of all gears, bearings, and other internal devices. The ports shall be located above the oil level, if practicable, so that oil draining is not required for inspection. The port shall be sized such that minor repairs could be made to reducers without requiring housing disassembly. Ports shall be properly sealed with seals that do not require replacement when ports are opened.

Reducers shall be furnished with moisture trap breathers, oil fills, break proof glass oil level indicators, drains and inspection ports.

Moisture-trap breathers shall be located above maximum oil levels in all positions of the reducer during operation, and its piping shall enter the unit at the highest point possible. Breathers shall not be mounted in bearing caps.

Oil level indicators shall be mounted in locations that can be easily viewed by maintenance crews. On reducers in which the oil level varies by more than 1/2-inch per 50°F temperature change, the sight glass shall be graduated. The indicator shall be vented back to the case. Sight glasses shall be of rugged construction and protected against breakage.

Oil drains shall be located at the lowest point possible. The drain shall have a hand operated level which can be locked in the closed position.

Oil sampling cocks shall be located in accessible positions on the reducers. There shall be two sampling cocks, one located at the lowest level of oil and one just below the upper oil level.

Speed reducers shall have provisions for oil expansion due to churning and temperature change.

Grease lubricated reducer bearings shall be furnished with separate fill and purge fittings, readily accessible after installation of reducer. Grease lubricated reducer bearings shall be furnished with internal seals between the bearing housing and reducer cavity, preventing grease and gear oil from interacting.

On shaft extensions, bearing shaft ring seals shall be mechanical type oil seals which compensate for wear. Dual lip spring loaded seals are preferred.

Shaft extensions for the various reducers shall be of the arrangement, lengths, and diameters shown on the Plans. Couplings shall be shrink fitted on the shafts in the shop.

On open-ended lower bearings of vertical shafts, extra precaution must be taken to prevent oil leakage. A dry-well arrangement in which the bearing is isolated from the oil bath is preferred. Grease lubrication of the lower bearing is required in these applications.

Pinions shall be proportioned so that the root diameter of the pinion is not smaller in diameter than the diameter of the journals for the pinion shaft.

Base plates for the reducers shall be large enough to give unobstructed access for drilling and reaming the mounting holes from above the unit.

Speed reducers driving bridge machinery and electrical controls shall be shown on Plans or approved equal.

The manufacturer shall submit for approval by the Engineer a certified print of each speed reducer showing a minimum of the following:

- All external mounting dimensions including shaft sizes, bores, and keyways where required.

- Internal Plans showing each reducer component with part numbers.

- The ratings that will appear on the nameplate.

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Location of all lubricant connections and details of any external lubrication piping.

Lubrication recommendations.

The manufacturer shall submit for approval by the Engineer computerized calculations showing conformity to the requirements of the AGMA Standard Practice specified. The approved reducer prints and design calculations must be made available to the County of San Joaquin prior to construction of the unit.

98-1.02J Hubs and Bores

The hubs of all gears, wheels, and couplings shall be finished on both faces and polished where the hub face performs the function of a collar to prevent shaft movement. The hubs shall be bored concentric with the rims of gears and wheels or with the outside of couplings. All hubs shall have an ANSI Class FN2 medium shrink fit on the shafts, unless otherwise specified.

98-1.02K Shims

Where shown on the Plans, all machinery shims required for leveling and alignment of equipment shall be stainless steel, neatly trimmed to the dimensions of the assembled parts and drilled for all bolts that pass through the shims.

Shims shall be Stainless Steel ASTM A240 Type 316 and furnished without bolt holes. Holes in shims shall be drilled and reamed to the same tolerance as the connected parts at final assembly. Shims greater than 1/2-inch shall include one solid plate of thickness equal to 1/2-inch less than total shim thickness.

Shims shall be shown and fully dimensioned as details on the shop drawings. Shims with open side or U-shaped holes for bolts will not be permitted. No shims shall have less than two holes for bolts, unless specified otherwise in the Plans. Bolt holes shall not be punched at machine shop to prevent distortion of the shims.

In general, sufficient thickness shall be furnished to secure 1/64-inch variations of the shim allowance plus one shims equal to the full allowance. The 1/2-inch nominal shim pack consists of the following thickness variations: one 1/4-inch, one 1/8-inch, one 1/16-inch, one 1/32-inch and two 1/64-inch.

98-1.02L Welding

Welding required for machinery shall be done in accordance with the Bridge Welding Code. ANSI/AASHTO/AWS D1.5 and all interim revisions published by AASHTO as of the bid opening date. Stress relieving will be required only specified. All welds used to fabricate machinery shall be completely tested by ultrasonic inspection (ASTM E164-74) per AWS D1.5 for compression welds unless otherwise noted. All machining shall be performed after welding and stress relieving.

Welding joint sizes and details shall be shown on working drawings. Where multi-pass welds are required, welding procedures shall be submitted with shop drawings. Distortion during fabrication shall be kept to a minimum by the use of welding fixtures and proper welding procedures.

98-1.02M Machinery Guards

Machinery guards shall be provided for all moving parts readily accessible to personnel and where otherwise required by OSHA or ANSI B15.1, Safety Standard for Mechanical Power Transmission Apparatus, including but not restricted to the following:

Couplings

Open Gears

Unused shaft extensions

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Shafts at platform and roadway level

Brakes

Instrument drives and limit switches

Machinery guards shall not be required for the rack segments and pinions. Machinery guards shall be constructed to comply with the applicable requirements of ANSI B15.1, Safety Standard for Mechanical Power Transmission Apparatus.

Unless otherwise indicated or specified, all machinery guards shall be constructed of stainless steel having minimum thickness of No. 12 Gauge and shall have provision for removal without requiring disassembly of any machinery component.

Machinery guards shall be provided with removable hinged or bolted covers for access to lubrication fittings enclosed by the guard. Phenolic nameplates shall be provided on these covers with lubrication instructions.

Machinery guards shall be painted Safety Orange.

98-1.02N Flexible Couplings

Couplings shall be of the type as shown on the Plans and shall include grid type, gear type, and others as needed.

Couplings shall, in general, be finish-bored and have keyways cut by the Coupling Manufacturer to dimensions and tolerances established on the shop drawings and then shipped to the manufacturers of the various components for shop installation on the shafts.

Grid-type, self-aligning, fully flexible, torsionally flexible couplings shall be used to connect electric motors to machinery components. the grid-type couplings shall have steel hubs, alloy steel grids, and steel or aluminum covers. Bolts in the covers shall be shrouded.

Gear-type, self-aligning, full-flexible couplings or semi-flexible couplings with floating shafts shall be used to connect all machinery components, except where other types of couplings are called for on the Plans. All couplings shall have shrouded bolts. The gear-type couplings shall be made of forged steel, have curved face teeth, and shall provide for at least a plus and minus of 3/4 degree misalignment per gear mesh.

Special couplings shall be as shown on the Plans.

Couplings shall be standard products of an established Manufacturer.

98-1.02O Lubrication

Lubrication Fittings: All bearings and surfaces requiring lubrication, other than gear teeth, shall be fitted for a pressure system of lubrication using NPS 1/4-inch giant button head fittings, unless otherwise indicated on the Plans. The fitting for greasing bushed bearings shall be tapped into the housing or connected thereto by stainless steel seamless pipe, which shall be tapped into the housings so that grease will be discharged directly through the housing, shims, bushing, and into the grease grooves for distribution. All grease fittings shall be conveniently located for greasing, and if necessary, shall be connected to the points requiring lubrication from convenient lubrication stations by NPS 1/4-inch stainless steel seamless pipe – schedule 80 with stainless steel threaded pipe fittings – 3000 psi. All stainless steel pipe and fittings shall meet ASTM A312 and ASTM A182, respectively. All pipe extensions shall be kept as short as practical, shall be securely supported at fittings and intermediate points and located so that it shall be protected from injury. All lubricating equipment shall be installed in perfect condition.

Not more than two sizes of fittings shall be used. The large size shall be used wherever possible, and the smaller size shall be used for motor bearings and other small devices. Pressure fittings shall be rated at a

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minimum of 10,000 psi. Fittings shall contain a steel check valve that will receive grease and close against back pressure.

Immediately after the completion of fabrication, all fitting locations shall be plugged until components are installed and regular lubrication is started. The plugs shall then be replaced with the proper grease fittings. During installation, the Contractor shall lubricate all rotating and sliding parts of the machinery and fill all gear reducers, bearing housings, and flexible couplings with lubricants indicated on approved lubrication charts.

Maintenance and lubrication literature for each machinery component shall be kept in the Control House in a heavy bound binder.

98-1.02P Spare Parts

The contractor shall provide a complete list of each and every shaft and coupling seal used at the job, including current part number and manufacturing of each seal furnished plus sufficient generic description and dimensions to order seals in the future when current models/manufacturers may no longer be identifiable.

In addition to the spare parts described under other items the following spare parts shall be provided:

One grid of each grid-type coupling.

One complete set of gaskets for every flexible coupling.

Five lubrication fittings of each different type and size used.

98-1.03 CONSTRUCTION

98-1.03A Shop Fabrication

The Contractor shall give no less than ten (10) working days notice to the Engineer of the beginning of work at foundries, forge, and machine shops so that inspection may be provided. No materials shall be cast, forged, or machined before the Engineer has been notified where the orders have been placed.

The Contractor shall furnish all facilities for inspection of material and workmanship in the foundries, forge, and machine shops and the Inspector designated by the Engineer shall be allowed free access to necessary parts of the premises. Work done while the Inspector has been refused access or presented in a manner that prevents adequate inspection will automatically be rejected.

The Inspector shall have the authority to reject materials or workmanship, which do not fulfill the requirements of these Specifications.

Inspection at the foundries, forge, and machine shops is intended as a means of facilitating the work and avoiding errors. It is expressly understood that inspection will not relieve the Contractor from any responsibility in regard to imperfect material or workmanship and the necessity for replacing defective materials or workmanship, which are delivered to the job site.

The Contractor shall furnish the Engineer with a copy of all orders covering work performed by subcontractors or suppliers.

Unless otherwise provided, the Contractor shall furnish without additional charge test specimens as required, and all labor, testing machines, tools, and equipment necessary to prepare the specimens and to make the physical tests and chemical analyses required by material specifications. A copy of all test reports and chemical analyses shall be furnished to the Engineer.

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Their acceptance of any material or finished parts by the Engineer shall not be a bar to their subsequent rejection if found defective. Rejected material and workmanship shall be replaced or made acceptable by the Contractor at no additional cost.

98-1.03B Shop Inspection and Testing

Machinery components shall be shop assembled to verify their correct fit prior to shipment. Measurements required for each assembly are shown on the Plans and/or described in individual pay items.

The speed reducer manufacturer shall shop test the reducers. The Contractors shall submit a testing procedure that will show how the test is to be performed, layout of the apparatus to be used, equipment to be used as well as forms that will be filled out to record the test. This procedure is to be reviewed and approved by the Engineer prior to testing being performed.

Except for instrument drive reducers, testing shall be performed on all reducers.

Before the start of the test, the following measurements shall be taken and documented. All documentation shall be submitted with the certificate of compliance:

- Temperature of ambient air.

- Temperature of oil near bottom of crankcase shall preferably not rise more than 40°F from ambient during the test. Oil temperature exceeding 150°F shall not be acceptable.

- Surface temperature of each bearing adjacent to shaft seals shall not rise more than 100°F from ambient during the test. Temperature above the rating of the seals or bearings is unacceptable.

- Sound level at point above and 3 feet distant from the edge of housing of unit shall not exceed 90dbA.

All reducer testing shall orient in the same mounting position as installed on the bridge.

Each reducer shall be first tested by running at no load and at 100% rated motor RPM for at least 2 hours in each direction (4 hours total continuous operation). Readings of measurement 4a through 4d above shall be taken at 30-minute intervals for the full duration of the test.

Each reducer shall be tested by running at 150% rated full load motor torque and at 100% rated motor RPM for 1/2-hour in each direction (1-hour total continuous operation). Readings of measurements 4a through 4d shall be taken at 15-minute intervals for the full duration of the test.

The tests shall be performed with the reducer filled to the dip-stick mark, with new oil of the type the manufacturer recommends on the lubrication charts for normal operation.

The reducer shall be checked for the following during both the load and no load testing:

- Any excessive or unusual noise

- Excessive bearing clearance

- Excessive vibration

- Excessive temperature rise

The proper lubrication of the oil system shall be demonstrated during the shop test.

Gear teeth shall be checked for proper distribution of load. This can be measured with the help of tooth contact tape applied to each gear. These tapes will be preserved in the records to be submitted with the Certificate of Compliance.

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Bluing dye can be used as an alternate so long as all teeth are coated and digital photographs taken before and after the tests are included with the report.

No testing shall be performed on the reducer without a representative of the Owner being present. Any testing not witnessed by the Engineer or the Owner's representative shall not be acceptable.

If any condition in 9a through 9d is observed, the manufacturer shall be put on notice by the Engineer of the observation. The manufacturer shall then determine the cause and corrective action necessary to correct the condition and submit a report to the Engineer for review and acceptance. A retest of the reducer will be required to show that the repair has corrected the condition and the Engineer or Owner's representative will determine if the reducer is acceptable.

The County of San Joaquin reserves the right to reject the reducer at any time for any nonconformance that is determined to be detrimental to the proper function and operation of the reducer. Repairs to be performed on the reducer shall be reviewed and accepted by the Engineer prior to the work being performed.

The Contractor is responsible for furnishing all materials required for the test including, but not limited to motor, test stand, and oil.

Additional testing of speed reducers may be specified under individual pay item sections.

98-1.03C Defective Material and Workmanship

All machinery rejected during inspection and testing that is not made acceptable shall be removed from the work site and replaced without additional cost.

Delays resulting from the rejection of material, equipment or work shall not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation shall be corrected by the Contractor without cost. In the event that the Contractor does not make the corrections in a timely manner, the County of San Joaquin reserves the right to make necessary corrections with its own forces and charge the resulting costs to the Contractor.

98-1.03D Delivery and Storage

98-1.03D(1) Protection for Shipment

Machinery parts shall be cleaned of dirt, chips, grit, and all other injurious materials prior to shipping and shall be given a coat of corrosion-inhibiting preservative.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion shall be coated as soon as practicable after finishing with a rust-inhibiting preservative. Excepting unfinished metal surfaces inside of gear reducers, this coating shall be removed prior to operation and from all surfaces prior to painting after erection.

Any interface between stainless steel or aluminum and Structural Steel shall receive an Engineer approval coat of zinc-chromate primer prior to assembly.

Machinery parts shall be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage.

Shaft journals that are shipped disassembled from their bearings shall be protected during shipment and before erection by a packing of oil-soaked rags secured in place by burlap and covered with heavy metal thimbles or heavy timber lagging securely attached. Every precaution shall be taken to ensure that the bearing surfaces are not damaged and that all parts arrive at their destination in satisfactory condition.

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Pillow blocks with anti-friction bearings that are shop mounted on shafts shall be supported independently of the shaft support to prevent false brinelling during shipment.

Assembled units shall be mounted on skids or otherwise crated for protection during handling and shipment.

98-1.03D(2) Packaging and Delivery of Spare Parts

Spare parts shall be protected for shipment and prolonged storage by coating, wrapping, and boxing.

All spare parts shall be durably tagged or marked with a clear identification showing the designation used on the approved shop drawing.

Boxes for spare parts shall be clearly marked on the outside to show their contents. Spare parts shall be delivered to a location designated by Bridge Maintenance.

98-1.03D(3) Guarantee and Warranties

Manufacturer's warranties or guarantees on equipment, materials or products purchased for use on the Contract which are consistent with those provided as customary trade practice, shall be obtained by the Contractor and, upon acceptance of the Contract, the Contractor shall assign to the County of San Joaquin, all manufacturer's warranties or guarantees on all such equipment, material, or products furnished for or installed as part of the Work.

The Contractor shall warrant the satisfactory in-service operation of the mechanical equipment, material, products, and related components. This warranty shall extend for a period of one year following the date of final acceptance of the Project.

98-1.03E Erection

98-1.03E(1) General

For each stage of construction, the Contractor shall submit calculations, drawings, and procedures detailing his intended scheme for installing all machinery. Machinery installation shall be done in a coordinated manner to ensure all the machinery components fit the adjacent material furnished under other items.

98-1.03E(2) Alignment and Bolting

The order of assembly and alignment of bridge machinery shall start at the final driven components and worked back to the prime mover. The Contractor shall limit the finality of some stage machinery installations so that proper alignment of mating components is met prior to final reaming and fastening.

All open gearing shall be aligned such that backlash is within tolerance and at least the center 50% of the effective face width of each pair of meshing teeth is in contact. The cross mesh shall not exceed 0.01 inch per 6 inches of face width. All open gear measurements shall be submitted to the Engineer for review and approval. The measurements include backlash, cross-mesh alignment, tooth valley gap and face contact. The type of bluing or lubricant used for face contact measurements shall be submitted to the Engineer for approval prior to any measurements. The measurements shall be performed at a minimum of 8 equally spaced span positions ranging from fully open to fully closed.

All parts of the machinery shall be match marked for proper assembly and correct orientation. Before final drilling or reaming, all parts shall be adjusted to exact alignment by means of shims. If required, tapered shims shall be provided at no additional cost. Installation, alignment, and shimming of the electric motors, and devices such as limit switches and encoders, shall be included with the machinery for such erection. After final alignment and bolting, all parts shall operate smoothly.

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The span shall not be operated by the bridge machinery until all components are installed, in final alignment and bolted as approved by the Engineer.

Bolt holes in structural steel for connecting machinery shall, in general, be drilled from the solid after final alignment of the machinery. Sufficient erection holes, subdrilled 1/4-inch undersize for undersized temporary bolts, may be used for erection and alignment of the machinery. When the machinery is aligned in its final position, the temporary bolts shall be removed one bolt at a time, full-size holes for the remaining bolts shall be drilled or subdrilled and reamed, and the full-size bolts installed.

Bolt holes in structural steel, shims, and machinery components shall be drilled and reamed assembled to assure accurate alignment of the hole and accurate clearance over the entire length of the bolt within the specified limit. Hand held reamers are not considered accurate enough and the Contractor shall assume that a reaming jig shall be used to keep the bolt hole cylindrical. This jig shall be of structural steel, fixed to the drill and secured to the work preventing the reamer shaft from deviating. Holes shall be checked with a bolt hole micrometer to assure uniform diameter.

ASTM A449 bolts shall be torqued to the same tension required for ASTM F3125 bolts specified in the Standard Specifications.

Torques for other classes of bolts shall be proportioned to their strength and shall be indicated on the erection drawings.

98-1.03E(3) Coatings

Threads for turned bolts shall be coated with anti-seize compound before assembly with nuts to prevent corrosion or galling and to facilitate future removal if necessary.

98-1.03E(4) Edges and Corners

All edges and corners of machinery parts, sheet metal work, bed plates, and fabricated supports that are exposed in the finished work shall be rounded or chamfered. All burrs or other surface defects that could be injurious to workers erecting or maintaining the bridge machinery shall be removed.

98-1.03E(5) Personnel and Facilities

The machinery shall be erected and adjusted by competent millwrights skilled in the type of work involved. They shall be provided with all necessary measuring and leveling instruments as may be required.

98-1.03F Painting

98-1.03F(1) General

Cleaning and painting of all unfinished surfaces of machinery shall comply with requirements of Section 91 of the Caltrans Standard Specification. A three coat system for metal shall be used. The Contractor shall submit for review with the working Plans an outline of painting materials and methods.

98-1.03F(2) Shop Painting

All unfinished machinery external surfaces shall be cleaned with final surface preparation, prior to painting, done by blast cleaning to meet the requirements of SSPC-SP6 "Commercial Blast Cleaning" with the following exceptions:

- Flexible couplings

- Reducers

- Sleeve bearings with bushings in place

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Electric motors

Brakes

Limit switches

Other equipment with shaft seals

The equipment excepted by the Engineer

The expected machinery or equipment shall be cleaned with solvent and hand tools to meet the requirements of SSPC-SP2, "Hand Tool Cleaning" as depicted in SSPC VIS 1, "Guide to Visual Standard No. 1".

After proper surface preparation, all unfinished machinery surfaces except for the interior of gear housings, flexible couplings, and pillow blocks shall be given one shop coat of primer by hand brushing. The modified aluminum epoxy mastic primer, Carbomastic 15 or approved equal, shall be compatible with the paints selected for subsequent coats. Interiors of gear housings shall be protected with special oil-resistant crankcase paint or approved equal.

98-1.03F(3) Field Painting

After erection is complete, all machinery surfaces remaining exposed, except machine finished surfaces in sliding contact, shall be thoroughly cleaned with an approved high-flash solvent and given an immediate field coat. The epoxy polyamide intermediate, Carboguard 888 or approved equal, shall be compatible with the finish coat. The intermediate coat shall be applied by hand brushing and shall be resistant to weathering (marine environment) and abrasion and free of lead.

After field testing is complete but prior to final acceptance of machinery, all machinery surfaces remaining exposed, except machine finished surfaces in sliding contact, shall be re-cleaned with an approved high-flash solvent and given a finish field coat. The aliphatic acrylic-polyester polyurethane, Carbothane 133 LH or approved equal, shall be compatible with the previous coats. The finish coat shall be applied by hand brushing, which shall color code to distinguish between fixed and moving parts. The following colors shall be used:

Federal Safety Orange: Except for machine finished surfaces in sliding contact, for all moving parts of the machinery such as shafting, couplings, and the side of gears and brake wheels.

Federal Safety Green: For all stationary parts of the machinery. Machinery component fasteners mating with machinery supports shall be painted the same color as the structural steel.

Paint for the finish coat shall be high-gloss, resistant to weathering and abrasion and conform to OSHA color requirements of the Safety Color Code for Marking Physical Hazards, ANSI Z53.1. The brand and colors shall be submitted to the Engineer for approval. The color for each component shall be indicated on the assembly shop drawings or separate paint drawings.

The Contractor shall place cautionary signs in the Control House, which shall explain the color code. Details of the signs giving text, dimensions, and materials shall be placed on a shop drawing.

The Contractor shall take special care to avoid painting of machinery surfaces which are in normal rubbing contact. All nameplates, legend plates, and escutcheons mounted on machinery shall be masked for protection from paint. Lubrication fittings shall be kept clog-free.

98-1.03G Contractor's Inspection

After erection is completed, the Contractor shall make a thorough inspection to ensure that all gears are

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clean and free of obstruction, that all parts are properly aligned and adjusted as closely as practicable without actual operation, that all bolts are properly tightened and that the span is properly balanced.

Inspection of tightened fasteners shall be in accordance with the County of San Joaquin Standard Specifications for Roads and Structures. The Contractor's inspection shall verify that field painting has been performed as specified herein. Touch-up painting shall be performed to correct all painting defects found during this inspection.

The Contractor's inspection shall verify that all enclosed gear housings are filled to the proper level, and all rotating and sliding parts are supplied with lubricants as recommended by the Manufacturers of the units. Typical products for the various locations are as follows:

Sleeve bearings and Pillow Blocks:

NLGI #2 Grease

Open Gears:

Open Gear Lubricant (Mobiltac 375 NC)

Specific Gravity, 72°F (22°C)	0.96
SUS @ 100°F	25,000
(cSt @ 40°C	5,000)
SUS @ 210°F	5,000
(cSt @ 100°C	1,100)

Enclosed Gear Reducers:

Refer to AGMA Standard 9005.D94 "Lubrication of Industrial Enclosed Gear Drives"

Gear Couplings:

NLGI #0 Grease

Grid Couplings:

NLGI #2 Grease

The Contractor shall be accompanied by the Engineer during his final inspection before field testing. On the basis of the results of this inspection, the Engineer shall determine whether the bridge is ready for field testing.

98-1.03H Field Testing

When the machinery and electrical equipment is ready for field testing, the Contractor shall meet with the Engineer to arrange a test schedule and shall keep available a complete crew of mechanics for a minimum of four working days in order to provide operation of the swing span for all tests and to make all adjustments and corrections which shall be required to complete the tests.

The Contractor shall prepare a field testing procedure, which shall be approved by the Engineer. The testing procedure shall be coordinated with the tests required for the electrical equipment and shall include measurements of power and current draw by the motors when operating under load as required hereinafter.

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The testing procedure shall include but not be limited to the verification of proper installation, alignment, fastening, and operation and/or final adjustment of the following:

Turning Machinery

Opening Machinery

Wedge Machinery

Stabilizing Machinery

Span Lock Machinery

When the machinery is ready for field testing, the bridge machinery shall be driven by the main electrical system through at least ten complete cycles.

Three phase kilowatts, single phase amperes, span position and motor RPM for all motors shall be recorded on a computerized data acquisition system. The recordings shall be for a complete span opening and closing cycle, with at least three cycles of data for each motor. The data acquisition system shall have 16-bit resolution and shall sample at a rate of 10 Hz. Minimum. Data shall be imported into Microsoft Excel format, and graphs shall be printed out on 11 x 17 paper. Time of day shall be on the X axis, and primary and secondary Y axis shall be chosen to best present the data. In addition, a CD shall be provided with all the raw data and all the Excel files.

During the test runs, each machinery assembly shall be inspected in its entirety to determine whether everything is in proper working order and fully meets the requirements of these Specifications, Plans and manufacturer's recommended tolerances. All test runs shall be performed in the presence of the Engineer. The temperature rise of all machinery components shall not exceed design ratings. If any tests show that any components are defective or inadequate, or function improperly, the Contractor shall make all corrections, adjustments, or replacements required before the final acceptance at no additional cost.

98-1.04 MEASUREMENT AND PAYMENT

98-1.04A General

General Machinery will not be measured for payment. All costs associated with furnishing and installing materials, labor, tools, and incidentals necessary to compete the work shall be included in the *Bridge Machinery* pay items.

98-2 BRIDGE MACHINERY

98-2.01 GENERAL

98-2.01A General

The work included under this item shall consist of the following:

REGROUT UNDER THE SOUTH SPAN LOCK BAR GUIDE

REPLACE ALL FLEXIBLE HOSES OF THE EAST AND WEST REST PIER MACHINERY SYSTEMS

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REPLACE THE HYDRAULIC POWER UNITS AND THE HYDRAULIC CABINETS OF THE EAST AND WEST REST PIER MACHINERY SYSTEMS

REPLACE THE CENTER WEDGE HYDRAULIC ACTUATORS (2)

REHABILITATE THE EXISTING RIGHT ANGLE GEAR REDUCERS (2)

Details and arrangement of all systems are shown on the Plans.

The work shall be in accordance with the requirements specified in "General Machinery".

The Contractor shall coordinate the work listed above with electrical work and structural work, as well as navigational and vehicular traffic closures and restrictions.

98-2.02 MATERIALS

98-2.02A General

The materials used to fabricate the machinery components shall be as shown on the Plans and in accordance with the requirements specified in "General Machinery".

98-2.02B Right Angle Gear Reducers

The existing gearboxes shall be rebuilt to a capacity as shown on the plans by the original equipment manufacturer as per the referenced quotation.

Take special care to maintain the thickness of the existing shims and replace the bolts in kind with bolts of the same fit as is existing to permit the gearbox to be reinstalled without being realigned.

The coupling hubs and flanged sleeve halves on the input and output shafts of the reducers may be replaced without replacing the other half of the couplings provided compatible equipment is provided.

The following is the existing name plate information

Manufacturer: Brad Foote Gear Works Inc. of Cicero, ILL

Serial no: G-5426

Size: 2RV1200-D

Ratio: 7.79:1

Service Factor 1.1

Input: RPM 28.5

HP Rating: 10

Date: 12/94

Gallons of oil: 45

AGMA lubricant no: 4EP/5EP

The following is the rehabilitated name plate information

Manufacturer: Brad Foote Gear Works Inc. of Cicero, ILL

Serial no: TBD

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Size: 2RV1200-D

Ratio: 7.79:1

Service Factor 1.5

Input: RPM 28.5

HP Rating: 12.5

Date: TBD

Gallons of oil: TBD

AGMA lubricant no: TBD

98-2.02C Self Contained Hydraulic Actuators for Center Wedges

Hydraulic actuators shall interface with the existing control and supply circuit however shall be provided with new limit switches where applicable. It shall be a functionally in kind replacement.

Actuators and wedge linkages shall be adjusted to drive the wedges into firm contact to take traffic loads however shall not be used to carry the bridge deadload.

Hydraulic actuators for the center wedges are as manufactured by one of the following companies or an equivalent quality approved equal:

Electro Hydraulic Machine

Parker Hannifin

Bosh Rexroth

98-2.02D Hydraulic Power Unit (HPU)

The HPU shall conform to ISO 4413.

All HPU components shall be arranged to be readily accessible for adjustment and maintenance.

The reservoir shall be a JIC configuration. The reservoir shall be of heavy-duty welded 316 SS construction. Painting of interior surfaces is not permitted. The exterior of the reservoir shall be painted with an epoxy-based paint that is compatible with the hydraulic fluid or left bare. The reservoir shall be structurally rigid to resist warpage and damage from the mounting of equipment on the reservoir top, handling during shipping, and erection at the bridge site. The reservoir shall have drains which allow a complete fluid change without disconnecting any hydraulic components. The reservoir shall have a fill port with a filter. The reservoir shall have an additional port to allow for a heat exchanger and/or other accessory to be added.

The reservoir shall contain a fluid conditioning magnet. The magnet shall extend from the top of the fluid level to 1" from the bottom of the reservoir and shall be removable without draining the reservoir.

The immersion heater shall be of the electric resistance, dry-well type. The watt density of the immersion heater shall not exceed the acceptable limits for the hydraulic fluid. the immersion heater shall maintain the fluid at a temperature of 100°F. The immersion heater shall be sized by the manufacturer to maintain the minimum acceptable fluid temperature when the ambient temperature is 32°F. The immersion heater shall be controlled by automatic thermostats.

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The level indicator with integral thermometer shall be compatible with the hydraulic fluid. Permanent markings shall be provided showing the acceptable range of fluid levels and temperatures.

98-2.02E Hydraulic Power Unit Hardware

All fastener bolts, nuts, washers and other mounting hardware mounted on the hydraulic power unit shall be of a similar material, i.e. type 316 stainless steel, unless otherwise approved.

Expansion anchors for fastening hydraulic equipment or brackets to concrete surfaces must be wedge type anchor bolts (unless otherwise specified), which must be locked in place by an expansion wedge as the nut is tightened. All parts of the expansion anchors must be series 300 stainless steel. Holes for the anchors must be drilled to the manufacturer instructed size and depth using carbide tipped masonry drills.

98-2.02F Hydraulic Cylinders and Accessories

Hydraulic cylinders shall be as specified on the plans or approved equal.

Hydraulic cylinders shall conform to ISO 4413, Section 5.4.2.

Protective flexible rod boots shall be provided for all cylinders that are normally extended.

98-2.02G Accumulators

Gas accumulators shall be charged with nitrogen, or other inert gas as approved by the Engineer.

98-2.02H Hydraulic Piping and Tubing

All hydraulic piping material shall be seamless, low carbon stainless steel conforming to ASTM A312, type 316L. All hydraulic tubing material shall be seamless, annealed, low carbon stainless steel conforming to ASTM A269, 316L, ISO 10763, and ANSI B31.1 standards. Maximum tubing size shall be 1.5 inches, nominal.

Pipe and tubing shall be designed such that the allowable working stresses established in ASME B21.1 are not exceeded at the maximum working pressure. The maximum allowable flow velocities are as follows:

Suction Lines – 5 feet/second

Pressure Lines – 15 feet/second

Return Lines – 15 feet/second

98-2.02I Hydraulic Pipe and Tube Supports

Hydraulic pipe and tube supports shall be a cushion clamp system as manufactured by the Hydra-Zorb Company or approved equal. All clamps, fasteners, and channels shall be 316 series stainless steel. Support spacing and locations shall be in accordance with ISO 4413, Section 5.4.6.

98-2.02J Pipe/Tube Fittings

All pipe and tube fittings shall be similar to the pipes/tubes in which they are fitted. Acceptable welded pipe fittings shall be 37° flare type or SAE straight thread for sizes up to and including 1.5-inch NPS. Mating 37° surface shall have an O-ring and O-ring boss for a leak-free connection. For connections greater than 1.5-inch NPS, butt welded or welded four-bolt flanges utilizing a captive O-ring pressure seal system shall be used. Flange fittings materials shall be similar to the flange materials. Flange bolts shall be provided with locking washers. Pipe threads shall not be used on any portion of the system where

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pressures exceed 200 psi. where pipe threads are permitted (200 psi and below), pipe sealant is not permitted.

Tube connections shall use 37° flared fittings. The mating 37° surface shall use an O-ring and O-ring boss to provide a leak-free connection. The maximum allowable tubing size shall be 1.5-inch OD (outside diameter).

The following standards apply for pipe and tube fittings:

SAE J514 for JIC 37° fittings

SAE J514 for O-Ring Boss (ORB) fittings

SAE J1453 for O-Ring Face Seal (ORFS) fittings

SAE J518 for Flanges

98-2.02K Flexible Hose

Flexible hose material shall be hydraulic duty. SAE J517 shall be used to determine the maximum allowable operating pressure for the hose. Hoses shall be designed for an operating pressure of 5,000 psi and burst pressure no less than 10,000 psi. Hose assemblies shall be shop assembled by the hose supplier.

Hose end connections shall be Type 304 stainless steel for 37° female JIC swivel connections or Type 316 stainless steel for four-bolt, O-ring flange connections. Flange dimensions shall be in accordance with SAE J518. Flange bolts shall be provided with locking washers. Hose fittings shall conform to SAE J516 standards.

Flexible hoses shall be restrained or confined in all cases where a hose failure would constitute a hazard.

98-2.02L Valves

Valves shall conform to ISO 4413, Section 5.4.4. All valves required for span movement shall be provided with a manual override.

Adjustable valves shall be equipped with protective caps or locking nuts on the adjusting screws to prevent unintentional maladjustment.

Directional control valves and blocking valves shall be provided with adjustable pilot control chokes to increase valve opening and closing time for shock and surge pressure control.

98-2.02M Filtration and Fluid Conditioning

Filtration and fluid conditioning shall be in accordance with ISO 4413. All filters and strainers shall be equipped with an indicator to show when the filter requires servicing. Filters shall provide the degree and quality of filtration to meet the cleanliness requirements provided herein. Bypass valves shall be provided as required by the Plans. Filter flow capacity ratings shall be as recommended by the pump manufacturer.

98-2.02N Pressure Indicators

Gages shall be of durable construction. Dial faces shall be clearly calibrated for pressure ranges 50% and beyond the maximum design operating pressures of the hydraulic system. Gages shall be accurate and shall permit continuous monitoring. Gages shall have a minimum of 4 inches and preferably 6 inches. Shutoff valves shall be provided at each gage.

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Portable gages shall be provided for maintenance and adjustment of the hydraulic system. The pressure ranges shall cover all possible values that will be needed for the system. One gage shall be provided for each pressure range such that the test pressure will be within the mid-half of the total pressure range of the gage. Connections for portable gages shall be of the quick-disconnect type. Test ports shall be equipped with removable, protective caps, secured by chains to be component. Shutoff valves shall be provided at each test port. Test ports shall be provided for all locations that can be pressurized without a permanent pressure gage indicating the pressure.

98-2.02O Nameplates

Hydraulic cylinders shall have engraved permanent stainless steel nameplates which are securely attached to the head of the cylinder. The nameplate shall clearly indicate the manufacturer, model number, cylinder bore, rod diameter, stroke length, pressure rating, and a list of nonstandard features.

Nameplates shall be provided for each control valve indicating the name and function of the valve. Nameplates shall either be engraved stainless steel or a lamicoid nameplate showing white characters on a black background or black characters on a white background.

Nameplates shall be provided for each adjustable hydraulic component. The nameplate shall provide the name, function, and set point for the component. Nameplates shall either be engraved stainless steel or a lamicoid nameplate showing white characters on a black background or black characters on a white background.

98-2.02P Manifolds

Manifolds shall be made of 316 stainless steel.

Manifolds shall be in accordance with ISO 4413.

98-2.02Q Hydraulic Fluid

The hydraulic fluid shall be an HETG type readily biodegradable iso 32 anti wear hydraulic fluid compatible with the existing hydraulic fluid currently in use in the system (Imperial Select Food Grade AW Hydraulic Oil). Readily biodegradable Saturated Ester (HEES) or Polyalkylene Glycol (HEPG) fluids are acceptable if proper flushing procedures are followed and seal compatibility with the portions of the system to remain is confirmed prior to installation.

98-2.02R Quick Disconnects

Quick disconnects shall not be used except where otherwise specified herein.

98-2.02S Bends

5D bends or greater shall be utilized where practicable to eliminate pipe joints. Bends of any lesser radius are not permitted.

98-2.03 CONSTRUCTION

98-2.03A Shop Inspection and Testing

The following shop tests shall be performed and witnessed by the Engineer:

Custom manifolds shall be pressure tested to 3 times the maximum working pressure. This requirement does not apply to commercial manifolds that are rated for the maximum working pressure.

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The assembled HPU shall be shop tested for proper operation. Certified test data shall be submitted to the County of San Joaquin for approval prior to shipment to the bridge site.

The HPU shall be shop tested at full drive motor speed under conditions of maximum design pressure at minimum fluid flow, and reduced pressure at maximum fluid flow. Each test shall be conducted for a minimum of 1 hour continuously.

During all tests, the HPU shall be checked for fluid leaks, fluid temperature, proper relief valve operation, and proper operation of charge pumps (as applicable).

Pump control shall be tested for correct speed, response time, and direction of rotation.

The settings for all adjustable hydraulic components shall be verified and recorded during shop testing.

Pumps and hydraulic motors shall be tested by the manufacturer before the HPU is assembled and catalog rating certification shall be provided to the County of San Joaquin. Tests shall be conducted for 15 minutes continuously, at a minimum test pressure equal to the maximum peak or intermittent pressure rating of the pump or motor.

Pumps shall be checked during testing for external leakage, charge pump pressure and flow (when applicable), and main pump pressure and flow. Integral relief valves shall be set at 3000 psi maximum and checked for proper operation.

Hydraulic motors shall be checked during testing for external leakage, pressure, flow, and torque.

The right angle reducers shall be shop tested per the shop testing requirements of the General Machinery specification.

98-2.04 MEASUREMENT AND PAYMENT

98-2.04A Basis of Payment

The lump sum price bid for "Bridge Machinery" must include the cost of furnishing all labor, materials, plant, training, equipment, and all necessary incidentals required to satisfactorily complete installation and perform the work described herein and shown on the Plans.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item with their bid. The total lump sum value for this item must be broken down in detail.

The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

Upon completion and acceptance of the installation of bridge machinery in accordance with the Contract Documents, the Contractor will be paid 90 percent of the bid price for this item.

Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the bid price for this item.

Payment will be made under:

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Pay Item

Pay Unit

980000

Bridge Machinery

Lump Sum

SPECIAL PROVISIONS
BRIDGE 29C-022
TRACY BOULEVARD
over
GRANT LINE CANAL

DEPARTMENT OF PUBLIC WORKS

COUNTY OF SAN JOAQUIN

STATE OF CALIFORNIA

79 – MISCELLANEOUS CONSTRUCTION

79.1 CENTER SPAN LOCK TEMPORARY SUPPORT

79-1.01 GENERAL

79-1.01A General

The work under this item consists of furnishing and installing temporary steel center span lock supports at locations shown on the Plans and in accordance with details shown on the Plans and these Specifications. The supports are to be installed for the purpose of re-shimming the center locks.

Incidental apparatus, appliance, material, or labor not mentioned that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor no additional cost.

79-1.01B Definitions

As used herein, certified test reports refer to reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

79-1.01C Submittals

Submit shop drawings for all steel fabrications. The Contractor must coordinate the work of the installation and removal of the center span lock supports with other items of work. The Contractor must review and accept all shop drawings to coordinate the proper assembly of all components before submission for the Engineer's acceptance.

79-1.01C(1) Shop Drawings

Shop drawings must include:

1. Welding sequences and procedures.
2. Details for connections not shown or dimensioned on the plans.
8. Details of allowed options incorporated into the work.
3. Material specification and grade listed on the bill of materials. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be forty-five (45) days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed center lock support installation plan including materials and equipment to be used for review and Engineer's acceptance. The installation plan must indicate the sequence of work.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from ordering materials prior to the acceptance of the shop drawings; and no work must be done until acceptance of the shop drawings. After acceptance of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings per the Engineer's order.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County.

79 – MISCELLANEOUS CONSTRUCTION

79.1 CENTER SPAN LOCK TEMPORARY SUPPORT

Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance in the same manner as specified for the shop drawings.

79-1.01D Quality Assurance

79-1.01D(1) Quality Assurance

Quality Assurance must be in accordance with applicable requirements of Section 55-1.01D of the Standard Specifications.

Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it is not meant that any other codes and standards must be assumed to be omitted if not mentioned.

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

79-1.01D(2) Measurements and Verification

Dimensions indicated on the Plans are nominal and are intended for guidance only. All variations from the nominal dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits prior to bid. Any variance between plan and actual field conditions must not be considered as a basis for claim.

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

79-1.01D(3) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

79-1.01D(4) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components to remain. The

79 – MISCELLANEOUS CONSTRUCTION

79.1 CENTER SPAN LOCK TEMPORARY SUPPORT

Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed will be completely compatible with the existing equipment to remain, and that all original system functions will be returned to operation at the completion of the Contract work.

79-1.02 MATERIALS

79-1.02A General

Structural steel shall be ASTM A709 Grade 50. Welding shall be in accordance with AWS D1.1. Bolts shall be ASTM A325.

79-1.03 CONSTRUCTION

79-1.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

All work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It is the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

79-1.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage.

79-1.03C Installation

The center span lock supports are temporary installations to support the superstructure during repairs at the end lock bearing seats. There will be live load on the bridge during the period the jacks are in use, however traffic will be limited to a single lane on the opposite side of the bridge from the center lock that is being worked on at any given time. Install center span lock supports as shown on the Plans and in the sequence defined on the Plans.

79-1.04 PAYMENT

The work under this item will not be measured for payment. The lump sum price bid for "Center Span Lock Temporary Support" must include the cost of furnishing all labor, materials, equipment, and all necessary incidentals required to satisfactorily complete installation and perform the work described herein and shown on the Plans. The cost of installing and uninstalling the support at each location is included in this item.

The cost of shimming the center locks as shown on the plans and described in the Specifications is included in Item 98.2.1 Bridge Machinery.

79 – MISCELLANEOUS CONSTRUCTION

79.1 CENTER SPAN LOCK TEMPORARY SUPPORT

79-1.04A

The lump sum price for Rest Pier Jacking Bracket must include the cost of all labor, materials, equipment, and incidental work necessary to satisfactorily complete installation and perform the work described herein and as shown on the Plans.

The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon completion of the center lock shimming operations at both locations and removal of the temporary support, the Contractor will be paid 90 percent of the bid price for this item.
2. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10percent of the bid price for this item.

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 790000	Center Span Lock Temporary Support	Lump Sum

79.2 MODIFICATIONS TO EXISTING TRAFFIC GATE FOUNDATION ON STRUCTURE

79-2.01 GENERAL

79-2.01A General

The work under this item consists of modifying two (2) existing traffic gate foundations on the bridge to accommodate new traffic gates at locations shown on the Plans and in accordance with details shown on the Plans and these Specifications. Modifications consist of fabricating and installing a new steel weldment at each location.

Incidental apparatus, appliance, material, or labor not mentioned that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor no additional cost.

79-2.01B Definitions

As used herein, certified test reports refer to reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

79-2.01C Submittals

Submit shop drawings for all steel fabrications. The Contractor must coordinate the work of modifying the gate supports with other items of work and the new traffic gates. The Contractor must review and accept all shop drawings to coordinate the proper assembly of all components before submission for the Engineer's acceptance.

79-2.01C(1) Shop Drawings

Shop drawings must include:

1. Welding sequences and procedures.
2. Details for connections not shown or dimensioned on the plans.
8. Details of allowed options incorporated into the work.
3. Material specification and grade listed on the bill of materials. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be forty-five (45) days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from ordering materials prior to the acceptance of the shop drawings; and no work must be done until acceptance of the shop drawings. After acceptance of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings per the Engineer's order.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County.

Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.

79 – MISCELLANEOUS CONSTRUCTION

79.2 MODIFICATIONS TO EXISTING TRAFFIC GATE FOUNDATION ON STRUCTURE

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance in the same manner as specified for the shop drawings.

79-2.01D Quality Assurance

79-2.01D(1) Quality Assurance

Quality Assurance must be in accordance with applicable requirements of Section 55 of the Standard Specifications.

Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it is not meant that any other codes and standards must be assumed to be omitted if not mentioned.

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

79-2.01D(2) Measurements and Verification

All variations from the dimensions of work as shown on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits prior to bid. Any variance between plan and actual field conditions must not be considered as a basis for claim.

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

79-2.01D(3) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

79-2.01D(4) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components to remain. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed will be completely compatible with the existing equipment to remain, and that all original system functions will be returned to operation at the completion of the Contract work.

79.2 MODIFICATIONS TO EXISTING TRAFFIC GATE FOUNDATION ON STRUCTURE

79-2.02 MATERIALS

79-2.02A General

Structural steel shall be ASTM A36 minimum. Welding shall be in accordance with AWS D1.1. Steel spacer for new traffic gate housing shall be hot dip galvanized after fabrication. Steel fabrication shall be in accordance with Section 55 of the Standard Specifications. Bolts shall be ASTM A325 and hot dip galvanized.

79-2.03 CONSTRUCTION

79-2.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

All work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It is the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

79-2.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage.

79-2.03C Installation

Install new spacers as shown on the Plans.

The installation of the new traffic gate housings and traffic gates is included in other items of work.

79-2.04 PAYMENT

The work under this item will not be measured for payment. The lump sum price bid for "Modifications to Existing Traffic Gate Foundation on Structure" must include the cost of furnishing all labor, materials, equipment, and all necessary incidentals required to satisfactorily complete installation and perform the work described herein and shown on the Plans. The lump sum price includes all the work required to modify two (2) existing traffic gate foundations on the structure.

The cost of installing the traffic gate housings and traffic gates is included in Item 88.1.1 Traffic Control Equipment.

79.2 MODIFICATIONS TO EXISTING TRAFFIC GATE FOUNDATION ON STRUCTURE

79-2.04A Basis of Payment

The lump sum price for Modifications to Existing Traffic Gate Foundation on Structure must include the cost of all labor, materials, equipment, and incidental work necessary to satisfactorily complete installation and perform the work described herein and as shown on the Plans.

The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon completion of the traffic gate foundations at both locations and removal of all unneeded material and equipment from the site, the Contractor will be paid 90 percent of the bid price for this item.
2. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10percent of the bid price for this item.

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 790010	Modifications to Existing Traffic Gate Foundation On Structure	Lump Sum

79- MISCELLANEOUS CONSTRUCTION

79.3 ON-GRADE TRAFFIC GATE FOUNDATION

79-3.01 GENERAL

79-3.01A General

The work under this item consists of removing two (2) existing on-grade concrete traffic gate foundations and installing two (2) new on-grade concrete traffic gate foundations to accommodate new traffic gates at locations shown on the Plans and in accordance with details shown on the Plans and these Specifications.

The material, equipment and labor required to install the 6" gravel base below the new foundation is included in the work of this item.

Incidental apparatus, appliance, material, or labor not mentioned that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor no additional cost.

79-3.01B Definitions

As used herein, certified test reports refer to reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

79-3.01C Submittals

Submit shop drawings for all steel reinforcement. The Contractor must coordinate the work of modifying the gate supports with other items of work and the new traffic gates. The Contractor must review and accept all shop drawings to coordinate the proper assembly of all components before submission for the Engineer's acceptance.

79-3.01C(1) Shop Drawings

Shop drawings must include:

1. Details for connections not shown or dimensioned on the plans.
2. Material specification and grade listed on the bill of materials. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be forty-five (45) days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from ordering materials prior to the acceptance of the shop drawings; and no work must be done until acceptance of the shop drawings. After acceptance of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings per the Engineer's order.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County.

Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must

79- MISCELLANEOUS CONSTRUCTION

79.3 ON-GRADE TRAFFIC GATE FOUNDATION

not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance in the same manner as specified for the shop drawings.

79-3.01D Quality Assurance

79-3.01D(1) Quality Assurance

Quality Assurance must be in accordance with applicable requirements of Sections 51 and 52 of the Standard Specifications.

Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it is not meant that any other codes and standards must be assumed to be omitted if not mentioned.

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

79-3.01D(2) Measurements and Verification

All variations from the dimensions of work as shown on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions and elevations during site visits prior to bid. Any variance between plan and actual field conditions must not be considered as a basis for claim.

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

79-3.01D(3) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

79-3.01D(4) Compatibility with Existing Equipment

The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed will be completely compatible with the existing equipment to remain, and that all original system functions will be returned to operation at the completion of the Contract work.

79- MISCELLANEOUS CONSTRUCTION

79.3 ON-GRADE TRAFFIC GATE FOUNDATION

79-3.02 MATERIALS

79-3.02A General

All reinforcement steel shall be epoxy coated and meet the requirements of Section 52-2 of the Standard Specifications.

Concrete shall be in accordance with Section 51 of the Standard Specifications. Concrete shall have a cement content of between 675 lbs and 800 lbs per CY. Minimum 28-day compressive strength of concrete shall be 4000 psi. Place and finish concrete in accordance with Section 51 of the Standard Specifications.

Gravel base shall be ¾" maximum Class 2 Aggregate Base and meet the requirements of Section 26-1 of the Standard Specifications.

79-3.03 CONSTRUCTION

79-3.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

All work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It is the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

79-3.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage.

79-3.03C Installation

Concrete and reinforcement shall be formed and placed in accordance with the appropriate sections of the Standard Specifications.

Aggregate base shall be installed and compacted in accordance with the requirements of Section 26 of the Standard Specifications.

The installation of the new traffic gate housings and traffic gates is included in other items of work.

79-3.04 PAYMENT

The work under this item will not be measured for payment. The lump sum price bid for "On-Grade Traffic

79- MISCELLANEOUS CONSTRUCTION

79.3 ON-GRADE TRAFFIC GATE FOUNDATION

Gate Foundation" shall include the cost of furnishing all labor, materials, equipment, and all necessary incidentals required to satisfactorily complete installation and perform the work described herein and shown on the Plans. The lump sum price includes all the work required to remove two (2) existing traffic gate foundations, place a 6" aggregate base course at each new foundations, and install two (2) new reinforced concrete traffic gate foundations. The work under this item includes all excavation needed to remove the old foundations and install the new foundations as shown on the Plans.

The cost of installing the traffic gate housings and traffic gates is included in Item 88.1.1 Traffic Control Equipment.

79-3.04A Basis of Payment

The lump sum price for On-Grade Traffic Gate Foundation must include the cost of all labor, materials, equipment, and incidental work necessary to satisfactorily complete installation and perform the work described herein and as shown on the Plans. The lump sum price includes the total price to remove two existing foundations and install two new foundations.

The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon completion of the traffic gate foundations at both locations and removal of all unneeded material and equipment from the site, the Contractor will be paid 90 percent of the bid price for this item.
2. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the bid price for this item.

The cost of removing and replacing the traffic gate housings and gates is included under Item 88.1.1 Traffic Control Equipment.

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 790020	On-Grade Traffic Gate Foundation	Lump Sum

88-1 TRAFFIC CONTROL EQUIPMENT

88-1.01 GENERAL

88-1.01A General

Section 88-1 includes specifications to furnish all labor, materials, tools, and equipment, and to perform the activities necessary to install, field test and place in satisfactory condition, Traffic Control Equipment shown on the Contract Drawings and specified herein.

The work consists of furnishing, installing, and placing in proper operating condition the gongs, warning gates, barrier gates, with all appurtenances, including anchor bolts, required for proper operation of the traffic control equipment. The item includes work to remove existing traffic control equipment.

Apparatus to control the operation of the traffic control equipment and conduits, boxes, wiring, cables, and other equipment required to extend the circuits from the Control House to the traffic control equipment must be furnished and installed under Section 88-6 Bridge Electrical Equipment.

The platforms, brackets, concrete foundations, traffic signal poles and bracket assemblies, drawbridge signs, traffic signals, etc. to mount the traffic control equipment are included under separate pay items as shown on the Contract Plans.

The Specification covers all apparatus, appliances, material, and labor necessary to properly install, wire, connect, equip, test, adjust, and put in authorized working order the corresponding portions of the work herein specified.

88-1.01A(1) Cited Standards

1. AASHTO
2. ASTM
3. AWS
4. NEC

88-1.01B Definitions

Not Used

88-1.01C Submittals

88-1.01C(1) General

The Contractor must prepare shop drawings under the requirements of San Joaquin County and must in addition meet the following requirements.

The Contractor must submit proposed detailed procedures for review and Engineer's acceptance. A detailed construction plan coordinating with all other work must be furnished for acceptance in the same manner as specified for the shop drawings.

If any departures from the Plans or the Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted for acceptance as soon as practicable. Departures must not be made without Engineer's authorization.

88-1.01C(2) Shop Drawings

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Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

88-1.01D Quality Assurance

88-1.01D(1) Qualifications, Personnel and Facilities

Materials used in the work under Section Traffic Control Equipment must be produced by manufacturers regularly engaged in the manufacture of the specified materials.

The Contractor must provide enough plant and necessary tools and instruments required for the proper performance of the personnel engaged in the specified work.

All equipment and its installation must comply with the requirements of the latest revision of the Standard Specifications for Movable Highway Bridges of the American Association of State Highway and Transportation Officials and California Manual on Uniform Traffic Control Devices (MUTCD), except as may be otherwise provided herein.

Materials and construction must comply with the requirements of the current local Electrical Code, NEC and to any applicable local rules and ordinances. The Contractor must obtain any required permits and approvals of all Departments or Agencies having jurisdiction.

Welding must comply with the requirements of the American Welding Society's Structural Welding Code - Aluminum D1.2.

88-1.01D(2) Measurements and Verification

Dimensions shown on the Plans are nominal and are for guidance only. Variations from the dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify existing component details and dimensions as required to detail, fabricate and install new components. Verification of existing components including existing alignments must be done prior to preparation of shop drawings. Details and dimensions of existing components shown on shop drawings or affecting new components must be identified on the shop drawings.

The Plans, as they relate to existing structural steel and the location of existing equipment, are based on original Plans and available shop drawings. Shop drawings are not available for all details. It is the Contractor's responsibility to verify in the field all dimensions relating to the new and rehabilitated machinery components and machinery supports.

Contractor must verify, by field measurements, the pertinent dimensions of all existing components to remain or to be reused which will be connected to or installed with the new/rehabilitated machinery.

88-1.01D(3) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in the Specification allow the Contractor to substitute other manufacturers and model numbers of materials of equal quality and rating for those specified.

Before the Contractor orders substitute material, the Engineer's acceptance of the equivalence of the substitute material must be obtained in writing. The acceptance of the substitute material is at the discretion of the Engineer who establishes the basis for equivalence and reviews the quality of the materials described in detail on the submitted shop drawings and material data.

The Engineer indicates "Authorized", "Revise and Resubmit" or "Not Authorized" on the substitute material submittal. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified material. Rejection must not in any way result in any extra cost. Engineer's acceptance of any substitute materials submitted by the Contractor does not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that material.

If departures from the Plans or these Specifications are deemed necessary by the Contractor, details of the departures and the reasons therefore must be submitted as soon as practicable for acceptance. No departures may be made without the Engineer's authorization. Necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, must be made by the Contractor at no additional cost.

88-1.01D(4) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed are compatible with the existing equipment, and that all original system functions are returned to operation at the completion of the Contract work.

It may not be possible to locate new components which fully integrate and provide compatible operation with existing equipment/components. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced or modified in the Contract Documents.

The Contractor must make a submittal to the Engineer, who has the discretion regarding acceptance of the alternate methods. Where accepted by the Engineer, the alternate methods are for the Contractor's benefit, and the Contractor does not receive additional payment for the changes in performed work. Costs for integration of the proposed work/equipment to existing systems, so that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-1.02 MATERIALS

88-1.02A General

Equipment and materials must be new. Equipment, materials, and workmanship must be first-class in every way and must be manufactured and erected to the Engineer's satisfaction.

The Contractor must warrantee the in-service working of the traffic control equipment for one year following the date of project acceptance.

If the Contractor has any objection to any feature of the equipment as designed and laid out, he must state the objection at once, in writing, to the Engineer; otherwise, the objection will be ignored if offered as an excuse for malfunctioning equipment or for defective or broken apparatus.

Each piece of electrical equipment and apparatus must have a corrosion-resisting metal nameplate, on

which is stamped the name of the manufacturer and the rating or capacity of the equipment or apparatus.

Mounting hardware and wire and cable terminals must be vibration-proof.

88-1.02B Warning Gates

Each gate must be B&B Roadway Model VW-4 or equal manufactured by Federal Signal Corporation, Bridge roadway Products, or Engineer accepted equal.

88-1.02B(1) Warning Gate Arm

The gate arm must be 4 inches (102 millimeters) square, 6005-T5 aluminum extruded tubing. Tip section must be constructed of 3 inches (76 millimeters) square fiberglass tubing. Maximum arm length must be 40 feet from the centerline of the housing. Arm lengths must be as shown on plans and as field verified by Contractor and gate manufacturer. Stainless steel truss cables and a damping type bumper rod may be furnished with longer arms at the manufacturer's discretion. Front and rear arm surfaces must be covered with alternating red and white high intensity reflective sheeting. Stripes must be 16 inches (406 millimeters) wide, and vertical under MUTCD. The remaining exposed surfaces must be painted white. All bolts, screws, or other fastenings used in the warning gate arm assembly and for connection to the warning gate stand shall be of corrosion-resisting metal or must be hot-dip galvanized.

A pair of carbon steel channels, hot dip galvanized, painted aluminum, must be rigidly affixed to the ends of the main arm shaft. The channels and a steel crossmember must provide a sturdy mount for the arm, arm base assembly and counterweights.

The arm base must be designed with a shear pin mechanism to minimize damage to the gate and vehicle in the event of a collision. On impact, the shear pin must break, allowing the arm to swing approximately 75 to 80 degrees. At the fully open position, a spring-loaded latch must engage, preventing the arm from swinging back into traffic. The arm must be easily reset by manually releasing the latch, rotating the arm back into position and replacing the shear pin.

The main arm shaft must be of 2 inches (51 millimeters) diameter AISI 4150 with a minimum tensile strength of 140,000 pounds per square inch. The shaft must be mounted in heavy duty ball bearings, which can be lubricated.

The warning gate must also feature a sidewalk arm extension, with a dimension as shown on plans and field verified, to signal a bridge opening to pedestrians and completely block the sidewalk passageway.

88-1.02B(2) Warning Gate Housing

The operating mechanism and main control components must be contained in a weatherproof housing. The housing must be constructed of 0.188-inch (4.8 millimeter) carbon steel, hot dip galvanized after fabrication. Exterior surfaces must be painted aluminum. Fasteners must be corrosion resistant. Arm shaft openings must incorporate O-ring seals. Front and rear access doors must be mounted on full cross bronze straps. Hinges must be of the slip-off type and must have stainless steel pins. Door latches, two per door, must use a vise action to compress a neoprene bulb-type gasket to seal the door openings. A locking strap must be provided, which is suitable for use with heavy duty standard padlocks or shackleless padlocks, provided by others. All internal wiring for each warning gate must be brought to numbered terminal blocks inside the housing for connecting external circuits.

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Doors must be provided on the roadway and sidewalk side of the housing, large enough for convenient removal of the largest component of the operating mechanism. Each door must be equipped with neoprene gaskets, 2 safety interlock switches, silicon bronze hinges with stainless steel pins, stainless steel catches and bolts, and locking strap with common keys to the barrier gate padlocks.

Each warning gate housing must be equipped with a thermostatically controlled heater; switched service light; and duplex, 15 amperes, 120-volt, Specification Grade GFCI receptacle. A 15-ampere circuit breaker must protect the above units and be mounted in the warning gate housing.

Each warning gate housing must be furnished with removable doors.

88-1.02B(3) Warning Gate Hand Crank

A hand crank must be provided for manual operation of each warning gate and stored inside the warning gate housing. A hand crank limit switch with 1 NO and 1 NC contacts must be provided to prevent electrical operation of warning gates while hand cranking. Insertion of the crank or operation of a manual operation button must release the brake and make the electrical controls inoperative.

88-1.02B(4) Warning Gate Arm Lights

The number of warning lights on the warning gate arms shall be as shown on the wiring diagrams. Each warning light must be a weatherproof, two-way, cast-aluminum unit with red Fresnel lenses, front and back. The lights must be interconnected and grounded with four-conductor portable cord using watertight connectors at the fixtures. A 12-volt, 8-watt, red LED lamp must be installed in each fixture. The lights must be connected so that adjacent lamps flash alternately. Fuses for the warning lights must be installed in molded rubber connection kits. The light at the tip of the warning gate arm must burn steady.

The flasher must be a 12 VAC solid state flasher having two alternately flashing circuits and one steady burn circuit. The flasher must be designed for heavy duty applications. The flasher assembly must include mounting hardware as required, solid-state flasher circuitry, a terminal block, silicon heat sink compound, and a transformer when required. The flasher assembly must be fully wired at the factory. The flasher base plate compound must be anodized for corrosion protection. All components must be of industrial quality. The terminal block must be clearly marked for field connections. The flash rate for the two alternately flashing circuits must be 0.50 seconds on, 0.50 seconds off. An additional steady burn circuit must be provided for the lamp furthest from the gate stand. The flasher must be B & B Roadway Model FL-12, or equal authorized by the Engineer.

88-1.02B(5) Warning Gate Transmission

The warning arm must pivot in the vertical plane via a mechanical 4-bar linkage. The linkage must use cranks keyed to the main arm shaft and transmission shaft and an adjustable connecting rod between a pair of self-aligning spherical rod ends. The connecting rod must be of 1 inch (25 millimeter) diameter AISI 4150. The linkage must be driven by a fully enclosed, double reduction, worm gear speed reducer. Gear ratio used must produce an operation time of approximately 11 seconds.

88-1.02B(6) Warning Gate Limit Switch

An 8-circuit limit switch must be provided in each warning gate operated by the warning gate mechanism. Each limit switch must be a rotary, cam-type, switch; and it must be gear driven from the transmission. The contacts must be quick-break with silver alloy buttons. The limit switch shaft must be stainless steel,

and cams must be secured thereto with set screws. Switches must be rated for 15 amps at 480 VAC.

88-1.02B(7) Warning Gate Motor and Brake

The motor must be furnished as part of the warning gate by the warning gate manufacturer. Each motor must be a totally-enclosed, 480 volt, three-phase, 60 cycle, ball-bearing induction motor not less than 1/2 HP and must be capable of withstanding instant reversal when running at full speed. Each motor and gear train must be capable of opening and closing the warning gate in about 13 seconds. A motor-mounted, spring-set, 480 VAC, solenoid-release, disc brake must be provided for stopping and holding the mechanism. The drive mechanism and motor brake must be capable of holding the gate vertical against a wind load of 100 miles-per-hour.

88-1.02B(8) Warning Gate Gong

A warning gong must be mounted on the top of the oncoming warning gate housings. Each warning gong must be a weatherproof, motor-operated, vandal-proof, 12-inch diameter gong mounted in a heavy-duty, cast-aluminum housing with hinged back door. The gong must be of spun silicon bronze or Engineer authorized equal. Gongs must be painted and mounted with hardware in such a way as to prevent theft.

Each gong must be the Type G-12 Warning Gong as made by the B & B Roadway LLC, the Western-Cullen No. 555, or the Security Materials Division of Federal Signal Corporation Type 555 or equal as authorized by the Engineer.

88-1.02B(9) Warning Gate Terminal Blocks and Wiring

A manual disconnect switch must be provided, pre-wired at the factory to break the main motor leads, to protect personnel during maintenance. Control components and terminal blocks must be mounted inside an electrical enclosure mounted facing the rear side access opening, except where custom components required by the customer prevent this arrangement. Pressure-type, modular terminal blocks must be labeled and clearly coded to wiring diagrams. Control wiring shall be clearly coded to wiring diagrams and must terminate at the terminal block. Connections to screw-type terminals must have lugs. Internal Conductors must be type XHHW-2 #14 AWG stranded, minimum.

88-1.02B(10) Warning Gate Spare Parts

Spare parts must be supplied under AASHTO Article 2.10.58 requirements and the Contract Plans. The spare parts must be furnished and packed in suitable cartons for storage at the bridge. The spare parts supplied must include the following:

For the warning gates:

1. One (1) motor, complete with motor pinion.
2. One (1) rotary cam limit switch with operating mechanism.
3. One (1) access door limit switch.
4. Six (6) warning light fixtures complete with lamps.
5. Six (6) lamps for warning lights.
6. Two (2) gate arms (one of each specified length).

7. One (1) flasher unit.

The Contractor must arrange the spare parts in uniform size cartons of substantial construction, with typed and clearly varnished labels to indicate their contents. The cartons must be stored where directed by San Joaquin County.

The cost of supplying the spare parts listed above must be included in the lump sum price bid for the "Traffic Control Equipment."

88-1.03 CONSTRUCTION

88-1.03A General

The Contractor must coordinate the Traffic Control Equipment with all bridge machinery items, electrical work and structural work, as well as navigational, railway, and vehicular traffic closures and restrictions.

88-1.03B Installation

Individual switches at the control desk enable the gate to be raised or lowered while the corresponding switch is operated. The raise and lower circuitry must be arranged such that the warning gate stops immediately when the selector switch is released.

Each warning gate housing must be bolted to its concrete or steel base as shown on the Plans.

Each warning gate motor must be controlled by a magnetic reversing contactor, electrically and mechanically interlocked, and must be protected by a three-element, thermal overload relay, with automatic reset to be provided under this specification. This equipment must be mounted in the motor control center under Section 88- Bridge Electrical System.

For each stage of construction, the Contractor must submit calculations, Plans and procedures detailing the intended scheme for removal and reinstallation of the Traffic Control Equipment.

All metal parts of the installation, except structural steel, must be of corrosion-resisting material such as aluminum, bronze, or stainless steel. Cast-iron, malleable iron, or steel with a hot-dip galvanized finish must be used where specified herein or permitted by the Engineer.

88-1.04 PAYMENT

This work is not measured for payment but is paid for at the Contract lump sum price.

88-1.04A BASIS OF PAYMENT

The lump sum bid for Item "Traffic Control Equipment" must include the cost of furnishing all labor, materials, plant, testing, adjusting, and equipment required, including all necessary incidentals for the work herein described and as shown on the Plans, for a complete installation. The work must also include adjustment of all apparatus and overload devices to provide proper functioning of the equipment.

The item includes work to remove existing traffic control equipment.

New control equipment, conduit, and wiring for warning and barrier gates must be installed under Section

88 BRIDGE ELECTRICAL SYSTEMS

88-6 "Bridge Electrical Equipment" and the corresponding Section 88-2 "PVC Coated Conduit and PVC Sched 80 Conduit".

The platforms and brackets for mounting the traffic control equipment are included under separate pay items as shown on the Contract Plans.

The Contractor must submit a detailed breakdown of his costs to the Engineer under this item within 30 days of execution of the contract. This breakdown shall be evaluated by the Engineer and be used as the basis for monthly progress payments for work satisfactorily completed. A minimum of ten percent of the bid will be retained by the San Joaquin County until final acceptance of the bridge electrical system, and the Contractor has completed all items on their punch lists, and all aspects of bridge operation, operator and maintenance personnel testing, training, and control are complete. Electrical component installation may not proceed until all electrical components are on site.

Payment is made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 880100	Traffic Control Equipment	Lump Sum

88-2 CONDUIT AND ACCESSORIES

88-2.01 GENERAL

88-2.01A General

Section 88-2 consists of furnishing and installing a conduit system. The Contractor must provide all labor, materials, plant, equipment, and incidentals required to furnish and install a functioning conduit/raceway system according to the Plans, Specifications, and the Engineer's order.

Follow the materials section for new conduit installations and where existing couplings, fittings, and conduit bodies are not in compliance with the ANSI Standard C80.1 and UL Standard UL6.

The work consists of furnishing, installing, terminating, and connecting the conduits for equipment and for interconnections between equipment, fixtures, and devices according to the Contract Documents and the Engineer's order. Necessary accessories, supports, fittings, raceways, attachments, and hardware must be provided to complete the conduit system.

Incidental apparatus, appliance, material, or labor not mentioned that is needed to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor at no additional cost.

88-2.01B Definitions

Certified test reports are reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

Factory tests are tests performed on the actual materials or equipment proposed for use. Results of the tests must be submitted in accordance with the provisions of this Specification for laboratory test results.

88-2.01C Submittals

88-2.01C(1) General

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for Engineer's acceptance. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification, any other applicable references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete, and a legend provided to decipher the manufacturer model number codes.

If any departures from the Contract Documents are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted to the Engineer in writing as soon as possible for his acceptance. No departures from the Plans are made without the Engineer's acceptance.

If the Contractor has any objections to the requirements on the Plans and/or Specifications, he must state his objection in writing to the Engineer before or when submitting shop drawings; otherwise, his objection is not considered if offered later as an excuse for malfunctioning, defective or broken machinery.

Manufacturer's data and/or shop drawings must be submitted for all conduits.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted to the Engineer for acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings are accepted by the Engineer, will be rectified by the Contractor at no additional cost.

