

California High-Speed Train System



TECHNICAL MEMORANDUM

Preliminary Engineering for Procurement Guidelines TM 0.1.1

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System Level Technical and Integration Reviews

The purpose of the review is to ensure:

- Technical consistency and appropriateness
- Check for integration issues and conflicts

System level reviews are required for all technical memoranda. Technical Leads for each subsystem are responsible for completing the reviews in a timely manner and identifying appropriate senior staff to perform the review. Exemption to the system level technical and integration review by any subsystem must be approved by the Engineering Manager.

System Level Technical Reviews by Subsystem:

Systems:	<u>Signed document on file</u> Bradley Banks, PE	<u>11 Nov 13</u> Date
Infrastructure:	<u>Not required</u> Gene Lusherovich, PE	<u> </u> Date
Operations and Maintenance:	<u>Not required</u> Joseph Metzler	<u> </u> Date
Rolling Stock:	<u>Not required</u> Frank Banko	<u> </u> Date
Regulatory Approvals:	<u>Not required</u> Vladimir Kanevskiy, PE	<u> </u> Date

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TABLE OF CONTENTS

ABSTRACT	1
1.0 INTRODUCTION	2
1.1 PURPOSE OF TECHNICAL MEMORANDUM	2
2.0 DEFINITION OF TECHNICAL TOPIC.....	4
3.0 ASSESSMENT / ANALYSIS.....	5
3.1 ASSESSMENT	5
3.1.1 ANALYSIS / APPROACH	5
3.1.2 APPLICABILITY	5
3.1.3 CODES, REGULATIONS, DESIGN STANDARDS AND GUIDELINES.....	5
3.2 TECHNICAL MEMORANDA	5
3.3 DESIGN CRITERIA	5
3.4 CADD/PLAN PREPARATION GUIDELINES	5
3.5 DRAWINGS	6
3.6 SURVEY AND MAPPING.....	6
3.7 RIGHT-OF-WAY	6
3.8 GEOTECHNICAL INVESTIGATION	6
3.9 SPECIFICATIONS	7
3.10 REPORTS	7
3.11 VARIANCE REQUESTS	8
3.12 AGENCY AGREEMENTS AND PERMITTING	8
3.13 CONSTRUCTION COST ESTIMATES	8
3.14 CONSTRUCTION SCHEDULE	8
3.15 VALUE ENGINEERING	8
3.16 DESIGN CALCULATIONS	8
3.17 ANCILLARY ACTIVITIES.....	9
3.18 DESIGN AND SYSTEM INTEGRATION.....	9



3.19 DESIGN-BUILD CONTRACT PACKAGING 9

3.20 DESIGN SUBMITTALS AND REVIEWS..... 9

3.1.4 3.20.1 RESPONSE TO COMMENTS..... 9

3.21 PROJECTSOLVE WEBSITE..... 9

4.0 SUMMARY AND RECOMMENDATIONS 9

4.1 GENERAL 9

5.0 SOURCE INFORMATION AND REFERENCES..... 10

6.0 DESIGN MANUAL CRITERIA 11

6.1 INFORMATION FOR INCLUSION IN DESIGN MANUAL..... 11

APPENDIX A - CONSTRUCTABILITY ASSESSMENT REPORT – OUTLINE

CONSTRUCTABILITY ASSESSMENT REPORT 26

APPENDIX B – EMT SYSTEMS COORDINATION AND INTEGRATION OF SYSTEMS

DESIGN WITH REGIONAL CONSULTANTS 29



ABSTRACT

This Technical Memorandum (TM) defines a minimum level of engineering design, referred to as Preliminary Engineering for Procurement (PE4P), required for the procurement of final design and construction services for the California High-Speed Train System (CHSTS) under a Design-Build procurement strategy. This technical memorandum identifies design elements, development level, and engineering deliverables with the objective of providing a consistent approach in developing Preliminary Engineering documents for all sections of the CHSTS and promoting compliance with applicable state and federal regulations as well as project specific design criteria.

It is anticipated that the Regional Consultants will develop detailed work scopes, cost estimates, schedules and work plans required for preparing Procurement level deliverables as described in this TM to support the procurement of Design-Build Teams to complete design. Regional Consultants are required to assess the need for additional engineering efforts, specific to the individual sections, and perform these efforts as required to complete the PE4P deliverables.



1.0 INTRODUCTION

1.1 PURPOSE OF TECHNICAL MEMORANDUM

The California High-Speed Train System (CHSTS) is organized into geographic regional sections for the planning, design, and implementation of preliminary design. For the Preliminary Engineering for Procurement (PE4P), the regional sections are further segmented into Construction Packages.

The purpose of this technical memorandum is to promote consistency of the project's engineering studies by defining a minimum overall level of engineering design needed to support procurement of Design-Build contracts and development of detailed construction cost estimates.

The PE4P for each section will be initiated by the Program Management Team (PMT) once there is a high confidence level in the preference for a single alignment alternative, typically no sooner than approval of the Preferred Alternative report and definition of limits for a procurement contract. The PE4P is guided by the previously developed 15% Design documents however an additional technical effort may be required to support procurement process.

The PE4P provides for a level of design for Design-Build procurement and recognizes that