88-2.01C(2) Shop Drawings

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted to document and perform the work, or obtain the Engineer's authorization to perform the work.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County and must in addition meet the following:

Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans are not be used as base sheets for assembly or erection plans and are not acceptable as shop drawings.

Where shop drawings are for materials that replace existing materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

Materials and material specifications must be stated for each component. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.

For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part and the manufacturer's part number assigned to each part. The plans or diagrams must show enough to disassemble and reassemble the assemblies covered. If any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.

Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary materials on which the manufacturer or supplier states mounting dimensions, ratings, and any other details for use on this specific project. The certified prints must identify and describe each part in addition to the following:

- Dimensions of all principal parts comprising the assembly.
- Certified external dimensions affecting clearances and required for installation.
- Capacity ratings.
- Location of mounting holes.
- Electrical operating characteristics.
- Location of conduit/cable entries, dimensioned and sized.
- Gross weight.

Certified prints must be signed by an officer of the manufacturing company.

Shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance as specified for the shop drawings.

The weight of each piece of equipment must be stated on the shop plans on which it is detailed or billed.

Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. The Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs, which may result from ordering materials before acceptance of the shop drawings. No work must be done until the shop drawings have been accepted. After acceptance of the shop drawings, the Contractor must submit up to three (3) prints of the shop drawings as ordered by the Engineer.

88-2.01C(3) Certificates

Where materials are specified to comply with requirements of the standards of an organization or standard listings by applicable codes, such as NEMA, NFPA, and UL, that use a label or listing indicating compliance, proof of such conformance must be submitted and accepted. The label or listing of the specified organization will be acceptable evidence. Instead of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and accepted by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

88-2.01C(4) Operating and Maintenance Manual Supplement

Final Operating and Maintenance Manual Supplement submittal must include a CD-ROM of the complete

supplemental manual materials in PDF format. Four (4) copies of the approved hard copy supplemental manual materials and four (4) copies of the CD-ROM must be delivered to the Engineer.

The supplemental manual materials must be assembled in a separate volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches, 20 lb. paper with accurately punched holes. The paper must be acid free and suitable for archival use. The holes for binding must be 5/16 inches diameter and be reinforced with plastic or cloth, spaced at the standard for three holes spacing.

Foldout drawings, diagrams, and illustrations must have 5/16 inches minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

The supplemental operating and maintenance manual materials must include as-built, revised, and updated; drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility, and capacity to be capable of reproduction as required San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the supplemental manual materials including the method of binding and the text must be submitted for Engineer's acceptance.

All printed matter, data, drawings, diagrams, etc. must be produced by methods to result in permanence and durability, including paper that is water and grease resistant. No materials must be used which adversely affect this permanence and durability.

The supplemental manual materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor, and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-2.01D Quality Assurance

88-2.01D(1) Qualifications, Personnel and Facilities

Materials used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified materials.

The Contractor must provide enough skilled, trained, and experienced tradesmen familiar with the requirements and methods for the properly executing the specified work.

The Contractor must submit proof of manufacturer training and certification for all workers that install PVC coated conduit through the Shop Drawing process.

The Contractor must provide enough plant and necessary tools and instruments required for the proper performance of the personnel executing the specified work.

88-2.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable Federal, State and local rules, regulations, and ordinances.

When a conflict between the Specification and the mentioned codes, standards, rules, regulations, and ordinances occurs, the most stringent requirement applies.

Work must comply with applicable requirements of the latest edition of codes and standards issued by, but not limited to, the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American Society for Testing and Materials	ASTM
A 653 – Standard Specification for steel Sheet, Zinc-Coated (Galvanized) or Zinc Alloy-Coated (Galvannealed) by the Hot-Dip Process.	
A 525 – Sheet Steel, Zinc Coated (Galvanized) by the Hot Dip Process, General Requirements	
American National Standards Institute	ANSI
C80.1 - Rigid Steel Conduit, Zinc Coated	
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additionally, the work must comply with the requirements of any local rules, regulations, ordinances, and other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it does not mean that other codes and standards are to be omitted if not mentioned.

88-2.01D(3) Measurements and Verification

Dimensions shown on the Plans are nominal and are intended for guidance only. Variations from dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits before bid. Variances between plan and field conditions are not a basis for claim.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It is the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits prior to bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new component can be finished to obtain the prescribed fit.

88-2.01D(4) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in the Specification allow the Contractor to substitute other manufacturers and model numbers of materials of equal quality and rating for those specified.

Before the Contractor orders substitute material, the Engineer's acceptance of the equivalence of the substitute material must be obtained in writing. The acceptance of the substitute material is at the discretion of the Engineer who establishes the basis for equivalence and reviews the quality of the materials described in detail on the submitted shop drawings and material data.

The Engineer indicates "Accepted" or "Revise and Resubmit" of substitute material. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified product. Rejection must not result in additional cost. Approval by the Engineer of any substitute products submitted by the Contractor must not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that product.

If departures from the Plans or these Specifications are deemed necessary by the Contractor, details of the departures and the reasons therefore must be submitted as soon as practicable for acceptance. No departures may be made without the Engineer's authorization. All necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, must be made by the Contractor at no additional cost.

88-2.01D(5) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer is not a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no

additional cost.

Delays resulting from the rejection of material, equipment or work is not the basis of a claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County reserves the right to make corrections with its own forces and charge the resulting costs to the Contractor.

88-2.01D(6) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed are completely compatible with the existing equipment, and that original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced/altered in the Contract Documents. The Contractor must make a submittal to the Engineer, who must have the discretion regarding acceptance of the alternate methods. Where accepted by the Engineer, the alternate methods are for the Contractor's benefit, and the Contractor does not receive additional payment for the changes in work performed. Costs for integration of the proposed work/equipment to existing systems, so that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-2.01D(7) Guarantees and/or Warranties

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon acceptance of the Contract, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such material furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical material and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-2.02 MATERIALS

88-2.02A Summary

All furnished equipment and materials must be brand new. Equipment, materials and workmanship must be first class in every way and must be manufactured and installed to the Engineer's satisfaction.

Work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, ordered, and easily identified.

88-2.02B Hot Dipped Rigid Galvanized Steel Conduit

All conduits must be standard weight, threaded, rigid steel conduit complying with ANSI Standard C80.1 and UL Standard UL6. All conduits must be hot-dipped galvanized inside and out. All conduit couplings and fittings must be made of malleable iron or steel and hot-dipped galvanized.

All conduits and fittings used in any single continuous conduit run must be the material of a single manufacturer.

88-2.02C PVC Coated Rigid Galvanized Steel Conduit

All conduits must meet the requirement for Hot Dipped Rigid Galvanized Steel Conduit in addition to the following:

All conduits must have factory-applied, polyvinyl-chloride (PVC) exterior coating with a nominal 40 mil thickness. The galvanized surfaces of the conduit and fittings must be coated with an epoxy-acrylic primer before plastic coating. A urethane coating must be applied to the interior with a nominal 2-mil thickness. The urethane interior coating must have enough flexibility to permit field bending without cracking or flaking of the interior coating. Conduit clamps, U-bolts, couplings, fittings, and elbows used with PVC coated conduits must have the same coating as the conduit.

Conduit bodies, pulling elbows and couplings must have flexible PVC sleeves which extend to overlap the PVC coating on the conduit. Sleeves must be 40-mil, nominal thickness.

The plastic coating must have an 85+ Shore A Durometer rating and comply with ASTM D746, and Federal Specifications LP406b, Method 2051, Amendment 1 of 25 September 1952. A two-part urethane, chemically cured coat must be applied to the interior of all conduit and fittings. This internal coating must be at the nominal 2-mil thickness and be flexible enough to permit field bending without cracking or flaking. The PVC coated, hot-dip galvanized steel conduit must be UL labeled and listed.

All hollow conduit and fittings, which serve as part of a raceway, must be coated with the same exterior PVC coating and interior urethane coating. The plastic exterior coating and the interior urethane coating must be factory applied by the same manufacturer who produces the hot-dip galvanized conduit.

Unions to connect sections of conduit that cannot be joined to each other or to boxes/enclosures in the regular manner must be Myers type, of malleable iron or steel, hot-dip galvanized, and PVC coated.

88-2.02D PVC Schedule 80 Conduit

All underground conduits must be PVC Schedule 80. Conduit must be rated for 90 degrees C conductors, UL Listed or accepted equal. Material must comply with NEMA Specification TC-2 (Conduit) and TC-3 (Fittings) and UL Standards 651 (Conduit) and 514b (Fittings). The conduits and fitting must carry a UL label (Conduit – on every 10 feet length; Fittings – stamped or molded on each fitting). Conduit and fittings must be identified for type and manufacturer and must be traceable to location of plant and date manufactured. The markings must be legible and permanent. The conduit must be made from polyvinyl chloride compound (recognized by UL) which includes inert modifiers to improve weatherability and heat distortion. Clean rework material, generated by the manufacturer's own conduit production, may be used by the same manufacturer, provided end products meet the requirements of this specification. The conduit and fittings must be homogeneous plastic free from visible cracks, holes or foreign inclusions. The conduit bore must be smooth and free of blisters, nicks or other imperfections which could mar conductors or cables.

88-2.02E Liquid Tight Flexible Metallic Conduit

Conduit must conform to UL Standard UL 360. Conduit must have a hot-dipped galvanized steel core with PVC jacket. All conduit couplings and fittings must be made of malleable iron or steel and hot-dip galvanized.

All conduit and fittings used in any single continuous conduit run must be the product of a single manufacturer. Connections must be made with Myers type hubs.

88-2.02F Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the new conduit/raceway components must be submitted for inclusion as an Appendix to the existing bridge operating and maintenance manuals.

The Contractor must review the existing O&M Manuals as part of this work to identify items that need to be

changed, added and/or require supplemental information.

The supplemental manual materials must include the following as a minimum for new and rehabilitated equipment:

New, updated and/or revised maintenance instructions for all new and rehabilitated equipment, including warnings and precautions observed during maintenance actions. All preventative maintenance procedures are outlined and a chart listing all maintenance procedures in chronological order must be provided.

New, updated, or revised listings of all parts suppliers' local representatives, including suppliers' and representatives' names.

New, updated and/or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.

New, updated and/or revised description of the proper theoretical approach to installing and testing new equipment.

All relevant As-Built Shop Drawings. Drawings must be certified.

New, updated and/or revised instructions for annual cursory inspections and bi-annual in-depth inspections.

Manufacturer's literature describing each piece of new equipment furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.

Material or information which in the opinion of the Engineer is desirable to include in order to assist in maintaining the bridge functional systems and subsystems.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor must apply to the overall bridge system described in the supplemental manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-2.03 CONSTRUCTION

88-2.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

It is the Contractor's responsibility to manufacture and install suitable functioning conduit and wireway systems. Review and acceptance of shop drawings by the Engineer does not relieve the Contractor of this responsibility.

The Contractor must coordinate the work of the conduit and wireway manufacturers where components interface. The Contractor must review and accept all shop drawings to coordinate the proper assembly of components prior to submission for the Engineer's acceptance.

88-2.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's plant. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not possible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities, so their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-2.03C Installation

All conduits, and fittings must be carefully examined before being installed, and all pieces having defects must be removed from the site and be replaced by the Contractor at no additional cost. All conduit bends must be made with standard size conduit elbows. Conduits and fittings must be assembled per manufacturer instruction. All cuttings and threading must be performed under conduit manufacturer's instructions. All conduits, enclosures, and fittings must be mechanically joined together to form a continuous electrical conductor to provide effective electrical continuity.

The interior surfaces must have a smooth finish and be free of burrs or projections. All conduits must be free from blisters, cracks, or injurious defects and must be reamed at each end after being threaded. Sections must be connected to each other with screw couplings made up so that the ends of both conduits will butt squarely against each other inside of the coupling. Conduits must be installed to be continuous and watertight between boxes/enclosures and equipment.

Conduit bends and offsets must be made by cold bending using approved methods and equipment. The use of a pipe tee or vise for bending conduit is not permitted. Conduit, which is crushed or in any way deformed, must be discarded. All bends must be long sweep, free from kinks, and with easy curvatures to permit the drawing of conductors without injury. Conduit runs must be made with as few couplings as standard lengths permit, and the total angle of all bends between any two boxes/enclosures or cabinets must not exceed 270 degrees, unless otherwise authorized by the Engineer. The radii of curvature of pipe bends must not be less than eight times the inside diameter of said conduit. Long running threads are not permitted. Pull boxes must be used as per NEC Article 314 to facilitate the installation of the wire where authorized by the Engineer.

All conduit joints must be threaded, using standard taper thread. Straight or clamp joints must not be used. All thread cuts after galvanizing must be thoroughly cleaned, degreased, and coated with an approved compound to provide cold galvanizing of the threaded area. A clear urethane coating must be applied to all conduit joints and threads after installation.

Where a conduit crosses an expansion joint longitudinally or where movement between adjacent sections

of conduit can be expected, conduit expansion fittings must be installed. The fittings must be bronze expansion fittings and must be provided with flexible bonding jumpers to maintain the electrical continuity across the joints. The fittings must permit a total conduit movement of 8.0 inches or as required for expected movement.

Where a conduit crosses a joint laterally or where an offsetting type movement between adjacent sections of conduit can be expected, expansion and deflection fittings must be installed. The fittings must be bronze expansion fittings and must be provided with flexible bonding jumpers to maintain the electrical continuity across the joints. The fittings must permit a movement of 3/4 inches or as required for movement expected from the normal in any direction.

Conduit ends must be well protected and sealed to prevent entrance of water or any other foreign matter during construction, work suspensions and overnight. Ends of abandoned conduits, spare conduits, and empty conduits and stubs must be capped during and after construction, and care must be taken to ensure that no moisture or other foreign matter is in or enters the conduits.

All conduits must be pitched not less than 1 inch in 10 feet. Where conduits cannot be drained to box or enclosure, a drain "T" with drain fitting must be installed at the low point. Submit details to the Engineer for review. Do not perform installation without accepted details.

Burrs on conduit ends must be removed and terminated. The termination of all conduits must be provided with bronze insulated grounding bushings. The insulated portion must be molded phenolic compound, and each fitting must have a screw type combination lug for bonding. All bushings in any box or enclosure must be bonded together with No. 8 AWG bare copper wire min or as required by largest upstream overcurrent protection device.

All conduits must be carefully cleaned both before and after installation with special attention being provided to conduits being reused. On completion of the conduit and box installation, the Contractor must clear each conduit by snaking with a mandrel of a diameter 90 percent or more of the nominal inside diameter of the conduit and with a wire brush of the same diameter as the conduit, before drawing in the cables. Any conduits that fail or get damaged must be replaced by the Contractor at no additional cost.

Both ends of each conduit run must be provided with a brass tag that has the same number stamped thereon in accordance with the existing as-built drawings, and these tags must be securely fastened to the conduit ends with No. 20 AWG brass wire. New or additional conduits, not part of the existing as-builts must be clearly identified and numbers must not be redundant to the existing conduit numbers. Conduit diagrams for inclusion in the O&M manual must be clearly identified with legend and plans must be submitted for acceptance during the shop drawing process.

All conduits projecting into boxes/enclosures must be provided with watertight, weatherproof, and insulated throat conduit hubs.

The final connection of the rigid steel conduit to the electrical equipment subject to vibration must be made with liquid-tight, flexible metal conduit and with suitable liquid-tight connectors. Flexible conduits are used, only where final connection to equipment with rigid conduit is not practicable in the Engineer's opinion, or where equipment is subject to vibration, such as equipment with adjustable mountings or to all machinery.

Liquid-tight unions must be installed where standard threaded couplings cannot be used. All nicks, cuts, exposed surfaces of conduit joints and abrasions to PVC coating on the rigid conduit must be repaired with the factory-supplied repair compound. The compound must form uniform coating and adhere to the original coating.

Conduit supports must be provided on each side of the conduit bends or elbows not more than 5 feet on each side of each outlet panel, pull box or other conduit termination. Conduit supports and hardware must be PVC coated or type 316 stainless steel.

Conduit runs exposed on the steel structure must be securely clamped to the steelwork. The conduit clamps, in general, must consist of U-bolts attached to structural steel supports bolted to the members. The clamps, in general, must consist of manufacturer instructed stainless steel bracket hangers attached to structural steel supports bolted to the members. Supports must be arranged so that conduits rest on top of the support and conduit U-bolts rest on top of the conduits. The use of J-bolts to fasten structural supports or to clamp conduits are not permitted.

All U-bolts and bracket hangers must be provided with medium-series lock washers and double hexagonal nuts. The bolts, nuts, and washers must be stainless steel complying with the requirements of the Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes, ASTM Designation A276, Type 316.

88-2.04 PAYMENT

Conduit is measured by the linear foot along the axis of the conduit, of the type and size specified, installed as per the Contract Documents and Specifications.

Conduit measurement includes all conduits, couplings, fittings, adaptors, expansion joints, bends and mounting hardware.

The work listed under this section does not include installation of junction boxes and pull boxes as they will be listed under other sections.

88-2.04A BASIS OF PAYMENT

The unit price for conduit per linear foot of each conduit size must include the cost of all labor, materials, expansion and connection fittings and equipment necessary to satisfactorily complete installation and perform the work. Excavation and backfill for conduit, if required, must be paid for separately under the item for conduit excavation and backfill under earthwork.

Liquid tight flexible metallic conduit is not paid separately. Where it is not paid under other electrical pay items, it is included as incidental to cost of conduit size and type or other pay item to which it is connected.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

Upon completion and acceptance of the installation of conduit and wireway in accordance with the Contract Documents, the Contractor is paid 90 percent of the item bid price.

Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor is paid the remaining 10 percent of the item bid price.

Removal of components is not included in the final system and is paid under Item 88-9 "Electrical Equipment Demolition."

Federal Aid Project 5929(229)
Tracy Boulevard over Grant Line Canal

88 BRIDGE ELECTRICAL SYSTEMS

Payment is made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 880010	PVC Coated Rigid Galvanized Steel Conduit – 1 inch	Linear Feet
Item 880190	PVC Coated Rigid Galvanized Steel Conduit – 1.5 inch	Linear Feet

88-3 ELECTRICAL BOXES

88-3.01 GENERAL

88-3.01A General

Section 88 consists of furnishing and providing all labor, materials, equipment and incidentals required to complete the installation of the stainless-steel electrical boxes, including junction, pull and terminal boxes complete with internal components, in accordance with the Plans, Specifications and the Engineer's authorization.

Any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor as if specifically mentioned in these Specifications at no additional cost.

88-3.01B Definitions

As used herein, certified test reports are reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

As used herein, factory tests are tests required to be performed on the actual materials or equipment proposed for use. Results of the tests must be submitted in accordance with the provisions of this Specification for laboratory test results.

88-3.01C Submittals

88-3.01C(1) General

If the Contractor has any objection to any requirements by the Plans and/or Specifications, he must state his objection in writing to the Engineer before or submitting shop drawings; otherwise, his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted as soon as practicable for approval. Departures must not be made without the Engineer's acceptance. All necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, must be made by the Contractor at no additional cost.

Materials and material specifications must be stated for each component. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification and any other applicable

references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete, and a legend provided to decipher the manufacturer model number codes.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted for the Engineer's acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings are approved by the Engineer, will be rectified by the Contractor at no additional cost.

88-3.01C(2) Shop Drawings

The Contractor must coordinate the work of the component manufacturers where components interface. The Contractor must review and accept all shop and shop drawings to coordinate the proper assembly of the various machinery components before submission for the Engineer's acceptance.

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for review and acceptance by the Engineer. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which result from ordering materials prior to shop drawing acceptance; and no work must be done until the shop drawings are accepted. After shop drawing acceptance, the Contractor must supply the Engineer with up to three (3) prints of the shop drawings the Engineer's order.

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted for the purposes of documenting and performing the work, or obtaining Engineer's authorization to perform the work.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings complying with the requirements of San Joaquin County and must meet the following:

Manufacturer's data and/or shop drawings must be submitted for all electrical items.

Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be base sheets for assembly or erection plans and will not be accepted as shop drawings.

Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.

For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The plans or diagrams must show enough to disassemble and reassemble the assemblies covered. If any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in

similar fashion.

Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary material on which the manufacturer or supplier states mounting dimensions, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they must show:

- Dimensions of all principal parts comprising the assembly.
- Certified external dimensions affecting clearances and required for installation.
- Capacity and normal operating ratings.
- Location of mounting holes.
- Electrical operating characteristics.
- Locations of conduit/cable entries, dimensioned and sized.
- Gross weight.
- Certified prints must be signed by an officer of the manufacturing company.

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance in the same manner as specified for the shop drawings.

The weight of each piece of equipment must be stated on the shop plan on which it is detailed or billed.

Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Connection to existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

Where shop drawings are for equipment/materials that replace existing equipment/materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

88-3.01C(3) Certificates

Where equipment or materials are specified to comply with requirements of organization standards, such as NEMA, NFPA, and UL, that use a label or listing indicating compliance, proof of compliance must be submitted and accepted. The label or listing of the specified organization will be acceptable evidence. Instead of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and accepted by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's standard or code.

88-3.01C(4) Operating and Maintenance Manual Supplement

Final Operating and Maintenance Manual Supplement submittal must include a CD-ROM of the complete supplemental manual materials in PDF format. Four (4) copies of the accepted hard copy supplemental manual materials and four (4) copies of the CD-ROM must be delivered to the Engineer.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Include all modifications and adjustments that were made in the field based

on final modifications and adjustment made to this item.

The supplemental manual materials must be assembled in a separate volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit all materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches, 20 lb. paper with accurately punched holes. The paper must have acid free quality suitable for archival use. The holes for binding must be 5/16 inches in diameter and be reinforced with plastic or cloth, spaced at the standard for three holes spacing.

Foldout drawings, diagrams, and illustrations must have 5/16 inches minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

The supplemental operating and maintenance manual materials must include as-built, revised, and updated; drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility and capacity to be capable of reproduction as required San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the supplemental manual materials including the method of binding and the text must be submitted for approval by the Engineer.

All printed matter, data, drawings, diagrams, etc. must be produced by methods to result in permanence and durability, including paper that is water and grease resistant. No used materials will adversely affect this permanence and durability.

The supplemental manual materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor, and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Additionally, replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-3.01D Quality Assurance

88-3.01D(1) Qualifications, Personnel and Facilities

Material used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified material.

Under this item, the Contractor must use enough skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide enough plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-3.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement applies.

Work must comply with all applicable requirements of the latest edition of codes and standards issued by, but not limited to, the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

The work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it does not mean that any other codes and standards are assumed to be omitted if not mentioned.

88-3.01D(3) Measurements and Verification

Dimensions indicated on the Plans are nominal and are for guidance only. Variations from the dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits before bid. Variance between plan and field conditions is not considered a basis for claim.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It is the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits prior to bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing

components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new component can be finished to obtain the prescribed fit.

88-3.01D(4) Substitution

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in the Specification are to allow the Contractor to substitute other manufacturers and model numbers of materials of equal quality and rating for those specified.

Before the Contractor orders any substitute material, the Engineer's acceptance of the substitute material must be obtained in writing. The acceptance of the substitute materials at the discretion of the Engineer who will establish the basis for equivalence and will review the quality of the materials and materials described in detail on the submitted shop drawings and material data.

The Engineer will indicate "Approved" or "Revise and Resubmit" substitute material. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified material. Rejection must not in any way result in any additional cost. Acceptance by the Engineer of any substitute materials submitted by the Contractor must not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that material.

88-3.01D(5) Defective Materials and Workmanship

The Engineer's acceptance of any material or finished parts is not a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work is not the basis of a claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County may make necessary correction with its own forces and charge the resulting costs to the Contractor.

88-3.01D(6) Compatibility with Existing Equipment

Under this item, new/rehabilitated items are connected to existing components. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed are completely compatible with the existing equipment, and that all original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who has the discretion of accepting the alternate methods. Where approved by the Engineer, the alternate methods are for the Contractor's benefit, and the Contractor will not receive additional payment for the changes in work performed. Any costs associated with ensuring integration of the proposed work/equipment to existing systems, such that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-3.01D(7) Guarantees and/or Warranties

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon acceptance of the Contract, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such material furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical material and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-3.02 MATERIALS

88-3.02A General

All equipment and materials furnished under the items specified herein must be brand new. All new equipment, materials and workmanship must be first class in every way and must be manufactured and installed to the Engineer's satisfaction.

Boxes must be designed, laid out, fabricated to match existing holes on a case-by-case basis. The Contractor is alerted that this may require multiple designs for a single box site.

It is the Contractor's responsibility to manufacture and install suitable functioning electric box assemblies. The Engineer's review and acceptance of shop drawings does not relieve the Contractor of this responsibility.

88-3.02B Electrical Boxes

88-3.02B(1) Surface Mounted Boxes

All surface mounted pull, junction, and terminal boxes must be minimum 14-gauge stainless steel, and must be provided with full length hinged gasketed, covers held with stainless steel fast operating clamps to provide NEMA 4 Rated watertight construction. No hardware is removable to prevent loss. They must be Engineer accepted equal to Hoffman Bulletin A51S or equivalent by Weigmann or Hammond.

Interior and exterior boxes must be provided with external mounting lugs and must be fastened in position with stainless steel through bolts. Stainless steel boxes must be provided with stainless steel conduit hubs. No box is drilled for more conduits or cables than enter it. Exterior boxes are provided with drain fittings of the same type as specified for conduit drains. Boxes with extra holes must be removed and replaced at no additional cost.

Electrical boxes containing terminals or equipment must have enough space to provide ample room for the interior wiring and terminal strips for the installation of conduit terminations and multi conductor cable fittings. Terminal boxes must be provided with a backpanel as required to mount terminals or equipment.

Interior mounting buttons with tapped holes must be provided for mounting the pull blocks where necessary.

88-3.02B(2) Flush Mounted Boxes

All flush mounted (sidewalk or roadway) pull, junction, and terminal boxes must be cast-iron, hot-dip galvanized inside and out, and must be provided with gasketed flat covers to provide NEMA-4X watertight construction, and AASHTO H-20 live load rated for full deliberate traffic. The boxes must be O.Z. Gedney Type YF, Spring City Type HP, Appleton Type WHF, except with stainless steel cover screws, or equal for Engineer's acceptance.

88-3.02C Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the new electrical box and internal components must be submitted for inclusion as an Appendix to the existing bridge operating and maintenance manuals.

The contractor must review the existing O&M Manuals as part of this work to identify items that need to be changed, added and/or require supplemental information.

The supplemental manual materials must include the following as a minimum for new and rehabilitated equipment:

New, updated and/or revised maintenance instructions for all new and rehabilitated equipment, including warnings and precautions to be observed during maintenance actions. All preventative maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order must be provided.

New, updated, or revised listings of all parts suppliers' local representatives, including suppliers' and representatives' names.

New, updated and/or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.

New, updated and/or revised description of the proper theoretical approach to installing and testing new equipment.

All relevant As-Built Shop Drawings. Drawings must be certified.

New, updated and/or revised instructions for annual cursory inspections and bi-annual in-depth inspections.

Manufacturer's literature describing each piece of new equipment furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.

Any other material or information which in the opinion of the Engineer may be desirable to include to assist in maintaining the bridge functional systems and subsystems.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor applies to the overall bridge system described in the supplemental manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-3.03 CONSTRUCTION

88-3.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

All work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, ordered, and easily identified. Not all boxes are shown on the Contract documents and the Contractor must provide additional boxes as required to meet his means and methods of installation, including but not limited to junction/pull boxes as required for conduit runs.

88-3.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's plant. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not feasible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities such that their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-3.03C Installation

Install boxes as required to facilitate conduit and cable installation. Do not reduce headroom or interfere with space required for passageways or other trades. Install internal components such as grounding, back panels, terminals, etc. as required and shown on the Contract Plans.

All boxes must be sized per requirements of the National Electrical Code (NEC) for wire pulling based upon the size of conduits entering/exiting the box. All supports, attachments and fastening hardware must be stainless steel. Contractor must drill box to receive conduits and must attach box to structure with approved supports as detailed on the Contract Plans and as specified in Section 23 "Bridge Electrical System".

Existing mounting/support holes must be re-used where possible if the size of the new electrical box matches the size of the replaced box.

88-3.04 PAYMENT

The electrical box is measured as number of complete stainless-steel or cast-iron electrical box assemblies installed in accordance with the Contract Documents and Specifications.

Measurement must include all hardware and supports required for a complete installation.

88-3.04A BASIS OF PAYMENT

The unit price for this item includes the cost of labor, equipment, materials, mounting, terminal blocks, internal components, hardware, connections, and other incidentals as necessary to satisfactorily complete installation and perform the work described herein and shown on the Plans.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The progress payments for the work herein must comply with the San Joaquin County standard payment practices and must be made as follows:

1. Upon completion and acceptance of the installation of electrical boxes in accordance with the Contract Documents, the Contractor will be paid 90 percent of the item bid price.
2. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the item bid price.

Removal of all components not included in the final system is be paid under Section 88-9 "Electrical Equipment Demolition."

Payment for boxes that do not match the nominal dimensions included herein will be paid under the item with the closest equivalent cubic volume.

Boxes not shown on Contract Plans but required to comply with installation, NEC, or Contract requirements must have Engineer's acceptance before ordering, or they will not be paid.

Payment is made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 880110	Stainless Steel NEMA 4 Rated Electrical Box - 12 by 12 by 8 inches	Each
Item 880120	Cast Iron NEMA 4 Rated Electrical Box - 24 by 24 by 12 inches	Each

88-4 INSULATED CONDUCTORS

88-4.01 GENERAL

88-4.01A General

The work consists of furnishing and installing new insulated conductors. The Contractor must provide all labor, materials, plant, equipment, and incidentals required to furnish and install a functioning wire and cable system complying with the Plans, Specifications, and the Engineer's order.

Any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor just as if specifically mentioned in these Specifications at no additional cost.

Any cables and wiring not specifically called out herein and are required to perform the work under this Contract must be paid under Item 88-6 "Bridge Electrical System".

88-4.01B Definitions

Certified test reports refer to reports of tests conducted on previously manufactured materials identical to that proposed for use.

Factory tests refer to tests required to be performed on the actual materials proposed for use. Results of the tests must be submitted in accordance with the provisions of this Specification for laboratory test results.

88-4.01C Submittals

88-4.01C(1) General

If any departures from the Contract Documents are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted to the Engineer in writing as soon as possible for his approval. No departures from the Plans must be made without the Engineer's approval.

If the Contractor has any objections to the requirements on the Plans and/or Specifications, he must state his objection in writing to the Engineer before or when submitting shop; otherwise, his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted for Engineer's acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings the Engineer's acceptance, will be rectified by the Contractor at no additional cost.

The Contractor must coordinate the work of the conductor, cable, conduit and wireway manufacturers where components interface. The Contractor must review and approve all shop drawings to coordinate the proper assembly of all components prior to submission to the Engineer for approval.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification

reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification and any other applicable references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete, and a legend provided to decipher the manufacturer model number codes.

Materials and material specifications must be stated for each component. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for review and Engineer's acceptance. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

88-4.01C(2) Shop Drawings

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which result from ordering materials prior to the shop drawing acceptance, and no work must be done until the shop drawings are accepted. After shop drawing acceptance, the Contractor must supply the Engineer with up to three (3) prints of the accepted shop drawings per the Engineer's order.

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted for the purposes of documenting and performing the work, or obtaining approval from the Engineer to perform the work.

Shop drawings must conform to the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County and must in addition meet the following:

Manufacturer's data and/or shop drawings must be submitted for all conductors.

Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.

Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.

For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The plans or diagrams must show enough to enable complete disassembly and reassembly of the assemblies covered. If any part is modified in any way from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts

modified in similar fashion.

Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary materials on which the manufacturer or supplier states mounting dimensions, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they must show:

- Dimensions of all principal parts comprising the assembly.
- Certified external dimensions affecting clearances and required for installation.
- Capacity ratings.
- Location of mounting holes.
- Electrical operating characteristics.
- Location of conduit/cable entries, dimensioned and sized.
- Gross weight.
- Certified prints must be signed by an officer of the manufacturing company.

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for approval in the same manner as specified for the shop drawings.

The weight of each piece of equipment must be stated on the shop plans upon which it is detailed or billed.

Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

Where shop drawings are for materials that replace existing materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

88-4.01C(3) Certificates

Where materials are specified to conform to requirements of the standards of an organization or are required to conform to standard listings by applicable codes, such as NEMA, NFPA, and UL, that use a label or listing as method of indicating compliance, proof of such conformance must be submitted and approved. The label or listing of the specified organization will be acceptable evidence. In lieu of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and approved by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

88-4.01C(4) Operating and Maintenance Manual Supplement

The supplemental manual materials must be assembled in a separate volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit all materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches 20 lb. paper with accurately

punched holes. The paper must be acid free quality suitable for archival use. The holes for binding must be 5/16-inch in diameter and be reinforced with plastic or cloth, spaced at the standard for three holes spacing.

Foldout drawings, diagrams, and illustrations must have 5/16-inch minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

Final submittal must include a CD-ROM of the complete supplemental manual materials in PDF format. Four (4) copies of the accepted hard copy supplemental manual materials and four (4) copies of the CD-ROM must be delivered to the Engineer.

The supplemental operating and maintenance manual materials must include but not limited to as-built, revised, and updated; drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility and capacity to be capable of reproduction as required San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the supplemental manual materials including the method of binding and the text must be submitted for Engineer's acceptance.

All printed matter, data, drawings, diagrams, etc. must be produced by methods to result in permanence and durability, including paper that is water and grease resistant. No materials must be used which will adversely affect this permanence and durability.

The supplemental manual materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor, and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Additionally, replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Also, include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-4.01D Quality Assurance

88-4.01D(1) Qualifications, Personnel and Facilities

Material used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified material.

For all the work required under this Item, the Contractor must use enough skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide adequate plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-4.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable Federal, State and local rules, regulations, and ordinances.

Work must comply with all applicable requirements of the latest edition of codes and standards issued by the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
B 3 - Soft or Annealed Copper Wire	
B 8 - Stranded Copper Wire, Specter Conductors, Hard, Medium Hard, or Soft	
B 33 - Tinned Soft or Annealed Copper Wire for Electrical Purposes	
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1

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California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it does not mean that any other codes and standards must be assumed to be omitted if not mentioned.

All work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, ordered, and easily identified.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement applies.

88-4.01D(3) Measurements and Verification

Dimensions indicated on the Plans are nominal and are for guidance only. Variations from the dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits before bid. Any variance between plan and field conditions is not considered a basis for claim.

The Contract Documents, insofar as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It must be the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new component can be finished to obtain the prescribed fit.

88-4.01D(4) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in these Specifications are to allow the Contractor to substitute other manufacturers and model numbers of materials of equal quality and rating for those specified.

Before the Contractor orders of any substitute material, the Engineer's acceptance of the substitute material must be obtained in writing. The acceptance of the substitute materials is at the sole discretion of the Engineer who will establish the basis for equivalence and will review the quality of the materials and

materials described in detail on the submitted shop drawings and material data.

The Engineer will indicate "Approved" or "Revise and Resubmit" substitute material. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified material. Rejection must not in any way result in any additional cost. Approval by the Engineer of any substitute materials submitted by the Contractor must not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that material.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted as soon as practicable for approval. Departures must not be made without acceptance by the Engineer. All necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, must be made by the Contractor at no additional cost.

88-4.01D(5) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County may make necessary correction with its own forces and charge the resulting costs to the Contractor.

88-4.01D(6) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components to remain. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed will be completely compatible with the existing equipment to remain, and that all original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components to remain. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who must have the discretion regarding acceptance of the alternate methods. Where accepted by the Engineer, the alternate methods are for the Contractor's benefit, and the Contractor must not receive additional payment for the changes in work performed. Any costs associated with ensuring integration of the proposed work/equipment to existing systems, such that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-4.01D(7) Guarantees and/or Warranties

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon acceptance of the Contract, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such material furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical material and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-4.02 MATERIALS

88-4.02A General

All equipment and materials furnished under the items specified herein must be brand-new. All new materials and workmanship must be first class in every way and must be manufactured and installed to the Engineer's satisfaction.

88-4.02B Conductors

The conductors must be annealed uncoated or tinned copper stranded in accordance with ASTM B 8, class B stranded, type XHHW-2 and cross-linked polyethylene, XLPE insulated. The thickness of the conductor insulation must comply with NEMA WC-70. The insulated conductors must be rated 90 degrees Celsius, 600 volts.

88-4.02C Twisted Shielded Cable

Quantity of twisted pairs and size of conductors must be as indicated on the Contract Drawings; tinned-copper conductors; color-coded, polyvinyl chloride (PVC) insulation; overall aluminum/polyester shield and 22 AWG tinned-copper drain wire; PVC jacket.

88-4.02D Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the conductor components must be submitted for inclusion as an Appendix to the existing bridge operating and maintenance manuals.

The contractor must review the existing O&M Manuals as part of this work to identify items that need to be changed, added and/or require supplemental information.

The supplemental manual materials must include the following as a minimum for new and rehabilitated equipment:

New, updated and/or revised maintenance instructions for all new and rehabilitated material, including warnings and precautions to be observed during maintenance actions. All preventative maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order must be provided.

New, updated, or revised listings of all parts suppliers' local representatives, including suppliers' and representatives' names.

New, updated and/or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.

New, updated and/or revised description of the proper theoretical approach to installing and testing new material.

All relevant As-Built Shop Drawings. Drawings must be certified.

New, updated and/or revised instructions for annual cursory inspections and bi-annual in-depth inspections.

Manufacturer's literature describing each piece of new material furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.

Any other material or information which in the Engineer's opinion may be desirable to include in order to assist in maintaining the bridge functional systems and subsystems.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor must apply to the overall bridge system described in the supplemental manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-4.03 CONSTRUCTION

88-4.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

It is the Contractor's responsibility to furnish and install suitable conductors and cables. Review and approval of shop drawings by the Engineer does not relieve the Contractor of this responsibility.

88-4.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not feasible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities such that their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-4.03C Installation

The Contractor must furnish, install, and test the conductors in conformance to AASHTO and NETA ATS standards.

Conductors must be color-coded for phase identification, under NEC Section 210-5 and the California Electrical Code. The white neutral conductor must be 100 percent rated. Conductors which have the insulation removed for termination or for splicing must be marked with appropriately colored insulating tape for phase identification. In addition, the name of the manufacturer, insulation type, voltage rating and wire size must be clearly and permanently imprinted throughout the length of each conductor.

Contractor must use existing wiring numbers from the existing as-built drawings as closely as possible. New or additional conductors/wires, not part of the existing as-built drawings must be clearly identified, and numbers must not be redundant to the existing wire numbers. Wiring/schematic diagrams for inclusion in the O&M manual must be clearly identified with legend and plans must be submitted for acceptance during the shop drawing process.

Both ends of every single length of conductor must be permanently and clearly tagged under the same numbers or designations appearing on the accepted wiring diagrams. Wire tags for marking the conductors must be heavy duty, waterproof, permanently marked, and resistant to ultraviolet light deterioration. Numbers and letters must be black on a white background. Each tag must be either pre-marked or blank and marked using self-laminating markers with legends added with permanent ink as required. The Contractor must submit the proposed wire marking system and a sample of the wire markers to be installed for the Engineer's acceptance. Each conductor, except control and instrument conductors, must be color coded with colored insulation.

88-4.04 PAYMENT

This work under this item will be measured as number of linear feet of the conductor, of the type and size specified, installed, tested, and accepted under the Contract Documents and Specifications.

The work listed under this Pay Item does not include installation of junction boxes, pull boxes, conduit and wireway as they are listed under other Pay Items.

All other cables not listed under this Pay Item and not paid elsewhere but required for the work under this Contract will be paid under Section 88-6 "Bridge Electrical Equipment".

88-4.04A BASIS OF PAYMENT

The unit price for conductor per linear foot of each conductor size must include the cost of all labor, materials, equipment, connecting, splicing and support of conductors and all other incidentals necessary to satisfactorily complete installation and perform the work described herein and as shown on the Plans.

The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

Upon completion and acceptance of the installation of conductors and cables in accordance with the Contract Documents, the Contractor will be paid 90 percent of the bid price for this item.

Upon completion, acceptance and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced material for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the bid price for this item.

Removal of all components not included in the final system will be paid under Section 88-9 "Electrical Equipment Demolition."

Payment is made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 880040	Insulated Conductor No. 12 AWG	Linear Feet
Item 880130	Insulated Conductor No. 10 AWG	Linear Feet

88-5 GROUND WIRE AWG

88-5.01 GENERAL

88-5.01A General

The work under this item consists of furnishing and installing new grounding conductors. The Contractor must provide all labor, materials, plant, equipment, and incidentals required to furnish and install a functioning ground wire and grounding system under the Plans, Specifications, and the Engineer's order.

Incidental apparatus, appliance, material, or labor not mentioned that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor no additional cost.

88-5.01B Definitions

As used herein, certified test reports refer to reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

As used herein, factory tests refer to tests required to be performed on the actual materials or equipment proposed for use. Results of the tests must be submitted under the provisions of this Specification for laboratory test results.

88-5.01C Submittals

The Contractor must coordinate the work of the conductor, cable, conduit and wireway manufacturers where components interface. The Contractor must review and accept all shop drawings to coordinate the proper assembly of all components before submission for the Engineer's acceptance.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams,

performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification, any other applicable references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete and a legend provided to decipher the manufacturer model number codes.

Materials and material specifications must be stated for each component. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

If the Contractor has any objections to the requirements on the Plans and/or Specifications, he must state his objection in writing before or when submitting shop drawings for the Engineer's acceptance; otherwise his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted for the Engineer's acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings are accepted by the Engineer, will be rectified by the Contractor at no additional cost.

88-5.01C(1) Shop Drawings

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for review and Engineer's acceptance. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from ordering materials prior to the acceptance of the shop drawings; and no work must be done until acceptance of the shop drawings. After acceptance of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings per the Engineer's order.

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted for the purposes of documenting and performing the work, or obtaining the Engineer's authorization to perform the work.

Where shop drawings are for materials that replace existing materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County and must in addition comply with the following:

Manufacturer's data and/or shop drawings must be submitted for all ground conductors.

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Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.

Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.

For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The plans or diagrams must show enough to enable complete disassembly and reassembly of the assemblies covered. If any part is modified in any way from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.

Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary materials on which the manufacturer or supplier states mounting dimensions, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they must show:

- Dimensions of all principal parts comprising the assembly.
- Certified external dimensions affecting clearances and required for installation.
- Capacity ratings.
- Location of mounting holes.
- Electrical operating characteristics.
- Location of conduit/cable entries, dimensioned and sized.
- Gross weight.
- Certified prints must be signed by an officer of the manufacturing company.

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance in the same manner as specified for the shop drawings.

The weight of each piece of equipment must be stated on the shop plans on which it is detailed or billed.

Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

88-5.01C(2) Certificates

Where materials are specified to comply with requirements of the standards of an organization or are required to conform to standard listings by applicable codes, such as NEMA, NFPA, and UL, that use a label or listing as method of indicating compliance, proof of such conformance must be submitted and accepted. The label or listing of the specified organization will be acceptable evidence. Instead of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and approved by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's standard or code.

88-5.01C(3) Operating and Maintenance Manual Supplement

The supplemental manual materials must be assembled in a separate volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit all materials without overcrowding. The binder must have a clear vinyl cover and spine to

allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches 20 lb. paper with accurately punched holes. The paper must be acid free quality suitable for archival use. The holes for binding must be 5/16-inch in diameter and be reinforced with plastic or cloth, spaced at the standard for three holes spacing.

Foldout drawings, diagrams, and illustrations must have 5/16-inch minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

Final submittal must include a CD-ROM of the complete supplemental manual materials in PDF format. Four (4) copies of the accepted hard copy supplemental manual materials and four (4) copies of the CD-ROM must be delivered to the Engineer.

The supplemental operating and maintenance manual materials must include as-built, revised, and updated; drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility and capacity to be capable of reproduction as required San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the supplemental manual materials including the method of binding and the text must be submitted for Engineer's acceptance.

All printed matter, data, drawings, diagrams, etc. must be produced by methods to result in permanence and durability, including paper that is water and grease resistant. No materials must be used which will adversely affect this permanence and durability.

The supplemental manual materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Additionally, replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Also, include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-5.01D Quality Assurance

88-5.01D(1) Qualifications, Personnel and Facilities

Materials used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified materials.

For all the work required by the Ground Wire Pay Item, the Contractor must use adequate numbers of skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide adequate plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-5.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable requirements of the latest edition of codes and standards issued by, but not limited to, the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it is not meant that any other codes and standards must be assumed to be omitted if not mentioned.

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

88-5.01D(3) Measurements and Verification

Dimensions indicated on the Plans are nominal and are intended for guidance only. All variations from the nominal dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits prior to bid. Any variance between plan and actual field conditions must not be considered as a basis for claim.

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all

existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new component can be finished to obtain the prescribed fit.

88-5.01D(4) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in these Specifications allow the Contractor to substitute other manufacturers and model numbers of materials of equal quality and rating for those specified.

Before the Contractor orders any substitute material, the Engineer's acceptance of the equivalence of the substitute material must be obtained in writing. The acceptance of the substitute materials is at the sole discretion of the Engineer who will establish the basis for equivalence and will review the quality of the materials and materials described in detail on the submitted shop drawings and material data.

The Engineer will indicate "Approved" or "Revise and Resubmit" substitute material. Upon return of a shop drawing showing rejection, the Contractor must resubmit the shop drawing showing the specified material. Rejection must not in any way result in any additional cost. Approval by the Engineer of any substitute materials submitted by the Contractor must not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that material.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted as soon as practicable for approval. Departures must not be made without the Engineer's acceptance. All necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, must be made by the Contractor at no additional cost.

88-5.01D(5) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County reserves the right to make necessary correction with its own forces and charge the resulting costs to the Contractor.

88-5.01D(6) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components to remain. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed will be completely compatible with the existing equipment to remain, and that all original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components to remain. In this case, the Contractor may propose alternate methods

including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who must have the sole discretion regarding approval of the alternate methods. Where accepted by the Engineer, the alternate methods are for the Contractor's benefit, and the Contractor does not receive additional payment for the changes in work performed. Any costs associated with ensuring integration of the proposed work/equipment to existing systems, such that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-5.01D(7) Guarantees and/or Warranties

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon acceptance of the Contract, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such materials furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical materials, and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-5.02 MATERIALS

88-5.02A General

All equipment and materials furnished under the items specified herein must be brand new. All new equipment, materials and workmanship must be first class in every way and must be manufactured and installed to the satisfaction of the Engineer.

It is the Contractor's responsibility to furnish and install suitable conductors and cables. Review and acceptance of shop drawings by the Engineer does not relieve the Contractor of this responsibility.

88-5.02B Ground Wire

All conductors must be insulated unless the Engineer accepted otherwise. The Engineer's discretion must be binding. The conductor and any other materials required, must be of the size indicated in the Plans and must consist of 7 strands for cable size less than 2/0 and 19 strands for size 2/0 or greater of soft-drawn copper wire complying with ASTM B-3 and ASTM B-8. The ground wire must be Underwriters Laboratories approved.

88-5.02C Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the ground wire components must be submitted for inclusion as an Appendix to the existing bridge operating and maintenance manuals.

The contractor must review the existing O&M Manuals as part of this work to identify items that need to be changed, added and/or require supplemental information.

The supplemental manual materials must include the following as a minimum for new and rehabilitated equipment:

New, updated and/or revised maintenance instructions for all new and rehabilitated equipment, including warnings and precautions to be observed during maintenance actions. All preventative maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order must be provided.

New, updated, or revised listings of all parts suppliers' local representatives, including suppliers'

and representatives' names.

New, updated and/or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.

New, updated and/or revised description of the proper theoretical approach to installing and testing new equipment.

All relevant As-Built Shop Drawings. Drawings must be certified.

New, updated and/or revised instructions for annual cursory inspections and bi-annual in-depth inspections.

Manufacturer's literature describing each piece of new equipment furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.

All other material or information which in the opinion of the Engineer may be desirable to include in order to assist in maintaining the bridge functional systems and subsystems.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor must apply to the overall bridge system described in the supplemental manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-5.03 CONSTRUCTION

88-5.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

All work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, ordered, and easily identified.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It must be the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

88-5.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not feasible or jeopardizes the longevity of the

components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities such that their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-5.03C Installation

The Contractor must furnish, install, and test the conductors under AASHTO and NETA ATS standards.

The ground conductors must be of the size specified, where shown on the Contract Plans. Where ground conductors are not provided in the existing system but are required to comply with NEC and/or AASHTO and to provide a complete bonded ground system, the Contractor must submit additional sizes and/or quantities for the Engineer's acceptance.

88-5.04 PAYMENT

The work under this item will be measured as the number of linear feet of ground wire, of the type and size specified, installed, tested, and accepted in accordance with the Contract Documents and Specifications.

The work listed under this Pay Item does not include installation of junction boxes, pull boxes, conduit and wireway as they will be listed under other Pay Items.

88-5.04A Basis of Payment

The unit price for conductor per linear foot of each conductor size must include the cost of all labor, materials, equipment, connecting, splicing and support of conductors and all other incidentals necessary to satisfactorily complete installation and perform the work described herein and as shown on the Plans.

The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

Upon completion and acceptance of the installation of conductors and cables in accordance with the Contract Documents, the Contractor will be paid 90 percent of the bid price for this item.

Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10percent of the bid price for this item.

Removal of all components not included in the final system will be paid under Section 88-9 "Electrical Equipment Demolition."

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Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 880060	Ground Wire No. 12 AWG	Linear Feet
Item 880140	Ground Wire No. 10 AWG	Linear Feet

88-6 BRIDGE ELECTRICAL EQUIPMENT

88-6.01 GENERAL

88-6.01A General

Section 88-6 includes furnishing and providing all labor materials, equipment and incidentals required to complete the installation of all the items listed herein and in accordance with the Plans, Specifications and the Engineer's order. The new components and work include:

- Bridge Control Equipment
- Power Distribution Equipment
- Instrumentation
- Control Apparatus
- Nameplates
- Bridge Control System
- Instrumentation Flexible Cables
- Hardware Supports
- Miscellaneous Work

Any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor as if specifically mentioned in these Specifications and without extra cost.

The alignment and fastening of electrical equipment incorporated into the bridge machinery, such as motors, brakes, rotary limit switches, and position encoders, must be done under the machinery item(s).

Where new or replaced components require additional modifications to the existing structure, machinery or electrical devices than what is specified or due to existing field conditions, the Contractor must make the modifications at no additional cost.

88-6.01B Definitions

Certified test reports refer to reports of tests conducted on previously manufactured materials identical to that proposed for use.

Factory tests refer to tests required to be performed on the actual materials proposed for use. Results of the tests must be submitted in accordance with the provisions of this Specification for laboratory test results.

88-6.01C Submittals

88-6.01C(1) General

The Contractor must coordinate the work of the electrical component manufacturers where components interface, both with other electrical components and with components of other trades. The Contractor must

review and accept all shop drawings to coordinate the proper assembly of the various machinery components prior to submission to the Engineer for approval.

Name and written qualifications of the proposed Control System Vendor must be submitted to the Engineer and must be subject to acceptance by the bridge owner's Engineering Department.

If any departures from the Plans or the Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefor must be submitted for acceptance as soon as possible. Departures must not be made nor work started without Engineer's acceptance.

If the Contractor has any objection to any feature of the electrical system as designed or required by the Plans and/or Specifications, he must state his objection in writing to the Engineer before or when submitting shop drawings; otherwise, his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted for the Engineer's acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings are Engineer accepted, will be rectified by the Contractor at no additional cost.

The Contractor must submit for inspection and test, if the Engineer orders, samples of any apparatus or device, which the Contractor proposes to use as a part of the electrical installation.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification and any other applicable references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete and a legend provided to decipher the manufacturer model number codes.

88-6.01C(2) Shop Drawings

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for Engineer's review and acceptance. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

The Contractor must submit PDF files of all shop drawings for Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from ordering materials before the acceptance of the shop drawings; and no work must be done until the shop drawings have been accepted. After acceptance of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings as Engineer ordered.

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted for the purposes of documenting and performing the work, or obtaining the Engineer's acceptance to perform the work.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County and must in addition comply with the following:

Manufacturer's data and/or shop drawings must be submitted for all electrical items.

Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.

Materials and material specifications must be stated for each component. Where ASTM or any other Standard Specifications are used, the applicable numbers of such specifications must be given.

Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.

For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The plans or diagrams must be enough to enable complete disassembly and reassembly of the assemblies covered. If any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.

Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary materials on which the manufacturer or supplier states mounting dimensions, ratios, speeds, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they must show:

- Dimensions of all principal parts comprising the assembly.
- Certified external dimensions affecting clearances and required for installation.
- Capacity and normal operating ratings.
- Location of mounting holes.
- Electrical operating characteristics.
- Locations of conduit/cable entries, dimensioned and sized.
- Gross weight.
- Certified prints must be signed by an officer of the manufacturing company.

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for approval in the same manner as specified for the shop drawings.

The weight of each piece of equipment must be stated on the shop plan upon which it is detailed or billed.

An installation plan must be provided. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

Where shop drawings are for materials that replace existing materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

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The following specific items must be included in the shop drawing submittals for this pay item as applicable:

Certified dimension prints of all motors, span brake motors, limit switches, control panels, instrumentation flexible cables, motor starters, drives, disconnect switches junction and pull boxes, motor control centers and other miscellaneous equipment in either machinery rooms, catwalks, fenders, counterweight pits, movable spans or power distribution room/s.

Revised schematic wiring diagram, including power, control, and lighting connections modified from existing. Both electrical devices and each wire between devices must be identified by an individual designation of letters, numbers, or a combination of both, and such designations must be used wherever the devices or wires appear on other drawings. Existing designations must be used and new additions must be clearly defined. A complete set of catalog cuts for materials furnished must be included for review at the time of schematic submittal.

Layout drawings and internal connection diagrams of the control and distribution panelboards, and terminal cabinets.

A schedule of electrical apparatus which must list each electrical device by its designation as shown on the schematic wiring diagram and must state for each device its rating, number of poles or contacts, function, catalog number, and location.

A complete interconnection diagram(s) for all electrical apparatus and equipment used in the operation of the movable span and its auxiliaries. The diagram(s) must be of the point-to-point type and must show the external connections of all devices and equipment. Computer-generated interconnection lists will not be acceptable instead of a true interconnection diagram.

Outline drawing, details, and connection diagram for distribution switches, its components, and assembly on bridges, if required to be replaced under this Contract.

A complete schematic conduit and cable diagram or diagrams showing the interconnection of all replaced devices and equipment, including ducts and junction boxes, and showing all multiconductor cables. The size of each replaced with new conduit, the wire number of each replaced with new conductor in multi conductor cables, must be shown on the diagrams. Each conduit and multi conductor cable must be suitably numbered or lettered and percent wire fill must be shown. The numbering system must be compatible with the original numbering system.

A complete set of layout and installation drawings for the electrical work under this Contract showing the location and installation, including support and mounting details, of all electrical apparatus and equipment. These drawings must be made to scale and must show the exact location of all conduits, cables, wiring ducts, boxes, motors, brakes, limit switches, disconnect switches, and other electrical equipment and the method of supporting them on the structure. All original layout and installation drawings must be shown as a background.

Outline drawings and mounting details of all navigation lights.

Catalog cuts of lighting fixtures, switches, outlets, and electric heating equipment.

Arrangement of service light wiring and fixtures, including service outlets, showing all conduits, boxes (including their support), and wiring.

Material listing and specifications for controller, if replaced with new, and equipment for interfacing.

Riser diagrams, wiring diagrams, details, and catalog cuts of the replaced with new electrical equipment, including outdoor enclosure and mounting brackets, monitor controls, and cabling.

Any other drawings, which the Engineer orders, necessary to show the electrical work required under this Contract.

All layout and installation drawings for the electrical work must be submitted for acceptance so provision is made for mounting of conduits, cables, and other electrical equipment. In most cases the existing holes either drilled in the existing concrete wall or steel structure will be used, unless the existing supports spacing violates current NEC criteria for conduit and cable supports.

p. Certified dimension prints of the apparatus must state in the certification the name of the job, bridge name, application of the apparatus, device designation, number required, right-hand or left-hand assembly, electrical rating, number of poles or contacts, material, finish, and any other pertinent data to show that the apparatus meets the specified requirements.

88-6.01C(3) Certificates

Where equipment or materials are specified to conform to requirements of the standards of an organization, such as NEMA, NFPA, and UL, that use a label or listing as method of indicating compliance, proof of such conformance must be submitted and accepted. The label or listing of the specified organization will be acceptable evidence. Instead of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and Engineer accepted, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

88-6.01C(4) Operating and Maintenance Manual Supplement

The manual supplemental materials must be assembled in a volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit all materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches 20 lb. paper with accurately punched holes. The paper must be acid free quality suitable for archival use. The holes for binding must be 5/16 inches in diameter and be reinforced with plastic or cloth, spaced at the standard for three hole spacing.

Foldout drawings, diagrams, and illustrations must have 5/16 inches minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

Final submittal must include a CD-ROM of the complete manual supplement materials in PDF format. Four copies of the approved hard copy supplemental manual materials and four copies of the CD-ROM must be delivered to the Engineer.

The supplemental operating and maintenance manual materials must include as-built, revised, and updated drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity,

legibility and capacity to be reproduced as required by San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reproduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the manual supplemental materials including the method of binding and the text must be submitted for acceptance by the Engineer.

All printed matter, data, drawings, diagrams, etc. must be produced by methods resulting in permanence and durability, including paper that is water and grease resistant. No materials must be used which will adversely affect this permanence and durability.

The manual supplemental materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor, and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Additionally, replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Also, include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-6.01D Quality Assurance

88-6.01D(1) Qualifications, Personnel and Facilities

88-6.01D(1.1) General

Materials used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified materials.

The Contractor must provide enough plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

For all the work required by this Section, the Contractor must use enough skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

88-6.01D(1.2) Control System Vendor

The Contractor must retain the services of a qualified control system vendor who must have complete system responsibility for the detailed integration of all system components, to ensure a complete operating system is provided at the completion of the Contract. The control system vendor must ensure total compatibility of all equipment and devices furnished and installed and must provide supervisory assistance in the selection, installation and integration of all bridge span drive and associated equipment. Components

associated with bridge span drive operations include span drive control, limit switches, motor controls and controllers, and associated devices.

The control system vendor must review shop drawings, prior to submission to the Engineer, to ensure that all components of the bridge operating system submitted for use are compatible in every respect and that all components meet or exceed the specific requirements and intent of the project. The total bridge operating system must be subject to the Engineer's acceptance, based on the specified project requirements.

The control system vendor must ensure maximum reliability and ease of maintenance for all operating system components and must train the bridge operator and maintenance staff and supervise all training operations.

The control system vendor must have confirmed skill in providing electrical control systems for movable bridges of various types, particularly bascule type, but including vertical lift and swing type bridges. Such experience must be demonstrated by identifying a minimum of (3) three movable bridges for which the control system vendor has provided complete systems within the past five years.

The control system vendor must make available a field service staff with the capability of providing services for field coordination of construction and final adjustments to the drive system to the Engineer's satisfaction. Field staff must be capable of responding, at the site, to an emergency within six (6) hours.

The Control System Vendor must additionally be responsible for:

Determination of all required control cables and routing for control system.

Selection of types and sizes of equipment to meet requirements shown on the Plans and included herein.

Verification and determination of quantity and type of all control system devices such as relays, I/O, switches, ports, etc.

Fabrication, integration, testing, and installation of the Control System and associated devices.

The Control System Vendor must specify and select all materials not specifically stated herein or noted on the Plans to provide a uniform and integrated system that provides seamless operation of the bridge and its associated electrical appurtenances.

Configuration of existing systems and devices (such as motor controllers) that are indicated to remain in part or whole, but that will be connected to new devices which may have different characteristics than the existing.

88-6.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

The Contractor must obtain any required permits and approvals of all Departments or Agencies having jurisdiction.

Work must comply with all applicable requirements of the latest edition of codes and standards issued by, the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

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American Association of State Highway and Transportation Officials	AASHTO
American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Code of Federal Regulations	CFR
29CFR1910.147 – The Control of Hazardous Energy (Lockout/Tagout)	
29CFR1926.24 – Fire Protection and Prevention	
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
AB-1 Standards for Circuit Breakers	
ST-20 Dry Type Transformers for General Applications	
PB-1 Standards for Panelboards	
NFPA 70 – National Electrical Code	NEC
NFPA 780 – National Fire Protection Code	NFPA
California Electrical Code	CAEC
National Electrical Safety Code	NESC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additional specific requirements include:

Title 33, Code of Federal Regulations 33 CFR, Part 118.80: Lighting on Bascule Bridges
Lightning Protection Institute Installation Code LPI 175

Instrumentation Flexible Cables must meet the following Industry Standards:

110 Degree C Temperature Rating
American Bureau of Shipping (ABS)
UL Listed as Marine Shipboard Cable
United States Coast Guard Approved

Where codes and standards are mentioned for any pay item, it is to call attention to them, it is not that any other codes and standards must be assumed to be omitted if not mentioned.

88-6.01D(3) Measurements and Verification

Dimensions indicated on the Plans are nominal and are for guidance only. All variations from the dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits before bid. Any variance between plan and field conditions must not be considered as a basis for claim.

The Contract Documents, relating to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It must be the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new component can be finished to obtain the prescribed fit.

88-6.01D(4) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in these Specifications are to allow the Contractor to substitute other manufacturers and model numbers of materials of equal quality and rating for those specified.

Before the Contractor orders any substitute material, the Engineer's acceptance of the equivalence of the substitute material must be obtained in writing. The acceptance of the substitute materials is at the sole discretion of the Engineer who establishes the basis for equivalence and will review the quality of the materials and materials described in detail on the submitted shop drawings and material data.

The Engineer marks as "Accepted" or "Revise and Resubmit" substitute material. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified material. Rejection must not in any way result in any additional cost. Engineer's acceptance of any substitute materials submitted by the Contractor does not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that material.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted as soon as practicable for acceptance. Departures must not be made without Engineer's acceptance. All necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, must be made by the Contractor at no additional cost.

88-6.01D(5) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County may make necessary correction with its own forces and charge the resulting costs to the Contractor.

88-6.01D(6) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components to remain. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed will be completely compatible with the existing equipment to remain, and that all original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components to remain. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who must have the sole discretion regarding approval of the alternate methods. Where Engineer accepted, the alternate methods

are for the Contractor's benefit, and the Contractor must not receive additional payment for the changes in work performed. Any costs associated with ensuring integration of the proposed work/equipment to existing systems, such that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-6.01D(7) Guarantees and/or Warranties

The Contractor must warrantee the in-service working of the electrical installations for one-year following project acceptance.

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon Contract acceptance, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such materials furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical materials and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-6.02 MATERIALS

88-6.02A General

All equipment and materials furnished under the items specified herein must be brand-new. All new equipment, materials and workmanship must be first class in every way and must be manufactured and installed to the Engineer's satisfaction.

No spare materials will be provided.

88-6.02B Materials

Each piece of electrical equipment and apparatus must have a corrosion-resisting metal nameplate on which is stamped the name of the manufacturer and the rating or capacity of the equipment or apparatus.

All metal parts of the installation, except structural steel, if applicable, must be of corrosion-resisting material, such as aluminum, bronze, or stainless steel. Cast-iron, malleable iron, or steel with a hot-dip galvanized finish must be used where specified herein. Structural steel must conform to the requirements given under County Standard Specifications.

All mounting hardware and all wire and cable terminals must be vibration proof and must use double nuts on all movable parts and flanking spans of bridges under this Contract.

88-6.02C Components

88-6.02C(1) Instrumentation

In general, for each device that replaces an existing device, the new instrumentation device must be identical in model and function. If an exact replacement is not available, then the following specifications for furnishing and installing a replacement for the damaged instrumentation must be used.

If space is a limiting factor or the instrumentation does not meet current NEC standards, then the Engineer must be informed prior to proceeding with the work.

Limit switches must be furnished in accordance with the Contract Drawings. Switches must be specified according to the operation required, including the number of switches, contacts, cams, circuits, degree of motion for operators, number of rated operations, and environmental ratings. Where limit switches will be installed to replace existing switches and/or interface with existing equipment, care must be taken to ensure

the proper materials are ordered. The Contractor must perform all field investigation necessary to order all proper parts and accessories to ensure that the limit switches perform in the exact manner as the existing switches that they replace.

88-6.02C(2) Control Equipment

Control apparatus must conform to the applicable requirements of NEMA Publication No. ICS, latest revision, Industrial Control and Systems rated.

88-6.02C(2.1) Controllers

Controllers that are indicated to be replaced must be replaced by new in their entirety.

Wiring diagrams must be provided for each controller. The diagrams must show the exact layout of the unit and must not be a generic diagram.

88-6.02C(2.2) Motor Starters and Magnetic Contactors

The continuous current rating of contactors and starters must be adequate for the connected loads, and starters must not be smaller than NEMA Size 1.

All starters must be full voltage type, 600 VAC, 60 Hertz, rated with 120 VAC operating coils.

All contact poles must be provided with arc chutes, and contactors rated 150 amperes and above must be equipped with magnetic blowouts.

Three-element, automatic reset, overload relays must be provided for motor protection.

Reversing contactors must be electrically and magnetically interlocked.

88-6.02C(2.3) Standalone Overload Relays

Three-element overload relays shall be provided for motor protection. Overload relays shall be of the automatic reset type unless otherwise specified. Overload relays shall be provided with the required auxiliary contacts as shown on the Contract Plans a minimum of two N.O./N.C. auxiliary contacts must be provided. Heater elements are to be selected based on motor full load running current.

88-6.02C(2.4) Control Relays

Auxiliary control relays must be multi contact magnetic relays with contacts rated at 15 amperes, 240 volts, on a continuous basis.

Relays known to meet the specified requirements are the Square D class 8501 type X, Allen-Bradley bulletin 700 type P, and the General Electric CR1208.

88-6.02C(2.5) Phase Failure and Reversal Relay

This relay must prevent energizing the bridge controls in the event of reversed phase sequence, loss of one phase, or low voltage.

Equipment known to meet the specified requirements must be as manufactured by, General Electric, Allen-Bradley or the Engineer approved equal.

88-6.02C(2.6) Selector Switches and Pushbuttons

Pushbuttons and control switches must be heavy-duty, oil-tight, contact blocks operated by glove handle selector knobs and push-button operators as indicated on the Plans.

Contacts must be fine silver, capable of interrupting 6 amperes at 120 volts AC, and of 10 ampere continuous duty.

88-6.02C(2.7) Indicating Lights

Indicating lights mounted at the control cabinets must be full voltage, heavy-duty, oil-tight sockets provided with LED lamps rated at 120 volts.

Indicating lights on the control consoles must be provided with group test contacts.
All lenses must be glass, with color and marking as shown on the Plans.

88-6.02C(3) Power Distribution System

88-6.02C(3.1) Transformers

Electrical ratings:

Number of phases: 3

Frequency: 60 Hertz

*KVA Rating: XX KVA

*Primary Voltage: XXX Volts Δ

*Secondary Voltage: XXX / XXX volts Y

Minimum Efficiency: As per DOE 2016 Requirements

* As required to match existing or as shown on plans.

Noise levels must be warranted by the manufacturer and must not exceed 40 decibels for transformers 0 - 9 KVA, 45 decibels for transformers 10 - 50KVA, 50 decibels for transformers 51 - 150 KVA, 55 decibels for transformers 151 - 300 KVA, 60 decibels for transformers 301 - 500KVA, 62 decibels for transformers 501 - 700 KVA, and 64 decibels for transformers 701 - 1000 KVA.

Transformer windings must be of copper, must be of continuous wound construction, and must be impregnated with non-hygroscopic, thermosetting varnish.

Transformers must feature an electrostatic shield.

Transformer insulation must be a UL recognized minimum 180 degrees C system with 80 degrees C temperature rise. Neither the primary nor the secondary temperature must exceed 180 degrees C at any point in the coils while carrying their full rating of sinusoidal or non-sinusoidal load.

All cores to be constructed with low hysteresis and eddy current losses. The core flux density must be well below the saturation point to prevent core overheating caused by harmonic voltage distortion. Transformers must be common core construction. Transformers using more than one core, or Scott T connections, will not be acceptable.

All insulation materials must be flame-retardant and must not support combustion as defined in ASTM Standard Test Method D635.

All transformers must be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure must not exceed 105 degrees C. The core of the transformer must be grounded to the enclosure.

The enclosure construction must be encapsulated, totally enclosed, non-ventilated, NEMA 4X 316 stainless steel.

The transformers must be Hammond Power Solutions, Cutler-Hammer, General Electric or Engineer accepted equal.

88-6.02C(3.2) Service Disconnect Switches

The switches must be fusible, heavy-duty, safety switches in watertight and dust-tight NEMA 4X, stainless-steel enclosures. Each disconnect switch must be furnished with two normally open. auxiliary contacts and phenolic nameplate to identify the switch. The switches must be rated at a minimum 240 volts AC for 208 volts AC, or 600 volts AC for 480 volts AC incoming voltages.

88-6.02C(3.3) Motor Disconnect Switches

The switches must be tag out lockable, fusible, heavy-duty, safety switches, rated as shown on the Contract Drawings, in waterproof, NEMA 4X, stainless steel enclosures. Each span motor and brake disconnect switch must be furnished with a normally open/normally closed auxiliary contact and phenolic nameplate to identify corresponding motor or brake.

88-6.02C(3.4) Circuit Breakers

All breakers must have quick-make and quick-break contacts, and the mechanism must be trip-free and trip indicating. Frame sizes must not be less than 100 amperes and as shown on the plans.

The breakers must be equipped with thermal-magnetic trips or adjustable, instantaneous, magnetic trip units, with trip rating as shown on the Plans or as required.

Molded-case circuit breakers must meet the requirements of the latest revision of NEMA Publication No. AB1.

The service entrance circuit breakers must be of frame size as the original frame size, 600 volt rated, with Contract Drawings specified ampere electronic trip setting with independently adjustable short time pick-up and time delay. Interrupting capacity must not be less than 100,000 amperes interrupting current.

Circuit breakers must be, as manufactured by General Electric or Square D Company or Engineer approved equal.

88-6.02C(3.5) Terminal Blocks

Terminal blocks for conductors of Size No. 8 AWG and smaller must be one-piece blocks of phenolic material recognized under the UL Component Recognition Program.

Barriers must not be less than 1/2 inch high and 1/8 inch thick and must be spaced 5/8 inch center-to-center. Straps and screws must be of brass; nickel plated for use in highly corrosive atmospheres and must be rated for 50 amperes minimum.

The blocks must provide a withstand voltage rating of 750 volts per IEEE switchgear standards.

The terminal blocks must provide strap screws suitable for use with ring tongue wire connectors.

Corrosion resistant marking strips must be provided for conductor identification.

At least ten percent spare terminals must be provided.

Terminal blocks must be Buchanan Type 2B112, ABB RGW25-M5 series, Marathon 1500 Series, or Engineer accepted equal.

88-6.02C(3.6) Power Distribution Blocks

Power distribution blocks, for all conductors larger than No. 8 AWG, must be constructed from a single piece of hard-drawn copper, machined, and electro-tinned.

All blocks must be mounted on heavy-duty phenolic material and furnished with safety cover kits.

Number and size of primary and secondary wire openings will be selected by the Contractor/Vendor and must be the MPDB66 series blocks as manufactured by Mersen, 140 Series as manufactured by Marathon Special Materials, or Engineer accepted equal manufactured by Allen-Bradley or Square D.

88-6.02C(3.7) Terminal Connectors

Connectors must be seamless, heavy-duty compression ring tongue terminals manufactured from pure electrolytic copper tubing. Terminals must be tin plated and provided with a double-thick tongue and insulation grip. Terminals and compression tools must be approved by the Engineer.

88-6.02C(3.8) Lighting Panelboards

Each lighting panelboard must be the dead-front type and must be provided with quick-make, quick-break, thermal-trip, E-frame, branch circuit breakers. Each breaker must trip free of the operating handle, and the handle must indicate the position of the breaker.

Each panelboard must be provided with a circuit breaker in the mains and with a full-sized neutral bar.

All branch circuits must be numbered, and a typewritten directory must be provided on the inside of each door.

Circuit breakers must meet the requirements of UL Standard 489.

All lighting panelboards must be either 208/120 volts or 240/120 volts, 3-phase, 4-wire panels surface or flush mounted as called out on the Plans. Panelboard enclosures must be code gauge galvanized steel with ANSI 61 light gray enamel finish. Panel boards must be NEMA 4X rated, with copper lugs and tin-plated copper busses.

Panelboards must be Engineer accepted equal to Siemens P2, Cooper Crouse-Hinds XLPB series or Square-D Type QO.

88-6.02C(3.9) Nameplates

Nameplates must be provided for all devices and must be made of laminated phenolic plastic with white front and back and black core and must be not less than 0.09 inches thick. The lettering must be etched through the front layer to show black engraved letters on a white background. Lettering must be not less than 6 millimeters high, unless otherwise detailed on the Plans. Nameplates must be securely fastened to the equipment with stainless steel screws.

88-6.02C(3.10) Instrumentation Flexible Cables

Flexible instrumentation cable must be heavy duty extremely flexible marine/shipboard rated cable. Instrumentation cable must at a minimum contain 4 twisted shield pairs each of No.18AWG. Pairs must be individually shielded and the cable must have an overall armor. Cable to be rated for 1KV and 110 Degrees C.

The instrumentation cable insulation for the individual conductors must be cross-linked flame retardant

polyolefin, meeting the requirements for Type P of IEEE 1580 and Type X110 of UL 1309/CSA 245.

Each twisted pair must have a dedicated bare tinned drain wire. Each pair must be shielded with polyester-backed aluminum foil tape to afford 100 percent coverage.

Individual conductors must be soft annealed flexible stranded tinned copper per IEEE 1580 Table 11.

Cable jacket must be black, arctic grade, flame retardant, oil, abrasion, chemical and sunlight resistant thermosetting compound complying with UL1309/CSA 245 and IEEE 1580.

Cable must have a bronze basket weave wire armor per IEEE 1580 and UL 1309/CSA 245.

The overall cable must utilize a black, arctic grade, flame retardant, oil, abrasion, chemical and sunlight resistant thermosetting compound sheath complying with UL 1309/CSA 245 and IEEE 1580.

88-6.02C(3.11) Hardware Supports

Supports for conduits, wireways, cables, boxes, cabinets, disconnect switches, small limit switches, and other separately mounted items of electrical equipment must be fabricated from structural steel not less than ¼ inches thick. Clip angles and other supporting members, which are fabricated from structural steel plates and shapes and bolted to the structural members, must be included under the Bridge Electrical System Item.

Structural steel brackets, boxes, and other equipment mounted on concrete surfaces must be provided with a full neoprene gasket not less than 0.05 inches thick between the equipment and the surface of the concrete.

Expansion anchors for fastening equipment or brackets to concrete surfaces must be wedge type anchor bolts, which must be locked in place by an expansion wedge as the nut is tightened. All parts of the expansion anchors must be of Type 303 stainless steel. Holes for the anchors must be drilled to the manufacturer instructed size and depth using carbide tipped masonry drills.

Mounting bolts, nuts, washers, and other detail parts used for fastening boxes, disconnect switches, small limit switches, conduit clamps, cable supports, brackets, and other electrical equipment must be of stainless steel complying with the requirements of ASTM Designation A276, Type 316. Bolt heads and nuts must be hexagonal and must be provided with medium-series lock washers. Bolts smaller than 1/2 inches in diameter must not be used, except as may be necessary to fit the mounting holes in small limit switches, boxes, and similar standard devices.

Using beam clamps for supporting conduits, boxes, or other equipment is not acceptable without prior Engineer's acceptance.

Preformed elongated holes metal framing channels, such as Kindorf, Unistrut, Superstrut, etc., are not acceptable for mounting or supporting electrical equipment or boxes.

88-6.02D Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the 'Bridge Electrical System' components must be submitted for inclusion in the existing operating and maintenance manuals.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor must apply to the overall bridge system described in the supplemental

manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

The manual supplemental materials must include the following as a minimum for new and rehabilitated equipment:

New, updated, or revised maintenance instructions for all equipment, including warnings and precautions to be observed during maintenance actions. All preventative maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order must be provided.

Listings of all parts suppliers' local representatives, including suppliers' and representatives' names.

New, updated, or revised schematics indicating what items should be cleaned and painted on a regular basis.

New, updated, or revised troubleshooting procedures, flowcharts and checklists for anticipated possible breakdowns of equipment.

New, updated, or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.

New, updated, or revised description of the proper theoretical approach to installing and testing new equipment.

All relevant as-built shop drawings. Drawings must be certified.

New, updated, or revised instructions for annual cursory inspections and bi-annual in-depth inspections.

Manufacturer's literature describing each piece of new equipment furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.

All other material or information which in the Engineer's opinion may be desirable to include to assist in maintaining the bridge functional systems and subsystems.

Preventative maintenance procedures, including how often the various procedures should be done. All safety precautions that are required to be observed for proper operation and maintenance must be included in a separate section in addition to wherever noted in the manuals.

Maintenance testing and procedure equipment lists.

Schematic indicating what items should be cleaned and painted on a regular basis.

Troubleshooting procedures, flowcharts and checklists which must include a troubleshooting flow chart for troubleshooting the bridge electrical system and instructions for diagnosing control system malfunctions and for detecting failures in external controls connected thereto.

Operating current, equipment, and criteria for drive and motors.

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Repair procedures and repair procedure equipment lists, including suggested procedures for installation and removal of items provided under the Contract.

Description of the proper theoretical approach to installing and testing electrical and control systems.

Anticipation of possible breakdowns and development of trouble-shooting procedures and identification of corrective actions.

As-Built Shop Drawings which must include schematic wiring diagrams, control desk and control panel layouts, connection diagrams as listed under "Bridge Electrical System"

Conduit and electrical layout and installation drawings, including mounting details.

Control desk, Control panels, Relay panels and wiring diagrams.

Schematic wiring diagrams.

Certified drawings.

Steps for cursory inspection that should be carried out annually

Steps for in depth inspection that should be carried out every two years

Manufacturer's literature describing each piece of equipment and giving complete identification including manufacturers' model number and drawing number. A set of descriptive leaflets, bulletins and plans covering all approved items of equipment furnished and installed, including any suggested installation, alignment, maintenance, troubleshooting and repair procedures. The catalog number of each piece must be given to be used when it becomes necessary to order replacement parts from the original manufacturer.

A detailed and complete description of the As Left height settings of the span rotary limit switches and corresponding height set points of the selsyn position indicator (if applicable). The description must include detailed instructions about setting each point of the rotary limit switch and a troubleshooting flow chart for diagnosing and correcting malfunctions. The rotary limit switch must be kept accurate within 0.25 inch of lift position.

All material or information which in the Engineer's opinion be desirable to include in order to assist in maintaining the bridge functional systems and subsystems.

Electrical wiring diagrams must be furnished, framed, and installed in the machinery, switchgear and operator's rooms or at locations the Engineer assigns.

Each framed diagram must conform to the following requirements:

No single diagram must show more than one system or parts thereof.

Diagrams must be reproduced by photographic process to the San Joaquin County Standard Drawing size and format as required and must be complete and legible in all respects. Systems must be subdivided into portions, which are operable from locations where diagrams are installed. Diagrams must be black on white paper and vacuum sealed in a transparent plastic, chemically inert, material of minimum 5 mil thickness, impervious to moisture and oil and resistant to abrasion. The plastic material must not affect the legibility of the Contract Plans.

Other formats which are equal in clarity, sharpness, durability and permanence will be considered.

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Contractor must submit proposed method with specific details to the Engineer for review and approval.

All printed matter, test, data and other matter must be clear and legible, accurate and distinct, and must be produced by methods to be permanent, as approved by and in the sole discretion and Engineer's opinion.

A complete copy of the manual supplemental materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-6.03 CONSTRUCTION

88-6.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

It is the Contractor's responsibility to manufacture and install suitable functioning electrical equipment. Review and acceptance of shop drawings by the Engineer does not relieve the Contractor of this responsibility.

All work must be performed and delivered in a workmanlike manner as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, orderly, and easily identified.

88-6.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not feasible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities such that their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-6.03C Installation

88-6.03C(1) General

Work under this Contract requires installation of numerous control and power devices that will be interfaced to an existing bridge control system that will remain in operation throughout and after the construction work under this Contract.

References in the Contract Documents to the bridge control system (or similar identifiers) include all aspects

of the existing interconnected devices which operate the bridge machinery, including relays, motor control equipment, motors, switches, instrumentation, wiring and cabling, control console, operators, and indicator lights.

The Contractor must perform work necessary to ensure that the components installed under this and other pay items are fully interfaced and connected to the portions of the Bridge Control System that will remain and will not be replaced under the Contract Work.

The Contractor must deliver a complete operating bridge control system at the Contract completion. However, should modification be necessary due to changes in available equipment or other circumstances beyond the control of San Joaquin County, the Contractor (through his subcontracted Control System Vendor) must interpret the intent of the original equipment and propose edits to accommodate the new equipment provided under this Contract. The Engineer must review proposed edits and must make a binding order to the Contractor.

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The electrical Contractor must modify the existing bridge control system and combination reversing starters for each of the gates. All new gates must be furnished, installed and all cam limit switches must be adjusted and set to the existing settings to match the functionality of the existing system. Conductors to the new warning gates and any downstream devices must be replaced.

Conduit to the existing rotary cam limit switches must be replaced, the cam settings of the existing rotary cam limit switches must be retained.

All necessary control modifications required to accommodate the above must be provided at no additional cost.

Detailed elementary control diagram must be provided with the shop drawings including sequence of operations (closely following the original span open/close sequence) for Engineer's acceptance.

88-6.03C(5) Components

88-6.03C(5.1) Limit Switches

Limit switches must be furnished and installed in accordance with the Contract Drawings. Where limit switches will be installed to replace existing switches and/or interface with existing equipment, care must be taken to ensure the proper materials are installed.

The Contractor must perform all adjustments, modifications to mounting, etc. to ensure that each switch operates in a manner consistent with the existing Bridge Control System.

Furnish all equipment, conduits, wiring and supports required to extend the instrumentation connections to the control/terminal cabinets. Cost of conduits, conductors with supports must be included in each individual conduit, conduit support and conductor item numbers.

88-6.03C(5.2) Controllers

All equipment installed in the existing MCC compartments as shown and listed on the Contract Drawings to be removed must be disconnected and removed.

Power to the existing controllers must be turned off by disconnecting the main circuit breaker feeding the controller.

The existing Motor Starters and Magnetic Contactors where shown on the Contract Drawings must be

removed and replaced by new motor starters and magnetic contactors.

New or accepted equal starters and other miscellaneous electrical components must be installed at appropriate locations as original and as shown on the Contract Drawings.

Inspection, troubleshooting and testing of the newly wired equipment together with the existing compartment equipment must be performed.

Equipment and wiring must be tested for continuity.

88-6.03C(5.3) Utility Power

The feeders from the utility power source and standby power sources (if applicable) must be connected to new power distribution equipment through disconnect switches and an automatic transfer switch if an engine generator is used to feed the distribution panel circuit breakers.

If a generator is part of the existing electrical system and in the event of failure of the preferred source, the automatic transfer switch must operate automatically to connect the standby engine generator power supply to the power distribution bus.

88-6.03C(5.4) Service Disconnect Switches

Fused safety switches, for use as disconnect switches, must be installed where shown on the plans.

Fused safety switches for use as disconnect switches must be installed within the range of view of each span motor, brake motor, tail lock motor, span lock motor and sump pump motor if Contract Drawings call for motor replacement on affected bridges.

88-6.03C(5.5) Circuit Breakers

All branch circuits from the power buses must be protected by molded-case circuit breakers mounted on the control panels.

88-6.03C(5.6) Lighting Panelboards

All branch circuits must be numbered, and a typewritten directory must be provided on the inside of each door.

88-6.03C(5.7) Nameplates

Nameplates must be provided for all devices. Nameplates must be securely fastened to the equipment with stainless steel screws.

88-6.03C(5.8) Hardware Supports

Structural steel brackets, boxes, and other equipment mounted on concrete surfaces must be provided with a full neoprene gasket not less than 0.05 inches thick between the equipment and the surface of the concrete.

Expansion anchors for fastening equipment or brackets to concrete surfaces must be wedge type anchor bolts, which must be locked in place by an expansion wedge as the nut is tightened. Holes for the anchors must be drilled to the manufacturer instructed size and depth using carbide tipped masonry drills.

Mounting bolts, nuts, washers, and other detail parts used for fastening boxes, disconnect switches, small limit switches, conduit clamps, cable supports, brackets, and other electrical equipment must be of stainless steel complying with the requirements of ASTM Designation A276, Type 316. Bolt heads and

nuts must be hexagonal and must be provided with medium-series lock washers. Bolts smaller than 1/2 inch in diameter must not be used, except as may be necessary to fit the mounting holes in small limit switches, boxes, and similar standard devices.

Using beam clamps for supporting conduits, boxes, or other equipment is not acceptable without prior Engineer's acceptance.

Preformed elongated holes metal framing channels, such as Kindorf, Unistrut, Superstrut, etc., are not acceptable for mounting or supporting electrical equipment or boxes.

88-6.03C(6) Bridge System Diagnostic Testing

The following must be completed after all Contract installation work is complete:

1. Bridge System Diagnostic Testing

The Contractor must follow the below described procedure to complete diagnostic testing to confirm integrity of the existing bridge system:

Acquire original acceptance testing script for bridge system diagnostic testing from San Joaquin County.

Modify the testing procedure script to match the installations under this Contract and submit for review & acceptance.

Perform complete diagnostic testing as specified in the accepted testing script under witness of the Engineer and San Joaquin County. Document results.

List failed bridge system components. Perform diagnostic services necessary to identify the cause of failures. Submit for Engineer's review and acceptance.

If failed components or systems are specified for replacement under part of this Contract, sequentially complete the work as specified under this Contract.

If failed components are not included for replacement as part of this Contract, submit to the Engineer the cost as an additional work. Cost must be only for new installation work. All diagnostic costs must be included in this pay item, and no additional compensation will be made for diagnostic time or materials.

Follow the Engineer's orders to complete the failed system work.

88-6.03C(7) Miscellaneous

All other materials and equipment (conduit, cables, etc.) that are not mentioned herein or specifically called out in other Pay items but required for the complete operation of the bridge and the system outlined in the Contract Documents must be included in the work for this Section.

88-6.04 PAYMENT

Payment for "Bridge Electrical System" must be made on a lump sum basis and must include all work specified herein and all work that is not paid elsewhere.

88-6.04A Basis of Payment

The lump sum price bid for "Bridge Electrical Equipment" must include the cost of furnishing all labor,

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materials, plant, training, equipment and all necessary incidentals required to satisfactorily complete installation and perform the work described herein and shown on the Plans.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item.

The Engineer must evaluate this breakdown and must have the authority to revise the breakdown as, in his judgment, may be required to make the various components of work conform to their true values.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The Contractor must agree that the detailed breakdown must not become effective until it has Engineer's acceptance.

The total lump sum value for this item must be broken down in detail.

The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon submission and approval of shop drawings by San Joaquin County authorized representative; the Contractor will be paid 5 percent of the distributed bid price.
2. Upon complete installation of the equipment described herein, the Contractor will be paid 40 percent of the distributed bid price.
3. Upon completion of Item 24 – Bridge System Testing, and demonstration of the proper operation of the bridge under all modes available under the original system design, the Contractor will be paid 30 percent of the distributed bid price.
4. Upon completion of all punch list items, the Contractor will be paid 15 percent of the distributed bid price.
5. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the distributed bid price.

Removal of all components not included in the final system will be paid under Section 88- "Electrical Equipment Demolition"

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
880070	Bridge Electrical Equipment	Lump Sum

88-7 BRIDGE SYSTEM TESTING

88-7.01 GENERAL

88-7.01A General

Section 88-7 includes furnishing all labor, materials, plant, and equipment required to perform all work necessary, such as adjustments or corrective measures, to properly test all systems included in the field testing and final acceptance testing.

The Contractor must prepare and submit all acceptance testing procedures for the Engineer's acceptance 20 days before the scheduled start of any required testing.

The Contractor must submit a testing sequence operation based on the included test designated tabulations under Field Testing sub-heading. This test sequence of operation must be used for the testing described herein and approved by the Engineer and San Joaquin County, before testing.

88-7.01B Definitions

Not Used

88-7.01C Submittals

The instrument/meter calibration documents must be submitted for the Engineer's review and acceptance.

The Contractor must submit a detailed testing procedure for use in performing the Field Testing. The procedure must be submitted for review and approval at least 20 days before the anticipated completion of electrical systems.

The Contractor must submit a detailed testing procedure for use in performing the Final Acceptance Testing. The procedure must be submitted for review and acceptance at least 1 month before the anticipated completion of electrical systems for above listed bridges.

The results of the system Final Acceptance Tests must be presented in a matrix form on a Test Report Data Sheet. The proposed format of these sheets must be submitted for the Engineer's acceptance before the actual testing.

88-7.01D Quality Assurance

88-7.01D(1) Qualifications, Personnel and Facilities

Included with furnishing the major items of electrical equipment, the manufacturer must furnish all necessary field supervisory start-up time by the manufacturer's designated representative to facilitate proper adjustment of all necessary equipment.

The manufacturer's field service engineering personnel must be experienced in the adjustment and functioning of the control equipment furnished by the manufacturer. The personnel must be capable of locating and correcting faults or defects and of obtaining from the manufacturer, without delay, new parts or replacements for apparatus that, in the opinion of the Engineer, does not perform satisfactorily.

During the field testing period, the Contractor must arrange to have representatives of the manufacturer of all major pieces of equipment at the site, if applicable, such as main span motors, brakes, transformer, etc. The representatives must be capable of supervising all adjustments to the equipment, of locating faults or defects and correcting them if possible, and of obtaining from the manufacturers, without delay, new parts or replacements for any apparatus which, in the Engineer's opinion, does not perform satisfactorily.

88-7.01D(2) Rules, Regulations and Ordinances

All meters must be calibrated per National Institute of Standards and Technology (NIST) guidelines within 6 months before testing.

88-7.02 MATERIALS

Equipment Required for Field and Final Acceptance Testing

The testing of the bridge electrical equipment necessitates the use of the following recording and testing devices:

- Recording Ammeter/Voltmeter
- Portable multimeter.
- Amp-probe.
- Infrared scanner.
- Measuring tape.
- Stopwatch (timer).
- All other necessary instrumentation and tools to monitor, adjust, or replace items during the bridge testing procedure.

88-7.03 CONSTRUCTION

88-7.03A Field Testing

The bridge field tests are to confirm each major sub-component and subsystem within the scope is operational. Confirmation of correct operation of components or sub-components must be demonstrated through successful operation of the component or assembly.

Nameplate legends, conductor identifications, instrument scales, escutcheon plate engraving, and all other details of construction must be checked for conformity with specified requirements.

The Field Testing must include running all functions of the bridge, including electrical equipment within the scope. It must include a schedule for opening the bridge on different combinations of drive equipment (main, backup, auxiliary, etc.) as well as a schedule for manual operation on the generator (if applicable).

The Field Testing Procedure must include a detailed method to test all functions built into the control system.

The Contractor must arrange for and provide all the necessary field tests, as defined in the accepted test procedures designation Table 1 and by the Engineer's orders, to demonstrate that the portions of the mechanical, and electrical systems that were repaired are in proper working order and comply with the Plans and Specifications within the scope of this contract. The tests must include operational testing of the operating machinery, warning gates, and electrical system, as applicable.

Continuity Test - Submarine Cables: After approval of the insulation resistance test of the reinstalled but unconnected submarine cables, the Contractor shall test the continuity of the individual conductors within submarine cable. The test is performed by tying together all conductors on the source side and on the destination side, except but one conductor on the destination side by isolating it and measuring the resistance between the destination side and the isolated conductor with all conductors tied together on the source side. The same procedure is followed for all conductors one at a time. This will verify the continuity of all conductors from source to destination within the submarine cable. The contractor shall submit detailed procedure to the engineer for approval. Upon completion of the continuity test the Contractor shall connect the submarine cables and test the energized installation as directed by the Engineer.

Megger Test - Submarine Cables: The test methods for measuring insulation resistance of cables installed in the field shall be in accordance with the specified NEMA Publications. The test equipment shall include a megohm meter capable of generating a constant 1,000-volt D.C. source, calibrated in a range legible from 0 to 1,000 megohms and up to infinity, with heavy-duty, rubber-insulated, alligator-clip leads, and a guard-circuit terminal available for use if required. Polarity for connecting the megohm meter to the cable under test and the duration of time for electrifying the cable before taking the resistance reading shall be in accordance with NEMA Publication. The insulation resistance of each conductor in the installed wire-armored, multi-conductor submarine cables shall be measured between the conductor and all the wires in the armor, all of which shall

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be bonded together and grounded. The measured values of insulation resistance for each conductor in the submarine cables shall be recorded for record.

Phase sequence: Test must include verifying line side phase sequence A B C and load side phase sequence A B C for compatibility and accuracy. Test must be performed for new transformer (or rewired), new motors (or rewired or if work was performed on their controllers), and on bridges with High leg delta services. Where high leg delta services are installed, phase B must be the high leg. All equipment that is installed must be tested to assure that no equipment unintentionally receives the high phase voltage.

Replace/Refurbish cabinets, terminal strips, and lugs: Inspect refurbished cabinet and new secured terminal strips. Test all individual terminals for any loose connections or over torquing. Test cabinet grounding connection. Test for conductors shorting consecutive terminal strips.

Instrumentation: All limit switches, rotary cam limit switches, fully open and fully closed limit switches and other miscellaneous instrumentation, if replaced or rewired must be tested for manufacturing quality and proper operation per manufacturer's instruction.

Short Circuit between new conductors: Test new conductors for conductor to conductor and conductor to ground

Should the tests show that any system, piece of equipment, electrical cable or wiring connection (which was installed/modified/damaged by the Contractor), in the Engineer's judgment, is defective or functions improperly, such adjustments and/or replacements must be made by the Contractor as to make the installation satisfactory to the Engineer at no extra cost to San Joaquin County.

88-7.03B Bridge Final Acceptance Testing

Results and observations must be carefully recorded throughout the tests. Before performance of these tests, all temporary bypasses, jumpers, switches, etc., installed during any previous testing must be removed. The control circuits must be in the state presented in the original as-built control wiring diagrams or as required to be modified and shown on plans. All tests and verifications must be for equipment for bridge leaves, lift span or swing spans. In addition to all devices listed below, all associated devices must also be tested.

After all bridge systems are operating to the satisfaction of the Engineer, the Contractor and the manufacturers' representatives, an operational test period of not less than one week must begin, during which time all aspects of the electrical system will be tested and observed by the Engineer, San Joaquin County personnel and representatives for the bridge.

During this period, the Contractor must make any repairs necessary as a result of equipment failure due to faulty equipment or workmanship. Should preliminary checks or operational tests show that any piece of equipment furnished by the Contractor, in the Engineer's judgment, is defective or functions improperly, such adjustments and/or replacements must be made by the Contractor as to make the installation completely acceptable to the Engineer, and at no extra cost to San Joaquin County.

The Final Acceptance Testing must include running all functions of the bridge, including all electrical equipment. It must include a schedule for opening the bridge on different combinations of drive equipment (main, backup, auxiliary, etc.) as well as a schedule for manual operation on the generator if applicable.

The Final Acceptance Testing procedure must include a detailed method to test all system interlocks, and test all functions built into the control system.

The acceptance test demonstrates that the normal operating systems, including mechanical systems, and electrical control and power systems are operational, trouble free, operating with all interlocks for systems within scope of the contract properly functioning, and complies with the requirements of the contract plans and specifications.

Confirmation of correct operation of sub-components must be demonstrated through successful operation of the total mechanical, and electrical control systems. However, the Contractor is still responsible for performing the field and other tests through acceptance as required per contract specifications prior to final bridge acceptance testing.

The recommended values of various device parameters can be found in the existing plans, specifications, and original O&M Manuals and manual supplements prepared by the Contractor. Correct operation of the subcomponents, and control circuit wiring connections will be verified through the successful completion of the entire bridge control and power systems tests. This testing procedure will evaluate performance and confirm correct operation of all major subsystems and devices. Visual inspections and physical measurements of some equipment are required for the purpose of recording valid parameter values. During operation, parameters as defined below must be recorded for each test and kept for the record together with all other recorded data.

The San Joaquin County must be in possession of the final new mechanical and electrical maintenance manual supplements at least 20 days before acceptance testing may begin in accordance with the requirements specified in Contract Specifications. There must be 10 consecutive days of nominal bridge operation using the new permanent systems, with a minimum of five (5) successful openings per day, before the final acceptance test must be scheduled for above listed bridges.

88-7.03C Final Acceptance Test Data

All test parameters, data and results specified herein to be recorded must be presented in a legible, tabular format, listing associated parameters and conditions. For example, performance and motor currents must reference speed (rpm), span angle (degrees), raise or lower mode, "Utility" or "Standby Generator" power system, etc. The results of the system tests must be presented in a matrix form on a Test Report Data Sheet. The proposed format of these sheets must be submitted for the Engineer's acceptance before the actual testing. Any parameter value which falls beyond the recommended range will require the readjustment or replacement of the defective device.

The name of the person who will perform the test, instruments used with calibration data if required, and the exact date, time and weather conditions, must be recorded.

Some devices such as the transfer switch, lamps, control desk indicator lights, brake function indicator lights, control console controlled lighting, navigation lighting and horn can be easily tested without performing a bridge opening operation.

The bridge main parameters must also be observed and visually compared to the control desk indicating meters. Any discrepancy between results must be recorded. The major bridge systems must be monitored while the bridge operates. All monitored parameters must be downloaded to the laptop computer, printed and kept for future reference. A printout copy must be attached to the appropriate Maintenance Manual supplement for reference. Another printout copy must be provided to the Engineer.

88-7.03D Final bridge Acceptance Tests to be Performed

After reaching substantial completion of the work on the bridges listed under Final Bridge Acceptance Testing, San Joaquin County Bridge Operations will test operate the movable spans ten (10) times using normal operation to determine if the spans are operating as required. The Contractor along with the Resident Engineer must be present for these test openings. During the testing, the Contractor must

arrange to have at the site qualified personnel capable of supervising adjustments to equipment, of locating faults or defects and identifying them if possible. If a malfunction is present, San Joaquin County will notify the Contractor to investigate and determine the cause of the malfunction.

If the malfunction is not the result of the work performed by the Contractor, San Joaquin County will authorize, in writing, the Contractor to develop a detailed scope of the work to correct the malfunction. The scope will detail the work required to place the system, component and/or components back into serviceable condition or replace the components based on the Contractor's recommendation and to the satisfaction of the Engineer and San Joaquin County. Cost for the correction must be paid for elsewhere in the Contract.

If the malfunction is the result of work performed by the Contractor on the bridge, the Contractor must correct the malfunction at no additional cost to San Joaquin County.

In addition to the above testing the following bridge specific tests must be performed:

Control Console

The control console devices such as switches, pilot lights, and recording multi-meters will be used throughout the tests, and all irregularities observed must be noted during and after the tests from the notes and printouts. Each individual gate selector switch must be operated in the lower operation as well as in the raise operation. Mid way through each operation the selector switch must be released from operation. Each gate must immediately come to a stop.

Traffic Gates Warning Lights

Test that the warning flashing lights turn on (Red) as required by MUTCD. Confirm that gates operate smoothly and indicate proper positioning and interlocking.

88-7.03E Bridge Operators and Maintenance Personnel Training

1. The Contractor's personnel must provide training and instruction for a period of one (1) working day after the construction of the permanent control system has been completed, fine-tuned, field tested, and utilized for span operations. Instructors must include representatives from manufacturers of the major equipment and a Control Engineer.
2. The Contractor's personnel must be skilled persons competent to operate the bridge and familiar with the operating equipment of the bridge and its auxiliaries, such as the communications system. They must be able to make any adjustments required to the electrical and mechanical equipment.
3. During the one (1) day period specified above, the Contractors personnel must be at the bridge for the normal working period of 8 hours per day.
4. Included in the one (1) day training and instruction period, there must be an on-site training of San Joaquin County bridge operators, electronic technicians, electricians, maintenance workers, and other personnel as indicated by San Joaquin County on subjects such as all modes of bridge operation, troubleshooting, repair of electronic motor controls, drive circuit logic, maintenance and adjustment of all electrical equipment, and other items required for full bridge operation and maintenance. Two (2), each four (4) hour sessions must be devoted to operator training. One (1) session must be devoted to hardware and maintenance related topics. The Contractor must furnish all necessary instruction sheets, training aids, books, paper, and booklets to supplement training. The Contractor must submit to San Joaquin County, a minimum of three weeks prior to training session, a schedule and syllabus for review and approval. It must be the Contractor's responsibility to coordinate with San Joaquin County the location where training sessions will be held. Supplying of visual aid equipment and other miscellaneous items required for training must be the responsibility of the Contractor.

5. Training of the designated bridge operational and maintenance personnel must commence four weeks before the official bridge opening date.

88-7.04 PAYMENT

Payment for "Bridge System Testing" must be made on a lump sum basis and must include all specified Field and Final Acceptance Testing as described herein.

88-7.04A Basis of Payment

The lump sum bid for "Bridge System Testing" must include the cost of all labor, materials, plant, training, equipment, and all necessary incidentals required to satisfactorily complete the bridge system testing as described herein.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item.

The Engineer must evaluate this breakdown and must have the authority to revise the breakdown as, in his judgment, may be required to make the various components of work conform to their true values.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The Contractor must agree that the detailed breakdown must not become effective until it has approved the Engineer's acceptance.

The total lump sum value for this item must be broken down in detail.

The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon submission and approval of all required testing procedures by San Joaquin County authorized representative; the Contractor will be paid 20 percent of the distributed bid price.
2. Upon completion of Field Testing as described and outlined herein, and upon acceptance by an authorized San Joaquin County representative, the Contractor will be paid 30 percent of the distributed bid price.
3. Upon completion of Bridge Final Acceptance Testing in as described and outlined herein, resolution of all associated punch list items, required training, and upon acceptance by an authorized San Joaquin County representative, the Contractor will be paid 40 percent of the distributed bid price.
4. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the distributed bid price.

Supplements to the Operating and Maintenance Manual must be paid under Item 88-6 "Bridge Electrical Equipment."

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
880080	Bridge System Testing	Lump Sum

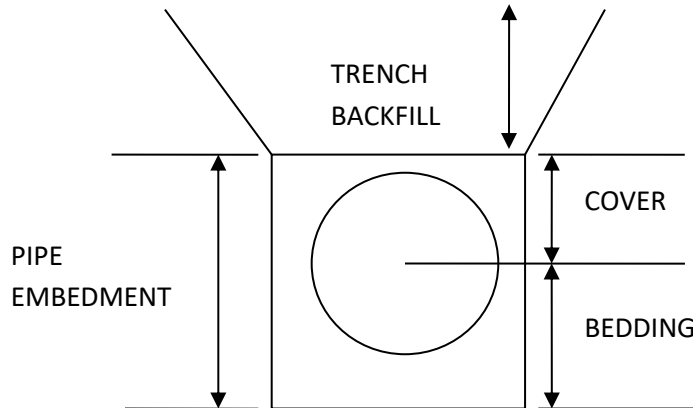
88-8 TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES

88-8.01 GENERAL

88-8.01A General

Section 88-8 includes general specifications for excavation, trenching, backfilling, and compacting for all underground utilities.

88-8.01B Definitions



Bedding: Bedding material placed in that portion of the trench cross section lying between a horizontal plane through the centerline of the pipe and a horizontal plane at the bottom of the trench. The minimum total thickness of pipe bedding directly below the pipe will be as shown on the Plans for the various classes of trenches.

Cover: Cover material placed in that portion of the trench cross section lying between the centerline of the Pipe and a horizontal plane above the centerline of the pipe. The minimum total thickness of cover above the pipe centerline must be as shown on the Plans for the various classes of trenches.

Pipe Embedment: Pipe trench cross sectional area including BEDDING and COVER.

Trench Backfill: All backfill from the top of the Pipe Embedment to the subgrade in paved area or subgrade of roadway areas or to the top of the finished grade in unsurfaced areas. Where topsoil is placed in unsurfaced areas, Trench Backfill must be to the bottom of the topsoil zone. Pipe installed in an area above natural ground surface, it is classified as embankment fill.

Imported Material: Material obtained by the Contractor from source(s) offsite.

Lift: Loose layer of material spread but not compacted.

Prepared Trench Bottom: Graded and smooth trench bottom prior to installation of pipe bedding material. Unsuitable materials below pipe bedding must be removed and replaced with suitable materials.

Relative Compaction: The ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by ASTM D1557. Corrections for oversize material may be applied to either the as-compacted field dry density or the maximum dry density, as determined by the Engineer.

Relative Density is a measure of the density of the cohesionless soil after compaction. Maximum and minimum density must be determined in the laboratory per ASTM D4253, D4254.

Well-Graded: A mixture of particle sizes that has no specific concentration or lack thereof of one or more sizes producing a material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids. Well-Graded does not define any numerical value that must be placed on the coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters.

Optimum Moisture Content: The optimum moisture content of a specified material is determined by ASTM D1557 to obtain the maximum dry density of that material when compacted. Field moisture content must be determined on the fraction passing the 3/4 inch sieve.

88-8.01C Submittals

88-8.01C(1) Testing Laboratory

1. Name and qualifications of testing laboratory that Contractor employs to conduct testing of all imported materials and native materials intended for trench bedding and backfill.
2. Submit laboratory test results not less than 30 days before delivery.

88-8.01C(2) Permits

Excavation permit issued by the California Department of Industrial Safety.

Submit respective pipe or conduit manufacturer's data regarding bedding methods of installation and general recommendations.

88-8.01C(3) Trench Dewatering Plan

Submit shop drawings showing locations, dimensions, and relationships of elements of each dewatering system. Submittal must include calculations demonstrating adequacy of proposed dewatering or isolation systems and their components.

Submit installation records of all components of the dewatering system proposed in the Plan.

88-8.01C(4) Trench Excavation Plan

Methods and sequencing of excavation.

Numbers, types, and sizes of equipment proposed to perform excavations.

Excavation slopes, sheeting/shoring method, and ground improvement.

Excavation support system design per Section 27-1.01D(2).

Proposed locations for stockpile excess excavated material.

Proposed spoil disposal sites with written authorization from the property owner or facility manager accepting the spoil material.

88-8.01C(5) Backfill compaction Plan, Detailing

Proposed backfill material including origin, test reports as described Section 88-8.02B.

Proposed methods and sequencing of placement including spreading, moisture conditioning, lift thickness and compaction.

Proposed compaction equipment including catalog and manufacturer's data sheets.

Trench shield (trench box) certification if employed:

- Specific to Project conditions.

- Re-certified if members become distressed.

- Certification by a California registered structural engineer.

- Submittal is for information only. Engineer is not responsible for the system design as it is prepared by a California Registered Engineer hired by the Contractor. Engineer will not review or accept.

88-8.01C(6) Samples

The Contractor must submit samples of all imported materials proposed to be used in the work not less than 30 days before delivery on site.

Sample sizes must be as determined by the Engineer, but not less than 1/4 cubic feet in volume.

88-8.01C(7) Safety Plan for Utility Excavation

Before construction begins, the Contractor must identify the locations of gas pipelines and sanitary sewer pipelines and other utilities in the alignment.

The Contractor must prepare and implement safety plans for excavation at these pipeline locations. Plans must include Contractor's emergency contact person and phone number, emergency reporting phone number for State and local regulatory agencies including, but not limited to, State Office of Emergency Services, Central Valley Regional Water Quality Control Board, local Health Department, Department of Fish and Game, gas company, sewer agency, fire department, police/sheriff department and Owner/Engineer.

Safety Plan must also include detailed procedures for reporting, isolation of pipeline, containment of spills, clean-up, laboratory testing of receiving waters per Regional Water Quality Control Board requirements.

Safety plans must be submitted and accepted by the Engineer before Contractor initiates trench excavation work.

88-8.01D QUALITY ASSURANCE

88-8.01D(1) Referenced Standards

ASTM International (ASTM):

- C33, Standard Specification for Concrete Aggregates.

- C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

- C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

- C143, Standard Test Method for Slump of Hydraulic Cement Concrete.

- D422, Standard Test for Particle Size Analysis of Soils.

- D448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction

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D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
D1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
D2216, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rocky Mass
D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
D2487, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
D2922, Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Mustow Depth).
D3017, Test Method for Moisture Content of Soil and Soil Aggregate in Place by Nuclear Methods (Mustow Depth).
D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
D4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
D6024, Ball Drop on Controlled Low Strength Material (CLSM) to Determine Suitability for Load Application.

State of California, Department of Transportation (Caltrans):

California Test 216, Method of Test for Relative Compaction of Untreated and Treated Soils and Aggregates.
California Test 226, Determination of Moisture Content by Oven Drying.
California Test 227, Evaluating Cleanness of Coarse Aggregate.
California Test 231, Method of Test for Relative Compaction of Untreated and Treated Soils and Aggregates by the Area Concept Utilizing Nuclear Gages.

2016 Uniform Building Code.

The Contractor's attention is directed to the provisions for "Shoring and Bracing Drawings" in Section 6705 of the California Labor Code. The Contractor, before beginning any trench or structure excavation 5 feet deep or more must submit to the Engineer and must be in receipt of the Engineer's written acceptance of the Contractor's detailed plan showing design of all shoring, bracing, sloping of the sides of excavation, monument monitoring, or other provisions for worker protection against the hazard of caving ground during the excavation of such trenches or structure excavation. If such plan varies from the shoring system standards established in the Construction Safety Orders of the State of California, such alternative systems plans must be prepared and sealed by a civil or structural engineer licensed in the State of California.

The Contractor's attention is also directed to the California Code of Regulations, Title 8, Section 1541.1. The code requires when excavation is adjacent to an existing structure, a registered professional engineer must accept the determination that such excavation work will not pose a hazard to employees. It is the Contractor's responsibility to hire a California Registered Civil Engineer to prepare analysis on trench safety, and to install all safety measures recommended by the Registered Engineer.

Excavation support systems must be designed by the Contractor to support earth pressure, unrelieved hydrostatic pressure, utility loads, equipment, applicable traffic loads, and other surcharge loads in such manner as will allow safe construction and will prevent damage to adjacent structures (including existing pipelines and utilities) and injury to workers and the public. In addition, a shoring deflection analysis must be performed. The installation of excavation support system must not cause a disruption to public convenience and access. Design must be prepared and sealed by a California registered Civil or Structural Engineer.

If utilized, all soldier piles must be placed in pre-drilled holes and grouted in-place to a depth in accordance with the Contractor's Plan.

The owner's approval of the Contractor's plans and methods of construction does not relieve the Contractor of the responsibility for adequacy of the design, installation or resulting trench support.

The Contractor must be or must employ a specialty dewatering Contractor with experience in the field of dewatering system design, installation, operation and maintenance. The Contractor must document successful completion of at least three (3) projects in soils and groundwater conditions similar to the project.

Dewatering system must be designed by a California registered Civil Engineer experienced in the design, installation, and operation of dewatering system.

Groundwater discharge must be based on accepted discharge permits. Unless indicated to be provided by the Owner, Contractor must obtain all necessary permits and associated costs.

Dewatering system must be designed to prevent excessive draw down of groundwater table which may cause settlement at neighboring properties.

Sump pump in the pipe trench must not be the primary means of dewatering. Sump pumps will be allowed in situations only to remove small quantities of accumulated seepage and stormwater run-off. Discharge of any sump pump must be subject to all the provisions of dewatering permits and plans.

To reduce the migration of water along the pipeline through relatively porous pipe bedding, seepage barriers must be placed at no more than 1,000 feet intervals along the constructed pipeline. Seepage barriers must be constructed a minimum of 3 feet from any pipe joints and as shown on the Plans.

Contractor's attention is directed toward the requirements listed in Chapter 33 of Uniform Building Code. Contractor must install, maintain, and remove devices to protect the adjoining properties, pedestrians during construction.

88-8.02 MATERIALS

88-8.02A General

Materials supplied for the Work must be accepted for each place of manufacture. Each quarry used to supply materials required in this specification must be sampled and tested, and the samples and test results submitted in accordance with this Section.

Only materials defined in these specifications as suitable materials may be used as fill or backfill subject to the indicated limitations. Materials listed as unsuitable must not be used for the Work. In addition, when acceptable to the Engineer, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a composite suitable material.

Suitable materials may be obtained from on-site excavations, may be processed on-site materials, or may be imported. If imported materials are required by this Section to meet the quantity requirements of the project, the Contractor must provide the imported materials as part of the work for that bid item at no additional cost to the Owner.

If on-site excavated (Native) materials are used for backfill, Contractor must submit laboratory test results for Engineer's review and acceptance. Cost of material testing is considered to have been included in Contractor's BID PRICE.

88-8.02B Material Laboratory tests

Perform following tests on all imported materials from each source and native materials intended for backfill/bedding:

Gradation, (ASTM C136 or D422), every 600 cubic yard or material change.

Moisture – Dry Density Relationship at three different compaction efforts, ASTM D1557, ASTM D698 and 26,400 ft-lb/ft³ at every material change. Results must be displayed in a family of DryDensity - Moisture Content curves, and in Maximum Dry Density – Compacted Effort curve.

Plasticity Index of Soils, (ASTM 4318), every 1,000 cubic yard or material change.

Sand Equivalent Value of Soils and Fine Aggregate, (ASTM D 2419), every 1,000 cubic yard or material change.

Laboratory Maximum Density, (ASTM D4253), each source.

Atterburg Limits, (ASTM D4318), every 600 cubic yard or material change.

Organic Content, (ASTM D2974), every 5,000 cubic yard or material change.

Chloride, Sulfate, Resistivity, and pH, every 600 cubic yard or material change.

88-8.02C Suitable Materials

88-8.02C(1) Concrete

Strength: 2,000 psi minimum.

88-8.02C(2) Controlled Low-Strength Material (CLSM) or Control Density Fill (CDF)

Slump: Between 6 and 8 inches as per ASTM C143.

Compressive strength: 28 days compressive strength of between 100 and 150 psi, per ASTM C39. For use under structures, 28 days compressive strength must be no greater than 1,200 psi.

Hardening time: one hour.

88-8.02C(3) Permeable Aggregate

Permeable material for use in backfilling trenches must consist of hard, durable, clean sand, gravel, or crushed stone, and must be free from organic material, clay balls or other deleterious substances. Reference May 2006 Caltrans Specification Section 68-1.025.

The permeable material must be either Class 1 or Class 2. When permeable material is required and the class is not specified, Class 2 permeable material must be used. Class 1 and Class 2 must conform to the following gradation tables:

Class 1	
SIEVE SIZE	PERCENTAGE PASSING - TYPE A
2 in	-
1 - 1/2 in	-
3/4 in	100
1/2 in	95 - 100
3/8 in	70 - 100
No. 4	0 - 55
No. 8	0 - 10
No. 200	0 - 3

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Class 2

SIEVE SIZE	PERCENTAGE PASSING
1 in	100
3/4 in	90 - 100
3/8 in	40 - 100
No. 4	25 - 40
No. 8	18 - 33
No. 30	5 - 15
No. 50	0 - 7
No. 200	0 - 3

Class 1 and Class 2 permeable material must have a Durability Index of not less than 40.

Class 2 Permeable material must have a Sand Equivalent value of not less than 75.

Filter fabric must be installed for applications of Class 1 permeable material. Wrap all aggregate in contact with soil or sand. See Caltrans Specifications for installation requirements.

Free from organic matter and other deleterious substances and must be of such nature that it can be compacted readily under watering and rolling to form a firm, stable base.

88-8.02C(4) Crushed Rock

Product of crushing rock or gravel

Percentage composition by weight must conform to the following gradations for the Type specified:

SIEVE SIZE	PERCENTAGE PASSING, 3/4 IN MAXIMUM
2 in	-
1½ in	-
1 in	100
¾ in	90 - 100
½ in	30 - 60
3/8 in	0 - 20
No. 4	0 - 5
No. 8	0 - 2

Minimum Cleanliness Value of 60 as determined by California Test Method 227.

The portion of material which is retained on the 3/8 inch sieve must contain at least 50 percent of particles having three (3) or more fracture faces.

88-8.02C(5) Graded Sand

Free from vegetable matter, lumps, balls of clay, or adherent films of clay.

Percentage composition by weight must conform to the following gradations:

SIEVE SIZE	PERCENTAGE PASSING BY WEIGHT
3/8 in	100
No. 4	95 - 100
No. 8	90 - 100
No. 16	80 - 100
No. 30	65 - 100
No. 50	40 - 70
No. 100	0 - 30
No. 200	0 - 12

88-8.02C(6) Native Material

Native material must be soil, loam, or other excavated material with a liquid limit less than 40, and a plasticity index 10 maximum when measured in accordance with ASTM D4318, and must have Expansion Potential less than 20, Maximum Dry Density not less than 105 pound per cubic feet (PCF) when tested per ASTM D1557 Method.

Native material must be free from rocks or unbroken clods having a maximum dimension of larger than 3 inches.

The Contractor may choose to import material for use at no additional cost to the Owner. Imported material must meet the requirements of Section 27-1.01C and must meet the following gradation:

U.S. STANDARD SIEVE SIZE	PERCENT PASSING BY WEIGHT
1 IN	100
3/8 IN	70-100
No. 4	55-100
No. 10	35-95
No. 20	20-80
No. 40	10-55
No. 200	0-35

Native material must be free from roots or organic matter, refuse, or other deleterious materials.

Soils that require conditioning to meet the requirements of Native Material must be processed by the Contractor in accepted lay down areas at no additional cost to the Owner.

Moisture content at time of placement must be within +2 percent to -2 percent of optimum moisture content as determined by ASTM D1557.

88-8.02C(7) Suitable Pipe Embedment

Suitable pipe embedment and backfill materials for various types of pipe materials are listed below.

PIPE MATERIAL	PIPE EMBEDMENT	TRENCH BACKFILL
PVC	<ul style="list-style-type: none"> — Aggregate (w/geotextile filter fabric if surrounding soil is fine grain material) — Graded Sand (w/filter fabric if surrounding soil is porous) — Native Material 	<ul style="list-style-type: none"> — Native Material(When Trench Backfill depth greater than 4 feet) — Aggregate(When Trench Backfill depth less than 4 feet or top 12 inch of Trench Backfill below pavement subgrade)
Ductile Iron	<ul style="list-style-type: none"> — Aggregate or crushed rock (w/geotextile filter fabric if surrounding soil is fine grain material). — CAUTION - Avoid rocks cutting through geotextile filter fabric, polyethylene wrap or scratching pipe coating. 	<ul style="list-style-type: none"> — Native Material(When Trench Backfill depth greater than 4 feet) — Aggregate(When Trench Backfill depth less than 4 feet or top 12 inch of Trench Backfill below pavement subgrade)

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PIPE MATERIAL	PIPE EMBEDMENT	TRENCH BACKFILL
	— Graded Sand (w/filter fabric if surrounding soil is porous)	
RCP (ASTM C76). RCP (ASTM C300, C301, C302, C303)	— Concrete (Cradle) — Aggregate or crushed rock (w/filter fabric if surrounding soil is fine grain material) — Graded Sand (w/filter fabric if surrounding soil is porous) — Native Material	— Native Material(When Trench Backfill depth greater than 4 feet) — Aggregate(When Trench Backfill depth less than 4 feet or top 12 inch of Trench Backfill below pavement subgrade)
Steel	— Graded Sand (w/filter fabric if surrounding soil is porous and for placement below pipe when rock is encountered) — Native Material(Depth to 70% of pipe OD)	— Native Material(When Trench Backfill depth greater than 4 feet) — Aggregate(When Trench Backfill depth less than 4 feet or top 12 inch of Trench Backfill below pavement subgrade)
High Density Polyethylene	— Aggregate or crushed rock (w/filter fabric if surrounding soil is fine grain material (Depth to less than 3/4 of Pipe OD) — Graded Sand (Depth to less than 3/4 of Pipe OD) — Native Material (Depth from 3/4 Pipe OD to top of Pipe Embedment))	— Native Material(When Trench Backfill depth greater than 4 feet) — Aggregate(When Trench Backfill depth less than 4 feet or top 12 inch of Trench Backfill below pavement subgrade)
Clay	— Aggregate or crushed rock (w/filter fabric if surrounding soil is fine grain material) — Graded Sand (w/filter fabric if surrounding soil is porous) — Native Material	— Native Material(When Trench Backfill depth greater than 4 feet) — Aggregate(When Trench Backfill depth less than 4 feet or top 12 inch of Trench Backfill below pavement subgrade)
Piping under structures or crossing other piping	— See Drawings	— See Drawings

88-8.02D UNSUITABLE MATERIAL

Unsuitable materials include:

1. Soils which, when classified under ASTM D 2487 fall in the classifications of Pt, OH, CH, MH, or OL.
2. Materials that contain hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.
3. Soils that contain greater concentrations of chloride or sulfate ions or have a soil resistivity or pH less than the existing on-site soils.
4. Topsoil, except as required for topsoil replacement in agricultural and easement areas.
5. Saturated native materials which are over optimum moisture content must not be considered "unsuitable" simply because they are too wet for proper compaction. The Contractor must, at his cost, dry wet materials, mix native materials with suitable imported backfill material, or selected drier material from elsewhere onsite. All mixing must be performed at accepted lay down areas.

88-8.02E UNDERGROUND WARNING TAPE

Materials:

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Polyester or polypropylene with aluminum backing.

Size: 6 inches wide (minimum).

Thickness: 5 millimeters thick per ASTM D1593.

Fabrication:

Legend: Preprinted and permanently imbedded.

Message continuous printed.

Letter height: 1-1/4 inches minimum.

Natural gas or digester gas:

Color: Yellow with black letters.

Legend:

First line: "CAUTION CAUTION CAUTION"

Second line: "BURIED GAS LINE BELOW"

Potable Water:

Color: Blue with black letters.

Legend:

First line: "CAUTION CAUTION CAUTION"

Second line: "WATER LINE BURIED BELOW"

Storm and sanitary sewer lines:

Color: Green with black letters.

Legend:

First line: "CAUTION CAUTION CAUTION"

Second line: "BURIED SEWER LINE BELOW"

(Non-potable or Reclaimed) water piping, except 3 inches and smaller irrigation pipe:

Color: Green with black letters.

Legend:

First line: "CAUTION CAUTION CAUTION"

Second line: "BURIED NON-POTABLE WATER LINE BELOW"

Chemical feed piping (e.g., chlorine solution, polymer solution, caustic solution, etc.):

Color: Yellow with black letters.

Legend:

First line: "CAUTION CAUTION CAUTION"

Second line: "BURIED CHEMICAL LINE BELOW"

Fiber-Optic

Color: Orange with black letters.

Legend:

First line: "CAUTION CAUTION CAUTION"

Second line: "FIBER OPTIC CABLE BURIED BELOW"

Telephone

Color: Orange with black letters.

Legend:

First line: "CAUTION CAUTION CAUTION"

Second line: "TELEPHONE LINE BURIED BELOW"

Cable TV

Color: Orange with black letters.

Legend:

First line: "CAUTION CAUTION CAUTION"

Second line: "CATV BURIED BELOW"

Electric:

Color: Red with black letters.

Legend:

First line: "CAUTION CAUTION CAUTION"

Second line: "ELECTRIC LINE BURIED BELOW"

Other piping (e.g., compressed air, irrigation, refrigerant, heating water, etc.):

Color: Yellow with black letters.

Legend:

First line: "CAUTION CAUTION CAUTION"
Second line: "BURIED PIPE LINE BELOW"

88-8.03 CONSTRUCTION

88-8.03A General

Perform dewatering prior to excavation.

Perform clearing and grubbing.

Excavation support: Install and maintain trench excavation support system as specified in this Section.

Observe 2016 Uniform Building Code requirements for traffic control, protection of adjacent properties and pedestrians.

Do not over-excavate without written authorization of the Engineer.

Avoid overloading or surcharge enough distance from edge of excavation to prevent slides or caving. The minimum distance from edge of excavation must be determined and listed in the Excavation Support System designed by the Contractor.

Maintain and trim excavated materials in such manner to be as little inconvenience as possible to public and adjoining property owners.

Provide full access to public and private premises and fire hydrants, at street crossings, sidewalks and other points as designated by Owner to prevent serious interruption of travel.

Protect and maintain bench marks, monuments or other established points and reference points and if disturbed or destroyed, replace items to full satisfaction of Owner and controlling agency.

Adhere to requirements from state and local regulatory agency regarding fugitive air emission, dust, storm water pollution prevention, etc.

Call Underground Services Alert to mark underground utilities prior to excavation. Bring to Engineer's attention whenever utility locations are different than shown on the Plans.

Remove and dispose of unsuitable or hazardous materials to a disposal site provided by Contractor.

Adhere to temporary traffic control requirements.

88-8.03B Excavation

88-8.03B(1) Unclassified Excavation

1. Remove rock, clay, silt, gravel, hard pan, loose shale, and loose stone as ordered by Engineer.

88-8.03B(2) Excavation for Appurtenances

12 inches (minimum) clear distance between outer surface of the structure and embankment (unexcavated ground).

88-8.03B(3) Groundwater Dewatering

Before excavation, the Contractor must submit a Dewatering Plan. Refer to Section 27-1.01D(2) for Dewatering System Criteria of this specification.

The Contractor must provide, install, operate, and maintain dewatering systems of enough size and capacity to permit excavation and subsequent construction in dry conditions and prevent hydraulic heave. Control groundwater table at least 3 feet below the bottom of any trench at all times.

Dewatering equipment may include the combination of sump pumps, eductors, well point system, temporary pipelines for water disposal, rock or gravel placement, holding basins, sediment traps, settling tanks and/or other means. Standby pumping equipment including self-contained emergency power generators on the Project site at all times.

System redundancy must be provided as required to keep trench free of water in event of failure of well point, pump, eductor, or other component. Contractor must promptly repair failed equipment and groundwater pipelines. The groundwater must never rise above the trench bottom.

Install groundwater monitoring wells as necessary. After work has been completed, wells must be properly abandoned in accordance with State or local Health Department regulations.

In the event that failure of dewatering system caused pipe to rise from the intended grade contractor must remove and reinstall the pipe, regrade the trench subgrade.

If groundwater contaminated with hazardous materials is encountered, the Contractor must stop dewatering operations and report to the Engineer immediately. Dewatering operations must not resume until authorized by the Engineer.

Install and maintain storm water pollution prevention measures in accordance with the accepted SWPPP.

Keep dewatering system in operation until pipe is properly backfilled.

Shut off dewatering system at such a rate to prevent a quick upsurge of water that might weaken the subgrade.

Cost of groundwater dewatering must be included in the lineal feet unit price of the pipe installation.

The Contractor must be fully and solely responsible and liable for all damages which may result from failure to adequately keep excavations dewatered. The Contractor is required to pay all costs associated with damage or delay in schedule that water imposes on the project.

The Contractor must repair without additional cost to the Owner any damage due to cracking or settlement that may result from his negligence, inadequate or improper installation, maintenance, or operation of the dewatering system, including but not limited to mechanical or electrical failures.

Contractor must be responsible for monitoring settlement of adjacent property resulting from lowering groundwater table. Contractor must be responsible for property damages due to dewatering operation.

Permitting

Refer to permit requirements Special Provision on the complete list of permits and licenses required by the Contractor.

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Contractor must remain in compliance with accepted disposal methods and disposal locations as specified in the National Pollution Discharge Elimination System (NPDES) requirements, Blanket Low Threat Discharge Permit, and Storm Water Pollution Prevention Plan (SWPPP).

Before start of work in waters, including wetlands or other jurisdictional lands, or dewatering, Contractor must ensure that all environmental related permits have been secured and are in place.

Removal of sediment through ponds and filters and testing for contaminants must comply with the appropriate permits and/or other requirements for disposal.

Contractor must dispose of water in accordance with permit conditions and without causing damage to adjacent property.

Disposal of Water

No dewatering flows from the Project may be discharged to any local drainage ditches, storm drains, or sanitary sewer prior to obtaining a discharge permit from the relevant agency depending on the intended point of discharge or as specified by the Engineer.

All dewatering water must be desilted through adequately sized desilting tanks prior to discharge.

The Contractor must dispose of water from the Work in a suitable manner without damage to adjacent property. Water must not be drained into work built or under construction without prior written authorization of the Engineer. Water must be filtered using a method to remove sand and fine-sized soil particles before disposal into any drainage system.

The release of groundwater to its static level must be performed in a way to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.

88-8.03B(4) Trench Excavation

Before excavation of the pipe trench in fill areas or roadway embankments, the fill area or embankment must be completed to a height above the pipe invert grade line of not less than twice the internal pipe diameter or to final fill or embankment subgrade, whichever is lower, but in no case less than 12 inches above the top of the pipe.

Prior to excavation contact Underground Services Alert (USA) to mark underground utilities.

Where the existing utility piping is expected, hand dig (pothole) the area to expose the existing utilities and survey the utility piping size and elevation prior to trench excavation.

Install traffic control devices in accordance with accepted traffic control plan.

Excavate trenches per accepted Trench Excavation Plan.

Excavate trench to lines and grades shown or as established by the Engineer with proper allowance for pipe wall thickness and bedding.

Support existing piping where proposed utility line crosses at a lower elevation. Exposed existing piping must be supported and braced against seismic forces.

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Stabilize excavation to prevent undermining of existing structures, utilities and piping.

Install trench shield or sheeting/shoring system in accordance with the accepted Trench Excavation Plan.

Open trench outside buildings, units, and structures:

No more than the distance between two manholes, structures, units, or 300 linear feet, whichever is less.

Field adjust limitations as weather conditions dictate.

Cover open trench with H-20 traffic rated steel plates at the end of each working day.

Trenching within buildings, units, or structures:

No more than 100 linear feet at any one time.

Any trench or portion of trench, which is opened and remains idle for seven calendar days, or longer, as determined by the Owner, may be directed to be immediately refilled, without completion of work, at no additional cost to Owner.

Said trench may not be reopened until Owner is satisfied that work associated with trench will be prosecuted with dispatch.

Observe following trenching criteria:

Trench size:

Excavate width to accommodate free working space for joint installation and soil compaction.

With the exception of pipe joints where trench width and depth should be increased to allow joint installations. Maximum trench width at top of pipe or conduit may not exceed outside diameter of pipe by more than 36 inches

If a movable trench shield is used during excavation operations, the trench width must be wider than the shield so that the shield is free to be lifted and then moved horizontally without binding against the trench sidewalls.

If the trench walls cave in or slough, the trench must be excavated as an open excavation with sloped sidewalls or with trench shoring.

Cut trench walls vertically from bottom of trench to 1 foot above top of pipe, conduit, or utility service.

Keep trenches free of surface water runoff.

Include cost in Bid.

No separate payment for surface water runoff pumping will be made.

88-8.03B(5) Trenching for Electrical Installations

Observe Section 88-8.01D(2) for Trench Shoring System.

Modify for electrical installations as follows:

Open no more than 600 linear feet of trench in exterior locations.

See Section 16135 for additional requirements.

88-8.03B(6) Over-Excavation

When the bottom of the trench is soft as a foundation for pipe bedding, notify Engineer immediately. The Engineer will determine the depth of over excavation, if required. Over excavation and re-compaction must be paid for in accordance with BID SCHEDULE.

Where rock is encountered, excavate minimum of 6 inches below bottom exterior surface of the pipe or conduit. Backfill to grade with materials listed 27-1.02C Suitable Materials.

Unstable trench bottom caused by Contractor failure to dewater, rainfall, or Contractor operations must be removed and replace with suitable material at Contractor's expense.

88-8.03B(7) Over-Excavation Not Ordered or Indicated

Any excavation carried below the grade ordered or indicated, must be backfilled to the required grade with indicated material and compaction.

No extra payment will be made to the Contractor.

88-8.03B(8) Excavation in Vicinity of Trees

Except where trees are indicated to be removed, trees must be protected from injury during construction operations. Tree trunks over 2 inches must not be cut without express permission of the Engineer. Trees must be supported during excavation by any means previously reviewed by the Engineer.

88-8.03C FILL/BACKFILL COMPACTION REQUIREMENTS

Cohesive materials must have moisture content, at the time of placement, maintained within two percent above to two percent below (+2 percent to -2percent) of Optimum Moisture Content (OMC) as determined by ASTM D1557, D2216. Sand must be on the wet side of OMC.

All field nuclear density test results must be corrected from wet density to dry density.

All field nuclear test results should be adjusted to reflect the difference in ASTM D1557 test and field nuclear test. The laboratory density test (ASTM D1557) runs on materials passing the No. 4 sieve while field density test involve samples that contains this fraction which is discarded in the laboratory test as it is commonly assumed that all moisture is held by the materials finer than No. 4 sieve.

Conform to the material and compaction requirements below. Refer to Section 88-8.02C Suitable Materials for additional requirements.

FILL AND BACKFILL CLASSIFICATIONS AND COMPACTION REQUIREMENTS		
General Application	Material Type	Relative Compaction (ASTM D1557, D2922) or Relative Density (ASTM D4253, D4254, D2922)
Embankment Fill	Native Material	90% Relative Compaction
Embankment Fill beneath Paved Area	Native Material	95% Relative Compaction
	Crushed Rock	75% Relative Density

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FILL AND BACKFILL CLASSIFICATIONS AND COMPACTION REQUIREMENTS		
General Application	Material Type	Relative Compaction (ASTM D1557, D2922) or Relative Density (ASTM D4253, D4254, D2922)
Over-excavation for unsuitable materials	Aggregate	75% Relative Density
	Controlled Low-Strength Material (CLSM) or Control Density Fill (CDF)	N/A
Bedding	Concrete	N/A
	Crushed Rock	75% Relative Density
	Aggregate	75% Relative Density
	Graded Sand	95% Relative Compaction
	Native Material	95% Relative Compaction
	CLSM or CDF	N/A
Cover	CLSM or CDF	N/A
	Native Material	90% Relative Compaction
	Graded Sand	90% Relative Compaction
	Crushed Rock	75% Relative Density
	Aggregate	75% Relative Density
	Concrete	N/A
Trench Backfill (Depth > 4 ft), except for under structures	Native Material	90% Relative Compaction
Trench Backfill (Depth 4 ft or less), except for under structures	Aggregate	75% Relative Density
Trench Backfill (Top 12" of trench backfill below pavement subgrade)	Aggregate	75% Relative Density
Trench Plug	Concrete	N/A
	Controlled Low-Strength Material (CLSM) or Control Density Fill (CDF)	N/A

88-8.03D TRENCH BACKFILL

Do not backfill until laboratory test results for backfill materials have been accepted by the Engineer.

Pipe Embedment Zone:

Furnish bedding and cover materials per Contract Documents.

Place material in Bedding Zone and Cover Zone in loose lifts not exceeding 8 inches.

After consolidation of pipe bedding by impact or vibratory means, the Contractor must perform a final trim to establish grade, such that each pipe section when first laid will be continually in contact with bedding along the entire bottom of the pipe. The Contractor must provide bell holes at each belled pipe joint.

Place backfill material between pipe and trench wall in loose lifts not exceeding 8 inches. Avoid dumping materials directly on top of pipe. Materials must be placed simultaneously on both sides of the pipe, keeping the level the same on each side.

Place continuous wrap around pipe Bedding and Cover with geotextile filter fabric.

Compact backfill materials with pneumatic rammers or vibratory plates between pipe OD and trench wall, except for crushed rocks which must be lightly compacted. Exercise care to avoid damage to the pipe or causing any horizontal or vertical misalignment, separation, or distortion.

Observe pipe manufacturer's recommendations regarding bedding, backfilling and compaction.

A minimum 12 inch layer of crushed rock wrapped by a geotextile filter fabric must be used for support of subsurface structure bases including manholes.

Trench Backfill Zone:

Place backfill materials in loose lifts not exceeding 8 inches.

Compact backfill materials with vibratory rollers, sheepsfoot or pneumatic rammers. Avoid displacing joints and appurtenances or causing any horizontal or vertical misalignment, separation, or distortion.

Observe pipe manufacturer's recommendations regarding bedding, backfilling and compaction.

Ponding and jetting methods will not be permitted. Moisture conditioning on sand through water spray to sand may be accepted if moisture content is maintained within the range specified in 27-1.02C Suitable Materials.

Backfilling for Electrical Installations:

Observe 27-1.02C Suitable Materials.

Observe notes and details on electrical drawings for fill in immediate vicinity of direct burial cables and conduit.

Underground Warning Tape;

Install detectable underground warning tape at 6 inches below grade, except where trench depth is less than 12 inches depth install tape at 3 inches below grade.

Maintenance of Trench Backfill:

After each section of trench is backfilled, maintain the surface of the backfilled trench even with adjacent ground surface until final surface restoration is completed.

Settlement of Backfill:

Settlement of trench backfill, or facilities constructed over trench is a result of defective compaction of trench backfill and will be corrected by the Contractor at no cost to the Owner regardless of the compaction test results performed during construction. It is Contractor's responsibility to repair settlement within the warranty period.

88-8.03E Stockpiling Excavated Material

Stockpile topsoil as required.

Stockpile native excavated material that is suitable for use as fill or backfill until material is needed.

Confine stockpiles to within easements, rights-of-way, and accepted work areas. Do not obstruct roads or streets.

Do not stockpile excavated material adjacent to trenches and other excavations unless excavation side slopes and excavation support systems are designed, constructed, and maintained for stockpile loads.

Do not stockpile excavated materials near or over existing facilities, adjacent property, or completed work.

88-8.03F Disposal of Spoil

Dispose of excavated materials, which are unsuitable or exceed quantity needed for fill or backfill, offsite. Contractor must make arrangements for and pay all costs and/or retain all profits.

Dispose of debris resulting from removal of underground facilities in accordance with State and local regulations.

Dispose of debris resulting from removal of organic matter, trash, refuse, and junk in accordance with State and local regulations and Standards.

88-8.03G Field Quality Control

Testing:

All field soils Quality Control testing must be conducted by the Contractor using a laboratory accepted by the Engineer, and in accordance with General Conditions and Supplementary Conditions to EJCDC General Conditions.

Where soil material is required to be compacted to a Relative Compaction, the Relative Compaction at Optimum Moisture content will be determined in accordance with ASTM D1557. ASTM D4253 and D4254 must be followed for testing of crushed rock.

Trenching, backfilling, and compacting for utilities will be measured by the cubic feet along the axis of the conduit route, installed in accordance with the Contract Documents and Specifications.

The work includes disposal or environmental costs.

88-8.04A Basis of Payment

The unit price for trenching, backfilling, and compacting for utility of each conduit size must include the cost of all labor, materials, and equipment necessary to satisfactorily complete installation and perform the work.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

Upon completion and acceptance of the installation of conduit and wireway in accordance with the Contract Documents, the Contractor will be paid 90 percent of the bid price for this item.

Upon completion, acceptance and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the bid price for this item.

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Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
880150	Trenching, Backfilling, and Compacting for Utilities	Cubic Feet

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88-9 BRIDGE ELECTRICAL DEMOLITION

88-9.01 GENERAL

88-9.01A General

Section 88-9 includes the removal and disposal of equipment where shown on the Plans, described in the Specification or the Engineer's orders.

The work under this item includes the removal and salvage of the temporary electrical equipment provided by the Contractor as part of this Contract, and includes materials and equipment installed by San Joaquin County maintenance for temporary operation of the bridge, during interim period and construction stages complying with the Plans and Specifications.

Any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor just as if specifically mentioned in these Specifications at no additional cost.

88-9.01B Definition

Not Used

88-9.01C Submittals

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit a schedule of equipment for removal and salvage for acceptance during the shop drawing process.

For any items requiring a demolition sequence, demolition plans signed and sealed by a licensed Professional Engineer must be submitted for the Engineer's acceptance before work.

Before the commencement of any work, the Contractor must submit a comprehensive staging plan in accordance with the requirements of these plans, which must clearly define specific milestone dates for electrical work for the Engineer's acceptance. The Contractor must document and verify all temporary electrical work at the bridge and must submit to the Engineer detailed plans documenting such work, in conjunction with the staging plan.

The Contractor must submit proposed detailed demolition/salvage plan including materials and equipment to be used for the Engineer's review and acceptance. The plan must indicate the sequence of work, required interconnections, and milestones where testing is required. A detailed schedule of equipment for removal and salvage must be submitted for the Engineer's review and acceptance.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. In case of correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from the commencement of work before the acceptance of the shop drawings; and no work must be done until the shop drawings therefore have been approved. After approval of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings as ordered by the Engineer.

88-9.01D Quality Assurance

88-9.01D(1) Qualifications, Personnel and Facilities

Materials used in the work under this item must be produced by manufacturers regularly engaged in the work required for removal, salvage and disposal of the work specified herein.

For all the work required by the work under these Pay Items, the Contractor must use enough of skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide enough plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-9.01D(2) Rules, Regulations and Ordinances

All removal, disposal and temporary work must comply with all applicable requirements of the latest edition of codes and standards issued by the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications.

Where codes and standards are mentioned for any pay item, it is intended to call attention to them, it is not intended that any other codes and standards must be assumed to be omitted if not mentioned.

All work must be performed and delivered in a workmanlike manner as shown on the Contract Documents and must follow industry-accepted standard practices.

Work must comply with all applicable Federal, State and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

88-9.01D(3) Measurements and Verification

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. The Contractor must verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

88-9.02 MATERIALS

The Contractor must provide all the necessary tools and equipment required to safely disconnect, remove and dispose of all equipment that is slated for removal, replacement or salvage.

88-9.03 CONSTRUCTION

88-9.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work and structural work, as well as navigational and vehicular traffic closures and restrictions.

88-9.03B Delivery and Storage

This section applies to all electrical equipment that must be tagged for salvage and delivered to the San Joaquin County.

The Contractor is responsible for storage of equipment until date of delivery and coordinating date of delivery with the San Joaquin within 120 days of execution of contract.

All electrical equipment that is tagged for salvage must be inspected and accepted by an authorized representative of the San Joaquin County before shipping and after delivery.

Protection for Shipment:

Protective wrappings must be provided for all equipment and materials that are to be salvaged and delivered. Materials must be packed and delivered to the pre-determined San Joaquin County locations in the state that they left from the bridge as accepted by the Engineer.

Damage caused to the materials due to improper storage, transportation, or delivery regardless of cause, must be repaired by the Contractor.

Materials must be completely protected from weather, dirt, and all other injurious conditions during removal, shipment, and storage. Materials must be stored in climate-controlled facilities.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-9.03C Removal of Existing Materials and Equipment

The Contractor must remove and dispose of the existing equipment and components that are not re-used in the final electrical system. Unless otherwise noted, all items must be removed, not abandoned.

Where removal of materials and equipment is called for on the Plans, such materials and equipment must become the property of the Contractor, unless stated otherwise elsewhere in the Specifications, must be legally disposed of away from County property. Under no circumstances must material be dropped in the waterway or abandoned on site. The Contractor must take care, during removal operations, to prevent damage to adjoining parts and components that are to be reused. All components damaged by the Contractor, unless scheduled to be discarded, must be replaced, as ordered by the Engineer, at no additional cost.

The Contractor is hereby notified that existing components such as motors, switches, disconnects, terminal/junction boxes, electrical cabinets, panelboards, etc. must be salvaged and must be protected for shipment by the Contractor and delivered to a San Joaquin County facility as directed by the Engineer. Before shipment, if any components, as determined by the Engineer, are not to be salvaged, such materials and equipment must become the property of the Contractor and must be legally disposed of away from County property as part of this item at no additional cost.

88-9.03D Temporary Electrical Work Removal

The Contractor must salvage all temporary electrical equipment components shown on the shop drawing and any temporary system provided by the Contractor as a part of this project. Scope of temporary electrical work must be field verified by the Contractor prior to bid, any removal or salvage work, or before using temporary electrical work for operation of the bridge during construction. No additional payment will be made for work not shown on the shop drawing, but at the bridge at the time of bid.

Coordinate with the Engineer for construction of all other disciplines that may affect operations, schedule or functional requirements of the bridge.

Where removal of materials and equipment for the temporary electrical system is called for in the Plans, such materials and equipment must become the property of San Joaquin County, where directed. The Contractor must coordinate directly with the San Joaquin County for identification and verification of items that must be salvaged and delivered to San Joaquin County. All identified items must be removed, packaged, and delivered to anywhere in San Joaquin County as pre-determined with the San Joaquin County. Prior to shipment, if any components, as determined by the Engineer, are not to be salvaged, such materials and equipment must become the property of the Contractor and must be legally disposed of away from County property as part of this item at no additional cost.

The County may direct the Contractor to dispose of temporary electrical system equipment. If directed, the Contractor must do so at no additional cost.

88-9.03D(1) Disconnect

Power must be turned off prior to disconnecting any equipment.

All equipment that is slated for replacement which includes: conduits, conductors, junction boxes, pull and/or terminal boxes, motors (including accessories), transformer, panelboards, instrumentation and other miscellaneous incidental equipment as shown on the Contract Documents must be disconnected without damage to any adjacent equipment or connections which are to remain.

Disconnect all temporary equipment (either hydraulic machinery or electrical) during various phases of construction as the space occupied by the temporary equipment will be required for permanent installation of new equipment. Equipment must be disconnected to not interrupt regular operation of the bridge.

88-9.03D(2) Removal

Removal of junction pull and/or terminal boxes, conduits, wiring and other miscellaneous damaged equipment must be done in such a manner as to protect the existing bridge structure and other machinery and electrical components and associated hardware which are to remain.

The Contractor must take care, during removal operations, to prevent damage to adjoining parts and components that are to be reused. All components damaged by the Contractor, unless scheduled to be discarded, must be repaired or replaced, as ordered by the Engineer, at no additional cost. All work must be coordinated with the accepted staging plan to keep bridge running and operational.

88-9.03D(3) Disposal

All removed equipment with associated hardware and miscellaneous damaged equipment must become property of the Contractor as determined and accepted by the Engineer and must be promptly removed from the site and disposed of in a legal manner as ordered by the Engineer.

88-9.03D(4) Patching

All openings which are not to be reused must be sealed in a watertight manner approved by the Engineer. All areas where equipment is removed must be cleaned and delivered in a tidy manner after removal.

88-9.04 PAYMENT

Payment for 'Electrical Equipment Demolition' must be made on a lump sum basis.

88-9.04A Basis of Payment

The lump sum bid price for the Item 'Electrical Equipment Demolition' must include the cost of furnishing all labor, materials, plant, equipment, and all necessary incidentals required to satisfactorily perform and complete the work described herein and perform the work described herein and shown on the plans. All removal/salvage operations and work must be included in this item.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item.

The Engineer must evaluate this breakdown and must have the authority to revise the breakdown as, in his judgment, may be required to make the various components of work conform to their true values.

The Contractor must agree that the detailed breakdown must not become effective until it has the Engineer's acceptance.

The total lump sum value for this item must be broken down in detail.

The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

Item 'Electrical Equipment Demolition'

Upon completion and acceptance of the San Joaquin County of the comprehensive staging plan for the Electrical Equipment Demolition and documentation the temporary electrical operating system, Contractor will be paid 10 percent of the distributed bid price.

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Upon removal and disposal of all equipment and materials slated for removal or replacement and upon inspection and acceptance by a representative of the San Joaquin County, Contractor will be paid 50 percent of the distributed bid price.

Upon delivery of the materials and equipment to the San Joaquin County anywhere in San Joaquin, inspection by a representative of San Joaquin County that it is in good working condition, and acceptance of the items, the Contractor will be paid 40 percent of the distributed bid price after submitting a signed receipt from the representative of San Joaquin County for the Engineer's review and acceptance of the payment.

Before beginning any work, the Contractor must submit to the Engineer a detailed schedule of work operation. This schedule must be complete and include the expected percentage of work to accomplish within specific time frames. The Contractor must prepare and submit an updated work schedule due to unforeseen issues. Failure by the Contractor to present such a document upon request will cause the progress payment procedure to terminate immediately.

Payment will be made under:

Item No.	Item Description	Pay Unit
880090	Electrical Equipment Demolition	Lump Sum

98 MACHINERY

98-1 GENERAL MACHINERY

98-1.01 GENERAL

98-1.01A General

This section gives the general requirements which apply to all bridges and their machinery. Also, this section applies to the installation of electric motors, brakes, instrument drives and limit switches to be mounted with the machinery but supplied under separate items.

The cost of work required by this "General Machinery" is included in the bridges' machinery pay items.

98-1.01B Definitions

Certified Test Reports: As used herein, certified test reports refer to reports of tests conducted on previously manufactured materials or equipment proposed for use. Results of the tests shall be submitted in accordance with the provisions of this Contract for laboratory test results.

Factory Tests: As used herein, factory tests refer to tests required to be performed on the actual materials or equipment proposed for use. Results of the tests shall be submitted in accordance with the provisions of this Contract for laboratory test results.

98-1.01C Submittals

98-1.01C(1) General

Manufacturer's data and/or shop drawing data shall be submitted for all manufactured and purchased items of bridge machinery.

Submittals for each manufactured item shall be manufacturer's descriptive literature, drawings, diagrams, performance and characteristic curves, and catalog cuts, and shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, applicable Federal and Military Specification references and all other information necessary to establish Contract compliance.

Temporary means needed to complete machinery items shall be developed by the contractor and submitted to the engineer for review. Submittals shall include all necessary information to illustrate and confirm safe operation and support of the machinery and/or span. Submittals should include shop and working drawings, installation and erection drawings, catalog and specification sheets, and checked calculations. Submittals shall be signed and sealed by a Professional Engineer licensed in the appropriate discipline by the State of California.

98-1.01C(2) Shop Drawings

Shop drawings shall conform to San Joaquin County Standards and as supplemented and amended elsewhere herein and to the special requirements specified hereinafter.

Shop drawings shall show all parts completely detailed and dimensioned. The grade and amount of finish machining, with all tolerances and allowances, shall be stated for each part for which a specific fit is required. Finished surfaces shall be defined by the ANSI B46.1, "Surface Texture", and fits shall be defined by the ANSI B4.1, "Preferred Limits and Fits for Cylindrical Parts", unless otherwise stated herein or on the Plans. ANSI B4.1 shall also apply to fits for non-cylindrical parts.

98 MACHINERY

All proprietary items shall be shown in outline on the drawings, which shall also indicate the method and sequence to be employed in assembly of bridge machinery and installation of necessary utilities support and service facilities. Shop drawings shall show all external dimensions and clearances necessary for installation and operation of each item of machinery in the bridge. All catalog cuts are considered as shop drawings. After approval, all catalog cuts are to conform to shop drawing for requirements and scanned as a PDF file format in accordance with the requirements of San Joaquin County.

For all bridge machinery shown on the Plans or listed herein, the Contractor shall furnish complete assembly diagrams showing each part contained within the item and the manufacturer's part number assigned to each part. The diagram shall be sufficient to enable complete disassembly and reassembly of the item covered. In the event that any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor shall deliver a drawing that details each modification; and the part shall be assigned a unique part number to preclude the supply of replacement parts not modified in similar fashion. The assembly drawings of each item shall, in addition to identifying and describing each internal part, contain dimensions of all principal elements within the item; certified external dimensions affecting interfaces or installations; gross weight capacity and normal operating ratings; method and recommended types of lubrication, including location and type of fittings and provisions for adding, draining, and checking the level of each lubricant employed; inspection openings, seals and vents; and details of all fasteners used to mount the equipment to its foundation.

Complete shop bills of materials shall be made for all machinery parts. If the bills are not shown on the shop drawings, prints of the bills shall be furnished for approval in the same manner as specified for the shop drawings.

The material and material specifications shall be stated for each part. Where American Society for Testing and Materials Specifications or any other Standard Specifications are used, the designating numbers of such Specifications shall be given. The following abbreviations will be used herein, and on the Plans to designate Standard Specifications for materials and workmanship:

American Association of State Highway and Transportation Officials, AASHTO

American Bearing Manufacturers Association, ABMA

American Gear Manufacturers Association, AGMA

American Iron and Steel Institute, AISI

American National Standards Institute, ANSI

American Railway Engineering and Maintenance-of-Way Association, AREMA

American Society for Testing and Materials, ASTM

National Lubricating Grease Institute, NLGI

National Electrical Manufacturers Association, NEMA

Society of Automotive Engineers, SAE

Complete assembly and erection drawings shall be furnished. These drawings shall give identifying marks and essential dimensions for locating each part or assembled unit with respect to the bridge structure or foundation. Use of mirror image or opposite hand erection drawings will not be allowed.

Each shop drawing shall be given a suitable title to describe the parts detailed thereon and shall state by whom shop inspection will be made. The Contractor shall allow the County or their authorized inspectors

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to audit their facilities prior to start of any fabrication, casting, machining, etc. in order to expedite inspection procedures by all inspection agencies and authorized personnel.

Standard Compliance: Where equipment or materials are specified to conform to requirements of the standards of an organization, such as American Society for Mechanical Engineers (ASME), Underwriters Laboratories (UL), American Gas Association (AGA), and American Refrigeration Institute (ARI), that use a label or listing as method indicating compliance, proof of such conformance shall be submitted and approved. The label or listing of the specified organization will be acceptable evidence. In lieu of the label or listing, the Contractor shall submit a certificate from an independent testing organization adequately equipped and competent to perform such services and approved by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 60 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor shall submit to the Engineer for his approval all shop drawings. In case of correction or rejection, the Contractor shall resubmit until each drawing is approved. The Contractor shall bear all costs for damages, which may result from the ordering of any materials prior to the approval of the shop drawings. After approval of the shop drawings, the Contractor shall supply the Engineer with copies of the approved shop drawings.

The Contractor shall update shop drawings digitally upon completion of installation to reflect the final condition and submit updated shop drawings as as-builts.

98-1.01D Operating and Maintenance Manuals

Operating and maintenance manuals shall be provided by the Contractor as per Item "Operating and Maintenance Manuals".

98-1.01E Posted Operating Instructions

Operating instructions approved by the Engineer shall be provided for the system and each principal piece of equipment for the use of operation and maintenance personnel. The operating instructions shall include diagrams showing the complete layout of the entire system, and shall be framed under glass or in approved laminated plastic and posted where directed by the Engineer; printed or engraved operating instructions for each principal piece of equipment including proper adjustment, operating, lubrication, safety precautions, procedure in the event of equipment failure, and any other necessary items of instruction as recommended by the manufacturer of the unit shall be attached to or posted adjacent to the piece of equipment or as directed by the Engineer. Operating instructions exposed to the weather shall be made of weather-resisting materials or shall be suitably enclosed to be weather protected. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

98-1.01F Quality Assurance

98-1.01F(1) General

Standard Products. Materials and equipment shall be essentially the standard catalogued products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest standard design that complies with the specification requirements. Materials and equipment shall essentially duplicate items that have been in satisfactory commercial or industrial use at least two years prior to bid opening. Where two units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be the products of the same manufacturer. Each major component of equipment shall have the manufacturer's name and

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address and the model and serial number on a nameplate, securely affixed in a conspicuous place. The name plate of the distributing agent will not be acceptable.

Manufacturer's Recommendations. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material. The Contractor shall provide as part of the work all special machining and installation required by the component manufacturer.

Code and Standards. Work under bridge machinery pay items shall comply with all applicable requirements of the latest edition of codes and standards issued by, but not limited to, the following organizations and publications, whose abbreviations used in this Specification shall be as shown:

American Association of State Highway and Transportation Officials, AASHTO

American Bearing Manufacturers Association, ABMA

American Gear Manufacturers Association, AGMA

American Iron and Steel Institute, AISI

American National Standards Institute, ANSI

American Society for Testing and Materials, ASTM

American Welding Society, AWS

National Lubricating Grease Institute, NLGI

Society of Automotive Engineers, SAE

San Joaquin County Standard Specifications

The design of new machinery conforms to the 1988 Standard Specifications for Movable Highway Bridges published by the American Association of State Highway and Transportation Officials, 1992 and 1993 Revisions (hereinafter referred to as the AASHTO Standard), except as otherwise noted on the Plans or otherwise specified herein.

98-1.01F(2) Qualifications, Personnel, and Facilities

For the fabrication, installation, aligning, cleaning, lubricating, testing and all other work required by bridge machinery pay items, the Contractor shall use adequate numbers of skilled, trained, and experienced mechanics, millwrights and service personnel who are thoroughly familiar with the requirements and methods specified for the proper execution of work.

Mechanics, millwrights, and service personnel shall be properly equipped with all necessary instruments to assure that related components have been provided within acceptable tolerances and to make all necessary adjustments for attaining the specified ratings.

98-1.01F(3) Rules, Regulations, and Facilities

Work shall comply with all applicable Federal, State, and Local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the above-mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement shall apply.

98-1.01F(4) Measurements and Verification

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Dimensions indicated on the Plans are nominal and are intended for guidance only. All variations from the nominal dimensions on the Plans shall be noted on the shop drawings.

98-1.01F(5) Substitutions

The terms “approved equal”, “of equal quality” and “or equal” which appear on the Plans and in these Specifications are intended to allow the Contractor to substitute other manufacturers and model numbers of products of equal quality and rating for those specified.

Prior to the Contractor’s ordering of any substitute product, the Engineer’s approval of the equivalence of the substitute product shall be obtained in writing. The acceptance of the substitute products is at the sole discretion of the Engineer who will establish the basis for equivalence and will review the quality of the materials and products described in detail on the submitted shop drawings and product data.

The Engineer will “Approved” or “Revise and Resubmit” substitute material. Upon return of a shop drawing showing rejection, the Contractor shall resubmit the shop drawing showing the specified product. Rejection shall not in any way result in any extra cost.

Approval by the Engineer of any substitute products submitted by the Contractor shall not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that product.

Where a manufacturer’s name and catalog part number, in this Specification or on the Plans, specifies a particular product it is so specified to establish quality, configuration, and arrangement of parts. An equivalent product made by another manufacturer may be substituted for the specified product subject to the approval of the Engineer; however, all necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, shall be made by the Contractor at no additional cost.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted as soon as practicable for approval. No such departures shall be made without approval by the Engineer.

98-1.02 MATERIAL

98-1.02A Castings and Forgings

98-1.02A(1) General

Before any work is started on castings and forgings, the manufacturer shall communicate with the Engineer to arrange for inspections and tests. The Engineer shall be notified not less than five (5) working days prior to the start of work so that a representative of the Engineer may be present.

All necessary precautions shall be taken to fabricate the castings true to pattern in form and dimensions, free of pouring faults, cracks, cold shuts, blow holes and other defects in positions affecting their strength and value for the service intended.

All castings shall be cleaned free of loose scale and sand; all fins, seams, gates, risers and other irregularities shall be removed. All unfinished edges of castings shall be neatly cast with rounded corners and all inside angles shall have ample fillets.

98-1.02A(2) Required Testing

All castings shall be visually examined in accordance with ASTM A802, meeting visual inspection acceptance criteria Level II. Castings that do not pass this test may be rejected. Test results, whether

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positive or negative, shall be submitted to the Engineer. Test records meeting Level III may be considered for weld repair, provided the manufacturer submits a procedure to the Engineer for review and approval.

All castings that have solid sections 2-inches thick or greater in the as-cast condition and all fracture critical members shall be ultrasonically tested in accordance with ASTM A609, Method A, meeting Quality Level 2. Castings that do not pass this test may be rejected. Test results, whether positive or negative, shall be submitted to the Engineer. Test records meeting Quality Level 3 may be considered for weld repair, provided the manufacturer submits a procedure to the Engineer for review and approval.

All casting surfaces shall be magnetic particle examined in accordance with ASTM E125, meeting the following acceptable levels of discontinuities:

i. Type I	Cracks/Hot Tears	1/4-inch max
ii. Type II	Shrinkage	Degree 3
iii. Type III	Inclusions	Degree 3
iv. Type IV	Chaplets	Degree 2
v. Type V	Porosity	Degree 1

Test results, whether positive or negative, shall be submitted to the Engineer. All surface discontinuities may be considered for weld repair, provided the manufacturer submits a procedure to the Engineer for review and approval.

All repair procedures shall include details of the areas to be repaired and a means to qualify the repair method. Approved repair procedures shall be performed prior to final heat treatment, so that no weld repairs will be needed after final machining. In addition, all surface defects removed by rough machining shall be performed prior to final heat treatment.

All castings that fail to meet the established acceptance criteria and considered rejected shall be replaced, at the Contractors expense, with new castings.

All carbon and alloy steel forgings shall meet the requirements of AASHTO Specification M102 (ASTM A668) unless otherwise indicated or approved by San Joaquin County.

All forgings shall be reduced to size from a single bloom or ingot until homogeneity is secured. The blooms or ingots, from which shafts or pins are to be made, shall have a cross-sectional area at least three times that required after finishing. No forging shall be done at less than a red-heat.

All finish machined forging surfaces shall be magnetic particle examined in accordance with ASTM A275. The maximum permissible indication on any surface shall be 1/4-inch. Indications greater than 1/4-inch may be cause for rejection. Test results, whether positive or negative, shall be submitted to the Engineer.

98-1.02A(3) Independent Testing

Independent inspection and testing, destructive and/or non-destructive, may be performed by a representative of the Engineer and shall be paid for by the Contractor. The tests would be in addition to and independent of tests being performed by the Contractor as per the plans and specifications.

The Contractor shall furnish, i.e. make available for use, all facilities at the foundry, forge shop and/or machine shop for independent inspection and testing, destructive and/or non-destructive, required by the Engineer.

The previously noted acceptance criteria shall apply to any independent testing. In addition, the independent testing may include radiographic testing to help isolate areas, which in the opinion of the Engineer, may require further investigation. Acceptance or rejection will not depend solely on the radiographic test results but rather they will help define any flaws, which may be of concern to the Engineer.

98-1.02A(4) Bronze Castings

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All bronze castings shall meet the requirements of AASHTO Specification M107 (ASTM B22) and be Copper Alloy UNS No. C91100 unless otherwise indicated.

98-1.02B Shafting and Pins

All shafts shall conform to tolerances in ASTM A29 unless otherwise indicated. Turned, ground and polished shafting straightness tolerances shall be 0.002 inch per foot for shafts up to and 1 1/2 inches in diameter and 0.003 inch per foot for shaft over 1 1/2 inches in diameter.

All shafts and pins shall be accurately finished, round, smooth, and straight; and when turned to different diameters, they shall have rounded fillets at the shoulders. Each shaft or pin having a uniform of more than 8 inches and each shaft or pin having several diameters, of which the smallest is more than 8 inches, shall be bored lengthwise through the center to a diameter approximately one-fifth the smallest body diameter.

Each end of all shafts, when finished to the required lengths, shall have a 60-degree lathe center, with clearance hole, at the exact center of the shaft. Shafts that have a hole bored lengthwise through their centers shall have their ends prepared for the attachment of a centering device equivalent to the lathe center. All such devices shall be furnished as part of the work.

Where it is required on the Plans that stepped shafts shall have fillets blended in smoothly to adjacent surfaces without tool marks or scratches, the surfaces shall have an ANSI maximum roughness of 63 micro inches, unless otherwise required herein or on the Plans to have a finer finish.

All cold-finished shafting shall be steel of the type and grade shown on the Plans and shall be tested for its mechanical properties, and a test certificate shall be furnished to the Engineer. Each cold-finished shaft shall be free from camber and shall run without vibration, noise, or chatter at all speeds up to and including the maximum rated speed.

All hubs mounted on the ends of cold-finished shafts shall have the fit specified herein of on the Plans. To obtain the required fit between hub and shaft, the Contractor may furnish the cold-finished shaft 1/16 inch larger than the nominal diameter specified and shall turn the ends to the required dimension for the hub. The Contractor may, at his option, furnish any cold-finished shaft of one diameter end to end; but such shaft shall have tolerances selected from the normal manufacturing range, which will provide the specified fit. The selected tolerances shall be shown on the shop drawings.

Turned, ground, and polished commercial shafting of the grade specified shall be used where shown on the Plans.

98-1.02C Fasteners

All bolts, either for connecting machinery parts to each other or to supporting members are categorized as one of the following types:

- High-strength bolts
- Finished body
- Turned bolts, and studs

All high-strength bolts shown on the plans shall be ASTM F3125 type A325, high-strength bolts unless otherwise noted and tightened to slip critical criteria.

Finished body bolts are to meet the requirements of ASTM A449 or SAE J429 GR5 cap screws. Bolts shall have finished bodies and regular hexagonal heads. Holes for finished body bolts are to be individually reamed for a clearance of not more than 0.010 inch (0.25 mm) larger than the actual diameter of individual bolts for that hole. Finished body bolts shall be tightened to slip critical criteria.

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Turned bolts, and studs are to be provided with turned shanks, cut threads, and finished washer-faced hexagonal heads. For the finished shank of all turned bolts, and studs, use 1/16 inch (1.6mm) larger in diameter than the diameter of the thread. Determine the head and nut dimensions based on the thread diameter unless otherwise noted. For the shanks of all turned fasteners, use a Class LC6 fit in the finished holes in accordance with ANSI B4.1. The material for the turned fasteners shall meet the requirements of ASTM A449 unless otherwise noted. Turned bolts shall be tightened between 50% and 70% proof strength.

Dimensions of all bolt heads, nuts, and hexagonal head cap screws are to conform to ANSI/ASME B18.2.1, Square and Hex Bolts and Screws, and ANSI/ASME B18.2.2, Square and Hex Nuts.

Provide heavy series heads and nuts for turned bolts, cap screws, and turned studs.

Dimensions of socket-head cap screws, socket flat-head cap screw, and socket-set screws are to conform to ANSI B18.3, Socket Cap, Shoulder, and Set Screws. Unless otherwise called for on the plans or specified herein, make the screws of heat-treated alloy steel, cadmium-plated, and furnish with a self-locking nylon pellet embedded in the threaded section. Set screws are to be of the headless, safety type with threads of the coarse thread series and having cup points. Do not use set screws to transmit torsion nor as the fastening or stop for any equipment that contributes to the stability or operation of the bridge.

Fabricate all threads for bolts, nuts, and cap screws to conform to the coarse thread series having a Class 2 tolerance for bolts and nuts or Class 2A tolerance for bolts and Class 2B tolerance for nuts in accordance with the ANSI/ASME B1.1, Unified Inch Screw Threads.

Spot face all bolt holes through unfinished surfaces for the head and nut, square with the axis of the hole.

Unless otherwise called for or required to account for fabrication tolerances, sub drill all bolt holes in the machinery parts for connecting these parts to the supporting steel work at least 1/32 inch (0.8 mm) smaller in diameter than the bolt diameter and ream assembled for the proper fit at assembly or at erection with the steel work after the parts are correctly assembled and aligned.

Furnish positive locks of an approved type for all nuts for any fastener which may be tightened below slip critical. Use of double nuts, jam nuts, and lock wire are preferred.

Furnish a hardened plain washer at each end of finished body high-strength bolts meeting the requirements of ASTM F436.

Provide cotters conforming to the SAE standard dimensions and made of half-round stainless steel wire, ASTM A276, Type 316.

Use only fasteners manufactured in the United States with the property class and source identification appearing on the top of head.

98-1.02D Keys and Keyways

Keys and keyways shall conform to the dimensions and tolerances for square and rectangular keys of the ANSI Standard B17.1, Keys and Keyseats, unless otherwise specified. All keys shall be effectively held in place, preferably by setting them into closed-end keyways milled into the shaft. The ends of all such keys shall be rounded to a half circle equal to the width of the key. Keyways shall not extend into any bearing. If two keys are used in a hub, they shall be located 120 degrees apart and in line with wheel arms where practicable.

Unless otherwise specified herein or on the Plans, keys shall be machined from alloy-steel forgings, ASTM A668 M, Class K.

98-1.02E Bearings and Bushings

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All split bearings shall have one half fitted to the other half as shown on the Plans. The surface between the cap and the base shall be accurately machined. All caps shall be securely bolted to the bases with turned bolts and double nuts. All caps and bases shall be provided with double-flanged bushings securely held against changing position under load by hexagonal-head, steel cap screws, unless otherwise shown on the Plans. All bushings shall fit the inside bore and end faces of the base and cap, with an ANSI Class LC1 clearance and location fit, and shall fit the shaft journals, with an ANSI Class RC6 running fit. All caps shall be provided with a tapped hole for lifting eyebolt, which shall be furnished for the purpose.

Bushings for split bearings shall be finished-bored with the caps in place and with 1/4-inch thick rolled bronze or brass liners. At least 1/8-inch of the liner thickness shall be of laminated construction capable of adjustment in increments of 0.003 of an inch. The edges of the liners toward the shaft journal shall be cut to fit the shaft shoulder fillets where they occur and shall be cut square and flush with the bushing flange if there is no change in shaft diameter. Except for a short distance from each end, the inside edges of the liners shall be cut back to form a grease groove along the shaft. All bolt holes shall be drilled through the liners.

For split bearings, each half bushing shall have machined double oval grease grooves connecting with the ends of the liner grooves and intersecting at the center of each half bushing, unless otherwise shown on the Plans. All grease grooves shall be precision machine-cut and smooth. The corners of all grooves shall be rounded to a radius of not more than half the width of the groove.

Anti-friction bearings shall be sized for a B-10 life of 40,000 hours as defined by ABMA for the ratings shown on the Plans.

Pillow block bearings shall be, adapter mounted, self-aligning expansion and non-expansion types as called for on the drawings. Housings shall be cast steel and capable of withstanding the design radial load in any direction, including uplift. Bases shall be cast without mounting holes. Mounting holes shall be drilled from the solid at assembly with the supporting steel work. Seals shall retain the lubricant and exclude water and debris. Cap bolts on pillow blocks shall be high-strength steel. The cap and cap bolts shall be capable of resisting the rated bearing load as an uplift force.

98-1.02F Shaft Journals

All journal bearing areas on shafts and pins shall be accurately turned, ground and polished with no trace of tool marks or scratches on the journal surface or adjoining shoulder fillets. Burnishing of the shaft journal areas and adjoining shoulder fillets will be acceptable in lieu of grinding and polishing, provided the burnishing is done with a Stellite roller or equal which has been finished to a mirror surface. Journal diameters shall be finished to the limits of an ANSI Class RC6 running fit.

98-1.02G Open Gearing

Spur gears shall have 20-degree full-depth, involute cut teeth in accordance with the proportions of the ANSI/AGMA 201.02, Tooth Proportions for Coarse-Pitch Involute Spur Gears, unless otherwise specified herein or shown on the Plans.

The teeth of all gears shall be cut from solid rims or blanks. The sides and peripheries of all gears and pinions shall be finished, and the pitch circle shall be scribed on both sides not less than 0.02-inch-deep with a V-pointed tool. The working surfaces of all gear teeth shall be true to the proper outline, accurately spaced on the true pitch circle, exceptionally smooth, and free from planing or milling-cutter ridges. Cutter burrs shall be removed from all edges of the teeth, and the top edges of all teeth shall be rounded to a 1/32-inch radius.

Except as otherwise provided herein or on the Plans, all gears shall be cut and mounted to meet the requirements for accuracy of ANSI/AGMA Standard 2000-A88, Gear Classification and Inspection

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Handbook. The AGMA quality number shall be stated on the applicable shop drawings. Open gearing shall conform to AGMA Quality No. 7 or higher.

Bevel gears shall have 20-degree full-depth, involute cut teeth in accordance with the proportions of the ANSI/AGMA 2005-B88, Design Manual for Bevel Gears.

98-1.02H Enclosed Speed Reducers

Speed reducers shall be standard models from one manufacturer, with sizes, ratios and construction details as shown on the Plans.

Speed reducers shall be designed to meet all requirements of ANSI/AGMA Standard 6010, manufactured in accordance with the requirements of AGMA and given nameplates with the following information:

Size

Ratio

Service Power Rating

High Speed Shaft RPM

Service Factor

Lubrication Specification

Gear teeth shall be through hardened and conform to AGMA Quality No. 8 or higher. Casehardened gears shall not be used to drive bridge machinery.

Gears shall have spur, helical, herringbone or bevel teeth, bearings shall be antifriction type, and housings shall be steel castings or welded steel plate, which shall be stress relieved. The inside of the housings shall be sandblast cleaned prior to assembly and be protected from rusting. Exact ratios shall be furnished where specified.

Speed reducers shall be able to withstand a momentary overload equal to three (3) times the rated full load torque of the driving motor(s) without any component reaching 75 percent of its yield strength.

Lubrication of the gears and bearings shall be automatic when the unit is in operation.

It is preferable that a bath lubrication system be utilized. In a bath lubrication system, all components in the speed reducer, which require lubrication, are partially submerged in an oil bath.

When the configuration of gears and bearings prevent bath lubrication, a splash lubrication system should be used. Splash lubrication systems shall continuously lubricate all gears and bearings properly. Oil feed troughs may be used to supply oil to bearings and gears, which are above the bath. Splash lubrication systems shall be designed such that equal lubrication is supplied to each internal component for both directions of operation.

If a pressurized lubrication system is required for the reducer, a redundant secondary lubrication system shall be provided. The secondary system shall operate at all times when the primary system is functioning.

Inspection ports on reducers shall provide for inspection of all gears, bearings, and other internal devices. The ports shall be located above the oil level, if practicable, so that oil draining is not required for inspection. The port shall be sized such that minor repairs could be made to reducers without requiring housing disassembly. Ports shall be properly sealed with seals that do not require replacement when ports are opened.

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Reducers shall be furnished with moisture trap breathers, oil fills, break proof glass oil level indicators, drains and inspection ports.

Moisture-trap breathers shall be located above maximum oil levels in all positions of the reducer during operation, and its piping shall enter the unit at the highest point possible. Breathers shall not be mounted in bearing caps.

Oil level indicators shall be mounted in locations that can be easily viewed by maintenance crews. On reducers in which the oil level varies by more than 1/2-inch per 50°F temperature change, the sight glass shall be graduated. The indicator shall be vented back to the case. Sight glasses shall be of rugged construction and protected against breakage.

Oil drains shall be located at the lowest point possible. The drain shall have a hand operated level which can be locked in the closed position.

Oil sampling cocks shall be located in accessible positions on the reducers. There shall be two sampling cocks, one located at the lowest level of oil and one just below the upper oil level.

Speed reducers shall have provisions for oil expansion due to churning and temperature change.

Grease lubricated reducer bearings shall be furnished with separate fill and purge fittings, readily accessible after installation of reducer. Grease lubricated reducer bearings shall be furnished with internal seals between the bearing housing and reducer cavity, preventing grease and gear oil from interacting.

On shaft extensions, bearing shaft ring seals shall be mechanical type oil seals which compensate for wear. Dual lip spring loaded seals are preferred.

Shaft extensions for the various reducers shall be of the arrangement, lengths, and diameters shown on the Plans. Couplings shall be shrink fitted on the shafts in the shop.

On open-ended lower bearings of vertical shafts, extra precaution must be taken to prevent oil leakage. A dry-well arrangement in which the bearing is isolated from the oil bath is preferred. Grease lubrication of the lower bearing is required in these applications.

Pinions shall be proportioned so that the root diameter of the pinion is not smaller in diameter than the diameter of the journals for the pinion shaft.

Base plates for the reducers shall be large enough to give unobstructed access for drilling and reaming the mounting holes from above the unit.

Speed reducers driving bridge machinery and electrical controls shall be shown on Plans or approved equal.

The manufacturer shall submit for approval by the Engineer a certified print of each speed reducer showing a minimum of the following:

- All external mounting dimensions including shaft sizes, bores, and keyways where required.

- Internal Plans showing each reducer component with part numbers.

- The ratings that will appear on the nameplate.

- Location of all lubricant connections and details of any external lubrication piping.

- Lubrication recommendations.

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The manufacturer shall submit for approval by the Engineer computerized calculations showing conformity to the requirements of the AGMA Standard Practice specified. The approved reducer prints and design calculations must be made available to the County of San Joaquin prior to construction of the unit.

98-1.02J Hubs and Bores

The hubs of all gears, wheels, and couplings shall be finished on both faces and polished where the hub face performs the function of a collar to prevent shaft movement. The hubs shall be bored concentric with the rims of gears and wheels or with the outside of couplings. All hubs shall have an ANSI Class FN2 medium shrink fit on the shafts, unless otherwise specified.

98-1.02K Shims

Where shown on the Plans, all machinery shims required for leveling and alignment of equipment shall be stainless steel, neatly trimmed to the dimensions of the assembled parts and drilled for all bolts that pass through the shims.

Shims shall be Stainless Steel ASTM A240 Type 316 and furnished without bolt holes. Holes in shims shall be drilled and reamed to the same tolerance as the connected parts at final assembly. Shims greater than 1/2-inch shall include one solid plate of thickness equal to 1/2-inch less than total shim thickness.

Shims shall be shown and fully dimensioned as details on the shop drawings. Shims with open side or U-shaped holes for bolts will not be permitted. No shims shall have less than two holes for bolts, unless specified otherwise in the Plans. Bolt holes shall not be punched at machine shop to prevent distortion of the shims.

In general, sufficient thickness shall be furnished to secure 1/64-inch variations of the shim allowance plus one shims equal to the full allowance. The 1/2-inch nominal shim pack consists of the following thickness variations: one 1/4-inch, one 1/8-inch, one 1/16-inch, one 1/32-inch and two 1/64-inch.

98-1.02L Welding

Welding required for machinery shall be done in accordance with the Bridge Welding Code. ANSI/AASHTO/AWS D1.5 and all interim revisions published by AASHTO as of the bid opening date. Stress relieving will be required only specified. All welds used to fabricate machinery shall be completely tested by ultrasonic inspection (ASTM E164-74) per AWS D1.5 for compression welds unless otherwise noted. All machining shall be performed after welding and stress relieving.

Welding joint sizes and details shall be shown on working drawings. Where multi-pass welds are required, welding procedures shall be submitted with shop drawings. Distortion during fabrication shall be kept to a minimum by the use of welding fixtures and proper welding procedures.

98-1.02M Machinery Guards

Machinery guards shall be provided for all moving parts readily accessible to personnel and where otherwise required by OSHA or ANSI B15.1, Safety Standard for Mechanical Power Transmission Apparatus, including but not restricted to the following:

- Couplings

- Open Gears

- Unused shaft extensions

- Shafts at platform and roadway level

- Brakes

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Instrument drives and limit switches

Machinery guards shall not be required for the rack segments and pinions. Machinery guards shall be constructed to comply with the applicable requirements of ANSI B15.1, Safety Standard for Mechanical Power Transmission Apparatus.

Unless otherwise indicated or specified, all machinery guards shall be constructed of stainless steel having minimum thickness of No. 12 Gauge and shall have provision for removal without requiring disassembly of any machinery component.

Machinery guards shall be provided with removable hinged or bolted covers for access to lubrication fittings enclosed by the guard. Phenolic nameplates shall be provided on these covers with lubrication instructions.

Machinery guards shall be painted Safety Orange.

98-1.02N Flexible Couplings

Couplings shall be of the type as shown on the Plans and shall include grid type, gear type, and others as needed.

Couplings shall, in general, be finish-bored and have keyways cut by the Coupling Manufacturer to dimensions and tolerances established on the shop drawings and then shipped to the manufacturers of the various components for shop installation on the shafts.

Grid-type, self-aligning, fully flexible, torsionally flexible couplings shall be used to connect electric motors to machinery components. the grid-type couplings shall have steel hubs, alloy steel grids, and steel or aluminum covers. Bolts in the covers shall be shrouded.

Gear-type, self-aligning, full-flexible couplings or semi-flexible couplings with floating shafts shall be used to connect all machinery components, except where other types of couplings are called for on the Plans. All couplings shall have shrouded bolts. The gear-type couplings shall be made of forged steel, have curved face teeth, and shall provide for at least a plus and minus of 3/4 degree misalignment per gear mesh.

Special couplings shall be as shown on the Plans.

Couplings shall be standard products of an established Manufacturer.

98-1.02O Lubrication

Lubrication Fittings: All bearings and surfaces requiring lubrication, other than gear teeth, shall be fitted for a pressure system of lubrication using NPS 1/4-inch giant button head fittings, unless otherwise indicated on the Plans. The fitting for greasing bushed bearings shall be tapped into the housing or connected thereto by stainless steel seamless pipe, which shall be tapped into the housings so that grease will be discharged directly through the housing, shims, bushing, and into the grease grooves for distribution. All grease fittings shall be conveniently located for greasing, and if necessary, shall be connected to the points requiring lubrication from convenient lubrication stations by NPS 1/4-inch stainless steel seamless pipe – schedule 80 with stainless steel threaded pipe fittings – 3000 psi. All stainless steel pipe and fittings shall meet ASTM A312 and ASTM A182, respectively. All pipe extensions shall be kept as short as practical, shall be securely supported at fittings and intermediate points and located so that it shall be protected from injury. All lubricating equipment shall be installed in perfect condition.

Not more than two sizes of fittings shall be used. The large size shall be used wherever possible, and the smaller size shall be used for motor bearings and other small devices. Pressure fittings shall be rated at a minimum of 10,000 psi. Fittings shall contain a steel check valve that will receive grease and close against back pressure.

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Immediately after the completion of fabrication, all fitting locations shall be plugged until components are installed and regular lubrication is started. The plugs shall then be replaced with the proper grease fittings. During installation, the Contractor shall lubricate all rotating and sliding parts of the machinery and fill all gear reducers, bearing housings, and flexible couplings with lubricants indicated on approved lubrication charts.

Maintenance and lubrication literature for each machinery component shall be kept in the Control House in a heavy bound binder.

98-1.02P Spare Parts

The contractor shall provide a complete list of each and every shaft and coupling seal used at the job, including current part number and manufacturing of each seal furnished plus sufficient generic description and dimensions to order seals in the future when current models/manufacturers may no longer be identifiable.

In addition to the spare parts described under other items the following spare parts shall be provided:

One grid of each grid-type coupling.

One complete set of gaskets for every flexible coupling.

Five lubrication fittings of each different type and size used.

98-1.02Q Discharge Piping and Fittings

Discharge piping shall be welded schedule 40 galvanized steel pipe in accordance with ASTM A53. All fittings shall be threaded, galvanized and conform to ASTM A865.

98-1.02R Pipe Supports

The Contractor shall provide manufactured hot-dip galvanized steel supports made from ASTM approved materials or approved equal corrosion resistant coated supports. All fastener materials under 5/8" shall be 316 stainless steel. Fasteners 5/8" and above: Nuts shall be ASTM A563 Grade A hot-dipped galvanized. Washers shall be hot-dip galvanized and conform to ASTM F436. Bolts shall be hot dip galvanized and conform to ASTM F3125 Grade 325. Supports connected to steel shall use 5/8" minimum diameter hardware.

Supports shall allow for thermal expansion of piping over a range of 140 degrees Fahrenheit. Space supports as shown on the Plans, but not exceeding 12 ft vertically or at each level.

Pipe support concrete anchors shall be a minimum of 3/8" diameter with either epoxy 3-1/2" minimum embedment or mechanical double expansion wedge anchors. Use stainless steel anchor rod meeting ASTM F593 (AISI 316) Condition CW, and stainless-steel nuts meeting ASTM F594 (AISI 316) Condition CW. Washers to meet ASME B18.22.1 Type A Plain and stainless-steel material AISI 316.

98-1.02S Sump Pump

Pump shall be standard model from manufacturer with the following parameters:

Capacity: Min. 28 GPM @ 17 ft. head, min. deadhead capability of 20 ft.

Min 3/4 HP motor, 3 Phase, 240V, 60 Hz

Discharge connection size 2 in.

Submersible centrifugal-type

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Corrosion resistant

The impeller shall be semi-open, non-clog, with ejector vanes on the top of the impeller, and dynamically balanced. Shaft shall be stainless steel.

The pump body shall be cast iron construction. Impeller shall be bronze or stainless-steel construction. The strainer and all hardware shall be stainless steel. Pump seals shall be silicon carbide. The pump shall be capable of passing 1/2" solids.

Pump motor shall be NEMA 6, submersible air-filled, hermetically sealed, with NEMA rated insulation, Class B, F or H. Motor housing shall be cast iron construction.

The power cable shall be sealed such that damage to the cable will not permit water to enter the motor.

98-1.03 CONSTRUCTION

98-1.03A Shop Fabrication

The Contractor shall give no less than ten (10) working days notice to the Engineer of the beginning of work at foundries, forge, and machine shops so that inspection may be provided. No materials shall be cast, forged, or machined before the Engineer has been notified where the orders have been placed.

The Contractor shall furnish all facilities for inspection of material and workmanship in the foundries, forge, and machine shops and the Inspector designated by the Engineer shall be allowed free access to necessary parts of the premises. Work done while the Inspector has been refused access or presented in a manner that prevents adequate inspection will automatically be rejected.

The Inspector shall have the authority to reject materials or workmanship, which do not fulfill the requirements of these Specifications.

Inspection at the foundries, forge, and machine shops is intended as a means of facilitating the work and avoiding errors. It is expressly understood that inspection will not relieve the Contractor from any responsibility in regard to imperfect material or workmanship and the necessity for replacing defective materials or workmanship, which are delivered to the job site.

The Contractor shall furnish the Engineer with a copy of all orders covering work performed by subcontractors or suppliers.

Unless otherwise provided, the Contractor shall furnish without additional charge test specimens as required, and all labor, testing machines, tools, and equipment necessary to prepare the specimens and to make the physical tests and chemical analyses required by material specifications. A copy of all test reports and chemical analyses shall be furnished to the Engineer.

Their acceptance of any material or finished parts by the Engineer shall not be a bar to their subsequent rejection if found defective. Rejected material and workmanship shall be replaced or made acceptable by the Contractor at no additional cost.

98-1.03B Shop Inspection and Testing

Machinery components shall be shop assembled to verify their correct fit prior to shipment. Measurements required for each assembly are shown on the Plans and/or described in individual pay items.

The speed reducer manufacturer shall shop test the reducers. The Contractors shall submit a testing procedure that will show how the test is to be performed, layout of the apparatus to be used, equipment to be used as well as forms that will be filled out to record the test. This procedure is to be reviewed and approved by the Engineer prior to testing being performed.

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Except for instrument drive reducers, testing shall be performed on all reducers.

Before the start of the test, the following measurements shall be taken and documented. All documentation shall be submitted with the certificate of compliance:

Temperature of ambient air.

Temperature of oil near bottom of crankcase shall preferably not rise more than 40°F from ambient during the test. Oil temperature exceeding 150°F shall not be acceptable.

Surface temperature of each bearing adjacent to shaft seals shall not rise more than 100°F from ambient during the test. Temperature above the rating of the seals or bearings is unacceptable.

Sound level at point above and 3 feet distant from the edge of housing of unit shall not exceed 90dbA.

All reducer testing shall orient in the same mounting position as installed on the bridge.

Each reducer shall be first tested by running at no load and at 100% rated motor RPM for at least 2 hours in each direction (4 hours total continuous operation). Readings of measurement 4a through 4d above shall be taken at 30-minute intervals for the full duration of the test.

Each reducer shall be tested by running at 150% rated full load motor torque and at 100% rated motor RPM for 1/2-hour in each direction (1-hour total continuous operation). Readings of measurements 4a through 4d shall be taken at 15-minute intervals for the full duration of the test.

The tests shall be performed with the reducer filled to the dip-stick mark, with new oil of the type the manufacturer recommends on the lubrication charts for normal operation.

The reducer shall be checked for the following during both the load and no load testing:

Any excessive or unusual noise

Excessive bearing clearance

Excessive vibration

Excessive temperature rise

The proper lubrication of the oil system shall be demonstrated during the shop test.

Gear teeth shall be checked for proper distribution of load. This can be measured with the help of tooth contact tape applied to each gear. These tapes will be preserved in the records to be submitted with the Certificate of Compliance.

Bluing dye can be used as an alternate so long as all teeth are coated and digital photographs taken before and after the tests are included with the report.

No testing shall be performed on the reducer without a representative of the Owner being present. Any testing not witnessed by the Engineer or the Owner's representative shall not be acceptable.

If any condition in 9a through 9d is observed, the manufacturer shall be put on notice by the Engineer of the observation. The manufacturer shall then determine the cause and corrective action necessary to correct the condition and submit a report to the Engineer for review and acceptance. A retest of the reducer will be required to show that the repair has corrected the condition and the Engineer or Owner's representative will determine if the reducer is acceptable.

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The County of San Joaquin reserves the right to reject the reducer at any time for any nonconformance that is determined to be detrimental to the proper function and operation of the reducer. Repairs to be performed on the reducer shall be reviewed and accepted by the Engineer prior to the work being performed.

The Contractor is responsible for furnishing all materials required for the test including, but not limited to motor, test stand, and oil.

Additional testing of speed reducers may be specified under individual pay item sections.

98-1.03C Defective Material and Workmanship

All machinery rejected during inspection and testing that is not made acceptable shall be removed from the work site and replaced without additional cost.

Delays resulting from the rejection of material, equipment or work shall not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation shall be corrected by the Contractor without cost. In the event that the Contractor does not make the corrections in a timely manner, the County of San Joaquin reserves the right to make necessary corrections with its own forces and charge the resulting costs to the Contractor.

98-1.03D Delivery and Storage

98-1.03D(1) Protection for Shipment

Machinery parts shall be cleaned of dirt, chips, grit, and all other injurious materials prior to shipping and shall be given a coat of corrosion-inhibiting preservative.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion shall be coated as soon as practicable after finishing with a rust-inhibiting preservative. Excepting unfinished metal surfaces inside of gear reducers, this coating shall be removed prior to operation and from all surfaces prior to painting after erection.

Any interface between stainless steel or aluminum and Structural Steel shall receive an Engineer approval coat of zinc-chromate primer prior to assembly.

Machinery parts shall be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage.

Shaft journals that are shipped disassembled from their bearings shall be protected during shipment and before erection by a packing of oil-soaked rags secured in place by burlap and covered with heavy metal thimbles or heavy timber lagging securely attached. Every precaution shall be taken to ensure that the bearing surfaces are not damaged and that all parts arrive at their destination in satisfactory condition.

Pillow blocks with anti-friction bearings that are shop mounted on shafts shall be supported independently of the shaft support to prevent false brinelling during shipment.

Assembled units shall be mounted on skids or otherwise crated for protection during handling and shipment.

98-1.03D(2) Packaging and Delivery of Spare Parts

Spare parts shall be protected for shipment and prolonged storage by coating, wrapping, and boxing.

All spare parts shall be durably tagged or marked with a clear identification showing the designation used on the approved shop drawing.

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Boxes for spare parts shall be clearly marked on the outside to show their contents. Spare parts shall be delivered to a location designated by Bridge Maintenance.

98-1.03D(3) Guarantee and Warranties

Manufacturer's warranties or guarantees on equipment, materials or products purchased for use on the Contract which are consistent with those provided as customary trade practice, shall be obtained by the Contractor and, upon acceptance of the Contract, the Contractor shall assign to the County of San Joaquin, all manufacturer's warranties or guarantees on all such equipment, material, or products furnished for or installed as part of the Work.

The Contractor shall warrant the satisfactory in-service operation of the mechanical equipment, material, products, and related components. this warranty shall extend for a period of one year following the date of final acceptance of the Project.

98-1.03E Erection

98-1.03E(1) General

For each stage of construction, the Contractor shall submit calculations, drawings, and procedures detailing his intended scheme for installing all machinery. Machinery installation shall be done in a coordinated manner to ensure all the machinery components fit the adjacent material furnished under other items.

98-1.03E(2) Alignment and Bolting

The order of assembly and alignment of bridge machinery shall start at the final driven components and worked back to the prime mover. The Contractor shall limit the finality of some stage machinery installations so that proper alignment of mating components is met prior to final reaming and fastening.

All open gearing shall be aligned such that backlash is within tolerance and at least the center 50% of the effective face width of each pair of meshing teeth is in contact. The cross mesh shall not exceed 0.01 inch per 6 inches of face width. All open gear measurements shall be submitted to the Engineer for review and approval. The measurements include backlash, cross-mesh alignment, tooth valley gap and face contact. The type of bluing or lubricant used for face contact measurements shall be submitted to the Engineer for approval prior to any measurements. The measurements shall be performed at a minimum of 8 equally spaced span positions ranging from fully open to fully closed.

All parts of the machinery shall be match marked for proper assembly and correct orientation. Before final drilling or reaming, all parts shall be adjusted to exact alignment by means of shims. If required, tapered shims shall be provided at no additional cost. Installation, alignment, and shimming of the electric motors, and devices such as limit switches and encoders, shall be included with the machinery for such erection. After final alignment and bolting, all parts shall operate smoothly.

The span shall not be operated by the bridge machinery until all components are installed, in final alignment and bolted as approved by the Engineer.

Bolt holes in structural steel for connecting machinery shall, in general, be drilled from the solid after final alignment of the machinery. Sufficient erection holes, subdrilled 1/4-inch undersize for undersized temporary bolts, may be used for erection and alignment of the machinery. When the machinery is aligned in its final position, the temporary bolts shall be removed one bolt at a time, full-size holes for the remaining bolts shall be drilled or subdrilled and reamed, and the full-size bolts installed.

Bolt holes in structural steel, shims, and machinery components shall be drilled and reamed assembled to assure accurate alignment of the hole and accurate clearance over the entire length of the bolt within the specified limit. Hand held reamers are not considered accurate enough and the Contractor shall assume

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that a reaming jig shall be used to keep the bolt hole cylindrical. This jig shall be of structural steel, fixed to the drill and secured to the work preventing the reamer shaft from deviating. Holes shall be checked with a bolt hole micrometer to assure uniform diameter.

ASTM A449 bolts shall be torqued to the same tension required for ASTM F3125 bolts specified in the Standard Specifications.

Torques for other classes of bolts shall be proportioned to their strength and shall be indicated on the erection drawings.

98-1.03E(3) Coatings

Threads for turned bolts shall be coated with anti-seize compound before assembly with nuts to prevent corrosion or galling and to facilitate future removal if necessary.

98-1.03E(4) Edges and Corners

All edges and corners of machinery parts, sheet metal work, bed plates, and fabricated supports that are exposed in the finished work shall be rounded or chamfered. All burrs or other surface defects that could be injurious to workers erecting or maintaining the bridge machinery shall be removed.

98-1.03E(5) Personnel and Facilities

The machinery shall be erected and adjusted by competent millwrights skilled in the type of work involved. They shall be provided with all necessary measuring and leveling instruments as may be required.

98-1.03F Painting

98-1.03F(1) General

Cleaning and painting of all unfinished surfaces of machinery shall comply with requirements of Section 91 of the Caltrans Standard Specification. A three-coat system for metal shall be used. The Contractor shall submit for review with the working Plans an outline of painting materials and methods.

98-1.03F(2) Shop Painting

All unfinished machinery external surfaces shall be cleaned with final surface preparation, prior to painting, done by blast cleaning to meet the requirements of SSPC-SP6 "Commercial Blast Cleaning" with the following exceptions:

- Flexible couplings
- Reducers
- Sleeve bearings with bushings in place
- Electric motors
- Brakes
- Limit switches
- Other equipment with shaft seals
- The equipment excepted by the Engineer

The expected machinery or equipment shall be cleaned with solvent and hand tools to meet the requirements of SSPC-SP2, "Hand Tool Cleaning" as depicted in SSPC VIS 1, "Guide to Visual Standard No. 1".

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After proper surface preparation, all unfinished machinery surfaces except for the interior of gear housings, flexible couplings, and pillow blocks shall be given one shop coat of primer by hand brushing. The modified aluminum epoxy mastic primer, Carbomastic 15 or approved equal, shall be compatible with the paints selected for subsequent coats. Interiors of gear housings shall be protected with special oil-resistant crankcase paint or approved equal.

98-1.03F(3) Field Painting

After erection is complete, all machinery surfaces remaining exposed, except machine finished surfaces in sliding contact, shall be thoroughly cleaned with an approved high-flash solvent and given an immediate field coat. The epoxy polyamide intermediate, Carboguard 888 or approved equal, shall be compatible with the finish coat. The intermediate coat shall be applied by hand brushing and shall be resistant to weathering (marine environment) and abrasion and free of lead.

After field testing is complete but prior to final acceptance of machinery, all machinery surfaces remaining exposed, except machine finished surfaces in sliding contact, shall be re-cleaned with an approved high-flash solvent and given a finish field coat. The aliphatic acrylic-polyester polyurethane, Carbothane 133 LH or approved equal, shall be compatible with the previous coats. The finish coat shall be applied by hand brushing, which shall color code to distinguish between fixed and moving parts. The following colors shall be used:

Federal Safety Orange: Except for machine finished surfaces in sliding contact, for all moving parts of the machinery such as shafting, couplings, and the side of gears and brake wheels.

Federal Safety Green: For all stationary parts of the machinery. Machinery component fasteners mating with machinery supports shall be painted the same color as the structural steel.

Paint for the finish coat shall be high-gloss, resistant to weathering and abrasion and conform to OSHA color requirements of the Safety Color Code for Marking Physical Hazards, ANSI Z53.1. The brand and colors shall be submitted to the Engineer for approval. The color for each component shall be indicated on the assembly shop drawings or separate paint drawings.

The Contractor shall place cautionary signs in the Control House, which shall explain the color code. Details of the signs giving text, dimensions, and materials shall be placed on a shop drawing.

The Contractor shall take special care to avoid painting of machinery surfaces which are in normal rubbing contact. All nameplates, legend plates, and escutcheons mounted on machinery shall be masked for protection from paint. Lubrication fittings shall be kept clog-free.

98-1.03G Contractor's Inspection

After erection is completed, the Contractor shall make a thorough inspection to ensure that all gears are clean and free of obstruction, that all parts are properly aligned and adjusted as closely as practicable without actual operation, that all bolts are properly tightened and that the span is properly balanced.

Inspection of tightened fasteners shall be in accordance with the County of San Joaquin Standard Specifications for Roads and Structures. The Contractor's inspection shall verify that field painting has been performed as specified herein. Touch-up painting shall be performed to correct all painting defects found during this inspection.

The Contractor's inspection shall verify that all enclosed gear housings are filled to the proper level, and all rotating and sliding parts are supplied with lubricants as recommended by the Manufacturers of the units. Typical products for the various locations are as follows:

Sleeve bearings and Pillow Blocks:

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NLGI #2 Grease

Open Gears:

Open Gear Lubricant (Mobiltac 375 NC)

Specific Gravity, 72°F (22°C) 0.96

SUS @ 100°F 25,000
(cSt @ 40°C 5,000)

SUS @ 210°F 5,000

(cSt @ 100°C 1,100)

Enclosed Gear Reducers:

Refer to AGMA Standard 9005.D94 "Lubrication of Industrial Enclosed Gear Drives"

Gear Couplings:

NLGI #0 Grease

Grid Couplings:

NLGI #2 Grease

The Contractor shall be accompanied by the Engineer during his final inspection before field testing. On the basis of the results of this inspection, the Engineer shall determine whether the bridge is ready for field testing.

98-1.03H Field Testing

When the machinery and electrical equipment is ready for field testing, the Contractor shall meet with the Engineer to arrange a test schedule and shall keep available a complete crew of mechanics for a minimum of four working days in order to provide operation of the swing span for all tests and to make all adjustments and corrections which shall be required to complete the tests.

The Contractor shall prepare a field testing procedure, which shall be approved by the Engineer. The testing procedure shall be coordinated with the tests required for the electrical equipment and shall include measurements of power and current draw by the motors when operating under load as required hereinafter.

The testing procedure shall include but not be limited to the verification of proper installation, alignment, fastening, and operation and/or final adjustment of the following:

Turning Machinery

Opening Machinery

Wedge Machinery

Stabilizing Machinery

Span Lock Machinery

When the machinery is ready for field testing, the bridge machinery shall be driven by the main electrical system through at least ten complete cycles.

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Three phase kilowatts, single phase amperes, span position and motor RPM for all motors shall be recorded on a computerized data acquisition system. The recordings shall be for a complete span opening and closing cycle, with at least three cycles of data for each motor. The data acquisition system shall have 16-bit resolution and shall sample at a rate of 10 Hz. Minimum. Data shall be imported into Microsoft Excel format, and graphs shall be printed out on 11 x 17 paper. Time of day shall be on the X axis, and primary and secondary Y axis shall be chosen to best present the data. In addition, a CD shall be provided with all the raw data and all the Excel files.

During the test runs, each machinery assembly shall be inspected in its entirety to determine whether everything is in proper working order and fully meets the requirements of these Specifications, Plans and manufacturer's recommended tolerances. All test runs shall be performed in the presence of the Engineer. The temperature rise of all machinery components shall not exceed design ratings. If any tests show that any components are defective or inadequate, or function improperly, the Contractor shall make all corrections, adjustments, or replacements required before the final acceptance at no additional cost.

98-1.04 MEASUREMENT AND PAYMENT

98-1.04A General

General Machinery will not be measured for payment. All costs associated with furnishing and installing materials, labor, tools, and incidentals necessary to compete the work shall be included in the *Bridge Machinery* pay items.

98-2 BRIDGE MACHINERY

98-2.01 GENERAL

98-2.01A General

The work included under this item shall consist of the following:

RESHIM THE CENTER SHEAR LOCK BAR GUIDES AND RECEIVING SOCKET WEAR
PLATES (2 LOCATIONS)

Details and arrangement of all systems are shown on the Plans.

The work shall be in accordance with the requirements specified in "General Machinery".

The Contractor shall coordinate the work listed above with electrical work and structural work, as well as navigational and vehicular traffic closures and restrictions.

98-2.02 MATERIALS

98-2.02A. General

The materials used to fabricate the machinery components shall be as shown in the Plans and in accordance with the requirements specified in the "General Machinery".

98-2.03 CONSTRUCTION

98-2.03A Construction Sequence

Install temporary center shear locks prior to shim adjustments the guides and receiving socket wear plates.

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Reshim guides and receiving socket wear plates to achieve an RC6 fit between the lock bars and wear plates. Maximum shim pack thickness to not exceed 3/16-inch to maintain sufficient bearing area between wear plate and housing.

Remove temporary center shear locks after existing guide and socket wear plates are adjusted and accepted.

98-2.03B Temporary Center Shear Locks

Temporary center shear locks shall be disposed of properly after they are removed from the span. Any new holes introduced to the structure as part of the temporary center shear lock system shall be filled.

98-2.04 MEASUREMENT AND PAYMENT

98-2.04A Basis of Payment

The lump sum price bid for "Bridge Machinery" must include the cost of furnishing all labor, materials, plant, training, equipment, and all necessary incidentals required to satisfactorily complete installation and perform the work described herein and shown on the Plans.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item with their bid. The total lump sum value for this item must be broken down in detail.

The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

Upon completion and acceptance of the installation of bridge machinery in accordance with the Contract Documents, the Contractor will be paid 90 percent of the bid price for this item.

Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the bid price for this item.

Payment will be made under:

Pay Item

980000 Bridge Machinery

Pay Unit

Lump Sum

SPECIAL PROVISIONS
BRIDGE 29C-114
EIGHT MILE ROAD
over
BISHOP CANAL

DEPARTMENT OF PUBLIC WORKS

COUNTY OF SAN JOAQUIN

STATE OF CALIFORNIA

79 – MISCELLANEOUS CONSTRUCTION

79.4 REST PIER JACKING BRACKET

79-4.01 GENERAL

79-4.01A General

The work under this item consists of furnishing and installing temporary steel jacking brackets at locations shown on the Plans and in accordance with these Specifications. The work also includes removal of the jacking brackets upon completion of the work.

Incidental apparatus, appliance, material, or labor not mentioned that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor no additional cost.

Schematic jacking brackets are shown on the plans and may be modified by the Contractor. If a configuration different from that shown on the Plans is used, the Contractor must submit design calculations prepared by a licensed Professional Engineer for the loads shown on the Plans. Brackets are to be fabricated to support the load shown on the Plans and to coordinate with the jack that is used.

79-4.01B Definitions

As used herein, certified test reports refer to reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

79-4.01C Submittals

Submit shop drawings for all steel fabrications. The Contractor must coordinate the work of the installation and removal of the jacking brackets with other items of work. The Contractor must review and accept all shop drawings to coordinate the proper assembly of all components before submission for the Engineer's acceptance.

79-4.01C(1) Shop Drawings

Shop drawings must include:

1. Welding sequences and procedures.
2. Details for connections not shown or dimensioned on the plans.
8. Details of allowed options incorporated into the work.
3. Material specification and grade listed on the bill of materials. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be forty-five (45) days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed jacking plan including materials and equipment to be used for review and Engineer's acceptance. The jacking plan must indicate the sequence of work.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from ordering materials prior to the acceptance of the shop drawings; and no work must be done until acceptance of the shop drawings. After acceptance of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings per the Engineer's order.

79 – MISCELLANEOUS CONSTRUCTION

79.4 REST PIER JACKING BRACKET

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County.

Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance in the same manner as specified for the shop drawings.

79-4.01D Quality Assurance

79-4.01D(1) Quality Assurance

Quality Assurance must be in accordance with applicable requirements of Section 55-1.01D of the Standard Specifications.

Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it is not meant that any other codes and standards must be assumed to be omitted if not mentioned.

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

79-4.01D(2) Measurements and Verification

Dimensions indicated on the Plans are nominal and are intended for guidance only. All variations from the nominal dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits prior to bid. Any variance between plan and actual field conditions must not be considered as a basis for claim.

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

79-4.01D(3) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

79 – MISCELLANEOUS CONSTRUCTION

79.4 REST PIER JACKING BRACKET

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County reserves the right to make necessary correction with its own forces and charge the resulting costs to the Contractor.

79-4.01D(4) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components to remain. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed will be completely compatible with the existing equipment to remain, and that all original system functions will be returned to operation at the completion of the Contract work.

79-4.02 MATERIALS

79-4.02A General

Structural steel shall be ASTM A709 Grade 50. Welding shall be in accordance with AWS D1.1. Anchor bolts shall be ASTM A1554 Grade 55.

79-4.03 CONSTRUCTION

79-4.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

All work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It is the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

79-4.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage.

79-4.03C Installation

The jacking brackets are temporary installations to support the superstructure during repairs at the end lock bearing seats. There will be live load on the bridge during the period the jacks are in use, however traffic will be limited to a single lane on the opposite side of the bridge from the jacking location. Install jacks as shown on the Plans and in the sequence defined on the Plans.

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79.4 REST PIER JACKING BRACKET

79-4.04 PAYMENT

The work under this item will not be measured for payment. The lump sum price bid for "Rest Pier Jacking Bracket" must include the cost of furnishing all labor, materials, equipment, and all necessary incidentals required to satisfactorily complete installation and perform the work described herein and shown on the Plans. The cost of installing and uninstalling the bracket at each jacking location is included in this item.

The cost of jacking and repairing the cracked grout at locations as shown on the Plans is included in Item 98.2.1 Bridge Machinery.

79-4.04A Basis of Payment

The lump sum price for Rest Pier Jacking Bracket must include the cost of all labor, materials, equipment, and incidental work necessary to satisfactorily complete installation and perform the work described herein and as shown on the Plans.

The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon completion of the jacking operations at all locations and removal of the temporary jacking bracket, the Contractor will be paid 90 percent of the bid price for this item.
2. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, and catalog cuts, the Contractor will be paid the remaining 10 percent of the bid price for this item.

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 790030	Rest Pier Jacking Bracket	Lump Sum

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88-1 CONDUIT AND ACCESSORIES

88-1.01 GENERAL

88-1.01A General

Section 88-1 consists of furnishing and installing a conduit system. The Contractor must provide all labor, materials, plant, equipment, and incidentals required to furnish and install a functioning conduit/raceway system according to the Plans, Specifications and the Engineer's order.

Follow the materials section for new conduit installations and where existing couplings, fittings, and conduit bodies are not in compliance with the ANSI Standard C80.1 and UL Standard UL6.

The work consists of furnishing, installing, terminating, and connecting the conduits for equipment and for interconnections between equipment, fixtures, and devices according to the Contract Documents and the Engineer's order. Necessary accessories, supports, fittings, raceways, attachments, and hardware must be provided to complete the conduit system.

Incidental apparatus, appliance, material, or labor not mentioned that is needed to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor at no additional cost.

88-1.01B Definitions

Certified test reports are reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

Factory tests are tests performed on the actual materials or equipment proposed for use. Results of the tests must be submitted in accordance with the provisions of this Specification for laboratory test results.

88-1.01C Submittals

88-1.01C(1) General

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for Engineer's acceptance. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification, any other applicable references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete, and a legend provided to decipher the manufacturer model number codes.

If any departures from the Contract Documents are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted to the Engineer in writing as soon as possible for his acceptance. No departures from the Plans are made without the Engineer's acceptance.

If the Contractor has any objections to the requirements on the Plans and/or Specifications, he must state

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his objection in writing to the Engineer before or when submitting shop drawings; otherwise, his objection is not considered if offered later as an excuse for malfunctioning, defective or broken machinery.

Manufacturer's data and/or shop drawings must be submitted for all conduits.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted to the Engineer for acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings are accepted by the Engineer, will be rectified by the Contractor at no additional cost.

88-1.01C(2) Shop Drawings

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted to document and perform the work, or obtain the Engineer's authorization to perform the work.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County and must in addition meet the following:

Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans are not to be used as base sheets for assembly or erection plans and are not acceptable as shop drawings.

Where shop drawings are for materials that replace existing materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

Materials and material specifications must be stated for each component. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.

For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part and the manufacturer's part number assigned to each part. The plans or diagrams must show enough to disassemble and reassemble the assemblies covered. If any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.

Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary materials on which the manufacturer or supplier states mounting dimensions, ratings, and any other details for use on this specific project. The certified prints must identify and describe each part in addition to the following:

1. Dimensions of all principal parts comprising the assembly.
2. Certified external dimensions affecting clearances and required for installation.
3. Capacity ratings.
4. Location of mounting holes.
5. Electrical operating characteristics.
6. Location of conduit/cable entries, dimensioned and sized.
7. Gross weight.

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Certified prints must be signed by an officer of the manufacturing company.

Shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance as specified for the shop drawings.

The weight of each piece of equipment must be stated on the shop plans on which it is detailed or billed.

Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. The Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs, which may result from ordering materials before acceptance of the shop drawings. No work must be done until the shop drawings have been accepted. After acceptance of the shop drawings, the Contractor must submit up to three (3) prints of the shop drawings as ordered by the Engineer.

88-1.01C(3) Certificates

Where materials are specified to comply with requirements of the standards of an organization or standard listings by applicable codes, such as NEMA, NFPA, and UL, that use a label or listing indicating compliance, proof of such conformance must be submitted and accepted. The label or listing of the specified organization will be acceptable evidence. Instead of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and accepted by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

88-1.01C(4) Operating and Maintenance Manual Supplement

Final Operating and Maintenance Manual Supplement submittal must include a CD-ROM of the complete supplemental manual materials in PDF format. Four (4) copies of the approved hard copy supplemental manual materials and four (4) copies of the CD-ROM must be delivered to the Engineer.

The supplemental manual materials must be assembled in a separate volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches, 20 lb. paper with accurately punched holes. The paper must be acid free and suitable for archival use. The holes for binding must be 5/16 inches diameter and be reinforced with plastic or cloth, spaced at the standard for three holes spacing.

Foldout drawings, diagrams, and illustrations must have 5/16 inches minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

The supplemental operating and maintenance manual materials must include as-built, revised, and updated; drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of

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the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility and capacity to be capable of reproduction as required San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the supplemental manual materials including the method of binding and the text must be submitted for Engineer's acceptance.

All printed matter, data, drawings, diagrams, etc. must be produced by methods to result in permanence and durability, including paper that is water and grease resistant. No materials must be used which adversely affect this permanence and durability.

The supplemental manual materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor, and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-1.01D Quality Assurance

88-1.01D(1) Qualifications, Personnel and Facilities

Materials used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified materials.

The Contractor must provide enough skilled, trained, and experienced tradesmen familiar with the requirements and methods for the properly executing the specified work.

The Contractor must submit proof of manufacturer training and certification for all workers that install PVC coated conduit through the Shop Drawing process.

The Contractor must provide enough plant and necessary tools and instruments required for the proper performance of the personnel executing the specified work.

88-1.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

When a conflict between the Specification and the mentioned codes, standards, rules, regulations, and

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ordinances occurs, the most stringent requirement applies.

Work must comply with applicable requirements of the latest edition of codes and standards issued by, but not limited to, the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American Society for Testing and Materials	ASTM
A 653 – Standard Specification for steel Sheet, Zinc-Coated (Galvanized) or Zinc Alloy-Coated (Galvannealed) by the Hot-Dip Process.	
A 525 – Sheet Steel, Zinc Coated (Galvanized) by the Hot Dip Process, General Requirements	
American National Standards Institute	ANSI
C80.1 - Rigid Steel Conduit, Zinc Coated	
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additionally, the work must comply with the requirements of any local rules, regulations, ordinances, and other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it does not mean that other codes and standards are to be omitted if not mentioned.

88-1.01D(3) Measurements and Verification

Dimensions shown on the Plans are nominal and are intended for guidance only. Variations from dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits before bid. Variances between plan and field conditions are not a basis for claim.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It is the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits prior to bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new

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component can be finished to obtain the prescribed fit.

88-1.01D(4) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in the Specification allow the Contractor to substitute other manufacturers and model numbers of materials of equal quality and rating for those specified.

Before the Contractor orders substitute material, the Engineer's acceptance of the equivalence of the substitute material must be obtained in writing. The acceptance of the substitute material is at the discretion of the Engineer who establishes the basis for equivalence and reviews the quality of the materials described in detail on the submitted shop drawings and material data.

The Engineer indicates "Accepted" or "Revise and Resubmit" of substitute material. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified product. Rejection must not result in additional cost. Approval by the Engineer of any substitute products submitted by the Contractor must not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that product.

If departures from the Plans or these Specifications are deemed necessary by the Contractor, details of the departures and the reasons therefore must be submitted as soon as practicable for acceptance. No departures may be made without the Engineer's authorization. All necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, must be made by the Contractor at no additional cost.

88-1.01D(5) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer is not a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work is not the basis of a claim.

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All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County reserves the right to make corrections with its own forces and charge the resulting costs to the Contractor.

88-1.01D(6) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed are completely compatible with the existing equipment, and that original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who must have the discretion regarding acceptance of the alternate methods. Where accepted by the Engineer, the alternate methods are for the Contractor's benefit, and the Contractor does not receive additional payment for the changes in work performed. Costs for integration of the proposed work/equipment to existing systems, so that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-1.01D(7) Guarantees and/or Warranties

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon acceptance of the Contract, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such material furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical material and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-1.02 MATERIALS

88-1.02A General

All furnished equipment and materials must be brand new. Equipment, materials, and workmanship must be first class in every way and must be manufactured and installed to the Engineer's satisfaction.

Work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, orderly, and easily identified.

88-1.02B Hot Dipped Rigid Galvanized Steel Conduit

All conduits must be standard weight, threaded, rigid steel conduit complying with ANSI Standard C80.1 and UL Standard UL6. All conduits must be hot-dipped galvanized inside and out. All conduit couplings and fittings must be made of malleable iron or steel and hot-dipped galvanized.

All conduits and fittings used in any single continuous conduit run must be the material of a single manufacturer.

88-1.02C PVC Coated Rigid Galvanized Steel Conduit

All conduits must meet the requirement for Hot Dipped Rigid Galvanized Steel Conduit in addition to the following:

All conduits must have factory-applied, polyvinyl-chloride (PVC) exterior coating with a nominal 40 mil

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thickness. The galvanized surfaces of the conduit and fittings must be coated with an epoxy-acrylic primer before plastic coating. A urethane coating must be applied to the interior with a nominal 2-mil thickness. The urethane interior coating must have enough flexibility to permit field bending without cracking or flaking of the interior coating. Conduit clamps, U-bolts, couplings, fittings, and elbows used with PVC coated conduits must have the same coating as the conduit.

Conduit bodies, pulling elbows and couplings must have flexible PVC sleeves which extend to overlap the PVC coating on the conduit. Sleeves must be 40-mil, nominal thickness.

The plastic coating must have an 85+ Shore A Durometer rating and comply with ASTM D746, and Federal Specifications LP406b, Method 2051, Amendment 1 of 25 September 1952. A two-part urethane, chemically cured coat must be applied to the interior of all conduit and fittings. This internal coating must be at the nominal 2-mil thickness and be flexible enough to permit field bending without cracking or flaking. The PVC coated, hot-dip galvanized steel conduit must be UL labeled and listed.

All hollow conduit and fittings, which serve as part of a raceway, must be coated with the same exterior PVC coating and interior urethane coating. The plastic exterior coating and the interior urethane coating must be factory applied by the same manufacturer who produces the hot-dipped galvanized conduit.

Unions to connect sections of conduit that cannot be joined to each other or to boxes/enclosures in the regular manner must be Myers type, of malleable iron or steel, hot-dipped galvanized, and PVC coated.

88-1.02D PVC Schedule 80 Conduit

All underground conduits must be PVC Schedule 80. Conduit must be rated for 90 degrees C conductors, UL Listed, or accepted equal. Material must comply with NEMA Specification TC-2 (Conduit) and TC-3 (Fittings) and UL Standards 651 (Conduit) and 514b (Fittings). The conduits and fitting must carry a UL label (Conduit – on every 10 feet length; Fittings – stamped or molded on each fitting). Conduit and fittings must be identified for type and manufacturer and must be traceable to location of plant and date manufactured. The markings must be legible and permanent. The conduit must be made from polyvinyl chloride compound (recognized by UL) which includes inert modifiers to improve weatherability and heat distortion. Clean rework material, generated by the manufacturer's own conduit production, may be used by the same manufacturer, provided end products meet the requirements of this specification. The conduit and fittings must be homogeneous plastic free from visible cracks, holes, or foreign inclusions. The conduit bore must be smooth and free of blisters, nicks or other imperfections which could mar conductors or cables.

88-1.02E Liquid Tight Flexible Metallic Conduit

Conduit must conform to UL Standard UL 360. Conduit must have a hot-dipped galvanized steel core with PVC jacket. All conduit couplings and fittings must be made of malleable iron or steel and hot-dipped galvanized.

All conduit and fittings used in any single continuous conduit run must be the product of a single manufacturer. Connections must be made with Myers type hubs.

88-1.02F Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the new conduit/raceway components must be submitted for inclusion as an Appendix to the existing bridge operating and maintenance manuals.

The Contractor must review the existing O&M Manuals as part of this work to identify items that need to be changed, added and/or require supplemental information.

The supplemental manual materials must include the following as a minimum for new and rehabilitated equipment:

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1. New, updated and/or revised maintenance instructions for all new and rehabilitated equipment, including warnings and precautions observed during maintenance actions. All preventative maintenance procedures are outlined and a chart listing all maintenance procedures in chronological order must be provided.
2. New, updated, or revised listings of all parts suppliers' local representatives, including suppliers' and representatives' names.
3. New, updated and/or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.
4. New, updated and/or revised description of the proper theoretical approach to installing and testing new equipment.
5. All relevant As-Built Shop Drawings. Drawings must be certified.
6. New, updated and/or revised instructions for annual cursory inspections and bi-annual in-depth inspections.
7. Manufacturer's literature describing each piece of new equipment furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.
8. Material or information which in the opinion of the Engineer is desirable to include in order to assist in maintaining the bridge functional systems and subsystems.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor must apply to the overall bridge system described in the supplemental manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-1.03 CONSTRUCTION

88-1.03A Summary

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

It is the Contractor's responsibility to manufacture and install suitable functioning conduit and wireway systems. Review and acceptance of shop drawings by the Engineer does not relieve the Contractor of this responsibility.

The Contractor must coordinate the work of the conduit and wireway manufacturers where components interface. The Contractor must review and accept all shop drawings to coordinate the proper assembly of components prior to submission for the Engineer's acceptance.

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88-1.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's plant. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not possible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities, so their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-1.03C Installation

All conduits, and fittings must be carefully examined before being installed, and all pieces having defects must be removed from the site and be replaced by the Contractor at no additional cost. All conduit bends must be made with standard size conduit elbows. Conduits and fittings must be assembled per manufacturer instruction. All cuttings and threading must be performed under conduit manufacturer's instructions. All conduits, enclosures, and fittings must be mechanically joined together to form a continuous electrical conductor to provide effective electrical continuity.

The interior surfaces must have a smooth finish and be free of burrs or projections. All conduits must be free from blisters, cracks, or injurious defects and must be reamed at each end after being threaded. Sections must be connected to each other with screw couplings made up so that the ends of both conduits will butt squarely against each other inside of the coupling. Conduits must be installed to be continuous and watertight between boxes/enclosures and equipment.

Conduit bends and offsets must be made by cold bending using approved methods and equipment. The use of a pipe tee or vise for bending conduit is not permitted. Conduit, which is crushed or in any way deformed, must be discarded. All bends must be long sweep, free from kinks, and with easy curvatures to permit the drawing of conductors without injury. Conduit runs must be made with as few couplings as standard lengths permit, and the total angle of all bends between any two boxes/enclosures or cabinets must not exceed 270 degrees, unless otherwise authorized by the Engineer. The radii of curvature of pipe bends must not be less than eight times the inside diameter of said conduit. Long running threads are not permitted. Pull boxes must be used as per NEC Article 314 to facilitate the installation of the wire where authorized by the Engineer.

All conduit joints must be threaded, using standard taper thread. Straight or clamp joints must not be used. All thread cuts after galvanizing must be thoroughly cleaned, degreased, and coated with an approved compound to provide cold galvanizing of the threaded area. A clear urethane coating must be applied to all conduit joints and threads after installation.

Where a conduit crosses an expansion joint longitudinally or where movement between adjacent sections of conduit can be expected, conduit expansion fittings must be installed. The fittings must be bronze expansion fittings and must be provided with flexible bonding jumpers to maintain the electrical continuity across the joints. The fittings must permit a total conduit movement of 8.0 inches or as required for expected movement.

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Where a conduit crosses a joint laterally or where an offsetting type movement between adjacent sections of conduit can be expected, expansion and deflection fittings must be installed. The fittings must be bronze expansion fittings and must be provided with flexible bonding jumpers to maintain the electrical continuity across the joints. The fittings must permit a movement of 3/4 inches or as required for movement expected from the normal in any direction.

Conduit ends must be well protected and sealed to prevent entrance of water or any other foreign matter during construction, work suspensions and overnight. Ends of abandoned conduits, spare conduits, and empty conduits and stubs must be capped during and after construction, and care must be taken to ensure that no moisture or other foreign matter is in or enters the conduits.

All conduits must be pitched not less than 1 inch in 10 feet. Where conduits cannot be drained to box or enclosure, a drain "T" with drain fitting must be installed at the low point. Submit details to the Engineer for review. Do not perform installation without accepted details.

Burrs on conduit ends must be removed and terminated. The termination of all conduits must be provided with bronze insulated grounding bushings. The insulated portion must be molded phenolic compound, and each fitting must have a screw type combination lug for bonding. All bushings in any box or enclosure must be bonded together with No. 8 AWG bare copper wire min or as required by largest upstream overcurrent protection device.

All conduits must be carefully cleaned both before and after installation with special attention being provided to conduits being reused. On completion of the conduit and box installation, the Contractor must clear each conduit by snaking with a mandrel of a diameter 90 percent or more of the nominal inside diameter of the conduit and with a wire brush of the same diameter as the conduit, before drawing in the cables. Any conduits that fail or get damaged must be replaced by the Contractor at no additional cost.

Both ends of each conduit run must be provided with a brass tag that has the same number stamped thereon in accordance with the existing as-built drawings, and these tags must be securely fastened to the conduit ends with No. 20 AWG brass wire. New or additional conduits, not part of the existing as-builts must be clearly identified and numbers must not be redundant to the existing conduit numbers. Conduit diagrams for inclusion in the O&M manual must be clearly identified with legend and plans must be submitted for acceptance during the shop drawing process.

All conduits projecting into boxes/enclosures must be provided with watertight, weatherproof, and insulated throat conduit hubs.

The final connection of the rigid steel conduit to the electrical equipment subject to vibration must be made with liquid-tight, flexible metal conduit and with suitable liquid-tight connectors. Flexible conduits are used, only where final connection to equipment with rigid conduit is not practicable in the Engineer's opinion, or where equipment is subject to vibration, such as equipment with adjustable mountings or to all machinery.

Liquid-tight unions must be installed where standard threaded couplings cannot be used. All nicks, cuts, exposed surfaces of conduit joints and abrasions to PVC coating on the rigid conduit must be repaired with the factory-supplied repair compound. The compound must form uniform coating and adhere to the original coating.

Conduit supports must be provided on each side of the conduit bends or elbows not more than 5 feet on each side of each outlet panel, pull box or other conduit termination. Conduit supports and hardware must be PVC coated or type 316 stainless steel.

Conduit runs exposed on the steel structure must be securely clamped to the steelwork. The conduit clamps, in general, must consist of U-bolts attached to structural steel supports bolted to the members. The clamps, in general, must consist of manufacturer instructed stainless steel bracket hangers attached to

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structural steel supports bolted to the members. Supports must be arranged so that conduits rest on top of the support and conduit U-bolts rest on top of the conduits. The use of J-bolts to fasten structural supports or to clamp conduits are not permitted.

All U-bolts and bracket hangers must be provided with medium-series lock washers and double hexagonal nuts. The bolts, nuts, and washers must be stainless steel complying with the requirements of the Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes, ASTM Designation A276, Type 316.

88-1.04 PAYMENT

Conduit is measured by the linear foot along the axis of the conduit, of the type and size specified, installed as per the Contract Documents and Specifications.

Conduit measurement includes all conduits, couplings, fittings, adaptors, expansion joints, bends and mounting hardware.

The work listed under this section does not include installation of junction boxes and pull boxes as they will be listed under other sections.

88-1.04A BASIS OF PAYMENT

The unit price for conduit per linear foot of each conduit size must include the cost of all labor, materials, expansion and connection fittings and equipment necessary to satisfactorily complete installation and perform the work. Excavation and backfill for conduit, if required, must be paid for separately under the item for conduit excavation and backfill under earthwork.

Liquid tight flexible metallic conduit is not paid separately. Where it is not paid under other electrical pay items, it is included as incidental to cost of conduit size and type or other pay item to which it is connected.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon completion and acceptance of the installation of conduit and wireway in accordance with the Contract Documents, the Contractor is paid 90 percent of the item bid price.
2. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor is paid the remaining 10 percent of the item bid price.

Removal of components is not included in the final system and is paid under Item 88-7 "Electrical Equipment Demolition."

Payment is made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 880010	PVC Coated Rigid Galvanized Steel Conduit – 1 inch	Linear Feet

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88-2 ELECTRICAL BOXES

88-2.01 GENERAL

88-2.01A General

Section 88-2 consists of furnishing and providing all labor, materials, equipment, and incidentals required to complete the installation of the stainless-steel electrical boxes, including junction, pull and terminal boxes complete with internal components, in accordance with the Plans, Specifications and the Engineer's authorization.

Any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor as if specifically mentioned in these Specifications at no additional cost.

88-2.01B Definitions

As used herein, certified test reports are reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

As used herein, factory tests are tests required to be performed on the actual materials or equipment proposed for use. Results of the tests must be submitted in accordance with the provisions of this Specification for laboratory test results.

88-2.01C Submittals

88-2.01C(1) General

If the Contractor has any objection to any requirements by the Plans and/or Specifications, he must state his objection in writing to the Engineer before or submitting shop drawings; otherwise, his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted as soon as practicable for approval. Departures must not be made without the Engineer's acceptance. All necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, must be made by the Contractor at no additional cost.

Materials and material specifications must be stated for each component. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification and any other applicable references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete, and a legend provided to decipher the manufacturer model number codes.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted for the Engineer's

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acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings are approved by the Engineer, will be rectified by the Contractor at no additional cost.

88-2.01C(2) Shop Drawings

The Contractor must coordinate the work of the component manufacturers where components interface. The Contractor must review and accept all shop and shop drawings to coordinate the proper assembly of the various machinery components before submission for the Engineer's acceptance.

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for review and acceptance by the Engineer. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which result from ordering materials prior to shop drawing acceptance; and no work must be done until the shop drawings are accepted. After shop drawing acceptance, the Contractor must supply the Engineer with up to three (3) prints of the shop drawings the Engineer's order.

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted for the purposes of documenting and performing the work, or obtaining Engineer's authorization to perform the work.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings complying with the requirements of San Joaquin County and must meet the following:

1. Manufacturer's data and/or shop drawings must be submitted for all electrical items.
2. Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be base sheets for assembly or erection plans and will not be accepted as shop drawings.
3. Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.
4. For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The plans or diagrams must show enough to disassemble and reassemble the assemblies covered. If any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.
5. Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary material on which the manufacturer or supplier states mounting dimensions, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they must show:
 - a. Dimensions of all principal parts comprising the assembly.
 - b. Certified external dimensions affecting clearances and required for installation.
 - c. Capacity and normal operating ratings.
 - d. Location of mounting holes.
 - e. Electrical operating characteristics.

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- f. Locations of conduit/cable entries, dimensioned and sized.
- g. Gross weight.
- h. Certified prints must be signed by an officer of the manufacturing company.

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance in the same manner as specified for the shop drawings.

The weight of each piece of equipment must be stated on the shop plan on which it is detailed or billed.

Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Connection to existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

Where shop drawings are for equipment/materials that replace existing equipment/materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

88-2.01C(3) Certificates

Where equipment or materials are specified to comply with requirements of organization standards, such as NEMA, NFPA, and UL, that use a label or listing indicating compliance, proof of compliance must be submitted and accepted. The label or listing of the specified organization will be acceptable evidence. Instead of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and accepted by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's standard or code.

88-2.01C(4) Operating and Maintenance Manual Supplement

Final Operating and Maintenance Manual Supplement submittal must include a CD-ROM of the complete supplemental manual materials in PDF format. Four (4) copies of the accepted hard copy supplemental manual materials and four (4) copies of the CD-ROM must be delivered to the Engineer.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

The supplemental manual materials must be assembled in a separate volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit all materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches, 20 lb. paper with accurately punched holes. The paper must have acid free quality suitable for archival use. The holes for binding must be 5/16-inches in diameter and be reinforced with plastic or cloth, spaced at the standard for three holes spacing.

Foldout drawings, diagrams, and illustrations must have 5/16-inches minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout

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drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

The supplemental operating and maintenance manual materials must include as-built, revised, and updated; drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility and capacity to be capable of reproduction as required San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the supplemental manual materials including the method of binding and the text must be submitted for approval by the Engineer.

All printed matter, data, drawings, diagrams, etc. must be produced by methods to result in permanence and durability, including paper that is water and grease resistant. No used materials will adversely affect this permanence and durability.

The supplemental manual materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor, and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Additionally, replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-2.01D Quality Assurance

88-2.01D(1) Qualifications, Personnel and Facilities

Material used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified material.

Under this item, the Contractor must use enough skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide enough plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-2.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

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In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement applies.

Work must comply with all applicable requirements of the latest edition of codes and standards issued by, but not limited to, the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

The work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it does not mean that any other codes and standards are assumed to be omitted if not mentioned.

88-2.01D(3) Measurements and Verification

Dimensions indicated on the Plans are nominal and are for guidance only. Variations from the dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits before bid. Variance between plan and field conditions is not considered a basis for claim.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It is the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits prior to bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new component can be finished to obtain the prescribed fit.

88-2.01D(4) Substitution

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in the Specification are to allow the Contractor to substitute other manufacturers and model numbers of materials

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of equal quality and rating for those specified.

Before the Contractor orders any substitute material, the Engineer's acceptance of the substitute material must be obtained in writing. The acceptance of the substitute materials at the discretion of the Engineer who will establish the basis for equivalence and will review the quality of the materials and materials described in detail on the submitted shop drawings and material data.

The Engineer will indicate "Approved" or "Revise and Resubmit" substitute material. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified material. Rejection must not in any way result in any additional cost. Acceptance by the Engineer of any substitute materials submitted by the Contractor must not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that material.

88-2.01D(5) Defective Materials and Workmanship

The Engineer's acceptance of any material or finished parts is not a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work is not the basis of a claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County may make necessary correction with its own forces and charge the resulting costs to the Contractor.

88-2.01D(6) Compatibility with Existing Equipment

Under this item, new/rehabilitated items are connected to existing components. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed are completely compatible with the existing equipment, and that all original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who has the discretion of accepting the alternate methods. Where approved by the Engineer, the alternate methods are for the Contractor's benefit, and the Contractor will not receive additional payment for the changes in work performed. Any costs associated with ensuring integration of the proposed work/equipment to existing systems, such that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-2.01D(7) Guarantees and/or Warranties

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon acceptance of the Contract, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such material furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical material and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

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88-2.02 MATERIALS

88-2.02A General

All equipment and materials furnished under the items specified herein must be brand new. All new equipment, materials and workmanship must be first class in every way and must be manufactured and installed to the Engineer's satisfaction.

Boxes must be designed, laid out, fabricated to match existing holes on a case-by-case basis. The Contractor is alerted that this may require multiple designs for a single box site.

It is the Contractor's responsibility to manufacture and install suitable functioning electric box assemblies. The Engineer's review and acceptance of shop drawings does not relieve the Contractor of this responsibility.

88-2.02B Electrical Boxes

88-2.02B(1) Surface Mounted Boxes

All surface mounted pull, junction, and terminal boxes must be minimum 14-gauge stainless steel, and must be provided with full length hinged gasketed, covers held with stainless steel fast operating clamps to provide NEMA 4 Rated watertight construction. No hardware is removable to prevent loss. They must be Engineer accepted equal to Hoffman Bulletin A51S or equivalent by Weigmann or Hammond.

Interior and exterior boxes must be provided with external mounting lugs and must be fastened in position with stainless steel through bolts. Stainless steel boxes must be provided with stainless steel conduit hubs. No box is drilled for more conduits or cables than enter it. Exterior boxes are provided with drain fittings of the same type as specified for conduit drains. Boxes with extra holes must be removed and replaced at no additional cost.

Electrical boxes containing terminals or equipment must have enough space to provide ample room for the interior wiring and terminal strips for the installation of conduit terminations and multi conductor cable fittings. Terminal boxes must be provided with a backpanel as required to mount terminals or equipment.

Interior mounting buttons with tapped holes must be provided for mounting the pull blocks where necessary.

88-2.02B(2) Flush Mounted Boxes

All flush mounted (sidewalk or roadway) pull, junction, and terminal boxes must be cast-iron, hot-dip galvanized inside and out, and must be provided with gasketed flat covers to provide NEMA-4X watertight construction, and AASHTO H-20 live load rated for full deliberate traffic. The boxes must be O.Z. Gedney Type YF, Spring City Type HP, Appleton Type WHF, except with stainless steel cover screws, or equal for Engineer's acceptance.

88-2.02C Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the new electrical box and internal components must be submitted for inclusion as an Appendix to the existing bridge operating and maintenance manuals.

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The contractor must review the existing O&M Manuals as part of this work to identify items that need to be changed, added and/or require supplemental information.

The supplemental manual materials must include the following as a minimum for new and rehabilitated equipment:

1. New, updated and/or revised maintenance instructions for all new and rehabilitated equipment, including warnings and precautions to be observed during maintenance actions. All preventative maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order must be provided.
2. New, updated, or revised listings of all parts suppliers' local representatives, including suppliers' and representatives' names.
3. New, updated and/or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.
4. New, updated and/or revised description of the proper theoretical approach to installing and testing new equipment.
5. All relevant As-Built Shop Drawings. Drawings must be certified.
6. New, updated and/or revised instructions for annual cursory inspections and bi-annual in-depth inspections.
7. Manufacturer's literature describing each piece of new equipment furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.
8. Any other material or information which in the opinion of the Engineer may be desirable to include to assist in maintaining the bridge functional systems and subsystems.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor applies to the overall bridge system described in the supplemental manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-2.03 CONSTRUCTION

88-2.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

All work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, orderly, and easily identified. Not all boxes are shown on the Contract documents and the Contractor must provide additional boxes as required to meet his means and methods of installation, including but not limited to junction/pull boxes as required for conduit runs.

88-2.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's plant. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not feasible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at

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no additional cost.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities such that their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-2.03C Installation

Install boxes as required to facilitate conduit and cable installation. Do not reduce headroom or interfere with space required for passageways or other trades. Install internal components such as grounding, back panels, terminals, etc. as required and shown on the Contract Plans.

All boxes must be sized per requirements of the National Electrical Code (NEC) for wire pulling based upon the size of conduits entering/exiting the box. All supports, attachments and fastening hardware must be stainless steel. Contractor must drill box to receive conduits and must attach box to structure with approved supports as detailed on the Contract Plans and as specified in Section 88-5 "Bridge Electrical Equipment".

Existing mounting/support holes must be re-used where possible if the size of the new electrical box matches the size of the replaced box.

88-2.04 PAYMENT

The electrical box is measured as number of complete stainless-steel or cast-iron electrical box assemblies installed in accordance with the Contract Documents and Specifications.

Measurement must include all hardware and supports required for a complete installation.

88-2.04A BASIS OF PAYMENT

The unit price for this item includes the cost of labor, equipment, materials, mounting, terminal blocks, internal components, hardware, connections, and other incidentals as necessary to satisfactorily complete installation and perform the work described herein and shown on the Plans.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The progress payments for the work herein must comply with the San Joaquin County standard payment practices and must be made as follows:

1. Upon completion and acceptance of the installation of electrical boxes in accordance with the Contract Documents, the Contractor will be paid 90 percent of the item bid price.
2. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the item bid price.

Removal of all components not included in the final system is be paid under Section 88-7 "Electrical

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Equipment Demolition.”

Payment for boxes that do not match the nominal dimensions included herein will be paid under the item with the closest equivalent cubic volume.

Boxes not shown on Contract Plans but required to comply with installation, NEC, or Contract requirements must have Engineer's acceptance before ordering, or they will not be paid.

Payment is made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 880030	Stainless Steel NEMA 4 Rated Electrical Box - 6 by 6 by 4 inches	Each

88-3 INSULATED CONDUCTORS

88-3.01 GENERAL

88-3.01A General

The work consists of furnishing and installing new insulated conductors. The Contractor must provide all labor, materials, plant, equipment, and incidentals required to furnish and install a functioning wire and cable system complying with the Plans, Specifications, and the Engineer's order.

Any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor just as if specifically mentioned in these Specifications at no additional cost.

Any cables and wiring not specifically called out herein and are required to perform the work under this Contract must be paid under Item 88-5 “Bridge Electrical Equipment”.

88-3.01B Definitions

Certified test reports refer to reports of tests conducted on previously manufactured materials identical to that proposed for use.

Factory tests refer to tests required to be performed on the actual materials proposed for use. Results of the tests must be submitted in accordance with the provisions of this Specification for laboratory test results.

88-3.01C Submittals

88-3.01C(1) General

If any departures from the Contract Documents are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted to the Engineer in writing as soon as possible for his approval. No departures from the Plans must be made without the Engineer's approval.

If the Contractor has any objections to the requirements on the Plans and/or Specifications, he must state

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his objection in writing to the Engineer before or when submitting shop; otherwise, his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted for Engineer's acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings the Engineer's acceptance, will be rectified by the Contractor at no additional cost.

The Contractor must coordinate the work of the conductor, cable, conduit and wireway manufacturers where components interface. The Contractor must review and approve all shop drawings to coordinate the proper assembly of all components prior to submission to the Engineer for approval.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification and any other applicable references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete, and a legend provided to decipher the manufacturer model number codes.

Materials and material specifications must be stated for each component. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for review and Engineer's acceptance. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

88-3.01C(2) Shop Drawings

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which result from ordering materials prior to the shop drawing acceptance, and no work must be done until the shop drawings are accepted. After shop drawing acceptance, the Contractor must supply the Engineer with up to three (3) prints of the accepted shop drawings per the Engineer's order.

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted for the purposes of documenting and performing the work, or obtaining approval from the Engineer to perform the work.

Shop drawings must conform to the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County and must in addition meet the following:

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1. Manufacturer's data and/or shop drawings must be submitted for all conductors.
2. Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.
3. Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.
4. For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The plans or diagrams must show enough to enable complete disassembly and reassembly of the assemblies covered. If any part is modified in any way from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.
5. Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary materials on which the manufacturer or supplier states mounting dimensions, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they must show:
 - a. Dimensions of all principal parts comprising the assembly.
 - b. Certified external dimensions affecting clearances and required for installation.
 - c. Capacity ratings.
 - d. Location of mounting holes.
 - e. Electrical operating characteristics.
 - f. Location of conduit/cable entries, dimensioned and sized.
 - g. Gross weight.
 - h. Certified prints must be signed by an officer of the manufacturing company.

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for approval in the same manner as specified for the shop drawings.

The weight of each piece of equipment must be stated on the shop plans upon which it is detailed or billed.

Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

Where shop drawings are for materials that replace existing materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

88-3.01C(3) Certificates

Where materials are specified to conform to requirements of the standards of an organization or are required to conform to standard listings by applicable codes, such as NEMA, NFPA, and UL, that use a label or listing as method of indicating compliance, proof of such conformance must be submitted and approved. The label or listing of the specified organization will be acceptable evidence. In lieu of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and approved by the Engineer, stating that the item has

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been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

88-3.01C(4) Operating and Maintenance Manual Supplement

The supplemental manual materials must be assembled in a separate volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit all materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches 20 lb. paper with accurately punched holes. The paper must be acid free quality suitable for archival use. The holes for binding must be 5/16-inch in diameter and be reinforced with plastic or cloth, spaced at the standard for three holes spacing.

Foldout drawings, diagrams, and illustrations must have 5/16-inch minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

Final submittal must include a CD-ROM of the complete supplemental manual materials in PDF format. Four (4) copies of the accepted hard copy supplemental manual materials and four (4) copies of the CD-ROM must be delivered to the Engineer.

The supplemental operating and maintenance manual materials must include but not limited to as-built, revised, and updated; drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility and capacity to be capable of reproduction as required San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the supplemental manual materials including the method of binding and the text must be submitted for Engineer's acceptance.

All printed matter, data, drawings, diagrams, etc. must be produced by methods to result in permanence and durability, including paper that is water and grease resistant. No materials must be used which will adversely affect this permanence and durability.

The supplemental manual materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor, and the Designer. All sheets must be

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numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Additionally, replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Also, include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-3.01D Quality Assurance

88-3.01D(1) Qualifications, Personnel and Facilities

Material used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified material.

For all the work required under this Item, the Contractor must use enough skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide adequate plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-3.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

Work must comply with all applicable requirements of the latest edition of codes and standards issued by the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American National Standards Institute	ANSI
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American Society for Testing and Materials	ASTM
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B 3 - Soft or Annealed Copper Wire

B 8 - Stranded Copper Wire, Specter Conductors, Hard, Medium Hard, or Soft

B 33 - Tinned Soft or Annealed Copper Wire for Electrical Purposes

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Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it does not mean that any other codes and standards must be assumed to be omitted if not mentioned.

All work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, ordered, and easily identified.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement applies.

88-3.01D(3) Measurements and Verification

Dimensions indicated on the Plans are nominal and are for guidance only. Variations from the dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits before bid. Any variance between plan and field conditions is not considered a basis for claim.

The Contract Documents, insofar as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It must be the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new component can be finished to obtain the prescribed fit.

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88-3.01D(4) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in these Specifications are to allow the Contractor to substitute other manufacturers and model numbers of materials of equal quality and rating for those specified.

Before the Contractor orders of any substitute material, the Engineer's acceptance of the substitute material must be obtained in writing. The acceptance of the substitute materials is at the sole discretion of the Engineer who will establish the basis for equivalence and will review the quality of the materials and materials described in detail on the submitted shop drawings and material data.

The Engineer will indicate "Approved" or "Revise and Resubmit" substitute material. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified material. Rejection must not in any way result in any additional cost. Approval by the Engineer of any substitute materials submitted by the Contractor must not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that material.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted as soon as practicable for approval. Departures must not be made without acceptance by the Engineer. All necessary changes required by the substitution in related machinery, structural, architectural and electrical parts, must be made by the Contractor at no additional cost.

88-3.01D(5) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County may make necessary correction with its own forces and charge the resulting costs to the Contractor.

88-3.01D(6) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components to remain. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed will be completely compatible with the existing equipment to remain, and that all original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components to remain. In this case, the Contractor may propose alternate

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methods including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who must have the discretion regarding acceptance of the alternate methods. Where accepted by the Engineer, the alternate methods are for the Contractor's benefit, and the Contractor must not receive additional payment for the changes in work performed. Any costs associated with ensuring integration of the proposed work/equipment to existing systems, such that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-3.01D(7) Guarantees and/or Warranties

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon acceptance of the Contract, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such material furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical material and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-3.02 MATERIALS

88-3.02A General

All equipment and materials furnished under the items specified herein must be brand-new. All new materials and workmanship must be first class in every way and must be manufactured and installed to the Engineer's satisfaction.

88-3.02B Conductors

The conductors must be annealed uncoated or tinned copper stranded in accordance with ASTM B 8, class B stranded, type XHHW-2 and cross-linked polyethylene, XLPE insulated. The thickness of the conductor insulation must comply with NEMA WC-70. The insulated conductors must be rated 90 degrees Celsius, 600 volts.

88-3.02C Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the conductor components must be submitted for inclusion as an Appendix to the existing bridge operating and maintenance manuals.

The contractor must review the existing O&M Manuals as part of this work to identify items that need to be changed, added and/or require supplemental information.

The supplemental manual materials must include the following as a minimum for new and rehabilitated equipment:

1. New, updated and/or revised maintenance instructions for all new and rehabilitated material, including warnings and precautions to be observed during maintenance actions. All preventative maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order must be provided.
2. New, updated, or revised listings of all parts suppliers' local representatives, including suppliers' and representatives' names.

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3. New, updated and/or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.
4. New, updated and/or revised description of the proper theoretical approach to installing and testing new material.
5. All relevant As-Built Shop Drawings. Drawings must be certified.
6. New, updated and/or revised instructions for annual cursory inspections and bi-annual in-depth inspections.
7. Manufacturer's literature describing each piece of new material furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.
8. Any other material or information which in the Engineer's opinion may be desirable to include in order to assist in maintaining the bridge functional systems and subsystems.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor must apply to the overall bridge system described in the supplemental manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-3.03 CONSTRUCTION

88-3.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

It is the Contractor's responsibility to furnish and install suitable conductors and cables. Review and approval of shop drawings by the Engineer does not relieve the Contractor of this responsibility.

88-3.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not feasible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

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Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities such that their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-3.03C Installation

The Contractor must furnish, install, and test the conductors in conformance to AASHTO and NETA ATS standards.

Conductors must be color-coded for phase identification, under NEC Section 210-5 and the California Electrical Code. The white neutral conductor must be 100 percent rated. Conductors, which have the insulation removed for termination or for splicing, must be marked with appropriately colored insulating tape for phase identification. In addition, the name of the manufacturer, insulation type, voltage rating and wire size must be clearly and permanently imprinted throughout the length of each conductor.

Contractor must use existing wiring numbers from the existing as-built drawings as closely as possible. New or additional conductors/wires, not part of the existing as-built drawings must be clearly identified, and numbers must not be redundant to the existing wire numbers. Wiring/schematic diagrams for inclusion in the O&M manual must be clearly identified with legend and plans must be submitted for acceptance during the shop drawing process.

Both ends of every single length of conductor must be permanently and clearly tagged under the same numbers or designations appearing on the accepted wiring diagrams. Wire tags for marking the conductors must be heavy duty, waterproof, permanently marked, and resistant to ultraviolet light deterioration. Numbers and letters must be black on a white background. Each tag must be either pre-marked or blank and marked using self-laminating markers with legends added with permanent ink as required. The Contractor must submit the proposed wire marking system and a sample of the wire markers to be installed for the Engineer's acceptance. Each conductor, except control and instrument conductors, must be color coded with colored insulation.

88-3.04 PAYMENT

This work under this item will be measured as number of linear feet of the conductor, of the type and size specified, installed, tested, and accepted under the Contract Documents and Specifications.

The work listed under this Pay Item does not include installation of junction boxes, pull boxes, conduit and wireway as they are listed under other Pay Items.

All other cables not listed under this Pay Item and not paid elsewhere but required for the work under this Contract will be paid under Section 88-5 "Bridge Electrical Equipment".

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88-3.04A BASIS OF PAYMENT

The unit price for conductor per linear foot of each conductor size must include the cost of all labor, materials, equipment, connecting, splicing and support of conductors and all other incidentals necessary to satisfactorily complete installation and perform the work described herein and as shown on the Plans.

The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon completion and acceptance of the installation of conductors and cables in accordance with the Contract Documents, the Contractor will be paid 90 percent of the bid price for this item.
2. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced material for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the bid price for this item.

Removal of all components not included in the final system will be paid under Section 88-7 "Electrical Equipment Demolition."

Payment is made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 880130	Insulated Conductor No. 10 AWG	Linear Feet

88-4 GROUND WIRE AWG

88-4.01 GENERAL

88-4.01A General

The work under this item consists of furnishing and installing new grounding conductors. The Contractor must provide all labor, materials, plant, equipment, and incidentals required to furnish and install a functioning ground wire and grounding system under the Plans, Specifications, and the Engineer's order.

Incidental apparatus, appliance, material, or labor not mentioned that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor no additional cost.

88-4.01B Definitions

As used herein, certified test reports refer to reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

As used herein, factory tests refer to tests required to be performed on the actual materials or equipment proposed for use. Results of the tests must be submitted under the provisions of this Specification for laboratory test results.

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88-4.01C Submittals

The Contractor must coordinate the work of the conductor, cable, conduit and wireway manufacturers where components interface. The Contractor must review and accept all shop drawings to coordinate the proper assembly of all components before submission for the Engineer's acceptance.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification, any other applicable references and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete and a legend provided to decipher the manufacturer model number codes.

Materials and material specifications must be stated for each component. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.

If the Contractor has any objections to the requirements on the Plans and/or Specifications, he must state his objection in writing before or when submitting shop drawings for the Engineer's acceptance; otherwise, his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted for the Engineer's acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings are accepted by the Engineer, will be rectified by the Contractor at no additional cost.

88-4.01C(1) Shop Drawings

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for review and Engineer's acceptance. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from ordering materials prior to the acceptance of the shop drawings; and no work must be done until acceptance of the shop drawings. After acceptance of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings per the Engineer's order.

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted for the purposes of documenting and performing the work, or obtaining the Engineer's authorization to perform the work.

Where shop drawings are for materials that replace existing materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications

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as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County and must in addition comply with the following:

1. Manufacturer's data and/or shop drawings must be submitted for all ground conductors.
2. Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.
3. Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.
4. For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The plans or diagrams must show enough to enable complete disassembly and reassembly of the assemblies covered. If any part is modified in any way from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.
5. Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary materials on which the manufacturer or supplier states mounting dimensions, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they must show:
 - a. Dimensions of all principal parts comprising the assembly.
 - b. Certified external dimensions affecting clearances and required for installation.
 - c. Capacity ratings.
 - d. Location of mounting holes.
 - e. Electrical operating characteristics.
 - f. Location of conduit/cable entries, dimensioned and sized.
 - g. Gross weight.
 - h. Certified prints must be signed by an officer of the manufacturing company.

Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance in the same manner as specified for the shop drawings.

The weight of each piece of equipment must be stated on the shop plans on which it is detailed or billed.

Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

88-4.01C(2) Certificates

Where materials are specified to comply with requirements of the standards of an organization or are required to conform to standard listings by applicable codes, such as NEMA, NFPA, and UL, that use a label or listing as method of indicating compliance, proof of such conformance must be submitted and accepted. The label or listing of the specified organization will be acceptable evidence. Instead of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and approved by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's standard or code.

88-4.01C(3) Operating and Maintenance Manual Supplement

The supplemental manual materials must be assembled in a separate volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as

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necessary to fit all materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches 20 lb. paper with accurately punched holes. The paper must be acid free quality suitable for archival use. The holes for binding must be 5/16-inch in diameter and be reinforced with plastic or cloth, spaced at the standard for three holes spacing.

Foldout drawings, diagrams, and illustrations must have 5/16-inch minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

Final submittal must include a CD-ROM of the complete supplemental manual materials in PDF format. Four (4) copies of the accepted hard copy supplemental manual materials and four (4) copies of the CD-ROM must be delivered to the Engineer.

The supplemental operating and maintenance manual materials must include as-built, revised, and updated; drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility and capacity to be capable of reproduction as required San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the supplemental manual materials including the method of binding and the text must be submitted for Engineer's acceptance.

All printed matter, data, drawings, diagrams, etc. must be produced by methods to result in permanence and durability, including paper that is water and grease resistant. No materials must be used which will adversely affect this permanence and durability.

The supplemental manual materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor, and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Additionally, replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Also, include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

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The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-4.01D Quality Assurance

88-4.01D(1) Qualifications, Personnel and Facilities

Materials used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified materials.

For all the work required by the Ground Wire Pay Item, the Contractor must use adequate numbers of skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide adequate plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-4.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable requirements of the latest edition of codes and standards issued by, but not limited to, the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is to call attention to them, it is not meant that any other codes and standards must be assumed to be omitted if not mentioned.

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

88-4.01D(3) Measurements and Verification

Dimensions indicated on the Plans are nominal and are intended for guidance only. All variations from the nominal dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits prior to bid. Any variance between plan and actual field conditions must not be considered as a basis for claim.

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all

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existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new component can be finished to obtain the prescribed fit.

88-4.01D(4) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in these Specifications allow the Contractor to substitute other manufacturers and model numbers of materials of equal quality and rating for those specified.

Before the Contractor orders any substitute material, the Engineer's acceptance of the equivalence of the substitute material must be obtained in writing. The acceptance of the substitute materials is at the sole discretion of the Engineer who will establish the basis for equivalence and will review the quality of the materials and materials described in detail on the submitted shop drawings and material data.

The Engineer will indicate "Approved" or "Revise and Resubmit" substitute material. Upon return of a shop drawing showing rejection, the Contractor must resubmit the shop drawing showing the specified material. Rejection must not in any way result in any additional cost. Approval by the Engineer of any substitute materials submitted by the Contractor must not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that material.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted as soon as practicable for approval. Departures must not be made without the Engineer's acceptance. All necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, must be made by the Contractor at no additional cost.

88-4.01D(5) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County reserves the right to make necessary correction with its own forces and charge the resulting costs to the Contractor.

88-4.01D(6) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components to remain. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed will be completely compatible with the existing equipment to remain, and that all original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components to remain. In this case, the Contractor may propose alternate methods

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including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who must have the sole discretion regarding approval of the alternate methods. Where accepted by the Engineer, the alternate methods are for the Contractor's benefit, and the Contractor does not receive additional payment for the changes in work performed. Any costs associated with ensuring integration of the proposed work/equipment to existing systems, such that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-4.01D(7) Guarantees and/or Warranties

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon acceptance of the Contract, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such materials furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical materials, and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-4.02 MATERIALS

88-4.02A General

All equipment and materials furnished under the items specified herein must be brand new. All new equipment, materials and workmanship must be first class in every way and must be manufactured and installed to the satisfaction of the Engineer.

It is the Contractor's responsibility to furnish and install suitable conductors and cables. Review and acceptance of shop drawings by the Engineer does not relieve the Contractor of this responsibility.

88-4.02B Ground Wire

All conductors must be insulated unless the Engineer accepted otherwise. The Engineer's discretion must be binding. The conductor and any other materials required, must be of the size indicated in the Plans and must consist of 7 strands for cable size less than 2/0 and 19 strands for size 2/0 or greater of soft-drawn copper wire complying with ASTM B-3 and ASTM B-8. The ground wire must be Underwriters Laboratories approved.

88-4.02C Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the ground wire components must be submitted for inclusion as an Appendix to the existing bridge operating and maintenance manuals.

The contractor must review the existing O&M Manuals as part of this work to identify items that need to be changed, added and/or require supplemental information.

The supplemental manual materials must include the following as a minimum for new and rehabilitated equipment:

1. New, updated and/or revised maintenance instructions for all new and rehabilitated equipment, including warnings and precautions to be observed during maintenance actions. All preventative maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order must be provided.
2. New, updated, or revised listings of all parts suppliers' local representatives, including suppliers' and representatives' names.

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3. New, updated and/or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.
4. New, updated and/or revised description of the proper theoretical approach to installing and testing new equipment.
5. All relevant As-Built Shop Drawings. Drawings must be certified.
6. New, updated and/or revised instructions for annual cursory inspections and bi-annual in-depth inspections.
7. Manufacturer's literature describing each piece of new equipment furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.
8. Any and all other material or information which in the opinion of the Engineer may be desirable to include to assist in maintaining the bridge functional systems and subsystems.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor must apply to the overall bridge system described in the supplemental manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-4.03 CONSTRUCTION

88-4.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

All work must be performed and delivered as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, ordered, and easily identified.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It must be the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

88-4.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not feasible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities such that their

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manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-4.02C Installation

The Contractor must furnish, install, and test the conductors under AASHTO and NETA ATS standards.

The ground conductors must be of the size specified, where shown on the Contract Plans. Where ground conductors are not provided in the existing system but are required to comply with NEC and/or AASHTO and to provide a complete bonded ground system, the Contractor must submit additional sizes and/or quantities for the Engineer's acceptance.

88-4.04 PAYMENT

The work under this item will be measured as the number of linear feet of ground wire, of the type and size specified, installed, tested, and accepted in accordance with the Contract Documents and Specifications.

The work listed under this Pay Item does not include installation of junction boxes, pull boxes, conduit and wireway as they will be listed under other Pay Items.

88-4.04A Basis of Payment

The unit price for conductor per linear foot of each conductor size must include the cost of all labor, materials, equipment, connecting, splicing and support of conductors and all other incidentals necessary to satisfactorily complete installation and perform the work described herein and as shown on the Plans.

The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon completion and acceptance of the installation of conductors and cables in accordance with the Contract Documents, the Contractor will be paid 90 percent of the bid price for this item.
2. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10percent of the bid price for this item.

Removal of all components not included in the final system will be paid under Section 88-7 "Electrical Equipment Demolition."

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
Item 880140	Ground Wire No. 10 AWG	Linear Feet

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88-5 BRIDGE ELECTRICAL EQUIPMENT

88-5.01 GENERAL

88-5.01A General

Section 88-5 includes furnishing and providing all labor materials, equipment and incidentals required to complete the installation of all the items listed herein and in accordance with the Plans, Specifications, and the Engineer's order. The new components and work include:

1. Bridge Control Equipment
2. Power Distribution Equipment
3. Instrumentation
4. Control Apparatus
5. Nameplates
6. Bridge Control System
7. Instrumentation Flexible Cables
8. Hardware Supports
9. Miscellaneous Work

Any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor as if specifically mentioned in these Specifications and without extra cost.

The alignment and fastening of electrical equipment incorporated into the bridge machinery, such as motors, brakes, rotary limit switches, and position encoders, must be done under the machinery item(s).

Where new or replaced components require additional modifications to the existing structure, machinery or electrical devices than what is specified or due to existing field conditions, the Contractor must make the modifications at no additional cost.

88-5.01B Definitions

Certified test reports refer to reports of tests conducted on previously manufactured materials identical to that proposed for use.

Factory tests refer to tests required to be performed on the actual materials proposed for use. Results of the tests must be submitted in accordance with the provisions of this Specification for laboratory test results.

88-5.01C Submittals

88-5.01C(1) General

The Contractor must coordinate the work of the electrical component manufacturers where components interface, both with other electrical components and with components of other trades. The Contractor must review and accept all shop drawings to coordinate the proper assembly of the various machinery components prior to submission to the Engineer for approval.

Name and written qualifications of the proposed Control System Vendor must be submitted to the Engineer and must be subject to acceptance by the bridge owner's Engineering Department.

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If any departures from the Plans or the Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefor must be submitted for acceptance as soon as possible. Departures must not be made nor work started without Engineer's acceptance.

If the Contractor has any objection to any feature of the electrical system as designed or required by the Plans and/or Specifications, he must state his objection in writing to the Engineer before or when submitting shop drawings; otherwise, his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted for the Engineer's acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings are Engineer accepted, will be rectified by the Contractor at no additional cost.

The Contractor must submit for inspection and test, if the Engineer orders, samples of any apparatus or device, which the Contractor proposes to use as a part of the electrical installation.

Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Military Specification and any other applicable references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete and a legend provided to decipher the manufacturer model number codes.

88-5.01C(2) Shop Drawings

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for Engineer's review and acceptance. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

The Contractor must submit PDF files of all shop drawings for Engineer's acceptance. Upon correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from ordering materials before the acceptance of the shop drawings; and no work must be done until the shop drawings have been accepted. After acceptance of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings as Engineer ordered.

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted for the purposes of documenting and performing the work, or obtaining the Engineer's acceptance to perform the work.

Shop drawings must comply with the provisions of the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

The Contractor must prepare shop drawings in accordance with the requirements of San Joaquin County and must in addition comply with the following:

1. Manufacturer's data and/or shop drawings must be submitted for all electrical items.
2. Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans

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must not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.

3. Materials and material specifications must be stated for each component. Where ASTM or any other Standard Specifications are used, the applicable numbers of such specifications must be given.

4. Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.

5. For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The plans or diagrams must be enough to enable complete disassembly and reassembly of the assemblies covered. If any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.

6. Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary materials on which the manufacturer or supplier states mounting dimensions, ratios, speeds, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they must show:

- a. Dimensions of all principal parts comprising the assembly.
- b. Certified external dimensions affecting clearances and required for installation.
- c. Capacity and normal operating ratings.
- d. Location of mounting holes.
- e. Electrical operating characteristics.
- f. Locations of conduit/cable entries, dimensioned and sized.
- g. Gross weight.
- h. Certified prints must be signed by an officer of the manufacturing company.

7. Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for approval in the same manner as specified for the shop drawings.

8. The weight of each piece of equipment must be stated on the shop plan upon which it is detailed or billed.

9. An installation plan must be provided. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

10. Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

11. Where shop drawings are for materials that replace existing materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

12. The following specific items must be included in the shop drawing submittals for this pay item as applicable:

- a. Certified dimension prints of all motors, span brake motors, limit switches, control panels, instrumentation flexible cables, motor starters, drives, disconnect switches junction and pull boxes, motor control centers and other miscellaneous equipment in either machinery rooms, catwalks, fenders, counterweight pits, movable spans or power distribution room/s.
- b. Revised schematic wiring diagram, including power, control, and lighting connections modified from existing. Both electrical devices and each wire between devices must be identified by an individual designation of letters, numbers, or a combination of both, and such designations must be used wherever the devices or wires appear on other drawings. Existing designations must be used and new additions must be clearly defined. A complete set of catalog cuts for materials furnished must be included for review at the time of schematic submittal.
- c. Layout drawings and internal connection diagrams of the control and distribution panelboards, and terminal cabinets.
- d. A schedule of electrical apparatus which must list each electrical device by its designation as shown on the schematic wiring diagram and must state for each device its rating, number of poles

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or contacts, function, catalog number, and location.

e. A complete interconnection diagram(s) for all electrical apparatus and equipment used in the operation of the movable span and its auxiliaries. The diagram(s) must be of the point-to-point type and must show the external connections of all devices and equipment. Computer-generated interconnection lists will not be acceptable instead of a true interconnection diagram.

f. Outline drawing, details, and connection diagram for distribution switches, its components, and assembly on bridges, if required to be replaced under this Contract.

g. A complete schematic conduit and cable diagram or diagrams showing the interconnection of all replaced devices and equipment, including ducts and junction boxes, and showing all multi conductor cables. The size of each replaced with new conduit, the wire number of each replaced with new conductor in multi conductor cables, must be shown on the diagrams. Each conduit and multi conductor cable must be suitably numbered or lettered and percent wire fill must be shown. The numbering system must be compatible with the original numbering system.

h. A complete set of layout and installation drawings for the electrical work under this Contract showing the location and installation, including support and mounting details, of all electrical apparatus and equipment. These drawings must be made to scale and must show the exact location of all conduits, cables, wiring ducts, boxes, motors, brakes, limit switches, disconnect switches, and other electrical equipment and the method of supporting them on the structure. All original layout and installation drawings must be shown as a background.

i. Outline drawings and mounting details of all navigation lights.

j. Catalog cuts of lighting fixtures, switches, outlets, and electric heating equipment.

k. Arrangement of service light wiring and fixtures, including service outlets, showing all conduits, boxes (including their support), and wiring.

l. Material listing and specifications for controller, if replaced with new, and equipment for interfacing.

m. Riser diagrams, wiring diagrams, details and catalog cuts of the replaced with new electrical equipment, including outdoor enclosure and mounting brackets, monitor controls, and cabling.

n. Any other drawings, which the Engineer orders, necessary to show the electrical work required under this Contract.

o. All layout and installation drawings for the electrical work must be submitted for acceptance so provision is made for mounting of conduits, cables, and other electrical equipment. In most cases the existing holes either drilled in the existing concrete wall or steel structure will be used, unless the existing supports spacing violates current NEC criteria for conduit and cable supports.

p. Certified dimension prints of the apparatus must state in the certification the name of the job, bridge name, application of the apparatus, device designation, number required, right-hand or left-hand assembly, electrical rating, number of poles or contacts, material, finish, and any other pertinent data to show that the apparatus meets the specified requirements.

88-5.01C(3) Certificates

Where equipment or materials are specified to conform to requirements of the standards of an organization, such as NEMA, NFPA, and UL, that use a label or listing as method of indicating compliance, proof of such conformance must be submitted and accepted. The label or listing of the specified organization will be acceptable evidence. Instead of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and Engineer accepted, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

88-5.01C(4) Operating and Maintenance Manual Supplement

The manual supplemental materials must be assembled in a volume with a heavy plastic cover. The manual materials must be a three-ring binder of approximately 9 by 12 inches with rings sized as necessary to fit all materials without overcrowding. The binder must have a clear vinyl cover and spine to allow the insertion of title sheets. The pages must be 8-1/2 by 11 inches 20 lb. paper with accurately punched holes. The paper must be acid free quality suitable for archival use. The holes for binding must be 5/16 inches in

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diameter and be reinforced with plastic or cloth, spaced at the standard for three-hole spacing.

Foldout drawings, diagrams, and illustrations must have 5/16-inches minimum diameter punched holes reinforced with plastic or cloth and must be accurately placed at standard three hole spacing. Foldout drawings, diagrams and illustrations must be neatly folded to 8-1/2 by 11 inches dimensions. All drawings must be black on white and readily legible. Original documents available in color must be reproduced in color.

Final submittal must include a CD-ROM of the complete manual supplement materials in PDF format. Four copies of the approved hard copy supplemental manual materials and four copies of the CD-ROM must be delivered to the Engineer.

The supplemental operating and maintenance manual materials must include as-built, revised, and updated drawings, equipment O&M manuals, cut sheets and all other documentation applicable to each component provided under this work. The level of detail must be enough for a qualified person to understand the function of each item and all other information necessary for the successful and safe operation, troubleshooting and maintenance of the item.

The supplemental manual materials must consist primarily of materials prepared by the manufacturer of the component, however not more than 15 percent of any page with non-applicable information must be crossed out. All materials must be accurate, distinct, easily legible, and possess characters of clarity, legibility and capacity to be reproduced as required by San Joaquin County. Illustrations must be clear and prepared to scale; dimensions and lettering on drawings must be legible. If reproduced drawings are incorporated in the manual materials, the original lines and letters must be darkened as necessary to retain their legibility after reproduction. Larger drawings may be folded and placed in pockets/sleeves in the manual materials.

The general arrangement of the manual supplemental materials including the method of binding and the text must be submitted for acceptance by the Engineer.

All printed matter, data, drawings, diagrams, etc. must be produced by methods resulting in permanence and durability, including paper that is water and grease resistant. No materials must be used which will adversely affect this permanence and durability.

The manual supplemental materials must be neatly entitled with a descriptive title, the name of the bridge, the Owner, the location, the year of rehabilitation, the Contractor, and the Designer. All sheets must be numbered and listed by section in a table of contents. All manufacturers' literature, catalog cuts and manuals must be properly cross referenced. Additionally, replacement components must include proper cross-references to the items they are replacing from the existing operating and maintenance manuals.

Each section/subsection must be separated with tabbed divider sheets. Each tab must be color coded and suitably titled.

The Contractor must submit the supplemental manual materials to the Engineer and San Joaquin County for review and acceptance. The title sheet of all versions must state the submission number and date of submission. The Contractor must allow at least 45 days for Engineer and San Joaquin County review.

For the final as-built supplemental manual materials, the Contractor must incorporate all comments received from the Engineer. Also, include all modifications and adjustments that were made in the field based on final modifications and adjustment made to this item.

The Contractor must adjudicate all comments received from the Engineer/San Joaquin County in writing.

88-5.01D Quality Assurance

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88-5.01D(1) Qualifications, Personnel and Facilities

88-5.01D(1.1) General

Materials used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified materials.

The Contractor must provide enough plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

For all the work required by this Section, the Contractor must use enough skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

88-5.01D(1.2) Control System Vendor

The Contractor must retain the services of a qualified control system vendor who must have complete system responsibility for the detailed integration of all system components, to ensure a complete operating system is provided at the completion of the Contract. The control system vendor must ensure total compatibility of all equipment and devices furnished and installed and must provide supervisory assistance in the selection, installation and integration of all bridge span drive and associated equipment. Components associated with bridge span drive operations include span drive control, limit switches, motor controls and controllers, and associated devices.

The control system vendor must review shop drawings, prior to submission to the Engineer, to ensure that all components of the bridge operating system submitted for use are compatible in every respect and that all components meet or exceed the specific requirements and intent of the project. The total bridge operating system must be subject to the Engineer's acceptance, based on the specified project requirements.

The control system vendor must ensure maximum reliability and ease of maintenance for all operating system components and must train the bridge operator and maintenance staff and supervise all training operations.

The control system vendor must have confirmed skill in providing electrical control systems for movable bridges of various types, particularly swing type, but including vertical lift and bascule type bridges. Such experience must be demonstrated by identifying a minimum of (3) three movable bridges for which the control system vendor has provided complete systems within the past five years.

The control system vendor must make available a field service staff with the capability of providing services for field coordination of construction and final adjustments to the drive system to the Engineer's satisfaction. Field staff must be capable of responding, at the site, to an emergency within six (6) hours.

The Control System Vendor must additionally be responsible for:

1. Determination of all required control cables and routing for control system.
2. Selection of types and sizes of equipment to meet requirements shown on the Plans and included herein.
3. Verification and determination of quantity and type of all control system devices such as relays, I/O, switches, ports, etc.
4. Fabrication, integration, testing, and installation of the Control System and associated devices.
5. The Control System Vendor must specify and select all materials not specifically stated herein or noted on the Plans to provide a uniform and integrated system that provides seamless operation of the bridge and its associated electrical appurtenances.
6. Configuration of existing systems and devices (such as motor controllers) that are indicated to remain in part or whole, but that will be connected to new devices which may have different characteristics than

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the existing.

88-5.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

The Contractor must obtain any required permits and approvals of all Departments or Agencies having jurisdiction.

Work must comply with all applicable requirements of the latest edition of codes and standards issued by, the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American Association of State Highway and Transportation Officials	AASHTO
American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Code of Federal Regulations	CFR
29CFR1910.147 – The Control of Hazardous Energy (Lockout/Tagout)	
29CFR1926.24 – Fire Protection and Prevention	
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
AB-1 Standards for Circuit Breakers	
ST-20 Dry Type Transformers for General Applications	
PB-1 Standards for Panelboards	
NFPA 70 – National Electrical Code	NEC
NFPA 780 – National Fire Protection Code	NFPA
California Electrical Code	CAEC
National Electrical Safety Code	NESC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additional specific requirements include:

1. Title 33, Code of Federal Regulations 33 CFR, Part 118.80: Lighting on Bascule Bridges
2. Lightning Protection Institute Installation Code LPI 175

Instrumentation Flexible Cables must meet the following Industry Standards:

1. 110 Degree C Temperature Rating
2. American Bureau of Shipping (ABS)
3. UL Listed as Marine Shipboard Cable
4. United States Coast Guard Approved

Where codes and standards are mentioned for any pay item, it is to call attention to them, it is not that any other codes and standards must be assumed to be omitted if not mentioned.

88.5.01D(3) Measurements and Verification

Dimensions indicated on the Plans are nominal and are for guidance only. All variations from the dimensions on the Plans must be noted on the shop drawings.

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The Contractor must verify dimensions during site visits before bid. Any variance between plan and field conditions must not be considered as a basis for claim.

The Contract Documents, relating to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. It must be the Contractor's responsibility to verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new component can be finished to obtain the prescribed fit.

88-5.01D(4) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in these Specifications are to allow the Contractor to substitute other manufacturers and model numbers of materials of equal quality and rating for those specified.

Before the Contractor orders any substitute material, the Engineer's acceptance of the equivalence of the substitute material must be obtained in writing. The acceptance of the substitute materials is at the sole discretion of the Engineer who establishes the basis for equivalence and will review the quality of the materials and materials described in detail on the submitted shop drawings and material data.

The Engineer marks as "Accepted" or "Revise and Resubmit" substitute material. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified material. Rejection must not in any way result in any additional cost. Engineer's acceptance of any substitute materials submitted by the Contractor does not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that material.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted as soon as practicable for acceptance. Departures must not be made without Engineer's acceptance. All necessary changes required by the substitution in related machinery, structural, architectural and electrical parts, must be made by the Contractor at no additional cost.

88-5.01D(5) Defective Materials and Workmanship

The acceptance of any material or finished parts by the Engineer must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or

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installation must be corrected by the Contractor at no additional cost. San Joaquin County may make necessary correction with its own forces and charge the resulting costs to the Contractor.

88-5.01D(6) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components to remain. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed will be completely compatible with the existing equipment to remain, and that all original system functions will be returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components to remain. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who must have the sole discretion regarding approval of the alternate methods. Where Engineer accepted, the alternate methods are for the Contractor's benefit, and the Contractor must not receive additional payment for the changes in work performed. Any costs associated with ensuring integration of the proposed work/equipment to existing systems, such that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

88-5.01D(7) Guarantees and/or Warranties

The Contractor must warrantee the in-service working of the electrical installations for one-year following project acceptance.

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon Contract acceptance, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all such materials furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the mechanical materials and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-5.02 MATERIALS

88-5.02A General

All equipment and materials furnished under the items specified herein must be brand-new. All new equipment, materials, and workmanship must be first class in every way and must be manufactured and installed to the Engineer's satisfaction.

No spare materials will be provided.

88-5.02B Materials

Each piece of electrical equipment and apparatus must have a corrosion-resisting metal nameplate on which is stamped the name of the manufacturer and the rating or capacity of the equipment or apparatus.

All metal parts of the installation, except structural steel, if applicable, must be of corrosion-resisting material, such as aluminum, bronze, or stainless steel. Cast-iron, malleable iron, or steel with a hot-dip galvanized finish must be used where specified herein. Structural steel must conform to the requirements given under County Standard Specifications.

All mounting hardware and all wire and cable terminals must be vibration proof and must use double nuts on all movable parts and flanking spans of bridges under this Contract.

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88-5.02C Components

88-5.02C(1) Instrumentation

In general, for each device that replaces an existing device, the new instrumentation device must be identical in model and function. If an exact replacement is not available, then the following specifications for furnishing and installing a replacement for the damaged instrumentation must be used.

If space is a limiting factor or the instrumentation does not meet current NEC standards, then the Engineer must be informed prior to proceeding with the work.

Limit switches must be furnished in accordance with the Contract Drawings. Switches must be specified according to the operation required, including the number of switches, contacts, cams, circuits, degree of motion for operators, number of rated operations, and environmental ratings. Where limit switches will be installed to replace existing switches and/or interface with existing equipment, care must be taken to ensure the proper materials are ordered. The Contractor must perform all field investigation necessary to order all proper parts and accessories to ensure that the limit switches perform in the exact manner as the existing switches that they replace.

88-5.02C(2) Control Equipment

Control apparatus must conform to the applicable requirements of NEMA Publication No. ICS, latest revision, Industrial Control and Systems rated.

88-5.02C(2.1) Controllers

Controllers that are indicated to be replaced must be replaced by new in their entirety.

Wiring diagrams must be provided for each controller. The diagrams must show the exact layout of the unit and must not be a generic diagram.

88-5.02C(2.2) Motor Starters and Magnetic Contactors

The continuous current rating of contactors and starters must be adequate for the connected loads, and starters must not be smaller than NEMA Size 1.

All starters must be full voltage type, 600 VAC, 60 Hertz, rated with 120 VAC operating coils.

All contact poles must be provided with arc chutes, and contactors rated 150 amperes and above must be equipped with magnetic blowouts.

Three-element, automatic reset, overload relays must be provided for motor protection.

Reversing contactors must be electrically and magnetically interlocked.

88-5.02C(2.3) Standalone Overload Relays

Three-element overload relays shall be provided for motor protection. Overload relays shall be of the automatic reset type unless otherwise specified. Overload relays shall be provided with the required auxiliary contacts as shown on the Contract Plans a minimum of two N.O./N.C. auxiliary contacts must be provided. Heater elements are to be selected based on motor full load running current.

88-5.02C(2.4) Control Relays

Auxiliary control relays must be multi contact magnetic relays with contacts rated at 15 amperes, 240 volts,

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on a continuous basis.

Relays known to meet the specified requirements are the Square D class 8501 type X, Allen-Bradley bulletin 700 type P, and the General Electric CR1208.

88-5.02C(2.5) Phase Failure and Reversal Relay

This relay must prevent energizing the bridge controls in the event of reversed phase sequence, loss of one phase, or low voltage.

Equipment known to meet the specified requirements must be as manufactured by, General Electric, Allen-Bradley or the Engineer approved equal.

88-5.02C(2.6) Selector Switches and Pushbuttons

Pushbuttons and control switches must be heavy-duty, oil-tight, contact blocks operated by glove handle selector knobs and push-button operators as indicated on the Plans.

Contacts must be fine silver, capable of interrupting 6 amperes at 120 volts AC, and of 10 ampere continuous duty.

88-5.02C(2.7) Indicating Lights

Indicating lights mounted at the control cabinets must be full voltage, heavy-duty, oil-tight sockets provided with LED lamps rated at 120 volts.

Indicating lights on the control consoles must be provided with group test contacts.
All lenses must be glass, with color and marking as shown on the Plans.

88-5.02C(3) Power Distribution System

88-5.02C(3.1) Transformers

Electrical ratings:

Number of phases: 3

Frequency: 60 Hertz

*KVA Rating: XX KVA

*Primary Voltage: XXX Volts Δ

*Secondary Voltage: XXX / XXX volts Y

Minimum Efficiency: As per DOE 2016 Requirements

* As required to match existing or as shown on plans.

Noise levels must be warranted by the manufacturer and must not exceed 40 decibels for transformers 0 - 9 KVA, 45 decibels for transformers 10 - 50KVA, 50 decibels for transformers 51 - 150 KVA, 55 decibels for transformers 151 - 300 KVA, 60 decibels for transformers 301 - 500KVA, 62 decibels for transformers 501 - 700 KVA, and 64 decibels for transformers 701 - 1000 KVA.

Transformer windings must be of copper, must be of continuous wound construction, and must be impregnated with non-hygroscopic, thermosetting varnish.

Transformers must feature an electrostatic shield.

Transformer insulation must be a UL recognized minimum 180 degrees C system with 80 degrees C temperature rise. Neither the primary nor the secondary temperature must exceed 180 degrees C at any point in the coils while carrying their full rating of sinusoidal or non-sinusoidal load.

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All cores to be constructed with low hysteresis and eddy current losses. The core flux density must be well below the saturation point to prevent core overheating caused by harmonic voltage distortion. Transformers must be common core construction. Transformers using more than one core, or Scott T connections, will not be acceptable.

All insulation materials must be flame-retardant and must not support combustion as defined in ASTM Standard Test Method D635.

All transformers must be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure must not exceed 105 degrees C. The core of the transformer must be grounded to the enclosure.

The enclosure construction must be encapsulated, totally enclosed, non-ventilated, NEMA 4X 316 stainless steel.

The transformers must be Hammond Power Solutions, Cutler-Hammer, General Electric or Engineer accepted equal.

88-5.02C(3.2) Service Disconnect Switches

The switches must be fusible, heavy-duty, safety switches in watertight and dusttight NEMA 4X, stainless-steel enclosures. Each disconnect switch must be furnished with two normally open, auxiliary contacts and phenolic nameplate to identify the switch. The switches must be rated at a minimum 240 volts AC for 208 volts AC, or 600 volts AC for 480 volts AC incoming voltages.

88-5.02C(3.3) Motor Disconnect Switches

The switches must be tag out lockable, fusible, heavy-duty, safety switches, rated as shown on the Contract Drawings, in waterproof, NEMA 4X, stainless steel enclosures. Each span motor and brake disconnect switch must be furnished with a normally open/normally closed auxiliary contact and phenolic nameplate to identify corresponding motor or brake.

88-5.02C(3.4) Circuit Breakers

All breakers must have quick-make and quick-break contacts, and the mechanism must be trip-free and trip indicating. Frame sizes must not be less than 100 amperes and as shown on the plans.

The breakers must be equipped with thermal-magnetic trips or adjustable, instantaneous, magnetic trip units, with trip rating as shown on the Plans or as required.

Molded-case circuit breakers must meet the requirements of the latest revision of NEMA Publication No. AB1.

The service entrance circuit breakers must be of frame size as the original frame size, 600 volt rated, with Contract Drawings specified ampere electronic trip setting with independently adjustable short time pick-up and time delay. Interrupting capacity must not be less than 100,000 amperes interrupting current.

Circuit breakers must be, as manufactured by General Electric or Square D Company or Engineer approved equal.

88-5.02C(3.5) Terminal Blocks

Terminal blocks for conductors of Size No. 8 AWG and smaller must be one-piece blocks of phenolic material recognized under the UL Component Recognition Program.

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Barriers must not be less than 1/2 inch high and 1/8 inch thick and must be spaced 5/8-inch center-to-center. Straps and screws must be of brass; nickel plated for use in highly corrosive atmospheres and must be rated for 50 amperes minimum.

The blocks must provide a withstand voltage rating of 750 volts per IEEE switchgear standards.

The terminal blocks must provide strap screws suitable for use with ring tongue wire connectors.

Corrosion resistant marking strips must be provided for conductor identification.

At least ten percent spare terminals must be provided.

Terminal blocks must be Buchanan Type 2B112, ABB RGW25-M5 series, Marathon 1500 Series, or Engineer accepted equal.

88-5.02C(3.6) Power Distribution Blocks

Power distribution blocks, for all conductors larger than No. 8 AWG, must be constructed from a single piece of hard-drawn copper, machined, and electro-tinned.

All blocks must be mounted on heavy-duty phenolic material and furnished with safety cover kits.

Number and size of primary and secondary wire openings will be selected by the Contractor/Vendor and must be the MPDB66 series blocks as manufactured by Mersen, 140 Series as manufactured by Marathon Special Materials, or Engineer accepted equal manufactured by Allen-Bradley or Square D.

88-5.02C(3.7) Terminal Connectors

Connectors must be seamless, heavy-duty compression ring tongue terminals manufactured from pure electrolytic copper tubing. Terminals must be tin plated and provided with a double-thick tongue and insulation grip. Terminals and compression tools must be approved by the Engineer.

88-5.02C(3.8) Lighting Panelboards

Each lighting panelboard must be the dead-front type and must be provided with quick-make, quick-break, thermal-trip, E-frame, branch circuit breakers. Each breaker must trip free of the operating handle, and the handle must indicate the position of the breaker.

Each panelboard must be provided with a circuit breaker in the mains and with a full-sized neutral bar.

All branch circuits must be numbered, and a typewritten directory must be provided on the inside of each door.

Circuit breakers must meet the requirements of UL Standard 489.

All lighting panelboards must be either 208/120 volts or 240/120 volts, 3-phase, 4-wire panels surface or flush mounted as called out on the Plans. Panelboard enclosures must be code gauge galvanized steel with ANSI 61 light gray enamel finish. Panel boards must be NEMA 4X rated, with copper lugs and tin-plated copper busses.

Panelboards must be Engineer accepted equal to Siemens P2, Cooper Crouse-Hinds XLPB series or Square-D Type QO.

88-5.02C(3.9) Nameplates

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Nameplates must be provided for all devices and must be made of laminated phenolic plastic with white front and back and black core and must be not less than 0.09 inches thick. The lettering must be etched through the front layer to show black engraved letters on a white background. Lettering must be not less than 0.24 inch high, unless otherwise detailed on the Plans. Nameplates must be securely fastened to the equipment with stainless steel screws.

88-5.02C(3.10) Hardware Supports

Supports for conduits, wireways, cables, boxes, cabinets, disconnect switches, small limit switches, and other separately mounted items of electrical equipment must be fabricated from structural steel not less than 0.25 inches thick. Clip angles and other supporting members, which are fabricated from structural steel plates and shapes and bolted to the structural members, must be included under the Bridge Electrical Equipment Item.

Structural steel brackets, boxes, and other equipment mounted on concrete surfaces must be provided with a full neoprene gasket not less than 0.05 inches thick between the equipment and the surface of the concrete.

Expansion anchors for fastening equipment or brackets to concrete surfaces must be wedge type anchor bolts, which must be locked in place by an expansion wedge as the nut is tightened. All parts of the expansion anchors must be of Type 303 stainless steel. Holes for the anchors must be drilled to the manufacturer instructed size and depth using carbide tipped masonry drills.

Mounting bolts, nuts, washers, and other detail parts used for fastening boxes, disconnect switches, small limit switches, conduit clamps, cable supports, brackets, and other electrical equipment must be of stainless steel complying with the requirements of ASTM Designation A276, Type 316. Bolt heads and nuts must be hexagonal and must be provided with medium-series lock washers. Bolts smaller than 1/2 inches in diameter must not be used, except as may be necessary to fit the mounting holes in small limit switches, boxes, and similar standard devices.

Using beam clamps for supporting conduits, boxes, or other equipment is not acceptable without prior Engineer's acceptance.

Preformed elongated holes metal framing channels, such as Kindorf, Unistrut, Superstrut, etc., are not acceptable for mounting or supporting electrical equipment or boxes.

88-5.02D Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the 'Bridge Electrical Equipment' components must be submitted for inclusion in the existing operating and maintenance manuals.

Contractor must note that several iterative submissions of supplemental manual materials may be required, if the submittals are incomplete or do not meet the requirements of the item as determined by the Engineer.

The Contractor is responsible for the systems provided by subcontractors and/or vendors. No disclaimer of any subcontractor or vendor must apply to the overall bridge system described in the supplemental manual materials.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

The manual supplemental materials must include the following as a minimum for new and rehabilitated equipment:

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1. New, updated, or revised maintenance instructions for all equipment, including warnings and precautions to be observed during maintenance actions. All preventative maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order must be provided.
2. Listings of all parts suppliers' local representatives, including suppliers' and representatives' names.
3. New, updated, or revised schematics indicating what items should be cleaned and painted on a regular basis.
4. New, updated, or revised troubleshooting procedures, flowcharts and checklists for anticipated possible breakdowns of equipment.
5. New, updated, or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.
6. New, updated, or revised description of the proper theoretical approach to installing and testing new equipment.
7. All relevant as-built shop drawings. Drawings must be certified.
8. New, dated, or revised instructions for annual cursory inspections and bi-annual in-depth inspections.
9. Manufacturer's literature describing each piece of new equipment furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.
10. All other material or information which in the Engineer's opinion may be desirable to include to assist in maintaining the bridge functional systems and subsystems.
11. Preventative maintenance procedures, including how often the various procedures should be done. All safety precautions that are required to be observed for proper operation and maintenance must be included in a separate section in addition to wherever noted in the manuals.
12. Maintenance testing and procedure equipment lists.
13. Schematic indicating what items should be cleaned and painted on a regular basis.
14. Troubleshooting procedures, flowcharts and checklists which must include a troubleshooting flow chart for troubleshooting the bridge electrical system and instructions for diagnosing control system malfunctions and for detecting failures in external controls connected thereto.
15. Operating current, equipment, and criteria for drive and motors.
16. Repair procedures and repair procedure equipment lists, including suggested procedures for installation and removal of items provided under the Contract.
17. Description of the proper theoretical approach to installing and testing electrical and control systems.
18. Anticipation of possible breakdowns and development of trouble-shooting procedures and identification of corrective actions.
19. As-Built Shop Drawings which must include schematic wiring diagrams, control desk and control panel layouts, connection diagrams as listed under "Bridge Electrical System"
20. Conduit and electrical layout and installation drawings, including mounting details.
21. Control desk, Control panels, Relay panels and wiring diagrams.
22. Schematic wiring diagrams.
23. Certified drawings.
24. Steps for cursory inspection that should be carried out annually
25. Steps for in depth inspection that should be carried out every two years
26. Manufacturer's literature describing each piece of equipment and giving complete identification including manufacturers' model number and drawing number. A set of descriptive leaflets, bulletins and plans covering all approved items of equipment furnished and installed, including any suggested installation, alignment, maintenance, troubleshooting and repair procedures. The catalog number of each piece must be given to be used when it becomes necessary to order replacement parts from the original manufacturer.
27. A detailed and complete description of the As Left height settings of the span rotary limit switches and corresponding height set points of the selsyn position indicator (if applicable). The description must include detailed instructions about setting each point of the rotary limit switch and a troubleshooting flow chart for diagnosing and correcting malfunctions. The rotary limit switch must be kept accurate within 0.25 inch of lift position.
28. All material or information which in the Engineer's opinion be desirable to include to assist in maintaining the bridge functional systems and subsystems.

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Electrical wiring diagrams must be furnished, framed, and installed in the machinery, switchgear, and operator's rooms or at locations the Engineer assigns.

Each framed diagram must conform to the following requirements:

1. No single diagram must show more than one system or parts thereof.
2. Diagrams must be reproduced by photographic process to the San Joaquin County Standard Drawing size and format as required and must be complete and legible in all respects. Systems must be subdivided into portions, which are operable from locations where diagrams are installed. Diagrams must be black on white paper and vacuum sealed in a transparent plastic, chemically inert, material of minimum 5 mil thickness, impervious to moisture and oil and resistant to abrasion. The plastic material must not affect the legibility of the Contract Plans.
3. Other formats which are equal in clarity, sharpness, durability, and permanence will be considered. Contractor must submit proposed method with specific details to the Engineer for review and approval.
4. All printed matter, test, data, and other matter must be clear and legible, accurate and distinct, and must be produced by methods to be permanent, as approved by and in the sole discretion and Engineer's opinion.

A complete copy of the manual supplemental materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-5.03 CONSTRUCTION

88-5.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

It is the Contractor's responsibility to manufacture and install suitable functioning electrical equipment. Review and acceptance of shop drawings by the Engineer does not relieve the Contractor of this responsibility.

All work must be performed and delivered in a workmanlike manner as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, orderly, and easily identified.

88-5.03B Delivery and Storage

Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.

Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not feasible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.

Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities such that their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

Assembled units must be mounted on skids or otherwise crated for protection during handling and

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shipment.

88-5.03C Installation

88-5.03C(1) General

Work under this Contract requires installation of numerous control and power devices that will be interfaced to an existing bridge control system that will remain in operation throughout and after the construction work under this Contract.

References in the Contract Documents to the bridge control system (or similar identifiers) include all aspects of the existing interconnected devices which operate the bridge machinery, including relays, motor control equipment, motors, switches, instrumentation, wiring and cabling, control console, operators, and indicator lights.

The Contractor must perform work necessary to ensure that the components installed under this and other pay items are fully interfaced and connected to the portions of the Bridge Control System that will remain and will not be replaced under the Contract Work.

The Contractor must deliver a complete operating bridge control system at the Contract completion. However, should modification be necessary due to changes in available equipment or other circumstances beyond the control of San Joaquin County, the Contractor (through his subcontracted Control System Vendor) must interpret the intent of the original equipment and propose edits to accommodate the new equipment provided under this Contract. The Engineer must review proposed edits and must make a binding order to the Contractor.

Detailed elementary control diagram must be provided with the shop drawings including sequence of operations (closely following the original span open/close sequence) for Engineer's acceptance.

88-5.03C(2) Eight Mile Rd (Bishop Canal, 29C-114) Scope

The electrical Contractor must modify the existing bridge control system and selector switches for each of the gates. Momentary spring return to center selector switches must be provided for all gates.

The operation of the traffic gate selector switches on the operating console must be modified. New momentary selector switches must be provided such that when the operator releases the switches the operation of the warning gates stop. The control system must be modified such that the warning gates do not automatically/sequentially operate as shown on plans.

The overall operation of the control system as well as the hydraulic system control must be modified. All timing and automatic functions must be removed as shown on plans. The hydraulic system control must be modified to accommodate the new hydraulic system.

The electrical Contractor must provide a new 24" wide by 20" high by 10" deep Stainless Steel NEMA 4x electrical enclosure to house the new control components which are to be installed at the pier level. The cost of the enclosure is included in this item.

All necessary control modifications required to accommodate the above must be provided at no additional cost.

Detailed elementary control diagram must be provided with the shop drawings including sequence of operations (closely following the original span open/close sequence) for Engineer's acceptance.

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88-5.03C(3) Components

88-5.03C(3.1) Limit Switches

Limit switches must be furnished and installed in accordance with the Contract Drawings. Where limit switches will be installed to replace existing switches and/or interface with existing equipment, care must be taken to ensure the proper materials are installed.

The Contractor must perform all adjustments, modifications to mounting, etc. to ensure that each switch operates in a manner consistent with the existing Bridge Control System.

Furnish all equipment, conduits, wiring and supports required to extend the instrumentation connections to the control/terminal cabinets. Cost of conduits, conductors with supports must be included in each individual conduit, conduit support and conductor item numbers.

88-5.03C(3.2) Controllers

All equipment installed in the existing MCC compartments as shown and listed on the Contract Drawings to be removed must be disconnected and removed.

Power to the existing controllers must be turned off by disconnecting the main circuit breaker feeding the controller.

The existing Motor Starters and Magnetic Contactors where shown on the Contract Drawings must be removed and replaced by new motor starters and magnetic contactors.

New or accepted equal starters and other miscellaneous electrical components must be installed at appropriate locations as original and as shown on the Contract Drawings.

Inspection, troubleshooting and testing of the newly wired equipment together with the existing compartment equipment must be performed.

Equipment and wiring must be tested for continuity.

88-5.03C(3.3) Utility Power

The feeders from the utility power source and standby power sources (if applicable) must be connected to new power distribution equipment through disconnect switches and an automatic transfer switch if an engine generator is used to feed the distribution panel circuit breakers.

If a generator is part of the existing electrical system and in the event of failure of the preferred source, the automatic transfer switch must operate automatically to connect the standby engine generator power supply to the power distribution bus.

88-5.03C(3.4) Service Disconnect Switches

Fused safety switches, for use as disconnect switches, must be installed where shown on the plans.

Fused safety switches for use as disconnect switches must be installed within the range of view of each span motor, brake motor, tail lock motor, span lock motor and sump pump motor if Contract Drawings call for motor replacement on affected bridges.

88-5.03C(3.5) Circuit Breakers

All branch circuits from the power buses must be protected by molded-case circuit breakers mounted on the control panels.

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88-5.03C(3.6) Lighting Panelboards

All branch circuits must be numbered, and a typewritten directory must be provided on the inside of each door.

88-5.03C(3.7) Nameplates

Nameplates must be provided for all devices. Nameplates must be securely fastened to the equipment with stainless steel screws.

88-5.03C(3.8) Hardware Supports

Structural steel brackets, boxes, and other equipment mounted on concrete surfaces must be provided with a full neoprene gasket not less than 0.05 inches thick between the equipment and the surface of the concrete.

Expansion anchors for fastening equipment or brackets to concrete surfaces must be wedge type anchor bolts, which must be locked in place by an expansion wedge as the nut is tightened. Holes for the anchors must be drilled to the manufacturer instructed size and depth using carbide tipped masonry drills.

Mounting bolts, nuts, washers, and other detail parts used for fastening boxes, disconnect switches, small limit switches, conduit clamps, cable supports, brackets, and other electrical equipment must be of stainless steel complying with the requirements of ASTM Designation A276, Type 316. Bolt heads and nuts must be hexagonal and must be provided with medium-series lock washers. Bolts smaller than 1/2 inch in diameter must not be used, except as may be necessary to fit the mounting holes in small limit switches, boxes, and similar standard devices.

Using beam clamps for supporting conduits, boxes, or other equipment is not acceptable without prior Engineer's acceptance.

Preformed elongated holes metal framing channels, such as Kindorf, Unistrut, Superstrut, etc., are not acceptable for mounting or supporting electrical equipment or boxes.

88-5.03C(4) Bridge System Diagnostic Testing

The following must be completed after all Contract installation work is complete:

1. Bridge System Diagnostic Testing

The Contractor must follow the below described procedure to complete diagnostic testing to confirm integrity of the existing bridge system:

- a. Acquire original acceptance testing script for bridge system diagnostic testing from San Joaquin County.
- b. Modify the testing procedure script to match the installations under this Contract and submit for review & acceptance.
- c. Perform complete diagnostic testing as specified in the accepted testing script under witness of the Engineer and San Joaquin County. Document results.
- d. List failed bridge system components. Perform diagnostic services necessary to identify the cause of failures. Submit for Engineer's review and acceptance.
- e. If failed components or systems are specified for replacement under part of this Contract, sequentially complete the work as specified under this Contract.
- f. If failed components are not included for replacement as part of this Contract, submit to the Engineer the cost as an additional work. Cost must be only for new installation work.

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All diagnostic costs must be included in this pay item, and no additional compensation will be made for diagnostic time or materials.

- g. Follow the Engineer's orders to complete the failed system work.

88-5.03C(5) Miscellaneous

All other materials and equipment (conduit, cables, etc.) that are not mentioned herein or specifically called out in other Pay items but required for the complete operation of the bridge and the system outlined in the Contract Documents must be included in the work for this Section.

88-5.04 PAYMENT

Payment for "Bridge Electrical Equipment" must be made on a lump sum basis and must include all work specified herein and all work that is not paid elsewhere.

88-5.04A Basis of Payment

The lump sum price bid for "Bridge Electrical Equipment" must include the cost of furnishing all labor, materials, plant, training, equipment, and all necessary incidentals required to satisfactorily complete installation and perform the work described herein and shown on the Plans.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item.

The Engineer must evaluate this breakdown and must have the authority to revise the breakdown as, in his judgment, may be required to make the various components of work conform to their true values.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The Contractor must agree that the detailed breakdown must not become effective until it has Engineer's acceptance.

The total lump sum value for this item must be broken down in detail.

The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon submission and approval of shop drawings by San Joaquin County authorized representative; the Contractor will be paid 5 percent of the distributed bid price.
2. Upon complete installation of the equipment described herein, the Contractor will be paid 40 percent of the distributed bid price.
3. Upon completion of Item 88.6.1 Bridge System Testing, and demonstration of the proper operation of the bridge under all modes available under the original system design, the Contractor will be paid 30 percent of the distributed bid price.
4. Upon completion of all punch list items, the Contractor will be paid 15 percent of the distributed bid price.
5. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the distributed bid price.

Removal of all components not included in the final system will be paid under Section 88-7 "Electrical Equipment Demolition"

Payment will be made under:

88 BRIDGE ELECTRICAL SYSTEMS

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
880070	Bridge Electrical Equipment	Lump Sum

88-6 BRIDGE SYSTEM TESTING

88-6.01 GENERAL

88-6.01A General

Section 88-6 includes furnishing all labor, materials, plant, and equipment required to perform all work necessary, such as adjustments or corrective measures, to properly test all systems included in the field testing and final acceptance testing.

The Contractor must prepare and submit all acceptance testing procedures for the Engineer's acceptance 20 days before the scheduled start of any required testing.

The Contractor must submit a testing sequence operation based on the included test designated tabulations under Field Testing sub-heading. This test sequence of operation must be used for the testing described herein and approved by the Engineer and San Joaquin County, before testing.

88-6.01B Definitions

Not Used

88-6.01C Submittals

The instrument/meter calibration documents must be submitted for the Engineer's review and acceptance.

The Contractor must submit a detailed testing procedure for use in performing the Field Testing. The procedure must be submitted for review and approval at least 20 days before the anticipated completion of electrical systems.

The Contractor must submit a detailed testing procedure for use in performing the Final Acceptance Testing. The procedure must be submitted for review and acceptance at least 1 month before the anticipated completion of electrical systems for above listed bridges.

The results of the system Final Acceptance Tests must be presented in a matrix form on a Test Report Data Sheet. The proposed format of these sheets must be submitted for the Engineer's acceptance before the actual testing.

88-6.01D Quality Assurance

88-6.01D(1) Qualifications, Personnel and Facilities

Included with furnishing the major items of electrical equipment, the manufacturer must furnish all necessary field supervisory start-up time by the manufacturer's designated representative to facilitate proper adjustment of all necessary equipment.

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The manufacturer's field service engineering personnel must be experienced in the adjustment and functioning of the control equipment furnished by the manufacturer. The personnel must be capable of locating and correcting faults or defects and of obtaining from the manufacturer, without delay, new parts or replacements for apparatus that, in the opinion of the Engineer, does not perform satisfactorily.

During the field testing period, the Contractor must arrange to have representatives of the manufacturer of all major pieces of equipment at the site, if applicable, such as main span motors, brakes, transformer, etc. The representatives must be capable of supervising all adjustments to the equipment, of locating faults or defects and correcting them if possible, and of obtaining from the manufacturers, without delay, new parts or replacements for any apparatus which, in the Engineer's opinion, does not perform satisfactorily.

88-6.01D(2) Rules, Regulations and Ordinances

All meters must be calibrated per National Institute of Standards and Technology (NIST) guidelines within 6 months before testing.

88-6.02 MATERIALS

Equipment Required for Field and Final Acceptance Testing

The testing of the bridge electrical equipment necessitates the use of the following recording and testing devices:

1. Recording Ammeter/Voltmeter
2. Portable multimeter.
3. Amp-probe.
4. Infrared scanner.
5. Measuring tape.
6. Stopwatch (timer).
7. All other necessary instrumentation and tools to monitor, adjust, or replace items during the bridge testing procedure.

88-6.03 CONSTRUCTION

88-6.03A Field Testing

The bridge field tests are to confirm each major sub-component and subsystem within the scope is operational. Confirmation of correct operation of components or sub-components must be demonstrated through successful operation of the component or assembly.

Nameplate legends, conductor identifications, instrument scales, escutcheon plate engraving, and all other details of construction must be checked for conformity with specified requirements.

The Field Testing must include running all functions of the bridge, including electrical equipment within the bridge scope. It must include a schedule for opening the bridge on different combinations of drive equipment (main, backup, auxiliary, etc.) as well as a schedule for manual operation on the generator (if applicable).

The Field Testing Procedure must include a detailed method to test all functions built into the control system.

The Contractor must arrange for and provide all the necessary field tests, as defined in the accepted test procedures designated below, and by the Engineer's orders, to demonstrate that the portions of the mechanical, and electrical systems that were repaired are in proper working order and comply with the Plans and Specifications within the scope of this contract. The tests must include operational testing of the operating machinery, warning gates, and electrical system, as applicable and as listed below.

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Continuity Test - Submarine Cables: After approval of the insulation resistance test of the reinstalled but unconnected submarine cables, the Contractor shall test the continuity of the individual conductors within submarine cable. The test is performed by tying together all conductors on the source side and on the destination side, except but one conductor on the destination side by isolating it and measuring the resistance between the destination side and the isolated conductor with all conductors tied together on the source side. The same procedure is followed for all conductors one at a time. This will verify the continuity of all conductors from source to destination within the submarine cable. The contractor shall submit detailed procedure to the engineer for approval. Upon completion of the continuity test the Contractor shall connect the submarine cables and test the energized installation as directed by the Engineer.

Megger Test - Submarine Cables: The test methods for measuring insulation resistance of cables installed in the field shall be in accordance with the specified NEMA Publications. The test equipment shall include a megohm meter capable of generating a constant 1,000-volt D.C. source, calibrated in a range legible from 0 to 1,000 megohms and up to infinity, with heavy-duty, rubber-insulated, alligator-clip leads, and a guard-circuit terminal available for use if required. Polarity for connecting the megohm meter to the cable under test and the duration of time for electrifying the cable before taking the resistance reading shall be in accordance with NEMA Publication. The insulation resistance of each conductor in the installed wire-armored, multi-conductor submarine cables shall be measured between the conductor and all the wires in the armor, all of which shall be bonded together and grounded. The measured values of insulation resistance for each conductor in the submarine cables shall be recorded for record.

Phase sequence: Test must include verifying line side phase sequence A B C and load side phase sequence A B C for compatibility and accuracy. Test must be performed for new transformer (or rewired), new motors (or rewired or if work was performed on their controllers), and on bridges with High leg delta services. Where high leg delta services are installed, phase B must be the high leg. All equipment that is installed must be tested to assure that no equipment unintentionally receives the high phase voltage.

Replace/Refurbish cabinets, terminal strips, and lugs: Inspect refurbished cabinet and new secured terminal strips. Test all individual terminals for any loose connections or over torquing. Test cabinet grounding connection. Test for conductors shorting consecutive terminal strips.

Instrumentation: All limit switches, rotary cam limit switches, fully open and fully closed limit switches and other miscellaneous instrumentation, if replaced or rewired must be tested for manufacturing quality and proper operation per manufacturer's instruction.

Short Circuit between new conductors: Test new conductors for conductor to conductor and conductor to ground

Existing bridge grounding system test: Test for compatibility with the NEC article 250.

Should the tests show that any system, piece of equipment, electrical cable or wiring connection (which was installed/modified/damaged by the Contractor), in the Engineer's judgment, is defective or functions improperly, such adjustments and/or replacements must be made by the Contractor as to make the installation satisfactory to the Engineer at no extra cost to San Joaquin County.

88-6.03B Bridge Final Acceptance Testing

Results and observations must be carefully recorded throughout the tests. Before performance of these tests, all temporary bypasses, jumpers, switches, etc., installed during any previous testing must be removed. The control circuits must be in the state presented in the original as-built control wiring diagrams or as required to be modified and shown on plans. All tests and verifications must be for equipment for bridge leaves, lift span or swing spans. In addition to all devices listed below, all associated devices must also be tested.

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After all bridge systems are operating to the satisfaction of the Engineer, the Contractor and the manufacturers' representatives, an operational test period of not less than one week must begin, during which time all aspects of the electrical system will be tested and observed by the Engineer, San Joaquin County personnel and representatives for the Eight Mile Rd Bridge (Bishop Canal, 29C-114).

During this period, the Contractor must make any repairs necessary because of equipment failure due to faulty equipment or workmanship. Should preliminary checks or operational tests show that any piece of equipment furnished by the Contractor, in the Engineer's judgment, is defective or functions improperly, such adjustments and/or replacements must be made by the Contractor as to make the installation completely acceptable to the Engineer, and at no extra cost to San Joaquin County.

The Final Acceptance Testing must include running all functions of the bridge, including all electrical equipment. It must include a schedule for opening the bridge on different combinations of drive equipment (main, backup, auxiliary, etc.) as well as a schedule for manual operation on the generator if applicable.

The Final Acceptance Testing procedure must include a detailed method to test all system interlocks, and test all functions built into the control system.

The acceptance test demonstrates that the normal operating systems, including mechanical systems, and electrical control and power systems are operational, trouble free, operating with all interlocks for systems within scope of the contract properly functioning, and complies with the requirements of the contract plans and specifications.

Confirmation of correct operation of sub-components must be demonstrated through successful operation of the total mechanical, and electrical control systems. However, the Contractor is still responsible for performing the field and other tests through acceptance as required per contract specifications prior to final bridge acceptance testing.

The recommended values of various device parameters can be found in the existing plans, specifications, and original O&M Manuals and manual supplements prepared by the Contractor. Correct operation of the subcomponents, and control circuit wiring connections will be verified through the successful completion of the entire bridge control and power systems tests. This testing procedure will evaluate performance and confirm correct operation of all major subsystems and devices. Visual inspections and physical measurements of some equipment are required for the purpose of recording valid parameter values. During operation, parameters as defined below must be recorded for each test and kept for the record together with all other recorded data.

The San Joaquin County must be in possession of the final new mechanical and electrical maintenance manual supplements at least 20 days before acceptance testing may begin in accordance with the requirements specified in Contract Specifications. There must be 10 consecutive days of nominal bridge operation using the new permanent systems, with a minimum of five (5) successful openings per day, before the final acceptance test must be scheduled.

88-6.03C Final Acceptance Test Data

All test parameters, data and results specified herein to be recorded must be presented in a legible, tabular format, listing associated parameters and conditions. For example, performance and motor currents must reference speed (rpm), span angle (degrees), raise or lower mode, "Utility" or "Standby Generator" power system, etc. The results of the system tests must be presented in a matrix form on a Test Report Data Sheet. The proposed format of these sheets must be submitted for the Engineer's acceptance before the actual testing. Any parameter value which falls beyond the recommended range will require the readjustment or replacement of the defective device.

The name of the person who will perform the test, instruments used with calibration data if required, and the exact date, time, and weather conditions, must be recorded.

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Some devices such as the transfer switch, lamps, control desk indicator lights, brake function indicator lights, control console controlled lighting, navigation lighting and horn can be easily tested without performing a bridge opening operation.

The bridge main parameters must also be observed and visually compared to the control desk indicating meters. Any discrepancy between results must be recorded. The major bridge systems must be monitored while the bridge operates. All monitored parameters must be downloaded to the laptop computer, printed, and kept for future reference. A printout copy must be attached to the appropriate Maintenance Manual supplement for reference. Another printout copy must be provided to the Engineer.

88-6.03D Final Bridge Acceptance Tests to be Performed

After reaching substantial completion of the work, under Final Bridge Acceptance Testing, San Joaquin County Bridge Operations will test operate the movable spans ten (10) times using normal operation to determine if the spans are operating as required. The Contractor along with the Resident Engineer must be present for these test openings. During the testing, the Contractor must arrange to have at the site qualified personnel capable of supervising adjustments to equipment, of locating faults or defects and identifying them if possible. If a malfunction is present, San Joaquin County will notify the Contractor to investigate and determine the cause of the malfunction.

If the malfunction is not the result of the work performed by the Contractor, San Joaquin County will authorize, in writing, the Contractor to develop a detailed scope of the work to correct the malfunction. The scope will detail the work required to place the system, component and/or components back into serviceable condition or replace the components based on the Contractor's recommendation and to the satisfaction of the Engineer and San Joaquin County. Cost for the correction must be paid for elsewhere in the Contract.

If the malfunction is the result of work performed by the Contractor on the bridge, the Contractor must correct the malfunction at no additional cost to San Joaquin County.

In addition to the above testing the following bridge specific tests must be performed:

1. Control Console

The control console devices such as switches, pilot lights, and recording multi-meters will be used throughout the tests, and all irregularities observed must be noted during and after the tests from the notes and printouts. Each individual gate selector switch must be operated in the lower operation as well as in the raise operation. Mid way through each operation the selector switch must be released from operation. Each gate must immediately come to a stop.

2. Span Operation

Several bridge openings may be required to demonstrate that all the operational parameters are acceptable and interlock functions safe. Subsequent runs will be required to simulate failures, and to test interlocking and bypass functions. The normal sequence of operation as described in the pre-approved "Sequence of Operation" as part of the original Operations and Maintenance (O&M) Manuals and must be followed up to the indicated operational step of the equipment to be tested.

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5. Normal Operation

Set the system to operate on the utility power. Follow the full accepted "Sequence of Operation". During the span "Open" and "Close" operation, the following parameters must be monitored and manually recorded:

- a. Span position (degrees),
- b. Near motor power (kilowatt).
- c. 3-phase current (amperes).
- d. 3-phase voltage (volts).
- e. Motor speed (RPM).
- f. Manually record maximum opening during the "Open", of the movable span.
- g. Manually record "Open" time and "Close" time.

These parameters must also be manually recorded at the fully closed, nearly closed, nearly open and fully open position for each leaf as indicated at the control desk by the span switches.

Verify that the movable span operated normally within the permissible position limits.

Verify that the limit switches indicated position are equal or within the set design tolerances with the readings at the control desk.

Normal Stop:

- a. With the span running at full speed during a "Open" operation, put the control switch in the "stop" position. The span should slow and stop smoothly within a minimum of 3 to 5 seconds and a maximum of 8-10 seconds deceleration.
- b. Repeat the test during a "Close" operation.

Interlock Checks:

- a. Verify that the span cannot be operated electrically if any motor or machinery brake has been released by hand.
- b. Verify that the span cannot be operated electrically if any one of the warning gates is not in the closed position.
- c. Verify all other interlocks in original design cannot be performed without bypass that is not described above.

Bypass Checks:

- a. Verify that when any of the interlock bypass switches is enabled, the given interlock is overridden.

Emergency Stops:

- a. Under each opening procedure, push the "Emergency Stop" red mushroom head button.
- b. Verify that all motor and brake contactors drop out and the span brakes set immediately.

88-6.03E Bridge Operators and Maintenance Personnel Training

88-6.03E(1) Training

The Contractor's personnel must provide training and instruction for a period of one (1) working day after the construction of the permanent control system has been completed, fine-tuned, field tested, and utilized for span operations. Instructors must include representatives from manufacturers of the major equipment and a Control Engineer.

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The Contractor's personnel must be skilled persons competent to operate the bridge and familiar with the operating equipment of the bridge and its auxiliaries, such as the communications system. They must be able to make any adjustments required to the electrical and mechanical equipment.

During the one (1) day period specified above, the Contractors personnel must be at the bridge for the normal working period of 8 hours per day.

Included in the one (1) day training and instruction period, there must be an on-site training of San Joaquin County bridge operators, electronic technicians, electricians, maintenance workers, and other personnel as indicated by San Joaquin County on subjects such as all modes of bridge operation, troubleshooting, repair of electronic motor controls, drive circuit logic, maintenance and adjustment of all electrical equipment, and other items required for full bridge operation and maintenance. Two (2), each four (4) hour sessions must be devoted to operator training. One (1) session must be devoted to hardware and maintenance related topics. The Contractor must furnish all necessary instruction sheets, training aids, books, paper, and booklets to supplement training. The Contractor must submit to San Joaquin County, a minimum of three weeks prior to training session, a schedule and syllabus for review and approval. It must be the Contractor's responsibility to coordinate with San Joaquin County the location where training sessions will be held. Supplying of visual aid equipment and other miscellaneous items required for training must be the responsibility of the Contractor.

Training of the designated bridge operational and maintenance personnel must commence four weeks before the official bridge opening date.

88-6.04 PAYMENT

Payment for "Bridge System Testing" must be made on a lump sum basis and must include all specified Field and Final Acceptance Testing as described herein.

88-6.04a Basis of Payment

The lump sum bid for "Bridge System Testing" must include the cost of all labor, materials, plant, training, equipment, and all necessary incidentals required to satisfactorily complete the bridge system testing as described herein.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item.

The Engineer must evaluate this breakdown and must have the authority to revise the breakdown as, in his judgment, may be required to make the various components of work conform to their true values.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The Contractor must agree that the detailed breakdown must not become effective until it has approved the Engineer's acceptance.

The total lump sum value for this item must be broken down in detail.

The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made as follows:

1. Upon submission and approval of all required testing procedures by San Joaquin County authorized representative; the Contractor will be paid 20 percent of the distributed bid price.

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2. Upon completion of Field Testing as described and outlined herein, and upon acceptance by an authorized San Joaquin County representative, the Contractor will be paid 30 percent of the distributed bid price.
3. Upon completion of Bridge Final Acceptance Testing in as described and outlined herein, resolution of all associated punch list items, required training, and upon acceptance by an authorized San Joaquin County representative, the Contractor will be paid 40 percent of the distributed bid price.
4. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the distributed bid price.

Supplements to the Operating and Maintenance Manual must be paid under Item 88-5 "Bridge Electrical Equipment."

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
880080	Bridge System Testing	Lump Sum

88-7 BRIDGE ELECTRICAL DEMOLITION

88-7.01 GENERAL

88-7.01A General

Section 88-7 includes the removal and disposal of equipment where shown on the Plans, described in the Specification or the Engineer's orders.

The work under this item includes the removal and salvage of the temporary electrical equipment provided by the Contractor as part of this Contract, and includes materials and equipment installed by San Joaquin County maintenance for temporary operation of the bridge, during interim period and construction stages complying with the Plans and Specifications.

Any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor just as if specifically mentioned in these Specifications at no additional cost.

88-7.01B Definition

Not Used

88-7.01C Submittals

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

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The Contractor must submit a schedule of equipment for removal and salvage for acceptance during the shop drawing process.

For any items requiring a demolition sequence, demolition plans signed and sealed by a licensed Professional Engineer must be submitted for the Engineer's acceptance before work.

Before the commencement of any work, the Contractor must submit a comprehensive staging plan in accordance with the requirements of these plans, which must clearly define specific milestone dates for electrical work for the Engineer's acceptance. The Contractor must document and verify all temporary electrical work at the bridge and must submit to the Engineer detailed plans documenting such work, in conjunction with the staging plan.

The Contractor must submit proposed detailed demolition/salvage plan including materials and equipment to be used for the Engineer's review and acceptance. The plan must indicate the sequence of work, required interconnections, and milestones where testing is required. A detailed schedule of equipment for removal and salvage must be submitted for the Engineer's review and acceptance.

The Contractor must submit PDF files all shop drawings for the Engineer's acceptance. In case of correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from the commencement of work before the acceptance of the shop drawings; and no work must be done until the shop drawings therefore have been approved. After approval of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings as ordered by the Engineer.

88-7.01D Quality Assurance

88-7.01D(1) Qualifications, Personnel and Facilities

Materials used in the work under this item must be produced by manufacturers regularly engaged in the work required for removal, salvage and disposal of the work specified herein.

For all the work required by the work under these Pay Items, the Contractor must use enough of skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide enough plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-7.01D(2) Rules, Regulations and Ordinances

All removal, disposal and temporary work must comply with all applicable requirements of the latest edition of codes and standards issued by the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA

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Underwriters Laboratories

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Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications.

Where codes and standards are mentioned for any pay item, it is intended to call attention to them, it is not intended that any other codes and standards must be assumed to be omitted if not mentioned.

All work must be performed and delivered in a workmanlike manner as shown on the Contract Documents and must follow industry-accepted standard practices.

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

88-7.01D(3) Measurements and Verification

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. The Contractor must verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

88-7.02 MATERIALS

The Contractor must provide all the necessary tools and equipment required to safely disconnect, remove and dispose of all equipment that is slated for removal, replacement or salvage.

88-7.03 CONSTRUCTION

88-7.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

88-7.03B Delivery and Storage

This section applies to all electrical equipment that must be tagged for salvage and delivered to the San Joaquin County.

The Contractor is responsible for storage of equipment until date of delivery and coordinating date of delivery with the San Joaquin within 120 days of execution of contract.

All electrical equipment that is tagged for salvage must be inspected and accepted by an authorized representative of the San Joaquin County before shipping and after delivery.

Protection for Shipment:

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1. Protective wrappings must be provided for all equipment and materials that are to be salvaged and delivered. Materials must be packed and delivered to the pre-determined San Joaquin County locations in the state that they left from the bridge as accepted by the Engineer.
2. Damage caused to the materials due to improper storage, transportation, or delivery regardless of cause, must be repaired by the Contractor.
3. Materials must be completely protected from weather, dirt, and all other injurious conditions during removal, shipment, and storage. Materials must be stored in climate-controlled facilities.
4. Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-7.03C Removal of Existing Materials and Equipment

The Contractor must remove and dispose of the existing equipment and components that are not re-used in the final electrical system. Unless otherwise noted, all items must be removed, not abandoned.

Where removal of materials and equipment is called for on the Plans, such materials and equipment must become the property of the Contractor, unless stated otherwise elsewhere in the Specifications, must be legally disposed of away from County property. Under no circumstances must material be dropped in the waterway or abandoned on site. The Contractor must take care, during removal operations, to prevent damage to adjoining parts and components that are to be reused. All components damaged by the Contractor, unless scheduled to be discarded, must be replaced, as ordered by the Engineer, at no additional cost.

The Contractor is hereby notified that existing components such as motors, switches, disconnects, terminal/junction boxes, electrical cabinets, panelboards, etc. must be salvaged and must be protected for shipment by the Contractor and delivered to a San Joaquin County facility as directed by the Engineer. Before shipment, if any components, as determined by the Engineer, are not to be salvaged, such materials and equipment must become the property of the Contractor and must be legally disposed of away from County property as part of this item at no additional cost.

88-7.03D Temporary Electrical Work Removal

The Contractor must salvage all temporary electrical equipment components shown on the shop drawing and any temporary system provided by the Contractor as a part of this project. Scope of temporary electrical work must be field verified by the Contractor prior to bid, any removal or salvage work, or before using temporary electrical work for operation of the bridge during construction. No additional payment will be made for work not shown on the shop drawing, but at the bridge at the time of bid.

Coordinate with the Engineer for construction of all other disciplines that may affect operations, schedule or functional requirements of the bridge.

Where removal of materials and equipment for the temporary electrical system is called for in the Plans, such materials and equipment must become the property of San Joaquin County, where directed. The Contractor must coordinate directly with the San Joaquin County for identification and verification of items that must be salvaged and delivered to San Joaquin County. All identified items must be removed, packaged, and delivered to anywhere in San Joaquin County as pre-determined with the San Joaquin County. Prior to shipment, if any components, as determined by the Engineer, are not to be salvaged, such materials and equipment must become the property of the Contractor and must be legally disposed of away from County property as part of this item at no additional cost.

The County may direct the Contractor to dispose of temporary electrical system equipment. If directed, the Contractor must do so at no additional cost.

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88-7.03D(1) Disconnect

Power must be turned off prior to disconnecting any equipment.

All equipment that is slated for replacement which includes: conduits, conductors, junction boxes, pull and/or terminal boxes, motors (including accessories), transformer, panelboards, instrumentation, and other miscellaneous incidental equipment as shown on the Contract Documents must be disconnected without damage to any adjacent equipment or connections which are to remain.

Disconnect all temporary equipment (either hydraulic machinery or electrical) during various phases of construction as the space occupied by the temporary equipment will be required for permanent installation of new equipment. Equipment must be disconnected to not interrupt regular operation of the bridge.

88-7.03D(2) Removal

Removal of junction pull and/or terminal boxes, conduits, wiring and other miscellaneous damaged equipment must be done in such a manner as to protect the existing bridge structure and other machinery and electrical components and associated hardware which are to remain.

The Contractor must take care, during removal operations, to prevent damage to adjoining parts and components that are to be reused. All components damaged by the Contractor, unless scheduled to be discarded, must be repaired, or replaced, as ordered by the Engineer, at no additional cost. All work must be coordinated with the accepted staging plan to keep bridge running and operational.

88-7.03D(3) Disposal

All removed equipment with associated hardware and miscellaneous damaged equipment must become property of the Contractor as determined and accepted by the Engineer and must be promptly removed from the site and disposed of in a legal manner as ordered by the Engineer.

88-7.03D(4) Patching

All openings which are not to be reused must be sealed in a watertight manner approved by the Engineer. All areas where equipment is removed must be cleaned and delivered in a tidy manner after removal.

88-7.04 PAYMENT

Payment for 'Electrical Equipment Demolition' must be made on a lump sum basis.

88-7.04A Basis of Payment

The lump sum bid price for the Item 'Electrical Equipment Demolition' must include the cost of furnishing all labor, materials, plant, equipment, and all necessary incidentals required to satisfactorily perform and complete the work described herein and perform the work described herein and shown on the plans. All removal/salvage operations and work must be included in this item.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item.

The Engineer must evaluate this breakdown and must have the authority to revise the breakdown as, in his judgment, may be required to make the various components of work conform to their true values.

The Contractor must agree that the detailed breakdown must not become effective until it has the Engineer's acceptance.

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The total lump sum value for this item must be broken down in detail.

The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

Item 'Electrical Equipment Demolition'

Upon completion and acceptance of the San Joaquin County of the comprehensive staging plan for the Electrical Equipment Demolition and documentation the temporary electrical operating system, Contractor will be paid 10 percent of the distributed bid price.

Upon removal and disposal of all equipment and materials slated for removal or replacement and upon inspection and acceptance by a representative of the San Joaquin County, Contractor will be paid 50 percent of the distributed bid price.

Upon delivery of the materials and equipment to the San Joaquin County anywhere in San Joaquin, inspection by a representative of San Joaquin County that it is in good working condition, and acceptance of the items, the Contractor will be paid 40 percent of the distributed bid price after submitting a signed receipt from the representative of San Joaquin County for the Engineer's review and acceptance of the payment.

Before beginning any work, the Contractor must submit to the Engineer a detailed schedule of work operation. This schedule must be complete and include the expected percentage of work to accomplish within specific time frames. The Contractor must prepare and submit an updated work schedule due to unforeseen issues. Failure by the Contractor to present such a document upon request will cause the progress payment procedure to terminate immediately.

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
880090	Electrical Equipment Demolition	Lump Sum

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98-1 GENERAL MACHINERY

98-1.01 GENERAL

98-1.01A General

This section gives the general requirements which apply to all bridges and their machinery. Also, this section applies to the installation of electric motors, brakes, instrument drives and limit switches to be mounted with the machinery but supplied under separate items.

The cost of work required by this "General Machinery" is included in the bridges' machinery pay items.

98-1.01B Definitions

Certified Test Reports: As used herein, certified test reports refer to reports of tests conducted on previously manufactured materials or equipment proposed for use. Results of the tests shall be submitted in accordance with the provisions of this Contract for laboratory test results.

Factory Tests: As used herein, factory tests refer to tests required to be performed on the actual materials or equipment proposed for use. Results of the tests shall be submitted in accordance with the provisions of this Contract for laboratory test results.

98-1.01C Submittals

98-1.01C(1) General

Manufacturer's data and/or shop drawing data shall be submitted for all manufactured and purchased items of bridge machinery. Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 60 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

Submittals for each manufactured item shall be manufacturer's descriptive literature, drawings, diagrams, performance and characteristic curves, and catalog cuts, and shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, applicable Federal and Military Specification references and all other information necessary to establish Contract compliance.

Temporary means needed to complete machinery items shall be developed by the contractor and submitted to the engineer for review. Submittals shall include all necessary information to illustrate and confirm safe operation and support of the machinery and/or span. Submittals should include shop and working drawings, installation and erection drawings, catalog and specification sheets, and checked calculations. Submittals shall be signed and sealed by a Professional Engineer licensed in the appropriate discipline by the State of California.

98-1.01C(2) Shop Drawings

Shop drawings shall conform to San Joaquin County Standards and as supplemented and amended elsewhere herein and to the special requirements specified hereinafter.

Shop drawings shall show all parts completely detailed and dimensioned. The grade and amount of finish machining, with all tolerances and allowances, shall be stated for each part for which a specific fit is required. Finished surfaces shall be defined by the ANSI B46.1, "Surface Texture", and fits shall be defined

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by the ANSI B4.1, "Preferred Limits and Fits for Cylindrical Parts", unless otherwise stated herein or on the Plans. ANSI B4.1 shall also apply to fits for non-cylindrical parts.

All proprietary items shall be shown in outline on the drawings, which shall also indicate the method and sequence to be employed in assembly of bridge machinery and installation of necessary utilities support and service facilities. Shop drawings shall show all external dimensions and clearances necessary for installation and operation of each item of machinery in the bridge. All catalog cuts are considered as shop drawings. After approval, all catalog cuts are to conform to shop drawing for requirements and scanned as a PDF file format in accordance with the requirements of San Joaquin County.

For all bridge machinery shown on the Plans or listed herein, the Contractor shall furnish complete assembly diagrams showing each part contained within the item and the manufacturer's part number assigned to each part. The diagram shall be sufficient to enable complete disassembly and reassembly of the item covered. In the event that any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor shall deliver a drawing that details each modification; and the part shall be assigned a unique part number to preclude the supply of replacement parts not modified in similar fashion. The assembly drawings of each item shall, in addition to identifying and describing each internal part, contain dimensions of all principal elements within the item; certified external dimensions affecting interfaces or installations; gross weight capacity and normal operating ratings; method and recommended types of lubrication, including location and type of fittings and provisions for adding, draining, and checking the level of each lubricant employed; inspection openings, seals and vents; and details of all fasteners used to mount the equipment to its foundation.

Complete shop bills of materials shall be made for all machinery parts. If the bills are not shown on the shop drawings, prints of the bills shall be furnished for approval in the same manner as specified for the shop drawings.

The material and material specifications shall be stated for each part. Where American Society for Testing and Materials Specifications or any other Standard Specifications are used, the designating numbers of such Specifications shall be given. The following abbreviations will be used herein, and on the Plans to designate Standard Specifications for materials and workmanship:

American Association of State Highway and Transportation Officials, AASHTO

American Bearing Manufacturers Association, ABMA

American Gear Manufacturers Association, AGMA

American Iron and Steel Institute, AISI

American National Standards Institute, ANSI

American Railway Engineering and Maintenance-of-Way Association, AREMA

American Society for Testing and Materials, ASTM

National Lubricating Grease Institute, NLGI

National Electrical Manufacturers Association, NEMA

Society of Automotive Engineers, SAE

Complete assembly and erection drawings shall be furnished. These drawings shall give identifying marks and essential dimensions for locating each part or assembled unit with respect to the bridge structure or foundation. Use of mirror image or opposite hand erection drawings will not be allowed.

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Each shop drawing shall be given a suitable title to describe the parts detailed thereon and shall state by whom shop inspection will be made. The Contractor shall allow the County or their authorized inspectors to audit their facilities prior to start of any fabrication, casting, machining, etc. in order to expedite inspection procedures by all inspection agencies and authorized personnel.

Standard Compliance: Where equipment or materials are specified to conform to requirements of the standards of an organization, such as American Society for Mechanical Engineers (ASME), Underwriters Laboratories (UL), American Gas Association (AGA), and American Refrigeration Institute (ARI), that use a label or listing as method indicating compliance, proof of such conformance shall be submitted and approved. The label or listing of the specified organization will be acceptable evidence. In lieu of the label or listing, the Contractor shall submit a certificate from an independent testing organization adequately equipped and competent to perform such services and approved by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 60 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor shall submit to the Engineer for his approval all shop drawings. In case of correction or rejection, the Contractor shall resubmit until each drawing is approved. The Contractor shall bear all costs for damages, which may result from the ordering of any materials prior to the approval of the shop drawings. After approval of the shop drawings, the Contractor shall supply the Engineer with copies of the approved shop drawings.

The Contractor shall update shop drawings digitally upon completion of installation to reflect the final condition and submit updated shop drawings as as-builts.

98-1.01D Operating and Maintenance Manuals

Operating and maintenance manuals shall be provided by the Contractor as per Item "Operating and Maintenance Manuals Supplement" in Section 88.

98-1.01E Posted Operating Instructions

Operating instructions approved by the Engineer shall be provided for the system and each principal piece of equipment for the use of operation and maintenance personnel. The operating instructions shall include diagrams showing the complete layout of the entire system, and shall be framed under glass or in approved laminated plastic and posed where directed by the Engineer; printed or engraved operating instructions for each principal piece of equipment including proper adjustment, operating, lubrication, safety precautions, procedure in the event of equipment failure, and any other necessary items of instruction as recommended by the manufacturer of the unit shall be attached to or posed adjacent to the piece of equipment or as directed by the Engineer. Operating instructions exposed to the weather shall be made of weather-resisting materials or shall be suitably enclosed to be weather protected. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

98-1.01F Quality Assurance

98-1.01F(1) General

Standard Products. Materials and equipment shall be essentially the standard catalogued products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest standard design that complies with the specification requirements. Materials and equipment shall essentially duplicate items that have been in satisfactory commercial or industrial use at least two years prior to bid opening. Where two units of the same class of equipment are required, these units shall be

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products of a single manufacturer; however, the component parts of the system need not be the products of the same manufacturer. Each major component of equipment shall have the manufacturer's name and address and the model and serial number on a nameplate, securely affixed in a conspicuous place. The name plate of the distributing agent will not be acceptable.

Manufacturer's Recommendations. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material. The Contractor shall provide as part of the work all special machining and installation required by the component manufacturer.

Code and Standards. Work under bridge machinery pay items shall comply with all applicable requirements of the latest edition of codes and standards issued by, but not limited to, the following organizations and publications, whose abbreviations used in this Specification shall be as shown:

American Association of State Highway and Transportation Officials, AASHTO

American Bearing Manufacturers Association, ABMA

American Gear Manufacturers Association, AGMA

American Iron and Steel Institute, AISI

American National Standards Institute, ANSI

American Society for Testing and Materials, ASTM

American Welding Society, AWS

National Lubricating Grease Institute, NLGI

Society of Automotive Engineers, SAE

San Joaquin County Standard Specifications

The design of new machinery conforms to the 1988 Standard Specifications for Movable Highway Bridges published by the American Association of State Highway and Transportation Officials, 1992 and 1993 Revisions (hereinafter referred to as the AASHTO Standard), except as otherwise noted on the Plans or otherwise specified herein.

98-1.01F(2) Qualifications, Personnel, and Facilities

For the fabrication, installation, aligning, cleaning, lubricating, testing and all other work required by bridge machinery pay items, the Contractor shall use adequate numbers of skilled, trained, and experienced mechanics, millwrights and service personnel who are thoroughly familiar with the requirements and methods specified for the proper execution of work.

Mechanics, millwrights, and service personnel shall be properly equipped with all necessary instruments to assure that related components have been provided within acceptable tolerances and to make all necessary adjustments for attaining the specified ratings.

98-1.01F(3) Rules, Regulations, and Facilities

Work shall comply with all applicable Federal, State, and Local rules, regulations, and ordinances.

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In the event of a conflict between these Specifications and the above-mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement shall apply.

98-1.01F(4) Measurements and Verification

Dimensions indicated on the Plans are nominal and are intended for guidance only. All variations from the nominal dimensions on the Plans shall be noted on the shop drawings.

98-1.01F(5) Substitutions

The terms “approved equal”, “of equal quality” and “or equal” which appear on the Plans and in these Specifications are intended to allow the Contractor to substitute other manufacturers and model numbers of products of equal quality and rating for those specified.

Prior to the Contractor’s ordering of any substitute product, the Engineer’s approval of the equivalence of the substitute product shall be obtained in writing. The acceptance of the substitute products is at the sole discretion of the Engineer who will establish the basis for equivalence and will review the quality of the materials and products described in detail on the submitted shop drawings and product data.

The Engineer will “Approved” or “Revise and Resubmit” substitute material. Upon return of a shop drawing showing rejection, the Contractor shall resubmit the shop drawing showing the specified product. Rejection shall not in any way result in any extra cost.

Approval by the Engineer of any substitute products submitted by the Contractor shall not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that product.

Where a manufacturer’s name and catalog part number, in this Specification or on the Plans, specifies a particular product it is so specified to establish quality, configuration, and arrangement of parts. An equivalent product made by another manufacturer may be substituted for the specified product subject to the approval of the Engineer; however, all necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, shall be made by the Contractor at no additional cost.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted as soon as practicable for approval. No such departures shall be made without approval by the Engineer.

98-1.02 MATERIAL

98-1.02A Castings and Forgings

98-1.02A(1) General

Before any work is started on castings and forgings, the manufacturer shall communicate with the Engineer to arrange for inspections and tests. The Engineer shall be notified not less than five (5) working days prior to the start of work so that a representative of the Engineer may be present.

All necessary precautions shall be taken to fabricate the castings true to pattern in form and dimensions, free of pouring faults, cracks, cold shuts, blow holes and other defects in positions affecting their strength and value for the service intended.

All castings shall be cleaned free of loose scale and sand; all fins, seams, gates, risers and other irregularities shall be removed. All unfinished edges of castings shall be neatly cast with rounded corners and all inside angles shall have ample fillets.

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98-1.02A(2) Required Testing

All castings shall be visually examined in accordance with ASTM A802, meeting visual inspection acceptance criteria Level II. Castings that do not pass this test may be rejected. Test results, whether positive or negative, shall be submitted to the Engineer. Test records meeting Level III may be considered for weld repair, provided the manufacturer submits a procedure to the Engineer for review and approval.

All castings that have solid sections 2-inches thick or greater in the as-cast condition and all fracture critical members shall be ultrasonically tested in accordance with ASTM A609, Method A, meeting Quality Level 2. Castings that do not pass this test may be rejected. Test results, whether positive or negative, shall be submitted to the Engineer. Test records meeting Quality Level 3 may be considered for weld repair, provided the manufacturer submits a procedure to the Engineer for review and approval.

All casting surfaces shall be magnetic particle examined in accordance with ASTM E125, meeting the following acceptable levels of discontinuities:

i. Type I	Cracks/Hot Tears	1/4-inch max
ii. Type II	Shrinkage	Degree 3
iii. Type III	Inclusions	Degree 3
iv. Type IV	Chaplets	Degree 2
v. Type V	Porosity	Degree 1

Test results, whether positive or negative, shall be submitted to the Engineer. All surface discontinuities may be considered for weld repair, provided the manufacturer submits a procedure to the Engineer for review and approval.

All repair procedures shall include details of the areas to be repaired and a means to qualify the repair method. Approved repair procedures shall be performed prior to final heat treatment, so that no weld repairs will be needed after final machining. In addition, all surface defects removed by rough machining shall be performed prior to final heat treatment.

All castings that fail to meet the established acceptance criteria and considered rejected shall be replaced, at the Contractors expense, with new castings.

All carbon and alloy steel forgings shall meet the requirements of AASHTO Specification M102 (ASTM A668) unless otherwise indicated or approved by San Joaquin County.

All forgings shall be reduced to size from a single bloom or ingot until homogeneity is secured. The blooms or ingots, from which shafts or pins are to be made, shall have a cross-sectional area at least three times that required after finishing. No forging shall be done at less than a red-heat.

All finish machined forging surfaces shall be magnetic particle examined in accordance with ASTM A275. The maximum permissible indication on any surface shall be 1/4-inch. Indications greater than 1/4-inch may be cause for rejection. Test results, whether positive or negative, shall be submitted to the Engineer.

98-1.02A(3) Independent Testing

Independent inspection and testing, destructive and/or non-destructive, may be performed by a representative of the Engineer and shall be paid for by the Contractor. The tests would be in addition to and independent of tests being performed by the Contractor as per the plans and specifications.

The Contractor shall furnish, i.e. make available for use, all facilities at the foundry, forge shop and/or machine shop for independent inspection and testing, destructive and/or non-destructive, required by the Engineer.

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The previously noted acceptance criteria shall apply to any independent testing. In addition, the independent testing may include radiographic testing to help isolate areas, which in the opinion of the Engineer, may require further investigation. Acceptance or rejection will not depend solely on the radiographic test results but rather they will help define any flaws, which may be of concern to the Engineer.

98-1.02A(4) Bronze Castings

All bronze castings shall meet the requirements of AASHTO Specification M107 (ASTM B22) and be Copper Alloy UNS No. C91100 unless otherwise indicated.

98-1.02B Shafting and Pins

All shafts shall conform to tolerances in ASTM A29 unless otherwise indicated. Turned, ground and polished shafting straightness tolerances shall be 0.002 inch per foot for shafts up to and 1 1/2 inches in diameter and 0.003 inch per foot for shaft over 1 1/2 inches in diameter.

All shafts and pins shall be accurately finished, round, smooth, and straight; and when turned to different diameters, they shall have rounded fillets at the shoulders. Each shaft or pin having a uniform of more than 8 inches and each shaft or pin having several diameters, of which the smallest is more than 8 inches, shall be bored lengthwise through the center to a diameter approximately one-fifth the smallest body diameter.

Each end of all shafts, when finished to the required lengths, shall have a 60-degree lathe center, with clearance hole, at the exact center of the shaft. Shafts that have a hole bored lengthwise through their centers shall have their ends prepared for the attachment of a centering device equivalent to the lathe center. All such devices shall be furnished as part of the work.

Where it is required on the Plans that stepped shafts shall have fillets blended in smoothly to adjacent surfaces without tool marks or scratches, the surfaces shall have an ANSI maximum roughness of 63 micro inches, unless otherwise required herein or on the Plans to have a finer finish.

All cold-finished shafting shall be steel of the type and grade shown on the Plans and shall be tested for its mechanical properties, and a test certificate shall be furnished to the Engineer. Each cold-finished shaft shall be free from camber and shall run without vibration, noise, or chatter at all speeds up to and including the maximum rated speed.

All hubs mounted on the ends of cold-finished shafts shall have the fit specified herein of on the Plans. To obtain the required fit between hub and shaft, the Contractor may furnish the cold-finished shaft 1/16 inch larger than the nominal diameter specified and shall turn the ends to the required dimension for the hub. The Contractor may, at his option, furnish any cold-finished shaft of one diameter end to end; but such shaft shall have tolerances selected from the normal manufacturing range, which will provide the specified fit. The selected tolerances shall be shown on the shop drawings.

Turned, ground, and polished commercial shafting of the grade specified shall be used where shown on the Plans.

98-1.02C Fasteners

All bolts, either for connecting machinery parts to each other or to supporting members are categorized as one of the following types:

- High-strength bolts
- Finished body
- Turned bolts, and studs

All high-strength bolts shown on the plans shall be ASTM F3125 type A325, high-strength bolts unless otherwise noted and tightened to slip critical criteria.

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Finished body bolts are to meet the requirements of ASTM A449 or SAE J429 GR5 cap screws. Bolts shall have finished bodies and regular hexagonal heads. Holes for finished body bolts are to be individually reamed for a clearance of not more than 0.010 inch (0.25 mm) larger than the actual diameter of individual bolts for that hole. Finished body bolts shall be tightened to slip critical criteria.

Turned bolts, and studs are to be provided with turned shanks, cut threads, and finished washer-faced hexagonal heads. For the finished shank of all turned bolts, and studs, use 1/16 inch (1.6mm) larger in diameter than the diameter of the thread. Determine the head and nut dimensions based on the thread diameter unless otherwise noted. For the shanks of all turned fasteners, use a Class LC6 fit in the finished holes in accordance with ANSI B4.1. The material for the turned fasteners shall meet the requirements of ASTM A449 unless otherwise noted. Turned bolts shall be tightened between 50% and 70% proof strength.

Dimensions of all bolt heads, nuts, and hexagonal head cap screws are to conform to ANSI/ASME B18.2.1, Square and Hex Bolts and Screws, and ANSI/ASME B18.2.2, Square and Hex Nuts.

Provide heavy series heads and nuts for turned bolts, cap screws, and turned studs.

Dimensions of socket-head cap screws, socket flat-head cap screw, and socket-set screws are to conform to ANSI B18.3, Socket Cap, Shoulder, and Set Screws. Unless otherwise called for on the plans or specified herein, make the screws of heat-treated alloy steel, cadmium-plated, and furnish with a self-locking nylon pellet embedded in the threaded section. Set screws are to be of the headless, safety type with threads of the coarse thread series and having cup points. Do not use set screws to transmit torsion nor as the fastening or stop for any equipment that contributes to the stability or operation of the bridge.

Fabricate all threads for bolts, nuts, and cap screws to conform to the coarse thread series having a Class 2 tolerance for bolts and nuts or Class 2A tolerance for bolts and Class 2B tolerance for nuts in accordance with the ANSI/ASME B1.1, Unified Inch Screw Threads.

Spot face all bolt holes through unfinished surfaces for the head and nut, square with the axis of the hole.

Unless otherwise called for or required to account for fabrication tolerances, sub drill all bolt holes in the machinery parts for connecting these parts to the supporting steel work at least 1/32 inch (0.8 mm) smaller in diameter than the bolt diameter and ream assembled for the proper fit at assembly or at erection with the steel work after the parts are correctly assembled and aligned.

Furnish positive locks of an approved type for all nuts for any fastener which may be tightened below slip critical. Use of double nuts, jam nuts, and lock wire are preferred.

Furnish a hardened plain washer at each end of finished body high-strength bolts meeting the requirements of ASTM F436.

Provide cotters conforming to the SAE standard dimensions and made of half-round stainless steel wire, ASTM A276, Type 316.

Use only fasteners manufactured in the United States with the property class and source identification appearing on the top of head.

98-1.02D Keys and Keyways

Keys and keyways shall conform to the dimensions and tolerances for square and rectangular keys of the ANSI Standard B17.1, Keys and Keyseats, unless otherwise specified. All keys shall be effectively held in place, preferably by setting them into closed-end keyways milled into the shaft. The ends of all such keys shall be rounded to a half circle equal to the width of the key. Keyways shall not extend into any bearing. If

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two keys are used in a hub, they shall be located 120 degrees apart and in line with wheel arms where practicable.

Unless otherwise specified herein or on the Plans, keys shall be machined from alloy-steel forgings, ASTM A668 M, Class K.

98-1.02E Bearings and Bushings

All split bearings shall have one half fitted to the other half as shown on the Plans. The surface between the cap and the base shall be accurately machined. All caps shall be securely bolted to the bases with turned bolts and double nuts. All caps and bases shall be provided with double-flanged bushings securely held against changing position under load by hexagonal-head, steel cap screws, unless otherwise shown on the Plans. All bushings shall fit the inside bore and end faces of the base and cap, with an ANSI Class LC1 clearance and location fit, and shall fit the shaft journals, with an ANSI Class RC6 running fit. All caps shall be provided with a tapped hole for lifting eyebolt, which shall be furnished for the purpose.

Bushings for split bearings shall be finished-bored with the caps in place and with 1/4-inch thick rolled bronze or brass liners. At least 1/8-inch of the liner thickness shall be of laminated construction capable of adjustment in increments of 0.003 of an inch. The edges of the liners toward the shaft journal shall be cut to fit the shaft shoulder fillets where they occur and shall be cut square and flush with the bushing flange if there is no change in shaft diameter. Except for a short distance from each end, the inside edges of the liners shall be cut back to form a grease groove along the shaft. All bolt holes shall be drilled through the liners.

For split bearings, each half bushing shall have machined double oval grease grooves connecting with the ends of the liner grooves and intersecting at the center of each half bushing, unless otherwise shown on the Plans. All grease grooves shall be precision machine-cut and smooth. The corners of all grooves shall be rounded to a radius of not more than half the width of the groove.

Anti-friction bearings shall be sized for a B-10 life of 40,000 hours as defined by ABMA for the ratings shown on the Plans.

Pillow block bearings shall be, adapter mounted, self-aligning expansion and non-expansion types as called for on the drawings. Housings shall be cast steel and capable of withstanding the design radial load in any direction, including uplift. Bases shall be cast without mounting holes. Mounting holes shall be drilled from the solid at assembly with the supporting steel work. Seals shall retain the lubricant and exclude water and debris. Cap bolts on pillow blocks shall be high-strength steel. The cap and cap bolts shall be capable of resisting the rated bearing load as an uplift force.

98-1.02F Shaft Journals

All journal bearing areas on shafts and pins shall be accurately turned, ground and polished with no trace of tool marks or scratches on the journal surface or adjoining shoulder fillets. Burnishing of the shaft journal areas and adjoining shoulder fillets will be acceptable in lieu of grinding and polishing, provided the burnishing is done with a Stellite roller or equal which has been finished to a mirror surface. Journal diameters shall be finished to the limits of an ANSI Class RC6 running fit.

98-1.02G Open Gearing

Spur gears shall have 20-degree full-depth, involute cut teeth in accordance with the proportions of the ANSI/AGMA 201.02, Tooth Proportions for Coarse-Pitch Involute Spur Gears, unless otherwise specified herein or shown on the Plans.

The teeth of all gears shall be cut from solid rims or blanks. The sides and peripheries of all gears and pinions shall be finished, and the pitch circle shall be scribed on both sides not less than 0.02-inch-deep

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with a V-pointed tool. The working surfaces of all gear teeth shall be true to the proper outline, accurately spaced on the true pitch circle, exceptionally smooth, and free from planing or milling-cutter ridges. Cutter burrs shall be removed from all edges of the teeth, and the top edges of all teeth shall be rounded to a 1/32-inch radius.

Except as otherwise provided herein or on the Plans, all gears shall be cut and mounted to meet the requirements for accuracy of ANSI/AGMA Standard 2000-A88, Gear Classification and Inspection Handbook. The AGMA quality number shall be stated on the applicable shop drawings. Open gearing shall conform to AGMA Quality No. 7 or higher.

Bevel gears shall have 20-degree full-depth, involute cut teeth in accordance with the proportions of the ANSI/AGMA 2005-B88, Design Manual for Bevel Gears.

98-1.02H Enclosed Speed Reducers

Speed reducers shall be standard models from one manufacturer, with sizes, ratios and construction details as shown on the Plans.

Speed reducers shall be designed to meet all requirements of ANSI/AGMA Standard 6010, manufactured in accordance with the requirements of AGMA and given nameplates with the following information:

Size

Ratio

Service Power Rating

High Speed Shaft RPM

Service Factor

Lubrication Specification

Gear teeth shall be through hardened and conform to AGMA Quality No. 8 or higher. Casehardened gears shall not be used to drive bridge machinery.

Gears shall have spur, helical, herringbone or bevel teeth, bearings shall be antifriction type, and housings shall be steel castings or welded steel plate, which shall be stress relieved. The inside of the housings shall be sandblast cleaned prior to assembly and be protected from rusting. Exact ratios shall be furnished where specified.

Speed reducers shall be able to withstand a momentary overload equal to three (3) times the rated full load torque of the driving motor(s) without any component reaching 75 percent of its yield strength.

Lubrication of the gears and bearings shall be automatic when the unit is in operation.

It is preferable that a bath lubrication system be utilized. In a bath lubrication system, all components in the speed reducer, which require lubrication, are partially submerged in an oil bath.

When the configuration of gears and bearings prevent bath lubrication, a splash lubrication system should be used. Splash lubrication systems shall continuously lubricate all gears and bearings properly. Oil feed troughs may be used to supply oil to bearings and gears, which are above the bath. Splash lubrication systems shall be designed such that equal lubrication is supplied to each internal component for both directions of operation.

If a pressurized lubrication system is required for the reducer, a redundant secondary lubrication system shall be provided. The secondary system shall operate at all times when the primary system is functioning.

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Inspection ports on reducers shall provide for inspection of all gears, bearings, and other internal devices. The ports shall be located above the oil level, if practicable, so that oil draining is not required for inspection. The port shall be sized such that minor repairs could be made to reducers without requiring housing disassembly. Ports shall be properly sealed with seals that do not require replacement when ports are opened.

Reducers shall be furnished with moisture trap breathers, oil fills, break proof glass oil level indicators, drains and inspection ports.

Moisture-trap breathers shall be located above maximum oil levels in all positions of the reducer during operation, and its piping shall enter the unit at the highest point possible. Breathers shall not be mounted in bearing caps.

Oil level indicators shall be mounted in locations that can be easily viewed by maintenance crews. On reducers in which the oil level varies by more than 1/2-inch per 50°F temperature change, the sight glass shall be graduated. The indicator shall be vented back to the case. Sight glasses shall be of rugged construction and protected against breakage.

Oil drains shall be located at the lowest point possible. The drain shall have a hand operated level which can be locked in the closed position.

Oil sampling cocks shall be located in accessible positions on the reducers. There shall be two sampling cocks, one located at the lowest level of oil and one just below the upper oil level.

Speed reducers shall have provisions for oil expansion due to churning and temperature change.

Grease lubricated reducer bearings shall be furnished with separate fill and purge fittings, readily accessible after installation of reducer. Grease lubricated reducer bearings shall be furnished with internal seals between the bearing housing and reducer cavity, preventing grease and gear oil from interacting.

On shaft extensions, bearing shaft ring seals shall be mechanical type oil seals which compensate for wear. Dual lip spring loaded seals are preferred.

Shaft extensions for the various reducers shall be of the arrangement, lengths, and diameters shown on the Plans. Couplings shall be shrink fitted on the shafts in the shop.

On open-ended lower bearings of vertical shafts, extra precaution must be taken to prevent oil leakage. A dry-well arrangement in which the bearing is isolated from the oil bath is preferred. Grease lubrication of the lower bearing is required in these applications.

Pinions shall be proportioned so that the root diameter of the pinion is not smaller in diameter than the diameter of the journals for the pinion shaft.

Base plates for the reducers shall be large enough to give unobstructed access for drilling and reaming the mounting holes from above the unit.

Speed reducers driving bridge machinery and electrical controls shall be shown on Plans or approved equal.

The manufacturer shall submit for approval by the Engineer a certified print of each speed reducer showing a minimum of the following:

All external mounting dimensions including shaft sizes, bores, and keyways where required.

Internal Plans showing each reducer component with part numbers.

The ratings that will appear on the nameplate.

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Location of all lubricant connections and details of any external lubrication piping.

Lubrication recommendations.

The manufacturer shall submit for approval by the Engineer computerized calculations showing conformity to the requirements of the AGMA Standard Practice specified. The approved reducer prints and design calculations must be made available to the County of San Joaquin prior to construction of the unit.

98-1.02J Hubs and Bores

The hubs of all gears, wheels, and couplings shall be finished on both faces and polished where the hub face performs the function of a collar to prevent shaft movement. The hubs shall be bored concentric with the rims of gears and wheels or with the outside of couplings. All hubs shall have an ANSI Class FN2 medium shrink fit on the shafts, unless otherwise specified.

98-1.02K Shims

Where shown on the Plans, all machinery shims required for leveling and alignment of equipment shall be stainless steel, neatly trimmed to the dimensions of the assembled parts and drilled for all bolts that pass through the shims.

Shims shall be Stainless Steel ASTM A240 Type 316 and furnished without bolt holes. Holes in shims shall be drilled and reamed to the same tolerance as the connected parts at final assembly. Shims greater than 1/2-inch shall include one solid plate of thickness equal to 1/2-inch less than total shim thickness.

Shims shall be shown and fully dimensioned as details on the shop drawings. Shims with open side or U-shaped holes for bolts will not be permitted. No shims shall have less than two holes for bolts, unless specified otherwise in the Plans. Bolt holes shall not be punched at machine shop to prevent distortion of the shims.

In general, sufficient thickness shall be furnished to secure 1/64-inch variations of the shim allowance plus one shims equal to the full allowance. The 1/2-inch nominal shim pack consists of the following thickness variations: one 1/4-inch, one 1/8-inch, one 1/16-inch, one 1/32-inch and two 1/64-inch.

98-1.02L Welding

Welding required for machinery shall be done in accordance with the Bridge Welding Code. ANSI/AASHTO/AWS D1.5 and all interim revisions published by AASHTO as of the bid opening date. Stress relieving will be required only specified. All welds used to fabricate machinery shall be completely tested by ultrasonic inspection (ASTM E164-74) per AWS D1.5 for compression welds unless otherwise noted. All machining shall be performed after welding and stress relieving.

Welding joint sizes and details shall be shown on working drawings. Where multi-pass welds are required, welding procedures shall be submitted with shop drawings. Distortion during fabrication shall be kept to a minimum by the use of welding fixtures and proper welding procedures.

98-1.02M Machinery Guards

Machinery guards shall be provided for all moving parts readily accessible to personnel and where otherwise required by OSHA or ANSI B15.1, Safety Standard for Mechanical Power Transmission Apparatus, including but not restricted to the following:

Couplings

Open Gears

Unused shaft extensions

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Shafts at platform and roadway level

Brakes

Instrument drives and limit switches

Machinery guards shall not be required for the rack segments and pinions. Machinery guards shall be constructed to comply with the applicable requirements of ANSI B15.1, Safety Standard for Mechanical Power Transmission Apparatus.

Unless otherwise indicated or specified, all machinery guards shall be constructed of stainless steel having minimum thickness of No. 12 Gauge and shall have provision for removal without requiring disassembly of any machinery component.

Machinery guards shall be provided with removable hinged or bolted covers for access to lubrication fittings enclosed by the guard. Phenolic nameplates shall be provided on these covers with lubrication instructions.

Machinery guards shall be painted Safety Orange.

98-1.02N Flexible Couplings

Couplings shall be of the type as shown on the Plans and shall include grid type, gear type, and others as needed.

Couplings shall, in general, be finish-bored and have keyways cut by the Coupling Manufacturer to dimensions and tolerances established on the shop drawings and then shipped to the manufacturers of the various components for shop installation on the shafts.

Grid-type, self-aligning, fully flexible, torsionally flexible couplings shall be used to connect electric motors to machinery components. the grid-type couplings shall have steel hubs, alloy steel grids, and steel or aluminum covers. Bolts in the covers shall be shrouded.

Gear-type, self-aligning, full-flexible couplings or semi-flexible couplings with floating shafts shall be used to connect all machinery components, except where other types of couplings are called for on the Plans. All couplings shall have shrouded bolts. The gear-type couplings shall be made of forged steel, have curved face teeth, and shall provide for at least a plus and minus of 3/4 degree misalignment per gear mesh.

Special couplings shall be as shown on the Plans.

Couplings shall be standard products of an established Manufacturer.

98-1.02O Lubrication

Lubrication Fittings: All bearings and surfaces requiring lubrication, other than gear teeth, shall be fitted for a pressure system of lubrication using NPS 1/4-inch giant button head fittings, unless otherwise indicated on the Plans. The fitting for greasing bushed bearings shall be tapped into the housing or connected thereto by stainless steel seamless pipe, which shall be tapped into the housings so that grease will be discharged directly through the housing, shims, bushing, and into the grease grooves for distribution. All grease fittings shall be conveniently located for greasing, and if necessary, shall be connected to the points requiring lubrication from convenient lubrication stations by NPS 1/4-inch stainless steel seamless pipe – schedule 80 with stainless steel threaded pipe fittings – 3000 psi. All stainless steel pipe and fittings shall meet ASTM A312 and ASTM A182, respectively. All pipe extensions shall be kept as short as practical, shall be securely supported at fittings and intermediate points and located so that it shall be protected from injury. All lubricating equipment shall be installed in perfect condition.

Not more than two sizes of fittings shall be used. The large size shall be used wherever possible, and the smaller size shall be used for motor bearings and other small devices. Pressure fittings shall be rated at a

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minimum of 10,000 psi. Fittings shall contain a steel check valve that will receive grease and close against back pressure.

Immediately after the completion of fabrication, all fitting locations shall be plugged until components are installed and regular lubrication is started. The plugs shall then be replaced with the proper grease fittings. During installation, the Contractor shall lubricate all rotating and sliding parts of the machinery and fill all gear reducers, bearing housings, and flexible couplings with lubricants indicated on approved lubrication charts.

Maintenance and lubrication literature for each machinery component shall be kept in the Control House in a heavy bound binder.

98-1.02P Spare Parts

The contractor shall provide a complete list of each and every shaft and coupling seal used at the job, including current part number and manufacturing of each seal furnished plus sufficient generic description and dimensions to order seals in the future when current models/manufacturers may no longer be identifiable.

In addition to the spare parts described under other items the following spare parts shall be provided:

One grid of each grid-type coupling.

One complete set of gaskets for every flexible coupling.

Five lubrication fittings of each different type and size used.

98-1.03 CONSTRUCTION

98-1.03A Shop Fabrication

The Contractor shall give no less than ten (10) working days notice to the Engineer of the beginning of work at foundries, forge, and machine shops so that inspection may be provided. No materials shall be cast, forged, or machined before the Engineer has been notified where the orders have been placed.

The Contractor shall furnish all facilities for inspection of material and workmanship in the foundries, forge, and machine shops and the Inspector designated by the Engineer shall be allowed free access to necessary parts of the premises. Work done while the Inspector has been refused access or presented in a manner that prevents adequate inspection will automatically be rejected.

The Inspector shall have the authority to reject materials or workmanship, which do not fulfill the requirements of these Specifications.

Inspection at the foundries, forge, and machine shops is intended as a means of facilitating the work and avoiding errors. It is expressly understood that inspection will not relieve the Contractor from any responsibility in regard to imperfect material or workmanship and the necessity for replacing defective materials or workmanship, which are delivered to the job site.

The Contractor shall furnish the Engineer with a copy of all orders covering work performed by subcontractors or suppliers.

Unless otherwise provided, the Contractor shall furnish without additional charge test specimens as required, and all labor, testing machines, tools, and equipment necessary to prepare the specimens and to make the physical tests and chemical analyses required by material specifications. A copy of all test reports and chemical analyses shall be furnished to the Engineer.

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Their acceptance of any material or finished parts by the Engineer shall not be a bar to their subsequent rejection if found defective. Rejected material and workmanship shall be replaced or made acceptable by the Contractor at no additional cost.

98-1.03B Shop Inspection and Testing

Machinery components shall be shop assembled to verify their correct fit prior to shipment. Measurements required for each assembly are shown on the Plans and/or described in individual pay items.

The speed reducer manufacturer shall shop test the reducers. The Contractors shall submit a testing procedure that will show how the test is to be performed, layout of the apparatus to be used, equipment to be used as well as forms that will be filled out to record the test. This procedure is to be reviewed and approved by the Engineer prior to testing being performed.

Except for instrument drive reducers, testing shall be performed on all reducers.

Before the start of the test, the following measurements shall be taken and documented. All documentation shall be submitted with the certificate of compliance:

- Temperature of ambient air.

- Temperature of oil near bottom of crankcase shall preferably not rise more than 40°F from ambient during the test. Oil temperature exceeding 150°F shall not be acceptable.

- Surface temperature of each bearing adjacent to shaft seals shall not rise more than 100°F from ambient during the test. Temperature above the rating of the seals or bearings is unacceptable.

- Sound level at point above and 3 feet distant from the edge of housing of unit shall not exceed 90dbA.

All reducer testing shall orient in the same mounting position as installed on the bridge.

Each reducer shall be first tested by running at no load and at 100% rated motor RPM for at least 2 hours in each direction (4 hours total continuous operation). Readings of measurement 4a through 4d above shall be taken at 30-minute intervals for the full duration of the test.

Each reducer shall be tested by running at 150% rated full load motor torque and at 100% rated motor RPM for 1/2-hour in each direction (1-hour total continuous operation). Readings of measurements 4a through 4d shall be taken at 15-minute intervals for the full duration of the test.

The tests shall be performed with the reducer filled to the dip-stick mark, with new oil of the type the manufacturer recommends on the lubrication charts for normal operation.

The reducer shall be checked for the following during both the load and no load testing:

- Any excessive or unusual noise

- Excessive bearing clearance

- Excessive vibration

- Excessive temperature rise

The proper lubrication of the oil system shall be demonstrated during the shop test.

Gear teeth shall be checked for proper distribution of load. This can be measured with the help of tooth contact tape applied to each gear. These tapes will be preserved in the records to be submitted with the Certificate of Compliance.

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Bluing dye can be used as an alternate so long as all teeth are coated and digital photographs taken before and after the tests are included with the report.

No testing shall be performed on the reducer without a representative of the Owner being present. Any testing not witnessed by the Engineer or the Owner's representative shall not be acceptable.

If any condition in 9a through 9d is observed, the manufacturer shall be put on notice by the Engineer of the observation. The manufacturer shall then determine the cause and corrective action necessary to correct the condition and submit a report to the Engineer for review and acceptance. A retest of the reducer will be required to show that the repair has corrected the condition and the Engineer or Owner's representative will determine if the reducer is acceptable.

The County of San Joaquin reserves the right to reject the reducer at any time for any nonconformance that is determined to be detrimental to the proper function and operation of the reducer. Repairs to be performed on the reducer shall be reviewed and accepted by the Engineer prior to the work being performed.

The Contractor is responsible for furnishing all materials required for the test including, but not limited to motor, test stand, and oil.

Additional testing of speed reducers may be specified under individual pay item sections.

98-1.03C Defective Material and Workmanship

All machinery rejected during inspection and testing that is not made acceptable shall be removed from the work site and replaced without additional cost.

Delays resulting from the rejection of material, equipment or work shall not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation shall be corrected by the Contractor without cost. In the event that the Contractor does not make the corrections in a timely manner, the County of San Joaquin reserves the right to make necessary corrections with its own forces and charge the resulting costs to the Contractor.

98-1.03D Delivery and Storage

98-1.03D(1) Protection for Shipment

Machinery parts shall be cleaned of dirt, chips, grit, and all other injurious materials prior to shipping and shall be given a coat of corrosion-inhibiting preservative.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion shall be coated as soon as practicable after finishing with a rust-inhibiting preservative. Excepting unfinished metal surfaces inside of gear reducers, this coating shall be removed prior to operation and from all surfaces prior to painting after erection.

Any interface between stainless steel or aluminum and Structural Steel shall receive an Engineer approval coat of zinc-chromate primer prior to assembly.

Machinery parts shall be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage.

Shaft journals that are shipped disassembled from their bearings shall be protected during shipment and before erection by a packing of oil-soaked rags secured in place by burlap and covered with heavy metal thimbles or heavy timber lagging securely attached. Every precaution shall be taken to ensure that the bearing surfaces are not damaged and that all parts arrive at their destination in satisfactory condition.

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Pillow blocks with anti-friction bearings that are shop mounted on shafts shall be supported independently of the shaft support to prevent false brinelling during shipment.

Assembled units shall be mounted on skids or otherwise crated for protection during handling and shipment.

98-1.03D(2) Packaging and Delivery of Spare Parts

Spare parts shall be protected for shipment and prolonged storage by coating, wrapping, and boxing.

All spare parts shall be durably tagged or marked with a clear identification showing the designation used on the approved shop drawing.

Boxes for spare parts shall be clearly marked on the outside to show their contents. Spare parts shall be delivered to a location designated by Bridge Maintenance.

98-1.03D(3) Guarantee and Warranties

Manufacturer's warranties or guarantees on equipment, materials or products purchased for use on the Contract which are consistent with those provided as customary trade practice, shall be obtained by the Contractor and, upon acceptance of the Contract, the Contractor shall assign to the County of San Joaquin, all manufacturer's warranties or guarantees on all such equipment, material, or products furnished for or installed as part of the Work.

The Contractor shall warrant the satisfactory in-service operation of the mechanical equipment, material, products, and related components. This warranty shall extend for a period of one year following the date of final acceptance of the Project.

98-1.03E Erection

98-1.03E(1) General

For each stage of construction, the Contractor shall submit calculations, drawings, and procedures detailing his intended scheme for installing all machinery. Machinery installation shall be done in a coordinated manner to ensure all the machinery components fit the adjacent material furnished under other items.

98-1.03E(2) Alignment and Bolting

The order of assembly and alignment of bridge machinery shall start at the final driven components and worked back to the prime mover. The Contractor shall limit the finality of some stage machinery installations so that proper alignment of mating components is met prior to final reaming and fastening.

All open gearing shall be aligned such that backlash is within tolerance and at least the center 50% of the effective face width of each pair of meshing teeth is in contact. The cross mesh shall not exceed 0.01 inch per 6 inches of face width. All open gear measurements shall be submitted to the Engineer for review and approval. The measurements include backlash, cross-mesh alignment, tooth valley gap and face contact. The type of bluing or lubricant used for face contact measurements shall be submitted to the Engineer for approval prior to any measurements. The measurements shall be performed at a minimum of 8 equally spaced span positions ranging from fully open to fully closed.

All parts of the machinery shall be match marked for proper assembly and correct orientation. Before final drilling or reaming, all parts shall be adjusted to exact alignment by means of shims. If required, tapered shims shall be provided at no additional cost. Installation, alignment, and shimming of the electric motors, and devices such as limit switches and encoders, shall be included with the machinery for such erection. After final alignment and bolting, all parts shall operate smoothly.

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The span shall not be operated by the bridge machinery until all components are installed, in final alignment and bolted as approved by the Engineer.

Bolt holes in structural steel for connecting machinery shall, in general, be drilled from the solid after final alignment of the machinery. Sufficient erection holes, subdrilled 1/4-inch undersize for undersized temporary bolts, may be used for erection and alignment of the machinery. When the machinery is aligned in its final position, the temporary bolts shall be removed one bolt at a time, full-size holes for the remaining bolts shall be drilled or subdrilled and reamed, and the full-size bolts installed.

Bolt holes in structural steel, shims, and machinery components shall be drilled and reamed assembled to assure accurate alignment of the hole and accurate clearance over the entire length of the bolt within the specified limit. Hand held reamers are not considered accurate enough and the Contractor shall assume that a reaming jig shall be used to keep the bolt hole cylindrical. This jig shall be of structural steel, fixed to the drill and secured to the work preventing the reamer shaft from deviating. Holes shall be checked with a bolt hole micrometer to assure uniform diameter.

ASTM A449 bolts shall be torqued to the same tension required for ASTM F3125 bolts specified in the Standard Specifications.

Torques for other classes of bolts shall be proportioned to their strength and shall be indicated on the erection drawings.

98-1.03E(3) Coatings

Threads for turned bolts shall be coated with anti-seize compound before assembly with nuts to prevent corrosion or galling and to facilitate future removal if necessary.

98-1.03E(4) Edges and Corners

All edges and corners of machinery parts, sheet metal work, bed plates, and fabricated supports that are exposed in the finished work shall be rounded or chamfered. All burrs or other surface defects that could be injurious to workers erecting or maintaining the bridge machinery shall be removed.

98-1.03E(5) Personnel and Facilities

The machinery shall be erected and adjusted by competent millwrights skilled in the type of work involved. They shall be provided with all necessary measuring and leveling instruments as may be required.

98-1.03F Painting

98-1.03F(1) General

Cleaning and painting of all unfinished surfaces of machinery shall comply with requirements of Section 91 of the Caltrans Standard Specification. A three-coat system for metal shall be used. The Contractor shall submit for review with the working Plans an outline of painting materials and methods.

98-1.03F(2) Shop Painting

All unfinished machinery external surfaces shall be cleaned with final surface preparation, prior to painting, done by blast cleaning to meet the requirements of SSPC-SP6 "Commercial Blast Cleaning" with the following exceptions:

- Flexible couplings

- Reducers

- Sleeve bearings with bushings in place

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Electric motors

Brakes

Limit switches

Other equipment with shaft seals

The equipment excepted by the Engineer

The expected machinery or equipment shall be cleaned with solvent and hand tools to meet the requirements of SSPC-SP2, "Hand Tool Cleaning" as depicted in SSPC VIS 1, "Guide to Visual Standard No. 1".

After proper surface preparation, all unfinished machinery surfaces except for the interior of gear housings, flexible couplings, and pillow blocks shall be given one shop coat of primer by hand brushing. The modified aluminum epoxy mastic primer, Carbomastic 15 or approved equal, shall be compatible with the paints selected for subsequent coats. Interiors of gear housings shall be protected with special oil-resistant crankcase paint or approved equal.

98-1.03F(3) Field Painting

After erection is complete, all machinery surfaces remaining exposed, except machine finished surfaces in sliding contact, shall be thoroughly cleaned with an approved high-flash solvent and given an immediate field coat. The epoxy polyamide intermediate, Carboguard 888 or approved equal, shall be compatible with the finish coat. The intermediate coat shall be applied by hand brushing and shall be resistant to weathering (marine environment) and abrasion and free of lead.

After field testing is complete but prior to final acceptance of machinery, all machinery surfaces remaining exposed, except machine finished surfaces in sliding contact, shall be re-cleaned with an approved high-flash solvent and given a finish field coat. The aliphatic acrylic-polyester polyurethane, Carbothane 133 LH or approved equal, shall be compatible with the previous coats. The finish coat shall be applied by hand brushing, which shall color code to distinguish between fixed and moving parts. The following colors shall be used:

Federal Safety Orange: Except for machine finished surfaces in sliding contact, for all moving parts of the machinery such as shafting, couplings, and the side of gears and brake wheels.

Federal Safety Green: For all stationary parts of the machinery. Machinery component fasteners mating with machinery supports shall be painted the same color as the structural steel.

Paint for the finish coat shall be high-gloss, resistant to weathering and abrasion and conform to OSHA color requirements of the Safety Color Code for Marking Physical Hazards, ANSI Z53.1. The brand and colors shall be submitted to the Engineer for approval. The color for each component shall be indicated on the assembly shop drawings or separate paint drawings.

The Contractor shall place cautionary signs in the Control House, which shall explain the color code. Details of the signs giving text, dimensions, and materials shall be placed on a shop drawing.

The Contractor shall take special care to avoid painting of machinery surfaces which are in normal rubbing contact. All nameplates, legend plates, and escutcheons mounted on machinery shall be masked for protection from paint. Lubrication fittings shall be kept clog-free.

98-1.03G Contractor's Inspection

After erection is completed, the Contractor shall make a thorough inspection to ensure that all gears are

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clean and free of obstruction, that all parts are properly aligned and adjusted as closely as practicable without actual operation, that all bolts are properly tightened and that the span is properly balanced.

Inspection of tightened fasteners shall be in accordance with the County of San Joaquin Standard Specifications for Roads and Structures. The Contractor's inspection shall verify that field painting has been performed as specified herein. Touch-up painting shall be performed to correct all painting defects found during this inspection.

The Contractor's inspection shall verify that all enclosed gear housings are filled to the proper level, and all rotating and sliding parts are supplied with lubricants as recommended by the Manufacturers of the units. Typical products for the various locations are as follows:

Sleeve bearings and Pillow Blocks:

NLGI #2 Grease

Open Gears:

Open Gear Lubricant (Mobiltac 375 NC)

Specific Gravity, 72°F (22°C)	0.96
SUS @ 100°F	25,000
(cSt @ 40°C	5,000)
SUS @ 210°F	5,000
(cSt @ 100°C	1,100)

Enclosed Gear Reducers:

Refer to AGMA Standard 9005.D94 "Lubrication of Industrial Enclosed Gear Drives"

Gear Couplings:

NLGI #0 Grease

Grid Couplings:

NLGI #2 Grease

The Contractor shall be accompanied by the Engineer during his final inspection before field testing. On the basis of the results of this inspection, the Engineer shall determine whether the bridge is ready for field testing.

98-1.03H Field Testing

When the machinery and electrical equipment is ready for field testing, the Contractor shall meet with the Engineer to arrange a test schedule and shall keep available a complete crew of mechanics for a minimum of four working days in order to provide operation of the swing span for all tests and to make all adjustments and corrections which shall be required to complete the tests.

The Contractor shall prepare a field testing procedure, which shall be approved by the Engineer. The testing procedure shall be coordinated with the tests required for the electrical equipment and shall include measurements of power and current draw by the motors when operating under load as required hereinafter.

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The testing procedure shall include but not be limited to the verification of proper installation, alignment, fastening, and operation and/or final adjustment of the following:

Turning Machinery

Opening Machinery

Wedge Machinery

Stabilizing Machinery

Span Lock Machinery

When the machinery is ready for field testing, the bridge machinery shall be driven by the main electrical system through at least ten complete cycles.

Three phase kilowatts, single phase amperes, span position and motor RPM for all motors shall be recorded on a computerized data acquisition system. The recordings shall be for a complete span opening and closing cycle, with at least three cycles of data for each motor. The data acquisition system shall have 16-bit resolution and shall sample at a rate of 10 Hz. Minimum. Data shall be imported into Microsoft Excel format, and graphs shall be printed out on 11 x 17 paper. Time of day shall be on the X axis, and primary and secondary Y axis shall be chosen to best present the data. In addition, a CD shall be provided with all the raw data and all the Excel files.

During the test runs, each machinery assembly shall be inspected in its entirety to determine whether everything is in proper working order and fully meets the requirements of these Specifications, Plans and manufacturer's recommended tolerances. All test runs shall be performed in the presence of the Engineer. The temperature rise of all machinery components shall not exceed design ratings. If any tests show that any components are defective or inadequate, or function improperly, the Contractor shall make all corrections, adjustments, or replacements required before the final acceptance at no additional cost.

Brakes shall be adjusted to be returned to their existing brake pad set pressure as verified using prescale pressure indicating film or direct measurement of set spring forces both before and after construction.

98-1.04 MEASUREMENT AND PAYMENT

98-1.04A General

General Machinery will not be measured for payment. All costs associated with furnishing and installing materials, labor, tools, and incidentals necessary to compete the work shall be included in the *Bridge Machinery* pay items.

98-2 BRIDGE MACHINERY

98-2.01 GENERAL

98-2.01A General

The work included under this item shall consist of the following:

REPLACE NORTHEAST JACK MOTOR (1)

REPAIR THE CRACKED GROUT AT THE SOUTHWEST END JACK REST PIER BEARING

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PLATE (1)

CLEAN AND PAINT ALL NON-MOVING BRIDGE MACHINERY COMPONENTS, INCLUDING BUT NOT LIMITED TO RIM BEARING ASSEMBLY, CENTER PIN ASSEMBLY, SHOE BRAKE ASSEMBLY, CENTER ROLLER AND END JACKS (11)

REPLACE END BEARING LOCK ACTUATORS (4)

REPLACE ALL FLEXIBLE HOSES AND DETERIORATED FITTINGS OF THE TURNING MACHINERY SYSTEM

REPLACE THE HPU OF THE TURNING MACHINERY SYSTEM (1)

REHABILITATE THE SHOE BRAKES, INCLUDING REPLACEMENT OF THE SPRINGS AND BRAKE SHOE RODS (4)

REPLACE THE GROUT UNDER THE BEARING END LOCK BEARING SEATS ON THE REST PIERS. ELIMINATE THE RUBBER SHIMS (4)

Details and arrangement of all systems are shown on the Plans.

The work shall be in accordance with the requirements specified in "General Machinery".

The Contractor shall coordinate the work listed above with electrical work and structural work, as well as navigational and vehicular traffic closures and restrictions.

98-2.02 MATERIALS

98-2.02A General

The materials used to fabricate the machinery components shall be as shown on the Plans and in accordance with the requirements specified in "General Machinery".

98-2.02B Jack Motor

The Contractor shall supply and install a new motor that matches the existing jack motor, or an Engineer approved equal. The following is existing motor Nameplate Data:

U.S. Electrical Motors

Unimount 125 Enclosed High Efficiency Motor

HP:	10	Phase:	3
Hz:	60	RPM:	1755
Code:	H	NEMA Design:	B
Frame:	215T	Type:	UT TE
SF:	1.25	Volts:	230/460
F.L. Amps	27.2/13.6	S.F. Amps	33.4/16.7
Shaft End Brg.	6208-27-J/C3	Opp. End Brg.	6206-27-J/C3

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The existing repaired jack motor is to be removed from the swing span and delivered to the County of San Joaquin's Maintenance Facility and be kept as a spare.

98-2.02C Hydraulic Power Unit (HPU)

The HPU shall conform to ISO 4413.

All HPU components shall be arranged to be readily accessible for adjustment and maintenance.

The reservoir shall be a JIC configuration. The reservoir shall be of heavy-duty welded 316 SS construction. Painting of interior surfaces is not permitted. The exterior of the reservoir shall be painted with an epoxy-based paint that is compatible with the hydraulic fluid or left bare. The reservoir shall be structurally rigid to resist warpage and damage from the mounting of equipment on the reservoir top, handling during shipping, and erection at the bridge site. The reservoir shall have drains which allow a complete fluid change without disconnecting any hydraulic components. The reservoir shall have a fill port with a filter. The reservoir shall have an additional port to allow for a heat exchanger and/or other accessory to be added.

The reservoir shall contain a fluid conditioning magnet. The magnet shall extend from the top of the fluid level to 1" from the bottom of the reservoir and shall be removable without draining the reservoir.

The immersion heater shall be of the electric resistance, dry-well type. The watt density of the immersion heater shall not exceed the acceptable limits for the hydraulic fluid. the immersion heater shall maintain the fluid at a temperature of 100°F. The immersion heater shall be sized by the manufacturer to maintain the minimum acceptable fluid temperature when the ambient temperature is 32°F. The immersion heater shall be controlled by automatic thermostats.

The level indicator with integral thermometer shall be compatible with the hydraulic fluid. Permanent markings shall be provided showing the acceptable range of fluid levels and temperatures.

98-2.02D Hydraulic Power Unit Hardware

All fastener bolts, nuts, washers and other mounting hardware mounted on the hydraulic power unit shall be of a similar material, i.e. type 316 stainless steel, unless otherwise approved.

Expansion anchors for fastening hydraulic equipment or brackets to concrete surfaces must be wedge type anchor bolts (unless otherwise specified), which must be locked in place by an expansion wedge as the nut is tightened. All parts of the expansion anchors must be series 300 stainless steel. Holes for the anchors must be drilled to the manufacturer instructed size and depth using carbide tipped masonry drills.

98-2.02E Hydraulic Cylinders and Accessories

Hydraulic cylinders shall be as specified on the plans or approved equal.

Hydraulic cylinders shall conform to ISO 4413, Section 5.4.2.

Protective flexible rod boots shall be provided for all cylinders that are normally extended.

98-2.02F Accumulators

Gas accumulators shall be charged with nitrogen, or other inert gas as approved by the Engineer.

98-2.02G Hydraulic Piping and Tubing

All hydraulic piping material shall be seamless, low carbon stainless steel conforming to ASTM A312, type 316L. All hydraulic tubing material shall be seamless, annealed, low carbon stainless steel conforming to

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ASTM A269, 316L, ISO 10763, and ANSI B31.1 standards. Maximum tubing size shall be 1.5 inches, nominal.

Pipe and tubing shall be designed such that the allowable working stresses established in ASME B21.1 are not exceeded at the maximum working pressure. The maximum allowable flow velocities are as follows:

Suction Lines – 5 feet/second

Pressure Lines – 15 feet/second

Return Lines – 15 feet/second

98-2.02H Hydraulic Pipe and Tube Supports

Hydraulic pipe and tube supports shall be a cushion clamp system as manufactured by the Hydra-Zorb Company or approved equal. All clamps, fasteners, and channels shall be 316 series stainless steel. Support spacing and locations shall be in accordance with ISO 4413, Section 5.4.6.

98-2.02I Pipe/Tube Fittings

All pipe and tube fittings shall be similar to the pipes/tubes in which they are fitted. Acceptable welded pipe fittings shall be 37° flare type or SAE straight thread for sizes up to and including 1.5-inch NPS. Mating 37° surface shall have an O-ring and O-ring boss for a leak-free connection. For connections greater than 1.5-inch NPS, butt welded or welded four-bolt flanges utilizing a captive O-ring pressure seal system shall be used. Flange fittings materials shall be similar to the flange materials. Flange bolts shall be provided with locking washers. Pipe threads shall not be used on any portion of the system where pressures exceed 200 psi. where pipe threads are permitted (200 psi and below), pipe sealant is not permitted.

Tube connections shall use 37° flared fittings. The mating 37° surface shall use an O-ring and O-ring boss to provide a leak-free connection. The maximum allowable tubing size shall be 1.5-inch OD (outside diameter).

The following standards apply for pipe and tube fittings:

SAE J514 for JIC 37° fittings

SAE J514 for O-Ring Boss (ORB) fittings

SAE J1453 for O-Ring Face Seal (ORFS) fittings

SAE J518 for Flanges

98-2.02J Flexible Hose

Flexible hose material shall be hydraulic duty. SAE J517 shall be used to determine the maximum allowable operating pressure for the hose. Hoses shall be designed for an operating pressure of 5,000 psi and burst pressure no less than 10,000 psi. Hose assemblies shall be shop assembled by the hose supplier.

Hose end connections shall be Type 304 stainless steel for 37° female JIC swivel connections or Type 316 stainless steel for four-bolt, O-ring flange connections. Flange dimensions shall be in accordance with SAE J518. Flange bolts shall be provided with locking washers. Hose fittings shall conform to SAE J516 standards.

Flexible hoses shall be restrained or confined in all cases where a hose failure would constitute a hazard.

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98-2.02K Valves

Valves shall conform to ISO 4413, Section 5.4.4. All valves required for span movement shall be provided with a manual override.

Adjustable valves shall be equipped with protective caps or locking nuts on the adjusting screws to prevent unintentional maladjustment.

Directional control valves and blocking valves shall be provided with adjustable pilot control chokes to increase valve opening and closing time for shock and surge pressure control.

98-2.02L Filtration and Fluid Conditioning

Filtration and fluid conditioning shall be in accordance with ISO 4413. All filters and strainers shall be equipped with an indicator to show when the filter requires servicing. Filters shall provide the degree and quality of filtration to meet the cleanliness requirements provided herein. Bypass valves shall be provided as required by the Plans. Filter flow capacity ratings shall be as recommended by the pump manufacturer.

98-2.02M Pressure Indicators

Gages shall be of durable construction. Dial faces shall be clearly calibrated for pressure ranges 50% and beyond the maximum design operating pressures of the hydraulic system. Gages shall be accurate and shall permit continuous monitoring. Gages shall have a minimum of 4 inches and preferably 6 inches. Shutoff valves shall be provided at each gage.

Portable gages shall be provided for maintenance and adjustment of the hydraulic system. The pressure ranges shall cover all possible values that will be needed for the system. One gage shall be provided for each pressure range such that the test pressure will be within the mid-half of the total pressure range of the gage. Connections for portable gages shall be of the quick-disconnect type. Test ports shall be equipped with removable, protective caps, secured by chains to be component. Shutoff valves shall be provided at each test port. Test ports shall be provided for all locations that can be pressurized without a permanent pressure gage indicating the pressure.

98-2.02N Nameplates

Hydraulic cylinders shall have engraved permanent stainless steel nameplates which are securely attached to the head of the cylinder. The nameplate shall clearly indicate the manufacturer, model number, cylinder bore, rod diameter, stroke length, pressure rating, and a list of nonstandard features.

Nameplates shall be provided for each control valve indicating the name and function of the valve. Nameplates shall either be engraved stainless steel or a lamicoid nameplate showing white characters on a black background or black characters on a white background.

Nameplates shall be provided for each adjustable hydraulic component. The nameplate shall provide the name, function, and set point for the component. Nameplates shall either be engraved stainless steel or a lamicoid nameplate showing white characters on a black background or black characters on a white background.

98-2.02O Manifolds

Manifolds shall be made of 316 stainless steel.

Manifolds shall be in accordance with ISO 4413.

98-2.02P Hydraulic Fluid

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The hydraulic fluid shall be an HETG type readily biodegradable iso 32 anti wear hydraulic fluid compatible with the existing hydraulic fluid currently in use in the system (Imperial Select Food Grade AW Hydraulic Oil). Readily biodegradable Saturated Ester (HEES) or Polyalkylene Glycol (HEPG) fluids are acceptable if proper flushing procedures are followed and seal compatibility with the portions of the system to remain is confirmed prior to installation.

98-2.02Q Quick Disconnects

Quick disconnects shall not be used except where otherwise specified herein.

98-2.02R Bends

5D bends or greater shall be utilized where practicable to eliminate pipe joints. Bends of any lesser radius are not permitted.

98-2.02S Brake Rods

Brake rods shall be 4140 Hot Rolled Steel, meeting the requirements of ASTM A304.

98-2.02T Brake Springs

Brake springs shall meet the requirements of ASTM A229 and shall be zinc plated and given a flexible coating to prevent corrosion.

98-2.03 CONSTRUCTION

98-2.03A Shop Inspection and Testing

The following shop tests shall be performed and witnessed by the Engineer:

Custom manifolds shall be pressure tested to 3 times the maximum working pressure. This requirement does not apply to commercial manifolds that are rated for the maximum working pressure.

The assembled HPU shall be shop tested for proper operation. Certified test data shall be submitted to the County of San Joaquin for approval prior to shipment to the bridge site.

The HPU shall be shop tested at full drive motor speed under conditions of maximum design pressure at minimum fluid flow, and reduced pressure at maximum fluid flow. Each test shall be conducted for a minimum of 1 hour continuously.

During all tests, the HPU shall be checked for fluid leaks, fluid temperature, proper relief valve operation, and proper operation of charge pumps (as applicable).

Pump control shall be tested for correct speed, response time, and direction of rotation.

The settings for all adjustable hydraulic components shall be verified and recorded during shop testing.

Pumps and hydraulic motors shall be tested by the manufacturer before the HPU is assembled and catalog rating certification shall be provided to the County of San Joaquin. Tests shall be conducted for 15 minutes continuously, at a minimum test pressure equal to the maximum peak or intermittent pressure rating of the pump or motor.

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Pumps shall be checked during testing for external leakage, charge pump pressure and flow (when applicable), and main pump pressure and flow. Integral relief valves shall be set at 3000 psi maximum and checked for proper operation.

Hydraulic motors shall be checked during testing for external leakage, pressure, flow, and torque.

98-2.04 MEASUREMENT AND PAYMENT

98-2.04A Basis of Payment

The lump sum price bid for "Bridge Machinery" must include the cost of furnishing all labor, materials, plant, training, equipment, and all necessary incidentals required to satisfactorily complete installation and perform the work described herein and shown on the Plans.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item with their bid. The total lump sum value for this item must be broken down in detail.

The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

Upon completion and acceptance of the installation of bridge machinery in accordance with the Contract Documents, the Contractor will be paid 90 percent of the bid price for this item.

Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the bid price for this item.

Payment will be made under:

Pay Item	Pay Unit
980000 Bridge Machinery	Lump Sum

SPECIAL PROVISIONS
BRIDGE 29C-219
EIGHT MILE ROAD
over
HONKER CUT

DEPARTMENT OF PUBLIC WORKS

COUNTY OF SAN JOAQUIN

STATE OF CALIFORNIA

88 BRIDGE ELECTRICAL SYSTEMS
88-1 BRIDGE SYSTEM TESTING

88-1.01 GENERAL

88-1.01A General

Section 88-1 includes furnishing all labor, materials, plant, and equipment required to perform all work necessary, such as adjustments or corrective measures, to properly test all systems included in the field testing and final acceptance testing.

The Contractor must prepare and submit all acceptance testing procedures for the Engineer's acceptance 20 days before the scheduled start of any required testing.

The Contractor must submit a testing sequence operation based on the included test designated tabulations under Field Testing sub-heading. This test sequence of operation must be used for the testing described herein and approved by the Engineer and San Joaquin County, before testing.

88-1.01B Definitions

Not Used

88-1.01C Submittals

The instrument/meter calibration documents must be submitted for the Engineer's review and acceptance.

The Contractor must submit a detailed testing procedure for use in performing the Field Testing. The procedure must be submitted for review and approval at least 20 days before the anticipated completion of electrical systems.

The Contractor must submit a detailed testing procedure for use in performing the Final Acceptance Testing. The procedure must be submitted for review and acceptance at least 1 month before the anticipated completion of electrical systems for above listed bridges.

The results of the system Final Acceptance Tests must be presented in a matrix form on a Test Report Data Sheet. The proposed format of these sheets must be submitted for the Engineer's acceptance before the actual testing.

88-1.01D Quality Assurance

88-1.01D(1) Rules, Regulations and Ordinances

All meters must be calibrated per National Institute of Standards and Technology (NIST) guidelines within 6 months before testing.

88-1.02 MATERIALS

Equipment Required for Field and Final Acceptance Testing

The testing of the bridge electrical equipment necessitates the use of the following recording and testing devices:

1. Measuring tape
2. Light Meter
3. All other necessary instrumentation and tools to monitor, adjust, or replace items during the bridge testing procedure.

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88-1.03 CONSTRUCTION

88-1.03A Field/Acceptance Testing

The bridge field tests are to confirm each major sub-component and subsystem within the bridge scope is operational. Confirmation of correct operation of components or sub-components must be demonstrated through successful operation of the component or assembly.

Nameplate legends, conductor identifications, instrument scales, escutcheon plate engraving, and all other details of construction must be checked for conformity with specified requirements.

The Field Testing must include running all functions of the bridge, including electrical equipment within the bridge scope. It must include a schedule for opening the bridge.

The Field Testing Procedure must include a detailed method to test all functions built into the navigation lighting system.

The Contractor must arrange for and provide all the necessary field tests, to demonstrate that the portions of the electrical systems that were repaired/installed are in proper working order and comply with the Plans and Specifications within the scope of this contract.

Solar Navigation Light operation test: Confirm that the solar navigation lights are outputting the specified candlepower under their own power during night viewing.

Should the tests show that any system, piece of equipment, electrical cable or wiring connection (which was installed/modified/damaged by the Contractor), in the Engineer's judgment, is defective or functions improperly, such adjustments and/or replacements must be made by the Contractor as to make the installation satisfactory to the Engineer at no extra cost to San Joaquin County.

88-1.04 PAYMENT

Payment for "Bridge System Testing" must be made on a lump sum basis and must include all specified Field and Final Acceptance Testing as described herein.

88-1.04A Basis of Payment

The lump sum bid for "Bridge System Testing" must include the cost of all labor, materials, plant, training, equipment, and all necessary incidentals required to satisfactorily complete the bridge system testing of the bridge as described herein.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item.

The Engineer must evaluate this breakdown and must have the authority to revise the breakdown as, in his judgment, may be required to make the various components of work conform to their true values.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The Contractor must agree that the detailed breakdown must not become effective until it has approved the Engineer's acceptance.

The total lump sum value for this item must be broken down in detail.

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The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon submission and approval of all required testing procedures by San Joaquin County authorized representative; the Contractor will be paid 20 percent of the distributed bid price.
2. Upon completion of Field Testing as described and outlined herein, and upon acceptance by an authorized San Joaquin County representative, the Contractor will be paid 30 percent of the distributed bid price.
3. Upon resolution of all associated punch list items, and upon acceptance by an authorized San Joaquin County representative, the Contractor will be paid 40 percent of the distributed bid price of the bridge.
4. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the distributed bid price.

Supplements to the Operating and Maintenance Manual must be paid under Item 88 "Bridge Electrical Equipment."

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
880080	Bridge System Testing	Lump Sum

88-2 Electrical Equipment Demolition

88-2.01 GENERAL

88-2.01A General

Section 88-2 includes the removal and disposal of equipment where shown on the Plans, described in the Specification or the Engineer's orders.

The work under this item includes the removal and salvage of the temporary electrical equipment provided by the Contractor as part of this Contract, and includes materials and equipment installed by San Joaquin County maintenance for temporary operation of the bridge, during interim period and construction stages complying with the Plans and Specifications.

Any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included that may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor just as if specifically mentioned in these Specifications at no additional cost.

88-2.01B Definition

Not Used

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88-2.01C Submittals

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit a schedule of equipment for removal and salvage for acceptance during the shop drawing process.

For any items requiring a demolition sequence, demolition plans signed and sealed by a licensed Professional Engineer must be submitted for the Engineer's acceptance before work.

Before the commencement of any work, the Contractor must submit a comprehensive staging plan in accordance with the requirements of these plans, which must clearly define specific milestone dates for electrical work for the Engineer's acceptance. The Contractor must document and verify all temporary electrical work at the bridge and must submit to the Engineer detailed plans documenting such work, in conjunction with the staging plan.

The Contractor must submit proposed detailed demolition/salvage plan including materials and equipment to be used for the Engineer's review and acceptance. The plan must indicate the sequence of work, required interconnections, and milestones where testing is required. A detailed schedule of equipment for removal and salvage must be submitted for the Engineer's review and acceptance.

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. In case of correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from the commencement of work before the acceptance of the shop drawings; and no work must be done until the shop drawings therefore have been approved. After approval of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the approved shop drawings as ordered by the Engineer.

88-2.01D Quality Assurance

88-2.01D(1) Qualifications, Personnel and Facilities

Materials used in the work under this item must be produced by manufacturers regularly engaged in the work required for removal, salvage and disposal of the work specified herein.

For all the work required by the work under these Pay Items, the Contractor must use enough of skilled, trained, and experienced tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide enough plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-2.01D(2) Rules, Regulations and Ordinances

All removal, disposal and temporary work must comply with all applicable requirements of the latest edition of codes and standards issued by the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA

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NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL

Additionally, the work must meet the requirements of any local rules, regulations, ordinances, and all other codes and standards as specified elsewhere in these Specifications.

Where codes and standards are mentioned for any pay item, it is intended to call attention to them, it is not intended that any other codes and standards must be assumed to be omitted if not mentioned.

All work must be performed and delivered in a workmanlike manner as shown on the Contract Documents and must follow industry-accepted standard practices.

Work must comply with all applicable Federal, State, and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

88-2.01D(3) Measurements and Verification

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. The Contractor must verify in the field all existing conditions (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

88-2.02 MATERIALS

The Contractor must provide all the necessary tools and equipment required to safely disconnect, remove, and dispose of all equipment that is slated for removal, replacement, or salvage.

88-2.03 CONSTRUCTION

88-2.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

88-2.03B Delivery and Storage

This section applies to all electrical equipment that must be tagged for salvage and delivered to the San Joaquin County.

The Contractor is responsible for storage of equipment until date of delivery and coordinating date of delivery with the San Joaquin within 120 days of execution of contract.

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All electrical equipment that is tagged for salvage must be inspected and accepted by an authorized representative of the San Joaquin County before shipping and after delivery.

Protection for Shipment:

1. Protective wrappings must be provided for all equipment and materials that are to be salvaged and delivered. Materials must be packed and delivered to the pre-determined San Joaquin County locations in the state that they left from the bridge as accepted by the Engineer.
2. Damage caused to the materials due to improper storage, transportation, or delivery regardless of cause, must be repaired by the Contractor.
3. Materials must be completely protected from weather, dirt, and all other injurious conditions during removal, shipment, and storage. Materials must be stored in climate-controlled facilities.
4. Assembled units must be mounted on skids or otherwise crated for protection during handling and shipment.

88-2.03C Removal of Existing Materials and Equipment

The Contractor must remove and dispose of the existing equipment and components that are not re-used in the final electrical system. Unless otherwise noted, all items must be removed, not abandoned.

Where removal of materials and equipment is called for on the Plans, such materials and equipment must become the property of the Contractor, unless stated otherwise elsewhere in the Specifications, must be legally disposed of away from County property. Under no circumstances must material be dropped in the waterway or abandoned on site. The Contractor must take care, during removal operations, to prevent damage to adjoining parts and components that are to be reused. All components damaged by the Contractor, unless scheduled to be discarded, must be replaced, as ordered by the Engineer, at no additional cost.

The Contractor is hereby notified that existing components such as motors, switches, disconnects, terminal/junction boxes, electrical cabinets, panelboards, etc. must be salvaged and must be protected for shipment by the Contractor and delivered to a San Joaquin County facility as directed by the Engineer. Before shipment, if any components, as determined by the Engineer, are not to be salvaged, such materials and equipment must become the property of the Contractor and must be legally disposed of away from County property as part of this item at no additional cost.

88-2.03D Temporary Electrical Work Removal

The Contractor must salvage all temporary electrical equipment components shown on the shop drawing and any temporary system provided by the Contractor as a part of this project. Scope of temporary electrical work must be field verified by the Contractor prior to bid, any removal or salvage work, or before using temporary electrical work for operation of the bridge during construction. No additional payment will be made for work not shown on the shop drawing, but at the bridge at the time of bid.

Coordinate with the Engineer for construction of all other disciplines that may affect operations, schedule or functional requirements of the bridge.

Where removal of materials and equipment for the temporary electrical system is called for in the Plans, such materials and equipment must become the property of San Joaquin County, where directed. The Contractor must coordinate directly with the San Joaquin County for identification and verification of items that must be salvaged and delivered to San Joaquin County. All identified items must be removed, packaged, and delivered to anywhere in San Joaquin County as pre-determined with the San Joaquin County. Prior to shipment, if any components, as determined by the Engineer, are not to be salvaged, such materials and equipment must become the property of the Contractor and must be legally disposed of away from County property as part of this item at no additional cost.

The County may direct the Contractor to dispose of temporary electrical system equipment. If directed, the

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Contractor must do so at no additional cost.

88-2.03D(1) Disconnect

Power must be turned off prior to disconnecting any equipment.

All equipment that is slated for replacement which includes: conduits, conductors, junction boxes, pull and/or terminal boxes, motors (including accessories), transformer, panelboards, instrumentation and other miscellaneous incidental equipment as shown on the Contract Documents must be disconnected without damage to any adjacent equipment or connections which are to remain.

Disconnect all temporary equipment (either hydraulic machinery or electrical) during various phases of construction as the space occupied by the temporary equipment will be required for permanent installation of new equipment. Equipment must be disconnected to not interrupt regular operation of the bridge.

88-2.03D(2) Removal

Removal of junction pull and/or terminal boxes, conduits, wiring and other miscellaneous damaged equipment must be done in such a manner as to protect the existing bridge structure and other machinery and electrical components and associated hardware which are to remain.

The Contractor must take care, during removal operations, to prevent damage to adjoining parts and components that are to be reused. All components damaged by the Contractor, unless scheduled to be discarded, must be repaired, or replaced, as ordered by the Engineer, at no additional cost. All work must be coordinated with the accepted staging plan to keep bridge running and operational.

88-2.03D(3) Disposal

All removed equipment with associated hardware and miscellaneous damaged equipment must become property of the Contractor as determined and accepted by the Engineer and must be promptly removed from the site and disposed of in a legal manner as ordered by the Engineer.

88-2.03D(4) Patching

All openings which are not to be reused must be sealed in a watertight manner approved by the Engineer. All areas where equipment is removed must be cleaned and delivered in a tidy manner after removal.

88-2.04 PAYMENT

Payment for 'Electrical Equipment Demolition' must be made on a lump sum basis.

88-2.04A Basis of Payment

The lump sum bid price for the Item 'Electrical Equipment Demolition' must include the cost of furnishing all labor, materials, plant, equipment, and all necessary incidentals required to satisfactorily perform and complete the work described herein and perform the work described herein and shown on the plans. All removal/salvage operations and work must be included in this item.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item.

The Engineer must evaluate this breakdown and must have the authority to revise the breakdown as, in his judgment, may be required to make the various components of work conform to their true values.

The Contractor must agree that the detailed breakdown must not become effective until it has the Engineer's acceptance.

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The total lump sum value for this item must be broken down in detail, with the assigned distribution percentages as shown on the Plans.

The approved detailed breakdown must be used as a basis of payment for the progress payments.. The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

Item 'Electrical Equipment Demolition'

1. Upon completion and acceptance of the San Joaquin County of the comprehensive staging plan for the Electrical Equipment Demolition and documentation the temporary electrical operating system, Contractor will be paid 10 percent of the distributed bid price.
2. Upon removal and disposal of all equipment and materials slated for removal or replacement and upon inspection and acceptance by a representative if the San Joaquin County, Contractor will be paid 50 percent of the distributed bid price.
3. Upon delivery of the materials and equipment to the San Joaquin County anywhere in San Joaquin, inspection by a representative of San Joaquin County that it is in good working condition, and acceptance of the items, the Contractor will be paid 40 percent of the distributed bid price after submitting a signed receipt from the representative of San Joaquin County for the Engineer's review and acceptance of the payment.

Before beginning any work, the Contractor must submit to the Engineer a detailed schedule of work operation. This schedule must be complete and include the expected percentage of work to accomplish within specific time frames. The Contractor must prepare and submit an updated work schedule due to unforeseen issues. Failure by the Contractor to present such a document upon request will cause the progress payment procedure to terminate immediately.

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
880090	Electrical Equipment Demolition	Lump Sum

88-3 BRIDGE ELECTRICAL EQUIPMENT

88-3.01 GENERAL

88-3.01A General

Section 88-3 includes furnishing and providing all labor, materials, equipment and incidentals required to complete the installation of new pier and fender navigation light fixtures as indicated on the Contract Documents and as specified herein.

This work includes integral junction boxes, cable and wiring internal to fixture, safety appurtenances and attachments to the bridge structure in accordance with the existing scheme and Contract Drawings or as the Engineer orders.

Any incidental apparatus, appliance, material, and labor not herein specifically mentioned or included that

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may be found necessary to comply with the requirements of the Contract Documents and referenced standards or codes must be furnished by the Contractor just as if specifically mentioned in these Specifications at no additional cost.

If the Contractor has any objection to any requirements by the Plans and/or Specifications, he must state his objection in writing to the Engineer when or before submitting shop drawings; otherwise, his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.

88-3.01B Definitions

As used herein, certified test reports refer to reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.

As used herein, factory tests refer to tests required to be performed on the actual materials or equipment proposed for use. Results of the tests must be submitted in accordance with the provisions of this Specification for laboratory test results.

88-3.01C Submittals

If any departures from the Contract Documents are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted to the Engineer in writing as soon as possible for his approval. No departures from the Plans must be made without the Engineer's approval.

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 45 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor must submit proposed detailed installation plan including materials and equipment to be used for the Engineer's review and acceptance. The installation plan must indicate the sequence of work, required interconnections, and milestones where testing is required.

The Contractor must develop and submit checklist of items (dimensions, clearances, equipment etc.) to be verified along with methods to take and confirm dimensions. Checklist must be submitted for the Engineer's acceptance. Costs/work necessary to rectify problems/defects caused by failure to comply with the above, even if shop drawings are Engineer accepted, will be rectified by the Contractor at no additional cost.

88-3.01C(1) Shop Drawings

The Contractor must submit PDF files of all shop drawings for the Engineer's acceptance. In case of correction or rejection, the Contractor must resubmit shop drawings until plans are accepted. The Contractor must bear all costs for damages, which may result from ordering any materials before the acceptance of the shop drawings; and no work must be done until the shop drawings therefore have been accepted. After acceptance of the shop drawings, the Contractor must supply the Engineer with up to three (3) prints of the accepted shop drawings as ordered by the Engineer.

Shop drawings must include all plans, working drawings, fabrication drawings, certifications, catalog cuts, and other information submitted for the purposes of documenting and performing the work, or obtaining the Engineer's acceptance to perform the work.

Where shop drawings are for equipment/materials that replace existing equipment/materials, the shop drawings must include references to existing equipment, including model numbers, catalog cuts, and/or photos of existing components for verification.

Shop drawings must comply with the general requirements of the Standard Specifications as supplemented and amended herein and to the special requirements specified hereinafter.

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The Contractor must prepare shop drawings under the requirements of San Joaquin County and must in addition comply with the following:

1. Manufacturer's data and/or shop drawings must be submitted for all electrical items.
2. The Contractor must coordinate the work of the component manufacturers where components interface. The Contractor must review and approve all shop drawings to coordinate the proper assembly of all components before submission for the Engineer's acceptance.
3. Shop drawings must show all parts completely detailed and dimensioned. Reproduction of the Plans must not be used as base sheets for assembly or erection plans and will not be accepted as shop drawings.
4. Materials and material specifications must be stated for each component. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications must be given.
5. Submittals for each component must include the manufacturer's descriptive literature, plans, diagrams, performance and characteristic curves, and catalog cuts, including the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, including ASTM, ANSI, UL, NEMA, NFPA, Federal Specification and any other applicable references, and all other information necessary to establish Contract-compliance. Where model numbers are provided, model numbers must be complete and a legend provided to decipher the manufacturer model number codes.
6. Shop drawings must show all external dimensions and clearances necessary for installation and operation of equipment provided and work performed under this Specification.
7. For all assemblies and parts, the Contractor must furnish complete assembly plans or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The plans or diagrams must be enough to enable complete disassembly and reassembly of the assemblies covered. If any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor must furnish a drawing which details each modification and the part must be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.
8. Certified prints of each manufactured assembly must be furnished. Certified prints are manufacturer's plans of proprietary products on which the manufacturer or supplier states mounting dimensions, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they must show:

- Dimensions of all principal parts comprising the assembly.
- Certified external dimensions affecting clearances and required for installation.
- Capacity and normal operating ratings.
- Location of mounting holes.
- Electrical operating characteristics.
- Locations of conduit/cable entries, dimensioned and sized.
- Gross weight.
- Certified prints must be signed by an officer of the manufacturing company.

9. Complete shop bills of materials must be made for all assemblies. If the bills are not shown on the shop drawings, prints of the bills must be furnished for acceptance in the same way as specified for the shop drawings.
10. The weight of each piece of equipment must be stated on the shop plan on which it is detailed or billed.
11. Shop drawings showing interconnection to existing equipment must show all existing equipment accurately, including dimension, makeup, location, and model information. Existing wire numbers and conduit numbers must be included in the shop drawings and labeled accordingly.

88-3.01D Quality Assurance

88-3.01D(1) Qualifications, Personnel and Facilities

Materials used in the work under this item must be produced by manufacturers regularly engaged in the manufacture of the specified materials.

For the work under this item, the Contractor must use enough of skilled, trained, and experienced

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tradesmen who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work.

The Contractor must provide enough plant and all necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

88-3.01D(2) Rules, Regulations and Ordinances

Work must comply with all applicable Federal, State and local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement must apply.

Work must comply with all applicable requirements of the latest edition of codes and standards issued by the following organizations and publications, whose abbreviations used in the Contract Documents must be as shown:

American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
Institute of Electrical and Electronics Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
NFPA 70 – National Electrical Code	NEC
National Electrical Contractors Association	NECA
Standard Practices for Good Workmanship in Electrical Contracting	NECA - 1
California Electrical Code	CAEC
Occupational Safety and Health Administration	OSHA
Underwriters Laboratories	UL
United States Coast Guard	USCG

Where codes and standards are mentioned for any pay item, it is meant to call attention to them, it is not meant that any other codes and standards must be assumed to be omitted if not mentioned.

88-3.01D(3) Measurements and Verification

Dimensions indicated on the Plans are nominal and are for guidance only. All variations from the nominal dimensions on the Plans must be noted on the shop drawings.

The Contractor must verify dimensions during site visits before bid. Any variance between plan and field conditions must not be considered as a basis for claim.

The Contract Documents, as they relate to structures and location of the items included in this work, are based on existing original Contract Documents, available shop drawings, and existing field conditions at the time of document creation. Original contract shop drawings are not available for all details. The Contractor must verify all existing conditions in the field (dimensions, clearances, equipment arrangement, layouts, etc.).

Where existing information may affect bid price, the Contractor must verify existing field conditions (dimensions, clearances, equipment arrangement, etc.) during site visits before bid. The Contractor must verify, by field measurements and investigations, the pertinent dimensions and characteristics of all existing components to remain that are required to successfully complete the work listed. The information of critical elements determined during field visits must be shown on the shop drawings.

If a critical dimension/detail of existing equipment cannot be measured prior to the fabrication/purchase of the new component that connects/interfaces to it, the dimension of the new component which is affected must be fabricated with enough allowance so that once the existing dimension is measured, the new

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component can be finished to obtain the prescribed fit.

88-3.01D(4) Substitutions

The terms "accepted equal", "of equal quality" and "or equal" which appear on the Plans and in these Specifications are to allow the Contractor to substitute other manufacturers and model numbers of products of equal quality and rating for those specified.

Before the Contractor orders any substitute product, the Engineer's acceptance of the equivalence of the substitute product must be obtained in writing. The acceptance of the substitute products is at the sole discretion of the Engineer who establishes the basis for equivalence and reviews the quality of the materials and products described in detail on the submitted shop drawings and product data.

The Engineer indicates "Accepted" or "Revise and Resubmit" substitute material. Upon return of a rejected shop drawing, the Contractor must resubmit the shop drawing showing the specified product. Rejection must not in any way result in any additional cost. Approval by the Engineer of any substitute products submitted by the Contractor must not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that product.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore must be submitted as soon as practicable for acceptance. No such departures must be made without Engineer's acceptance. All necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, must be made by the Contractor at no additional cost.

88-3.01D(5) Defective Materials and Workmanship

The Engineer's acceptance of any material must not be a bar to their subsequent rejection if found defective. Rejected material and workmanship must be replaced or made acceptable by the Contractor at no additional cost.

All materials rejected during inspection and testing must be removed from the work site and replaced at no additional cost.

Delays resulting from the rejection of material, equipment or work must not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation must be corrected by the Contractor at no additional cost. San Joaquin County may make necessary correction with its own forces and charge the resulting costs to the Contractor.

88-3.01D(6) Compatibility with Existing Equipment

Work under this item requires connection of new/rehabilitated items to existing components to remain. The Contractor must perform field visits and verifications necessary to ensure that the materials and methods being proposed are completely compatible with the existing equipment to remain, and that all original system functions are returned to operation at the completion of the Contract work.

It may not be possible to obtain new components which fully integrate and provide compatible operation with existing equipment/components to remain. In this case, the Contractor may propose alternate methods including replacement/alteration of existing system components that are not shown to be replaced/alterd in the Contract Documents. The Contractor must make a submittal to the Engineer, who must have the sole discretion regarding acceptance of the alternate methods. Where Engineer accepted, the alternate methods are for the Contractor's benefit, and the Contractor must not receive additional payment for the changes in work performed. Any costs associated with ensuring integration of the proposed work/equipment to existing systems, such that the existing systems are restored to original functionality, must be borne by the Contractor and included in the bid price of this item.

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88-3.01D(7) Certificates

Where equipment or materials are specified to comply with the standards of an organization, such as NEMA, NFPA, and UL, that use a label or listing as method of indicating compliance, proof of such conformance must be submitted and accepted. The label or listing of the specified organization is acceptable evidence. In lieu of the label or listing, the Contractor must submit a certificate from an independent testing organization adequately equipped and competent to perform such services and Engineer accepted, stating that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's standard or code.

88-3.01D(8) Guarantee and Warranty

Manufacturer's warranties and/or guarantees on materials purchased for use on the Contract which are consistent with those provided as customary trade practice, must be obtained by the Contractor and, upon acceptance of the Contract, the Contractor must assign to the San Joaquin County all manufacturer's warranties or guarantees on all material furnished for or installed as part of the Work. The Contractor must warrant the satisfactory in-service operation of the material and related components. This warranty must extend for a period of one year following the date of final acceptance of the Project.

88-3.02 MATERIALS

88-3.02A General

All equipment and materials furnished under the items specified herein must be brand new. All new equipment, materials and workmanship must be first class in every way and must be manufactured and installed to the Engineer's satisfaction.

88-3.02B Pier and Fender Lights

The pier and/or fender lights must be designated for use as a marine signal light for marking stationary piers and fenders, per U.S. Coast Guard Bridge Administration General Construction Requirements.

The navigation lights must be made of high-impact polycarbonate. Navigation lights must be made of a two-unit system. One part must be the navigation lens and bulb while the second part must be the platform mount. Dimensions must be roughly 12 by 6 inches diameter including the platform.

Navigation lights must be 180 Degree Red and be visible 1-4 miles away.

Navigation lights must incorporate an integrated Solar panel, sized and provided by the manufacturer as a unit. Solar panel and battery unit must be capable of operating the navigation light to specification for 10 nights without sunlight. Battery must have a life of 4 years minimum.

Select pier/fender navigation lights require separate external solar panel arrays so that the panel can be placed in a location where sunlight is more abundant. The external solar panel system must be sized and provided by the same manufacturer that provides the navigation lights.

Navigation lights must be as manufactured by McDermott Corporation model number TOPHATX-PLAT-RS-6L5V-.030-180-RED or Engineer accepted equal.

Pier and fender light shop drawings must be submitted for the Engineer's acceptance.

88-3.02C Swing Span Light

The span navigation light must be designed as a marine signal light for marking swing bridge span position and must comply with Coast Guard recommendations and requirements pertaining to swing bridge marking signals.

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The navigation lights must be made of high-impact polycarbonate. Navigation lights must be made of a two-unit system. One part must be the navigation lens and bulb while the second part must be the platform mount. Dimensions must be roughly 12 by 6 inches diameter including the platform.

Navigation lights must be 90 degrees green alternating with 90 degrees red. Four lens sections must be used to complete a 360 degrees section. Navigation lights must be visible 1-4 miles away minimum

Navigation lights must incorporate an integrated Solar panel, sized and provided by the manufacturer as a unit. Solar panel and battery unit must be capable of operating the navigation light to specification for 10 nights without sunlight. Battery must have a life of 4 years minimum

Navigation lights must be as manufactured by McDermott Corporation model number TOPHATX-PLAT-RS-6L5V-.030-180-RED or Engineer accepted equal.

Span Navigation light shop drawings must be submitted for the Engineer's acceptance.

88-3.01D Operating and Maintenance Manual Supplement

New and/or updated operating and maintenance information for the new pier/fender and span navigation light fixture must be submitted for inclusion as an Appendix to the existing bridge operating and maintenance manuals.

The contractor must review the existing O&M Manuals as part of this work to identify items that need to be changed, added and/or require supplemental information.

The supplemental manual materials must include the following as a minimum for new and rehabilitated equipment:

1. New, updated and/or revised maintenance instructions for all new and rehabilitated equipment, including warnings and precautions to be observed during maintenance actions. All preventative maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order must be provided.
2. New, updated, or revised listings of all parts suppliers' local representatives, including suppliers' and representatives' names.
3. New, updated and/or revised repair procedures and equipment lists, including procedures for installation and removal of items provided under this work.
4. New, updated and/or revised description of the proper theoretical approach to installing and testing new equipment.
5. All relevant As-Built Shop Drawings. Drawings must be certified.
6. New, updated and/or revised instructions for annual cursory inspections and bi-annual in-depth inspections.
7. Manufacturer's literature describing each piece of new equipment furnished under this work including the manufacturer's model number and drawing number. The catalog number of each piece must be provided to facilitate the ordering of replacement parts from the original manufacturer.
8. Any other material or information which in the Engineer's opinion may be desirable to include in order to assist in maintaining the bridge functional systems and subsystems.

A complete copy of the supplemental manual materials must be maintained at the bridge, located with the existing operating and maintenance manuals, for use during field testing.

88-3.03 CONSTRUCTION

88-3.03A General

The Contractor must coordinate the work under this item with all other bridge machinery items, mechanical

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work, electrical work, and structural work, as well as navigational and vehicular traffic closures and restrictions.

All work must be performed and delivered in a workmanlike manner as shown on the Contract Documents and must follow industry-accepted standard practices. Installation must be neat, ordered, and easily identified.

88-3.03B Delivery and Storage

1. Materials must be packed and delivered to the site in the state that they left from the manufacturer's facility. Protective wrappings must be left in place until installation.
2. Damage caused to the materials due to improper storage, regardless of cause, must be repaired by the Contractor. If the Engineer determines that repair is not possible or jeopardizes the longevity of the components, the Contractor must remove the damaged materials and replace in kind with new materials at no additional cost.
3. Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion must be coated as soon as practicable after finishing with a rust-inhibiting preservative.
4. Materials must be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage. Materials must be stored in climate-controlled facilities such that their manufacturer-provided storage temperature, humidity, and other environmental ratings are not exceeded.

88-3.03C Installation

The navigation lights must be installed in accordance with the rules and regulations of the United States Coast Guard and in compliance with the Contract Drawings

The installation must be tested to insure proper functionality. The test must consist of energizing the lights and verifying that all splices and wire ways are properly attached to the bridge structure. If testing fails, troubleshooting must be performed at no additional cost to the San Joaquin County.

88-3.04 PAYMENT

The pier/fender or span navigation light fixture must be measured as number of complete pier/fender navigation lights installed in accordance with the Contract Documents and Specifications.

Measurement of each unit must include pier or fender navigation light, junction box (if required), conduit (length not to exceed 5 feet), conductors, mounting, hardware and supports required to complete installation of each unit.

The work listed under this Pay Item does not include other conduits and conductors, excluding as specified herein, and will be listed under other Sections.

88-3.04A Basis of Payment

The unit bid price for this item includes the cost of labor, materials, equipment, junction box, mounting hardware, supports, conduit and wiring, and any other incidentals and connections necessary to satisfactorily complete installation and perform the work described herein and shown on the Plans.

No less than 10 percent of this items bid price will be withheld to guarantee compliance with the Operating and Maintenance Manuals requirements. The withheld percentage shall be released as outlined below.

The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

1. Upon completion and acceptance of the installation of the pier and fender navigation light under the Contract Documents, the Contractor will be paid 90 percent of the bid price for this item.

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2. Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the bid price for this item.

Removal of all components not included in the final system will be paid under Section 88-7 "Electrical Equipment Demolition."

The work listed under this Section does not include other conduits and conductors, not specified herein, and must be paid under their respective Sections.

Payment will be made under:

<u>Item No.</u>	<u>Item Description</u>	<u>Pay Unit</u>
880160	Span Navigation Lights	Each
880170	Pier Navigation Lights with Integral Solar	Each
880180	Pier Navigation Lights with Remote Solar	Each

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98-1 GENERAL MACHINERY

98-1.01 GENERAL

98-1.01A General

This section gives the general requirements which apply to all bridges and their machinery. Also, this section applies to the installation of electric motors, brakes, instrument drives and limit switches to be mounted with the machinery but supplied under separate items.

The cost of work required by this "General Machinery" is included in the bridges' machinery pay items.

98-1.01B Definitions

Certified Test Reports: As used herein, certified test reports refer to reports of tests conducted on previously manufactured materials or equipment proposed for use. Results of the tests shall be submitted in accordance with the provisions of this Contract for laboratory test results.

Factory Tests: As used herein, factory tests refer to tests required to be performed on the actual materials or equipment proposed for use. Results of the tests shall be submitted in accordance with the provisions of this Contract for laboratory test results.

98-1.01C Submittals

98-1.01C(1) General

Manufacturer's data and/or shop drawing data shall be submitted for all manufactured and purchased items of bridge machinery.

Submittals for each manufactured item shall be manufacturer's descriptive literature, drawings, diagrams, performance and characteristic curves, and catalog cuts, and shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, certified layout dimensions, capacity, specification reference, applicable Federal and Military Specification references and all other information necessary to establish Contract compliance.

Temporary means needed to complete machinery items shall be developed by the contractor and submitted to the engineer for review. Submittals shall include all necessary information to illustrate and confirm safe operation and support of the machinery and/or span. Submittals should include shop and working drawings, installation and erection drawings, catalog and specification sheets, and checked calculations. Submittals shall be signed and sealed by a Professional Engineer licensed in the appropriate discipline by the State of California.

98-1.01C(2) Shop Drawings

Shop drawings shall conform to San Joaquin County Standards and as supplemented and amended elsewhere herein and to the special requirements specified hereinafter.

Shop drawings shall show all parts completely detailed and dimensioned. The grade and amount of finish machining, with all tolerances and allowances, shall be stated for each part for which a specific fit is required. Finished surfaces shall be defined by the ANSI B46.1, "Surface Texture", and fits shall be defined by the ANSI B4.1, "Preferred Limits and Fits for Cylindrical Parts", unless otherwise stated herein or on the Plans. ANSI B4.1 shall also apply to fits for non-cylindrical parts.

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All proprietary items shall be shown in outline on the drawings, which shall also indicate the method and sequence to be employed in assembly of bridge machinery and installation of necessary utilities support and service facilities. Shop drawings shall show all external dimensions and clearances necessary for installation and operation of each item of machinery in the bridge. All catalog cuts are considered as shop drawings. After approval, all catalog cuts are to conform to shop drawing for requirements and scanned as a PDF file format in accordance with the requirements of San Joaquin County.

For all bridge machinery shown on the Plans or listed herein, the Contractor shall furnish complete assembly diagrams showing each part contained within the item and the manufacturer's part number assigned to each part. The diagram shall be sufficient to enable complete disassembly and reassembly of the item covered. In the event that any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor shall deliver a drawing that details each modification; and the part shall be assigned a unique part number to preclude the supply of replacement parts not modified in similar fashion. The assembly drawings of each item shall, in addition to identifying and describing each internal part, contain dimensions of all principal elements within the item; certified external dimensions affecting interfaces or installations; gross weight capacity and normal operating ratings; method and recommended types of lubrication, including location and type of fittings and provisions for adding, draining, and checking the level of each lubricant employed; inspection openings, seals and vents; and details of all fasteners used to mount the equipment to its foundation.

Complete shop bills of materials shall be made for all machinery parts. If the bills are not shown on the shop drawings, prints of the bills shall be furnished for approval in the same manner as specified for the shop drawings.

The material and material specifications shall be stated for each part. Where American Society for Testing and Materials Specifications or any other Standard Specifications are used, the designating numbers of such Specifications shall be given. The following abbreviations will be used herein, and on the Plans to designate Standard Specifications for materials and workmanship:

American Association of State Highway and Transportation Officials, AASHTO

American Bearing Manufacturers Association, ABMA

American Gear Manufacturers Association, AGMA

American Iron and Steel Institute, AISI

American National Standards Institute, ANSI

American Railway Engineering and Maintenance-of-Way Association, AREMA

American Society for Testing and Materials, ASTM

National Lubricating Grease Institute, NLGI

National Electrical Manufacturers Association, NEMA

Society of Automotive Engineers, SAE

Complete assembly and erection drawings shall be furnished. These drawings shall give identifying marks and essential dimensions for locating each part or assembled unit with respect to the bridge structure or foundation. Use of mirror image or opposite hand erection drawings will not be allowed.

Each shop drawing shall be given a suitable title to describe the parts detailed thereon and shall state by whom shop inspection will be made. The Contractor shall allow the County or their authorized inspectors

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to audit their facilities prior to start of any fabrication, casting, machining, etc. in order to expedite inspection procedures by all inspection agencies and authorized personnel.

Standard Compliance: Where equipment or materials are specified to conform to requirements of the standards of an organization, such as American Society for Mechanical Engineers (ASME), Underwriters Laboratories (UL), American Gas Association (AGA), and American Refrigeration Institute (ARI), that use a label or listing as method indicating compliance, proof of such conformance shall be submitted and approved. The label or listing of the specified organization will be acceptable evidence. In lieu of the label or listing, the Contractor shall submit a certificate from an independent testing organization adequately equipped and competent to perform such services and approved by the Engineer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

Submittals must be made promptly after Notice to Proceed such that the on-site construction schedule can be met. The review period shall be 60 days from initial submission through approved submission, assuming two (2) submissions and ten-day (10-day) reviews for each submission.

The Contractor shall submit to the Engineer for his approval all shop drawings. In case of correction or rejection, the Contractor shall resubmit until each drawing is approved. The Contractor shall bear all costs for damages, which may result from the ordering of any materials prior to the approval of the shop drawings. After approval of the shop drawings, the Contractor shall supply the Engineer with copies of the approved shop drawings.

The Contractor shall update shop drawings digitally upon completion of installation to reflect the final condition and submit updated shop drawings as as-builts.

98-1.01D Operating and Maintenance Manuals

Operating and maintenance manuals shall be provided by the Contractor as per Item "Operating and Maintenance Manual Supplements".

98-1.01E Posted Operating Instructions

Operating instructions approved by the Engineer shall be provided for the system and each principal piece of equipment for the use of operation and maintenance personnel. The operating instructions shall include diagrams showing the complete layout of the entire system, and shall be framed under glass or in approved laminated plastic and posted where directed by the Engineer; printed or engraved operating instructions for each principal piece of equipment including proper adjustment, operating, lubrication, safety precautions, procedure in the event of equipment failure, and any other necessary items of instruction as recommended by the manufacturer of the unit shall be attached to or posted adjacent to the piece of equipment or as directed by the Engineer. Operating instructions exposed to the weather shall be made of weather-resisting materials or shall be suitably enclosed to be weather protected. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

98-1.01F Quality Assurance

98-1.01F(1) General

Standard Products. Materials and equipment shall be essentially the standard catalogued products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest standard design that complies with the specification requirements. Materials and equipment shall essentially duplicate items that have been in satisfactory commercial or industrial use at least two years prior to bid opening. Where two units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be the products of the same manufacturer. Each major component of equipment shall have the manufacturer's name and

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address and the model and serial number on a nameplate, securely affixed in a conspicuous place. The name plate of the distributing agent will not be acceptable.

Manufacturer's Recommendations. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material. The Contractor shall provide as part of the work all special machining and installation required by the component manufacturer.

Code and Standards. Work under bridge machinery pay items shall comply with all applicable requirements of the latest edition of codes and standards issued by, but not limited to, the following organizations and publications, whose abbreviations used in this Specification shall be as shown:

American Association of State Highway and Transportation Officials, AASHTO

American Bearing Manufacturers Association, ABMA

American Gear Manufacturers Association, AGMA

American Iron and Steel Institute, AISI

American National Standards Institute, ANSI

American Society for Testing and Materials, ASTM

American Welding Society, AWS

National Lubricating Grease Institute, NLGI

Society of Automotive Engineers, SAE

San Joaquin County Standard Specifications

The design of new machinery conforms to the 1988 Standard Specifications for Movable Highway Bridges published by the American Association of State Highway and Transportation Officials, 1992 and 1993 Revisions (hereinafter referred to as the AASHTO Standard), except as otherwise noted on the Plans or otherwise specified herein.

98-1.01F(2) Qualifications, Personnel, and Facilities

For the fabrication, installation, aligning, cleaning, lubricating, testing and all other work required by bridge machinery pay items, the Contractor shall use adequate numbers of skilled, trained, and experienced mechanics, millwrights and service personnel who are thoroughly familiar with the requirements and methods specified for the proper execution of work.

Mechanics, millwrights, and service personnel shall be properly equipped with all necessary instruments to assure that related components have been provided within acceptable tolerances and to make all necessary adjustments for attaining the specified ratings.

98-1.01F(3) Rules, Regulations, and Facilities

Work shall comply with all applicable Federal, State, and Local rules, regulations, and ordinances.

In the event of a conflict between these Specifications and the above-mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement shall apply.

98-1.01F(4) Measurements and Verification

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Dimensions indicated on the Plans are nominal and are intended for guidance only. All variations from the nominal dimensions on the Plans shall be noted on the shop drawings.

98-1.01F(5) Substitutions

The terms “approved equal”, “of equal quality” and “or equal” which appear on the Plans and in these Specifications are intended to allow the Contractor to substitute other manufacturers and model numbers of products of equal quality and rating for those specified.

Prior to the Contractor’s ordering of any substitute product, the Engineer’s approval of the equivalence of the substitute product shall be obtained in writing. The acceptance of the substitute products is at the sole discretion of the Engineer who will establish the basis for equivalence and will review the quality of the materials and products described in detail on the submitted shop drawings and product data.

The Engineer will “Approved” or “Revise and Resubmit” substitute material. Upon return of a shop drawing showing rejection, the Contractor shall resubmit the shop drawing showing the specified product. Rejection shall not in any way result in any extra cost.

Approval by the Engineer of any substitute products submitted by the Contractor shall not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that product.

Where a manufacturer’s name and catalog part number, in this Specification or on the Plans, specifies a particular product it is so specified to establish quality, configuration, and arrangement of parts. An equivalent product made by another manufacturer may be substituted for the specified product subject to the approval of the Engineer; however, all necessary changes required by the substitution in related machinery, structural, architectural, and electrical parts, shall be made by the Contractor at no additional cost.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted as soon as practicable for approval. No such departures shall be made without approval by the Engineer.

98-1.02 MATERIAL

98-1.02A Castings and Forgings

98-1.02A(1) General

Before any work is started on castings and forgings, the manufacturer shall communicate with the Engineer to arrange for inspections and tests. The Engineer shall be notified not less than five (5) working days prior to the start of work so that a representative of the Engineer may be present.

All necessary precautions shall be taken to fabricate the castings true to pattern in form and dimensions, free of pouring faults, cracks, cold shuts, blow holes and other defects in positions affecting their strength and value for the service intended.

All castings shall be cleaned free of loose scale and sand; all fins, seams, gates, risers and other irregularities shall be removed. All unfinished edges of castings shall be neatly cast with rounded corners and all inside angles shall have ample fillets.

98-1.02A(2) Required Testing

All castings shall be visually examined in accordance with ASTM A802, meeting visual inspection acceptance criteria Level II. Castings that do not pass this test may be rejected. Test results, whether

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positive or negative, shall be submitted to the Engineer. Test records meeting Level III may be considered for weld repair, provided the manufacturer submits a procedure to the Engineer for review and approval.

All castings that have solid sections 2-inches thick or greater in the as-cast condition and all fracture critical members shall be ultrasonically tested in accordance with ASTM A609, Method A, meeting Quality Level 2. Castings that do not pass this test may be rejected. Test results, whether positive or negative, shall be submitted to the Engineer. Test records meeting Quality Level 3 may be considered for weld repair, provided the manufacturer submits a procedure to the Engineer for review and approval.

All casting surfaces shall be magnetic particle examined in accordance with ASTM E125, meeting the following acceptable levels of discontinuities:

i. Type I	Cracks/Hot Tears	1/4-inch max
ii. Type II	Shrinkage	Degree 3
iii. Type III	Inclusions	Degree 3
iv. Type IV	Chaplets	Degree 2
v. Type V	Porosity	Degree 1

Test results, whether positive or negative, shall be submitted to the Engineer. All surface discontinuities may be considered for weld repair, provided the manufacturer submits a procedure to the Engineer for review and approval.

All repair procedures shall include details of the areas to be repaired and a means to qualify the repair method. Approved repair procedures shall be performed prior to final heat treatment, so that no weld repairs will be needed after final machining. In addition, all surface defects removed by rough machining shall be performed prior to final heat treatment.

All castings that fail to meet the established acceptance criteria and considered rejected shall be replaced, at the Contractors expense, with new castings.

All carbon and alloy steel forgings shall meet the requirements of AASHTO Specification M102 (ASTM A668) unless otherwise indicated or approved by San Joaquin County.

All forgings shall be reduced to size from a single bloom or ingot until homogeneity is secured. The blooms or ingots, from which shafts or pins are to be made, shall have a cross-sectional area at least three times that required after finishing. No forging shall be done at less than a red-heat.

All finish machined forging surfaces shall be magnetic particle examined in accordance with ASTM A275. The maximum permissible indication on any surface shall be 1/4-inch. Indications greater than 1/4-inch may be cause for rejection. Test results, whether positive or negative, shall be submitted to the Engineer.

98-1.02A(3) Independent Testing

Independent inspection and testing, destructive and/or non-destructive, may be performed by a representative of the Engineer and shall be paid for by the Contractor. The tests would be in addition to and independent of tests being performed by the Contractor as per the plans and specifications.

The Contractor shall furnish, i.e. make available for use, all facilities at the foundry, forge shop and/or machine shop for independent inspection and testing, destructive and/or non-destructive, required by the Engineer.

The previously noted acceptance criteria shall apply to any independent testing. In addition, the independent testing may include radiographic testing to help isolate areas, which in the opinion of the Engineer, may require further investigation. Acceptance or rejection will not depend solely on the radiographic test results but rather they will help define any flaws, which may be of concern to the Engineer.

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98-1.02A(4) Bronze Castings

All bronze castings shall meet the requirements of AASHTO Specification M107 (ASTM B22) and be Copper Alloy UNS No. C91100 unless otherwise indicated.

98-1.02B Shafting and Pins

All shafts shall conform to tolerances in ASTM A29 unless otherwise indicated. Turned, ground and polished shafting straightness tolerances shall be 0.002 inch per foot for shafts up to and 1 1/2 inches in diameter and 0.003 inch per foot for shaft over 1 1/2 inches in diameter.

All shafts and pins shall be accurately finished, round, smooth, and straight; and when turned to different diameters, they shall have rounded fillets at the shoulders. Each shaft or pin having a uniform of more than 8 inches and each shaft or pin having several diameters, of which the smallest is more than 8 inches, shall be bored lengthwise through the center to a diameter approximately one-fifth the smallest body diameter.

Each end of all shafts, when finished to the required lengths, shall have a 60-degree lathe center, with clearance hole, at the exact center of the shaft. Shafts that have a hole bored lengthwise through their centers shall have their ends prepared for the attachment of a centering device equivalent to the lathe center. All such devices shall be furnished as part of the work.

Where it is required on the Plans that stepped shafts shall have fillets blended in smoothly to adjacent surfaces without tool marks or scratches, the surfaces shall have an ANSI maximum roughness of 63 micro inches, unless otherwise required herein or on the Plans to have a finer finish.

All cold-finished shafting shall be steel of the type and grade shown on the Plans and shall be tested for its mechanical properties, and a test certificate shall be furnished to the Engineer. Each cold-finished shaft shall be free from camber and shall run without vibration, noise, or chatter at all speeds up to and including the maximum rated speed.

All hubs mounted on the ends of cold-finished shafts shall have the fit specified herein of on the Plans. To obtain the required fit between hub and shaft, the Contractor may furnish the cold-finished shaft 1/16 inch larger than the nominal diameter specified and shall turn the ends to the required dimension for the hub. The Contractor may, at his option, furnish any cold-finished shaft of one diameter end to end; but such shaft shall have tolerances selected from the normal manufacturing range, which will provide the specified fit. The selected tolerances shall be shown on the shop drawings.

Turned, ground, and polished commercial shafting of the grade specified shall be used where shown on the Plans.

98-1.02C Fasteners

All bolts, either for connecting machinery parts to each other or to supporting members are categorized as one of the following types:

- High-strength bolts
- Finished body
- Turned bolts, and studs

All high-strength bolts shown on the plans shall be ASTM F3125 type A325, high-strength bolts unless otherwise noted and tightened to slip critical criteria.

Finished body bolts are to meet the requirements of ASTM A449 or SAE J429 GR5 cap screws. Bolts shall have finished bodies and regular hexagonal heads. Holes for finished body bolts are to be individually reamed for a clearance of not more than 0.010 inch (0.25 mm) larger than the actual diameter of individual bolts for that hole. Finished body bolts shall be tightened to slip critical criteria.

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Turned bolts, and studs are to be provided with turned shanks, cut threads, and finished washer-faced hexagonal heads. For the finished shank of all turned bolts, and studs, use 1/16 inch (1.6mm) larger in diameter than the diameter of the thread. Determine the head and nut dimensions based on the thread diameter unless otherwise noted. For the shanks of all turned fasteners, use a Class LC6 fit in the finished holes in accordance with ANSI B4.1. The material for the turned fasteners shall meet the requirements of ASTM A449 unless otherwise noted. Turned bolts shall be tightened between 50% and 70% proof strength.

Dimensions of all bolt heads, nuts, and hexagonal head cap screws are to conform to ANSI/ASME B18.2.1, Square and Hex Bolts and Screws, and ANSI/ASME B18.2.2, Square and Hex Nuts.

Provide heavy series heads and nuts for turned bolts, cap screws, and turned studs.

Dimensions of socket-head cap screws, socket flat-head cap screw, and socket-set screws are to conform to ANSI B18.3, Socket Cap, Shoulder, and Set Screws. Unless otherwise called for on the plans or specified herein, make the screws of heat-treated alloy steel, cadmium-plated, and furnish with a self-locking nylon pellet embedded in the threaded section. Set screws are to be of the headless, safety type with threads of the coarse thread series and having cup points. Do not use set screws to transmit torsion nor as the fastening or stop for any equipment that contributes to the stability or operation of the bridge.

Fabricate all threads for bolts, nuts, and cap screws to conform to the coarse thread series having a Class 2 tolerance for bolts and nuts or Class 2A tolerance for bolts and Class 2B tolerance for nuts in accordance with the ANSI/ASME B1.1, Unified Inch Screw Threads.

Spot face all bolt holes through unfinished surfaces for the head and nut, square with the axis of the hole.

Unless otherwise called for or required to account for fabrication tolerances, sub drill all bolt holes in the machinery parts for connecting these parts to the supporting steel work at least 1/32 inch (0.8 mm) smaller in diameter than the bolt diameter and ream assembled for the proper fit at assembly or at erection with the steel work after the parts are correctly assembled and aligned.

Furnish positive locks of an approved type for all nuts for any fastener which may be tightened below slip critical. Use of double nuts, jam nuts, and lock wire are preferred.

Furnish a hardened plain washer at each end of finished body high-strength bolts meeting the requirements of ASTM F436.

Provide cotters conforming to the SAE standard dimensions and made of half-round stainless steel wire, ASTM A276, Type 316.

Use only fasteners manufactured in the United States with the property class and source identification appearing on the top of head.

98-1.02D Keys and Keyways

Keys and keyways shall conform to the dimensions and tolerances for square and rectangular keys of the ANSI Standard B17.1, Keys and Keyseats, unless otherwise specified. All keys shall be effectively held in place, preferably by setting them into closed-end keyways milled into the shaft. The ends of all such keys shall be rounded to a half circle equal to the width of the key. Keyways shall not extend into any bearing. If two keys are used in a hub, they shall be located 120 degrees apart and in line with wheel arms where practicable.

Unless otherwise specified herein or on the Plans, keys shall be machined from alloy-steel forgings, ASTM A668 M, Class K.

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98-1.02E Bearings and Bushings

All split bearings shall have one half fitted to the other half as shown on the Plans. The surface between the cap and the base shall be accurately machined. All caps shall be securely bolted to the bases with turned bolts and double nuts. All caps and bases shall be provided with double-flanged bushings securely held against changing position under load by hexagonal-head, steel cap screws, unless otherwise shown on the Plans. All bushings shall fit the inside bore and end faces of the base and cap, with an ANSI Class LC1 clearance and location fit, and shall fit the shaft journals, with an ANSI Class RC6 running fit. All caps shall be provided with a tapped hole for lifting eyebolt, which shall be furnished for the purpose.

Bushings for split bearings shall be finished-bored with the caps in place and with 1/4-inch thick rolled bronze or brass liners. At least 1/8-inch of the liner thickness shall be of laminated construction capable of adjustment in increments of 0.003 of an inch. The edges of the liners toward the shaft journal shall be cut to fit the shaft shoulder fillets where they occur and shall be cut square and flush with the bushing flange if there is no change in shaft diameter. Except for a short distance from each end, the inside edges of the liners shall be cut back to form a grease groove along the shaft. All bolt holes shall be drilled through the liners.

For split bearings, each half bushing shall have machined double oval grease grooves connecting with the ends of the liner grooves and intersecting at the center of each half bushing, unless otherwise shown on the Plans. All grease grooves shall be precision machine-cut and smooth. The corners of all grooves shall be rounded to a radius of not more than half the width of the groove.

Anti-friction bearings shall be sized for a B-10 life of 40,000 hours as defined by ABMA for the ratings shown on the Plans.

Pillow block bearings shall be, adapter mounted, self-aligning expansion and non-expansion types as called for on the drawings. Housings shall be cast steel and capable of withstanding the design radial load in any direction, including uplift. Bases shall be cast without mounting holes. Mounting holes shall be drilled from the solid at assembly with the supporting steel work. Seals shall retain the lubricant and exclude water and debris. Cap bolts on pillow blocks shall be high-strength steel. The cap and cap bolts shall be capable of resisting the rated bearing load as an uplift force.

98-1.02F Shaft Journals

All journal bearing areas on shafts and pins shall be accurately turned, ground and polished with no trace of tool marks or scratches on the journal surface or adjoining shoulder fillets. Burnishing of the shaft journal areas and adjoining shoulder fillets will be acceptable in lieu of grinding and polishing, provided the burnishing is done with a Stellite roller or equal which has been finished to a mirror surface. Journal diameters shall be finished to the limits of an ANSI Class RC6 running fit.

98-1.02G Open Gearing

Spur gears shall have 20-degree full-depth, involute cut teeth in accordance with the proportions of the ANSI/AGMA 201.02, Tooth Proportions for Coarse-Pitch Involute Spur Gears, unless otherwise specified herein or shown on the Plans.

The teeth of all gears shall be cut from solid rims or blanks. The sides and peripheries of all gears and pinions shall be finished, and the pitch circle shall be scribed on both sides not less than 0.02-inch-deep with a V-pointed tool. The working surfaces of all gear teeth shall be true to the proper outline, accurately spaced on the true pitch circle, exceptionally smooth, and free from planing or milling-cutter ridges. Cutter burrs shall be removed from all edges of the teeth, and the top edges of all teeth shall be rounded to a 1/32-inch radius.

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Except as otherwise provided herein or on the Plans, all gears shall be cut and mounted to meet the requirements for accuracy of ANSI/AGMA Standard 2000-A88, Gear Classification and Inspection Handbook. The AGMA quality number shall be stated on the applicable shop drawings. Open gearing shall conform to AGMA Quality No. 7 or higher.

Bevel gears shall have 20-degree full-depth, involute cut teeth in accordance with the proportions of the ANSI/AGMA 2005-B88, Design Manual for Bevel Gears.

98-1.02H Enclosed Speed Reducers

Speed reducers shall be standard models from one manufacturer, with sizes, ratios and construction details as shown on the Plans.

Speed reducers shall be designed to meet all requirements of ANSI/AGMA Standard 6010, manufactured in accordance with the requirements of AGMA and given nameplates with the following information:

Size

Ratio

Service Power Rating

High Speed Shaft RPM

Service Factor

Lubrication Specification

Gear teeth shall be through hardened and conform to AGMA Quality No. 8 or higher. Casehardened gears shall not be used to drive bridge machinery.

Gears shall have spur, helical, herringbone or bevel teeth, bearings shall be antifriction type, and housings shall be steel castings or welded steel plate, which shall be stress relieved. The inside of the housings shall be sandblast cleaned prior to assembly and be protected from rusting. Exact ratios shall be furnished where specified.

Speed reducers shall be able to withstand a momentary overload equal to three (3) times the rated full load torque of the driving motor(s) without any component reaching 75 percent of its yield strength.

Lubrication of the gears and bearings shall be automatic when the unit is in operation.

It is preferable that a bath lubrication system be utilized. In a bath lubrication system, all components in the speed reducer, which require lubrication, are partially submerged in an oil bath.

When the configuration of gears and bearings prevent bath lubrication, a splash lubrication system should be used. Splash lubrication systems shall continuously lubricate all gears and bearings properly. Oil feed troughs may be used to supply oil to bearings and gears, which are above the bath. Splash lubrication systems shall be designed such that equal lubrication is supplied to each internal component for both directions of operation.

If a pressurized lubrication system is required for the reducer, a redundant secondary lubrication system shall be provided. The secondary system shall operate at all times when the primary system is functioning.

Inspection ports on reducers shall provide for inspection of all gears, bearings, and other internal devices. The ports shall be located above the oil level, if practicable, so that oil draining is not required for inspection. The port shall be sized such that minor repairs could be made to reducers without requiring housing

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disassembly. Ports shall be properly sealed with seals that do not require replacement when ports are opened.

Reducers shall be furnished with moisture trap breathers, oil fills, break proof glass oil level indicators, drains and inspection ports.

Moisture-trap breathers shall be located above maximum oil levels in all positions of the reducer during operation, and its piping shall enter the unit at the highest point possible. Breathers shall not be mounted in bearing caps.

Oil level indicators shall be mounted in locations that can be easily viewed by maintenance crews. On reducers in which the oil level varies by more than 1/2-inch per 50°F temperature change, the sight glass shall be graduated. The indicator shall be vented back to the case. Sight glasses shall be of rugged construction and protected against breakage.

Oil drains shall be located at the lowest point possible. The drain shall have a hand operated level which can be locked in the closed position.

Oil sampling cocks shall be located in accessible positions on the reducers. There shall be two sampling cocks, one located at the lowest level of oil and one just below the upper oil level.

Speed reducers shall have provisions for oil expansion due to churning and temperature change.

Grease lubricated reducer bearings shall be furnished with separate fill and purge fittings, readily accessible after installation of reducer. Grease lubricated reducer bearings shall be furnished with internal seals between the bearing housing and reducer cavity, preventing grease and gear oil from interacting.

On shaft extensions, bearing shaft ring seals shall be mechanical type oil seals which compensate for wear. Dual lip spring loaded seals are preferred.

Shaft extensions for the various reducers shall be of the arrangement, lengths, and diameters shown on the Plans. Couplings shall be shrink fitted on the shafts in the shop.

On open-ended lower bearings of vertical shafts, extra precaution must be taken to prevent oil leakage. A dry-well arrangement in which the bearing is isolated from the oil bath is preferred. Grease lubrication of the lower bearing is required in these applications.

Pinions shall be proportioned so that the root diameter of the pinion is not smaller in diameter than the diameter of the journals for the pinion shaft.

Base plates for the reducers shall be large enough to give unobstructed access for drilling and reaming the mounting holes from above the unit.

Speed reducers driving bridge machinery and electrical controls shall be shown on Plans or approved equal.

The manufacturer shall submit for approval by the Engineer a certified print of each speed reducer showing a minimum of the following:

- All external mounting dimensions including shaft sizes, bores, and keyways where required.

- Internal Plans showing each reducer component with part numbers.

- The ratings that will appear on the nameplate.

- Location of all lubricant connections and details of any external lubrication piping.

- Lubrication recommendations.

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The manufacturer shall submit for approval by the Engineer computerized calculations showing conformity to the requirements of the AGMA Standard Practice specified. The approved reducer prints and design calculations must be made available to the County of San Joaquin prior to construction of the unit.

98-1.02J Hubs and Bores

The hubs of all gears, wheels, and couplings shall be finished on both faces and polished where the hub face performs the function of a collar to prevent shaft movement. The hubs shall be bored concentric with the rims of gears and wheels or with the outside of couplings. All hubs shall have an ANSI Class FN2 medium shrink fit on the shafts, unless otherwise specified.

98-1.02K Shims

Where shown on the Plans, all machinery shims required for leveling and alignment of equipment shall be stainless steel, neatly trimmed to the dimensions of the assembled parts and drilled for all bolts that pass through the shims.

Shims shall be Stainless Steel ASTM A240 Type 316 and furnished without bolt holes. Holes in shims shall be drilled and reamed to the same tolerance as the connected parts at final assembly. Shims greater than 1/2-inch shall include one solid plate of thickness equal to 1/2-inch less than total shim thickness.

Shims shall be shown and fully dimensioned as details on the shop drawings. Shims with open side or U-shaped holes for bolts will not be permitted. No shims shall have less than two holes for bolts, unless specified otherwise in the Plans. Bolt holes shall not be punched at machine shop to prevent distortion of the shims.

In general, sufficient thickness shall be furnished to secure 1/64-inch variations of the shim allowance plus one shims equal to the full allowance. The 1/2-inch nominal shim pack consists of the following thickness variations: one 1/4-inch, one 1/8-inch, one 1/16-inch, one 1/32-inch and two 1/64-inch.

98-1.02L Welding

Welding required for machinery shall be done in accordance with the Bridge Welding Code. ANSI/AASHTO/AWS D1.5 and all interim revisions published by AASHTO as of the bid opening date. Stress relieving will be required only specified. All welds used to fabricate machinery shall be completely tested by ultrasonic inspection (ASTM E164-74) per AWS D1.5 for compression welds unless otherwise noted. All machining shall be performed after welding and stress relieving.

Welding joint sizes and details shall be shown on working drawings. Where multi-pass welds are required, welding procedures shall be submitted with shop drawings. Distortion during fabrication shall be kept to a minimum by the use of welding fixtures and proper welding procedures.

98-1.02M Machinery Guards

Machinery guards shall be provided for all moving parts readily accessible to personnel and where otherwise required by OSHA or ANSI B15.1, Safety Standard for Mechanical Power Transmission Apparatus, including but not restricted to the following:

- Couplings

- Open Gears

- Unused shaft extensions

- Shafts at platform and roadway level

- Brakes

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Instrument drives and limit switches

Machinery guards shall not be required for the rack segments and pinions. Machinery guards shall be constructed to comply with the applicable requirements of ANSI B15.1, Safety Standard for Mechanical Power Transmission Apparatus.

Unless otherwise indicated or specified, all machinery guards shall be constructed of stainless steel having minimum thickness of No. 12 Gauge and shall have provision for removal without requiring disassembly of any machinery component.

Machinery guards shall be provided with removable hinged or bolted covers for access to lubrication fittings enclosed by the guard. Phenolic nameplates shall be provided on these covers with lubrication instructions.

Machinery guards shall be painted Safety Orange.

98-1.02N Flexible Couplings

Couplings shall be of the type as shown on the Plans and shall include grid type, gear type, and others as needed.

Couplings shall, in general, be finish-bored and have keyways cut by the Coupling Manufacturer to dimensions and tolerances established on the shop drawings and then shipped to the manufacturers of the various components for shop installation on the shafts.

Grid-type, self-aligning, fully flexible, torsionally flexible couplings shall be used to connect electric motors to machinery components. the grid-type couplings shall have steel hubs, alloy steel grids, and steel or aluminum covers. Bolts in the covers shall be shrouded.

Gear-type, self-aligning, full-flexible couplings or semi-flexible couplings with floating shafts shall be used to connect all machinery components, except where other types of couplings are called for on the Plans. All couplings shall have shrouded bolts. The gear-type couplings shall be made of forged steel, have curved face teeth, and shall provide for at least a plus and minus of 3/4 degree misalignment per gear mesh.

Special couplings shall be as shown on the Plans.

Couplings shall be standard products of an established Manufacturer.

98-1.02O Lubrication

Lubrication Fittings: All bearings and surfaces requiring lubrication, other than gear teeth, shall be fitted for a pressure system of lubrication using NPS 1/4-inch giant button head fittings, unless otherwise indicated on the Plans. The fitting for greasing bushed bearings shall be tapped into the housing or connected thereto by stainless steel seamless pipe, which shall be tapped into the housings so that grease will be discharged directly through the housing, shims, bushing, and into the grease grooves for distribution. All grease fittings shall be conveniently located for greasing, and if necessary, shall be connected to the points requiring lubrication from convenient lubrication stations by NPS 1/4-inch stainless steel seamless pipe – schedule 80 with stainless steel threaded pipe fittings – 3000 psi. All stainless steel pipe and fittings shall meet ASTM A312 and ASTM A182, respectively. All pipe extensions shall be kept as short as practical, shall be securely supported at fittings and intermediate points and located so that it shall be protected from injury. All lubricating equipment shall be installed in perfect condition.

Not more than two sizes of fittings shall be used. The large size shall be used wherever possible, and the smaller size shall be used for motor bearings and other small devices. Pressure fittings shall be rated at a minimum of 10,000 psi. Fittings shall contain a steel check valve that will receive grease and close against back pressure.

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Immediately after the completion of fabrication, all fitting locations shall be plugged until components are installed and regular lubrication is started. The plugs shall then be replaced with the proper grease fittings. During installation, the Contractor shall lubricate all rotating and sliding parts of the machinery and fill all gear reducers, bearing housings, and flexible couplings with lubricants indicated on approved lubrication charts.

Maintenance and lubrication literature for each machinery component shall be kept in the Control House in a heavy bound binder.

98-1.02P Spare Parts

The contractor shall provide a complete list of each and every shaft and coupling seal used at the job, including current part number and manufacturing of each seal furnished plus sufficient generic description and dimensions to order seals in the future when current models/manufacturers may no longer be identifiable.

In addition to the spare parts described under other items the following spare parts shall be provided:

One grid of each grid-type coupling.

One complete set of gaskets for every flexible coupling.

Five lubrication fittings of each different type and size used.

98-1.03 CONSTRUCTION

98-1.03A Shop Fabrication

The Contractor shall give no less than ten (10) working days notice to the Engineer of the beginning of work at foundries, forge, and machine shops so that inspection may be provided. No materials shall be cast, forged, or machined before the Engineer has been notified where the orders have been placed.

The Contractor shall furnish all facilities for inspection of material and workmanship in the foundries, forge, and machine shops and the Inspector designated by the Engineer shall be allowed free access to necessary parts of the premises. Work done while the Inspector has been refused access or presented in a manner that prevents adequate inspection will automatically be rejected.

The Inspector shall have the authority to reject materials or workmanship, which do not fulfill the requirements of these Specifications.

Inspection at the foundries, forge, and machine shops is intended as a means of facilitating the work and avoiding errors. It is expressly understood that inspection will not relieve the Contractor from any responsibility in regard to imperfect material or workmanship and the necessity for replacing defective materials or workmanship, which are delivered to the job site.

The Contractor shall furnish the Engineer with a copy of all orders covering work performed by subcontractors or suppliers.

Unless otherwise provided, the Contractor shall furnish without additional charge test specimens as required, and all labor, testing machines, tools, and equipment necessary to prepare the specimens and to make the physical tests and chemical analyses required by material specifications. A copy of all test reports and chemical analyses shall be furnished to the Engineer.

Their acceptance of any material or finished parts by the Engineer shall not be a bar to their subsequent rejection if found defective. Rejected material and workmanship shall be replaced or made acceptable by the Contractor at no additional cost.

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98-1.03B Shop Inspection and Testing

Machinery components shall be shop assembled to verify their correct fit prior to shipment. Measurements required for each assembly are shown on the Plans and/or described in individual pay items.

The speed reducer manufacturer shall shop test the reducers. The Contractors shall submit a testing procedure that will show how the test is to be performed, layout of the apparatus to be used, equipment to be used as well as forms that will be filled out to record the test. This procedure is to be reviewed and approved by the Engineer prior to testing being performed.

Except for instrument drive reducers, testing shall be performed on all reducers.

Before the start of the test, the following measurements shall be taken and documented. All documentation shall be submitted with the certificate of compliance:

Temperature of ambient air.

Temperature of oil near bottom of crankcase shall preferably not rise more than 40°F from ambient during the test. Oil temperature exceeding 150°F shall not be acceptable.

Surface temperature of each bearing adjacent to shaft seals shall not rise more than 100°F from ambient during the test. Temperature above the rating of the seals or bearings is unacceptable.

Sound level at point above and 3 feet distant from the edge of housing of unit shall not exceed 90dbA.

All reducer testing shall orient in the same mounting position as installed on the bridge.

Each reducer shall be first tested by running at no load and at 100% rated motor RPM for at least 2 hours in each direction (4 hours total continuous operation). Readings of measurement 4a through 4d above shall be taken at 30-minute intervals for the full duration of the test.

Each reducer shall be tested by running at 150% rated full load motor torque and at 100% rated motor RPM for 1/2-hour in each direction (1-hour total continuous operation). Readings of measurements 4a through 4d shall be taken at 15-minute intervals for the full duration of the test.

The tests shall be performed with the reducer filled to the dip-stick mark, with new oil of the type the manufacturer recommends on the lubrication charts for normal operation.

The reducer shall be checked for the following during both the load and no load testing:

Any excessive or unusual noise

Excessive bearing clearance

Excessive vibration

Excessive temperature rise

The proper lubrication of the oil system shall be demonstrated during the shop test.

Gear teeth shall be checked for proper distribution of load. This can be measured with the help of tooth contact tape applied to each gear. These tapes will be preserved in the records to be submitted with the Certificate of Compliance.

Bluing dye can be used as an alternate so long as all teeth are coated and digital photographs taken before and after the tests are included with the report.

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No testing shall be performed on the reducer without a representative of the Owner being present. Any testing not witnessed by the Engineer or the Owner's representative shall not be acceptable.

If any condition in 9a through 9d is observed, the manufacturer shall be put on notice by the Engineer of the observation. The manufacturer shall then determine the cause and corrective action necessary to correct the condition and submit a report to the Engineer for review and acceptance. A retest of the reducer will be required to show that the repair has corrected the condition and the Engineer or Owner's representative will determine if the reducer is acceptable.

The County of San Joaquin reserves the right to reject the reducer at any time for any nonconformance that is determined to be detrimental to the proper function and operation of the reducer. Repairs to be performed on the reducer shall be reviewed and accepted by the Engineer prior to the work being performed.

The Contractor is responsible for furnishing all materials required for the test including, but not limited to motor, test stand, and oil.

Additional testing of speed reducers may be specified under individual pay item sections.

98-1.03C Defective Material and Workmanship

All machinery rejected during inspection and testing that is not made acceptable shall be removed from the work site and replaced without additional cost.

Delays resulting from the rejection of material, equipment or work shall not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation shall be corrected by the Contractor without cost. In the event that the Contractor does not make the corrections in a timely manner, the County of San Joaquin reserves the right to make necessary corrections with its own forces and charge the resulting costs to the Contractor.

98-1.03D Delivery and Storage

98-1.03D(1) Protection for Shipment

Machinery parts shall be cleaned of dirt, chips, grit, and all other injurious materials prior to shipping and shall be given a coat of corrosion-inhibiting preservative.

Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion shall be coated as soon as practicable after finishing with a rust-inhibiting preservative. Excepting unfinished metal surfaces inside of gear reducers, this coating shall be removed prior to operation and from all surfaces prior to painting after erection.

Any interface between stainless steel or aluminum and Structural Steel shall receive an Engineer approval coat of zinc-chromate primer prior to assembly.

Machinery parts shall be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage.

Shaft journals that are shipped disassembled from their bearings shall be protected during shipment and before erection by a packing of oil-soaked rags secured in place by burlap and covered with heavy metal thimbles or heavy timber lagging securely attached. Every precaution shall be taken to ensure that the bearing surfaces are not damaged and that all parts arrive at their destination in satisfactory condition.

Pillow blocks with anti-friction bearings that are shop mounted on shafts shall be supported independently of the shaft support to prevent false brinelling during shipment.

Assembled units shall be mounted on skids or otherwise crated for protection during handling and shipment.

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98-1.03D(2) Packaging and Delivery of Spare Parts

Spare parts shall be protected for shipment and prolonged storage by coating, wrapping, and boxing.

All spare parts shall be durably tagged or marked with a clear identification showing the designation used on the approved shop drawing.

Boxes for spare parts shall be clearly marked on the outside to show their contents. Spare parts shall be delivered to a location designated by Bridge Maintenance.

98-1.03D(3) Guarantee and Warranties

Manufacturer's warranties or guarantees on equipment, materials or products purchased for use on the Contract which are consistent with those provided as customary trade practice, shall be obtained by the Contractor and, upon acceptance of the Contract, the Contractor shall assign to the County of San Joaquin, all manufacturer's warranties or guarantees on all such equipment, material, or products furnished for or installed as part of the Work.

The Contractor shall warrant the satisfactory in-service operation of the mechanical equipment, material, products, and related components. This warranty shall extend for a period of one year following the date of final acceptance of the Project.

98-1.03E Erection

98-1.03E(1) General

For each stage of construction, the Contractor shall submit calculations, drawings, and procedures detailing his intended scheme for installing all machinery. Machinery installation shall be done in a coordinated manner to ensure all the machinery components fit the adjacent material furnished under other items.

98-1.03E(2) Alignment and Bolting

The order of assembly and alignment of bridge machinery shall start at the final driven components and worked back to the prime mover. The Contractor shall limit the finality of some stage machinery installations so that proper alignment of mating components is met prior to final reaming and fastening.

All open gearing shall be aligned such that backlash is within tolerance and at least the center 50% of the effective face width of each pair of meshing teeth is in contact. The cross mesh shall not exceed 0.01 inch per 6 inches of face width. All open gear measurements shall be submitted to the Engineer for review and approval. The measurements include backlash, cross-mesh alignment, tooth valley gap and face contact. The type of bluing or lubricant used for face contact measurements shall be submitted to the Engineer for approval prior to any measurements. The measurements shall be performed at a minimum of 8 equally spaced span positions ranging from fully open to fully closed.

All parts of the machinery shall be match marked for proper assembly and correct orientation. Before final drilling or reaming, all parts shall be adjusted to exact alignment by means of shims. If required, tapered shims shall be provided at no additional cost. Installation, alignment, and shimming of the electric motors, and devices such as limit switches and encoders, shall be included with the machinery for such erection. After final alignment and bolting, all parts shall operate smoothly.

The span shall not be operated by the bridge machinery until all components are installed, in final alignment and bolted as approved by the Engineer.

Bolt holes in structural steel for connecting machinery shall, in general, be drilled from the solid after final alignment of the machinery. Sufficient erection holes, subdrilled 1/4-inch undersize for undersized temporary bolts, may be used for erection and alignment of the machinery. When the machinery is aligned

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in its final position, the temporary bolts shall be removed one bolt at a time, full-size holes for the remaining bolts shall be drilled or subdrilled and reamed, and the full-size bolts installed.

Bolt holes in structural steel, shims, and machinery components shall be drilled and reamed assembled to assure accurate alignment of the hole and accurate clearance over the entire length of the bolt within the specified limit. Hand held reamers are not considered accurate enough and the Contractor shall assume that a reaming jig shall be used to keep the bolt hole cylindrical. This jig shall be of structural steel, fixed to the drill and secured to the work preventing the reamer shaft from deviating. Holes shall be checked with a bolt hole micrometer to assure uniform diameter.

ASTM A449 bolts shall be torqued to the same tension required for ASTM F3125 bolts specified in the Standard Specifications.

Torques for other classes of bolts shall be proportioned to their strength and shall be indicated on the erection drawings.

98-1.03E(3) Coatings

Threads for turned bolts shall be coated with anti-seize compound before assembly with nuts to prevent corrosion or galling and to facilitate future removal if necessary.

98-1.03E(4) Edges and Corners

All edges and corners of machinery parts, sheet metal work, bed plates, and fabricated supports that are exposed in the finished work shall be rounded or chamfered. All burrs or other surface defects that could be injurious to workers erecting or maintaining the bridge machinery shall be removed.

98-1.03E(5) Personnel and Facilities

The machinery shall be erected and adjusted by competent millwrights skilled in the type of work involved. They shall be provided with all necessary measuring and leveling instruments as may be required.

98-1.03F Painting

98-1.03F(1) General

Cleaning and painting of all unfinished surfaces of machinery shall comply with requirements of Section 91 of the Caltrans Standard Specification. A three-coat system for metal shall be used. The Contractor shall submit for review with the working Plans an outline of painting materials and methods.

98-1.03F(2) Shop Painting

All unfinished machinery external surfaces shall be cleaned with final surface preparation, prior to painting, done by blast cleaning to meet the requirements of SSPC-SP6 "Commercial Blast Cleaning" with the following exceptions:

- Flexible couplings

- Reducers

- Sleeve bearings with bushings in place

- Electric motors

- Brakes

- Limit switches

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Other equipment with shaft seals

The equipment excepted by the Engineer

The expected machinery or equipment shall be cleaned with solvent and hand tools to meet the requirements of SSPC-SP2, "Hand Tool Cleaning" as depicted in SSPC VIS 1, "Guide to Visual Standard No. 1".

After proper surface preparation, all unfinished machinery surfaces except for the interior of gear housings, flexible couplings, and pillow blocks shall be given one shop coat of primer by hand brushing. The modified aluminum epoxy mastic primer, Carbomastic 15 or approved equal, shall be compatible with the paints selected for subsequent coats. Interiors of gear housings shall be protected with special oil-resistant crankcase paint or approved equal.

98-1.03F(3) Field Painting

After erection is complete, all machinery surfaces remaining exposed, except machine finished surfaces in sliding contact, shall be thoroughly cleaned with an approved high-flash solvent and given an immediate field coat. The epoxy polyamide intermediate, Carboguard 888 or approved equal, shall be compatible with the finish coat. The intermediate coat shall be applied by hand brushing and shall be resistant to weathering (marine environment) and abrasion and free of lead.

After field testing is complete but prior to final acceptance of machinery, all machinery surfaces remaining exposed, except machine finished surfaces in sliding contact, shall be re-cleaned with an approved high-flash solvent and given a finish field coat. The aliphatic acrylic-polyester polyurethane, Carbothane 133 LH or approved equal, shall be compatible with the previous coats. The finish coat shall be applied by hand brushing, which shall color code to distinguish between fixed and moving parts. The following colors shall be used:

Federal Safety Orange: Except for machine finished surfaces in sliding contact, for all moving parts of the machinery such as shafting, couplings, and the side of gears and brake wheels.

Federal Safety Green: For all stationary parts of the machinery. Machinery component fasteners mating with machinery supports shall be painted the same color as the structural steel.

Paint for the finish coat shall be high-gloss, resistant to weathering and abrasion and conform to OSHA color requirements of the Safety Color Code for Marking Physical Hazards, ANSI Z53.1. The brand and colors shall be submitted to the Engineer for approval. The color for each component shall be indicated on the assembly shop drawings or separate paint drawings.

The Contractor shall place cautionary signs in the Control House, which shall explain the color code. Details of the signs giving text, dimensions, and materials shall be placed on a shop drawing.

The Contractor shall take special care to avoid painting of machinery surfaces which are in normal rubbing contact. All nameplates, legend plates, and escutcheons mounted on machinery shall be masked for protection from paint. Lubrication fittings shall be kept clog-free.

98-1.03G Contractor's Inspection

After erection is completed, the Contractor shall make a thorough inspection to ensure that all gears are clean and free of obstruction, that all parts are properly aligned and adjusted as closely as practicable without actual operation, that all bolts are properly tightened and that the span is properly balanced.

Inspection of tightened fasteners shall be in accordance with the County of San Joaquin Standard Specifications for Roads and Structures. The Contractor's inspection shall verify that field painting has been

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performed as specified herein. Touch-up painting shall be performed to correct all painting defects found during this inspection.

The Contractor's inspection shall verify that all enclosed gear housings are filled to the proper level, and all rotating and sliding parts are supplied with lubricants as recommended by the Manufacturers of the units. Typical products for the various locations are as follows:

Sleeve bearings and Pillow Blocks:

NLGI #2 Grease

Open Gears:

Open Gear Lubricant (Mobiltac 375 NC)

Specific Gravity, 72°F (22°C) 0.96

SUS @ 100°F 25,000

(cSt @ 40°C 5,000)

SUS @ 210°F 5,000

(cSt @ 100°C 1,100)

Enclosed Gear Reducers:

Refer to AGMA Standard 9005.D94 "Lubrication of Industrial Enclosed Gear Drives"

Gear Couplings:

NLGI #0 Grease

Grid Couplings:

NLGI #2 Grease

The Contractor shall be accompanied by the Engineer during his final inspection before field testing. On the basis of the results of this inspection, the Engineer shall determine whether the bridge is ready for field testing.

98-1.03H Field Testing

When the machinery and electrical equipment is ready for field testing, the Contractor shall meet with the Engineer to arrange a test schedule and shall keep available a complete crew of mechanics for a minimum of four working days in order to provide operation of the swing span for all tests and to make all adjustments and corrections which shall be required to complete the tests.

The Contractor shall prepare a field testing procedure, which shall be approved by the Engineer. The testing procedure shall be coordinated with the tests required for the electrical equipment and shall include measurements of power and current draw by the motors when operating under load as required hereinafter.

The testing procedure shall include but not be limited to the verification of proper installation, alignment, fastening, and operation and/or final adjustment of the following:

Turning Machinery

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Opening Machinery

Wedge Machinery

Stabilizing Machinery

Span Lock Machinery

When the machinery is ready for field testing, the bridge machinery shall be driven by the main electrical system through at least ten complete cycles.

Three phase kilowatts, single phase amperes, span position and motor RPM for all motors shall be recorded on a computerized data acquisition system. The recordings shall be for a complete span opening and closing cycle, with at least three cycles of data for each motor. The data acquisition system shall have 16-bit resolution and shall sample at a rate of 10 Hz. Minimum. Data shall be imported into Microsoft Excel format, and graphs shall be printed out on 11 x 17 paper. Time of day shall be on the X axis, and primary and secondary Y axis shall be chosen to best present the data. In addition, a CD shall be provided with all the raw data and all the Excel files.

During the test runs, each machinery assembly shall be inspected in its entirety to determine whether everything is in proper working order and fully meets the requirements of these Specifications, Plans and manufacturer's recommended tolerances. All test runs shall be performed in the presence of the Engineer. The temperature rise of all machinery components shall not exceed design ratings. If any tests show that any components are defective or inadequate, or function improperly, the Contractor shall make all corrections, adjustments, or replacements required before the final acceptance at no additional cost.

98-1.03J Bridge Operators and Maintenance Personnel Training

1. The Contractor's personnel must provide training and instruction for a period of one (1) working day after the construction of the permanent control system has been completed, fine-tuned, field tested, and utilized for span operations. Instructors must include representatives from manufacturers of the major equipment.
2. The Contractor's personnel must be skilled persons competent to operate the bridge and familiar with the operating equipment of the bridge and its auxiliaries, such as the communications system. They must be able to make any adjustments required to the mechanical equipment.
3. During the one (1) day period specified above, the Contractors personnel must be at the bridge for the normal working period of 8 hours per day.
4. Included in the one (1) day training and instruction period, there must be an on-site training of San Joaquin County bridge operators, maintenance workers, and other personnel as indicated by San Joaquin County on subjects such as all modes of bridge operation, troubleshooting, repair of equipment, maintenance and adjustment of all mechanical equipment, and other items required for full bridge operation and maintenance. Each four (4) hour session must be devoted to operator training. One (1) session must be devoted to hardware and maintenance related topics. The Contractor must furnish all necessary instruction sheets, training aids, books, paper, and booklets to supplement training. The Contractor must submit to San Joaquin County, a minimum of three weeks prior to training session, a schedule and syllabus for review and approval. It must be the Contractor's responsibility to coordinate with San Joaquin County the location where training sessions will be held. Supplying of visual aid equipment and other miscellaneous items required for training must be the responsibility of the Contractor.
5. Training of the designated bridge operational and maintenance personnel must commence before the official bridge opening date.

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98-1.04 MEASUREMENT AND PAYMENT

98-1.04A General

General Machinery will not be measured for payment. All costs associated with furnishing and installing materials, labor, tools, and incidentals necessary to complete the work shall be included in the *Bridge Machinery* pay items.

98-2 BRIDGE MACHINERY

98-2.01 GENERAL

98-2.01A General

The work included under this item shall consist of the following:

ADJUST AND SYNCHRONIZE ALL CENTER AND END WEDGE CRANK SHAFTS AND CONNECTING RODS TO PROVIDE ADDITIONAL CLEARANCE FOR BRIDGE MOVEMENT (12)

REMOVE AND REPLACE THE GASOLINE ENGINE (1) WITH A DEISEL ENGINE

REPLACE THE BALANCE WHEEL TRACK MOUNTING PLATE AND ALIGN THE TRACK RAIL (1)

RESHIM THE BALANCE WHEELS TO PROVIDE CLEARANCE WITH THE TRACK WHEN THE SWING SPAN IS IN THE CLOSED POSITION (6)

REPLACE ALL SHAFT BABBITTED BEARINGS OF THE SWING SPAN TURNING MACHINERY (12)

REPLACE ALL SHAFT BABBITTED BEARINGS S OF THE WEDGE DRIVE MACHINERY (58)

REPLACE ALL JAW COUPLINGS AND DAMAGED SHAFTS OF THE WEDGE DRIVE MACHINERY (22)

REBUILD THE WORM GEAR REDUCERS OF THE WEDGE DRIVE MACHINERY (3)

Details and arrangement of all systems are shown on the Plans.

The work shall be in accordance with the requirements specified in "General Machinery".

The Contractor shall coordinate the work listed above with electrical work and structural work, as well as navigational and vehicular traffic closures and restrictions.

98-2.02 MATERIALS

98-2.02A General

The materials used to fabricate the machinery components shall be as shown on the Plans and in

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accordance with the requirements specified in "General Machinery".

98-2.02B Engine

The engine, complete with all set-mounted accessories and auxiliary equipment, shall be factory-assembled by the manufacturer. The engine set shall be approved as manufactured by Cummins, Caterpillar, Kohler or approved equal.

The engine and machinery shall be coupled together through a non-backlash type, flexible coupling though a power takeoff, and mounted on a self-supporting, structural steel base (skid). The structural steel base shall be bolted to the structural support bolts of size and number as recommended by the manufacturer.

The engine shall be a diesel fueled, water-cooled, four-cycle, 6 cylinder, heavy-duty turbocharged, after-cooled unit. The engine shall be equipped with replaceable wet cylinder liners and have pistons of one-piece construction. The engine shall be certified by the Environmental Protection Agency (EPA) to conform to Tier 4 final non-road emissions regulations.

The engine shall be furnished complete with all accessories such as radiator with duct flanges and duct, jacket water circulating pump, fuel supply system, pressure lubrication system with pump, closed loop regulating speed governor, intake air cleaner and silencer, electric starting motor, battery, alternator, and exhaust system. The engine shall be furnished with an engine safety control switch, which shall be arranged to give a visual, and an audible alarm on shut down of the engine under the condition of low oil pressure, high water temperature, overcrank, or overspeed

The engine shall be supplied with either an integral or separate reversing gear which shall be linked to the operators control station and shall be used similar to the existing.

The Contractor shall furnish any tools of special nature, which may be required to properly service the engine and its accessories. A hand tachometer shall also be provided.

A set of 3 filters each for lube oil, air and fuel, and a set of spare parts normally recommended by the manufacturer shall be furnished with the generator set and stored as directed by Construction Manager. Adequate engine oil of the proper grade for two oil changes shall be included.

98-2.02D Exhaust System

Exhaust lines shall be as short and as straight as possible. It shall be Schedule 40 black iron pipe or materials recommended by the manufacturer. Where possible, sweep elbows with a radius of at least three times the pipe diameter shall be used.

Flexible corrugated stainless-steel exhaust tubing shall be connected to the engine exhaust outlet to take up thermal expansion and generator set movement. The tubing shall be 24 inches long minimum. The flexible section shall not be bent or used to make up for misalignment between the engine exhaust and the exhaust piping. A Y- or Tee-type condensation trap with a drain plug or petcock shall be installed between the engine and exhaust silencer. This will prevent moisture in the engine exhaust from draining into the engine when it is shut down.

The exhaust piping shall be routed a minimum 36 inches from combustible materials. The piping shall be sized according to the recommendations of the engine manufacturer. The exhaust piping and silencer shall be insulated with suitable high-temperature insulation and supported by non-combustible hangers or supports, not by the engine exhaust outlet. The transition from inside the building to the outside shall be made through an approved wall thimble.

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Horizontal runs of exhaust piping shall slope downwards, away from the engine to the outdoors or a condensate trap. The exhaust outlet shall be located in a manner that will prevent exhaust fumes from entering a building or enclosure. Thimbles shall be used where the exhaust piping runs through a wall or ceiling.

98-2.02E Fuel System

A sub base or stand alone fuel tank may be used and shall include a rupture basin capable of holding 200% of the main tank capacity. Both the inner and outer UL-listed tanks shall have emergency pressure-relief vents. The containment tank's double-layer, heavy-gauge construction shall protect against fuel leaks and ruptures. The inner tank shall be sealed inside the outer tank. The outer tank shall contain the fuel if the inner tank leaks or ruptures. The fuel tank shall be completely filled with fuel at the time of acceptance.

The sub-base fuel tank shall have an integral stub-up area, with removable end channel for easy access. The fuel tank shall include lockable fill cap and mechanical fuel gauge, normal vent with riser and mushroom cap, and basin drain. The rupture basin shall be provided with leak detector. Low level and leak detector liquid level switches shall be float operated, installed through and threaded into a single 1/4" tapping on the top of the tank, shall be entirely of non-ferrous materials.

The Contractor shall furnish and install fuel lines between the fuel tanks and diesel engine and shall be of the type recommended by the manufacturer. The end of the suction line in the tank shall be provided with a double-poppet, brass foot valve and strainer located 3" clear above the bottom of the tank. Connections of both lines at the engine shall be made with bronze, flexible fuel hose with brazed-on brass couplings and threaded terminal fittings.

The connections in the fuel suction line shall be made with forged steel, plain-faced, slip-on welding flanges conforming to the requirements of ANSI B 16.5-1968. The flanges shall be welded back and front to the connecting pipes. Gaskets shall be suitable for the intended use.

To allow filling the fuel tank, a fuel port box shall be furnished and installed near the engine location at a place with convenient access for filling. The fuel port shall include all valves and fittings necessary for connection from a fuel tanker as well as the ability to fill with portable type fuel cans packaged within a lockable, weatherproof spill containment box. The fuel port shall contain sufficient storage for 8.5 gallons spill containment area. The unit shall be furnished with quick disconnect hose coupling with dust plug, check valve, shut-off valve, hand pump for spill containment with shut-off and check valve and ground stud.

A tank vent line consisting of 2 inch diameter pipe shall be extended from the storage tank to a point outside and slightly higher in elevation than the fuel port top. The line shall provide for overflow at the tank and shall terminate in a short length of vertical pipe with a mushroom vent fitting. The mushroom vent fitting shall be of galvanized cast iron with bronze screens.

All piping shall be complete with all valves, fittings, supports and clamps necessary for a complete installation. Drain plugs shall be provided at all low points in the fuel lines.

The Contractor shall furnish and install all regulating and safety equipment necessary to extend fuel service to the generator to render it operable as specified. The installation shall conform to the BOCA National Building Code, San Joaquin County requirements and any other local codes or ordinances.

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Fuel line piping between the fuel port box and the fuel tank shall be black iron pipe, sized per the generator manufacturer's recommendations. All pipe fittings shall be of similar construction as the pipe.

The fuel system is listed under UL 142, and will bear their mark of UL Approval according to their particular classification. It is intended to be installed in accordance with the Flammable and Combustible Liquids Code-NFPA 30, the Standard for Installation and Use of Stationary Combustible Engine and Gas Turbines-NFPA 37.

98-2.02F Shaft Bearings

The Contractor has the option of replacing the babbitt material in place or replacing with bushings at all shaft bearings locations. A procedure for rebabbiting shall be submitted if that option is chosen. Existing bearings may be reused if the surface can be reconditioned and the bearing tolerance restored to an RC6 fit while maintaining alignment.

Babbitt bearings replaced in-kind shall use existing or new shafts as mandrels for each respective bearing replacement to ensure proper shaft, bearing, and gear alignment. Alternate methods may be used, with prior approval of the Engineer.

In the event that bearing replacement will not be done in the field, all shaft diameters shall be measured to ensure proper mandrel size. In preparation for pouring molten Babbitt, shaft surfaces in bearing contact (or mandrels) shall be thoroughly cleaned of all debris to the satisfaction of the Engineer.

Bearing ends shall be sealed with a retaining compound for damming, molding, and positioning of low melting point materials to ensure tight joints. Each bearing base, cap, and mandrel shall be preheated to 200°F - 300°F prior to pouring molten Babbitt.

Babbitt metal shall be thoroughly stirred while temperature is slowly increased during melting process to ensure homogenous mixture. Temperature shall be kept constant at 800°F during pour. The Contractor shall be responsible for the exact positioning of shafting/mandrels and bearings being poured to ensure proper gear mating, shaft alignment, and uniform bearing thickness.

Molten Babbitt shall be poured through grease fittings on horizontally aligned shafts and capped tightly upon completion to the satisfaction of the Engineer. Finished bearing surfaces shall be inspected and approved by the Engineer prior to final assembly. Babbitt shall be removed from the grease fitting channel and a lubrication groove introduced in the lining. Bearings shall be shimmed or Babbitt lining bored to a final tolerance to achieve an RC6 fit with the shaft, unless otherwise specified on the plans.

98-2.02G Worm Gear Reducers

The worm gear reducers shall be removed from the span and transported to a shop capable of rehabilitating the reducers. Rehabilitation shall be defined as replacing the internal bushings and cleaning all internal components. Contractor to report any significant damage to internal gears to the Engineer.

98-2.03 CONSTRUCTION

98-2.03A Gasoline Engine Replacement

The Contractor should be aware that the owner has limited information for existing the Ford Flathead V8 gasoline engine used on Eight Mile Road Bridge over Honker Cut. The contractor is responsible to obtain the correct engine specifications which shall be submitted and submit to the Engineer for review, along with the performance curves of the proposed replacement engine. Note that it is critical that the torque of the existing and replacement engines match to prevent mechanical failure of the drive system. If the

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existing engine output and gearbox information cannot be found the engine may be dynamo tested and the performance curves submitted instead.

Test the replacement engine in shop prior to field shipment. Load test engine with dynamometer and perform compression test on cylinders after load testing.

98-2.03B Balance Wheel Track Mounting Plate

The Contractor shall measure, survey, and locate the positions of the track rail after the new balance wheel track mounting plate is installed. The Contractor shall submit the results to the Engineer for review. The elevation of the track shall be within 1/32 inch of level. The track rail shall be positioned with a centerline concentricity tolerance of 1/32 inch with respect to the swing span center of rotation.

98-2.04 MEASUREMENT AND PAYMENT

98-2.04A Basis of Payment

The lump sum price bid for "Bridge Machinery" must include the cost of furnishing all labor, materials, plant, training, equipment, and all necessary incidentals required to satisfactorily complete installation and perform the work described herein and shown on the Plans.

The Contractor must submit to the Engineer a detailed breakdown of the costs under this item with their bid. The total lump sum value for this item must be broken down in detail.

The approved detailed breakdown must be used as a basis of payment for the progress payments. The progress payments for the work herein must be made in accordance with the San Joaquin County standard payment practices and must be made as follows:

Upon completion and acceptance of the installation of bridge machinery in accordance with the Contract Documents, the Contractor will be paid 90 percent of the bid price for this item.

Upon completion, acceptance, and final submittal of the revised/updated as-built, data sheets, drawings, catalog cuts, and operating, troubleshooting and maintenance guides of new/replaced equipment for the existing Operating and Maintenance Manual, the Contractor will be paid the remaining 10 percent of the bid price for this item.

Payment will be made under:

Pay Item	Item Description	Pay Unit
980000	Bridge Machinery	Lump Sum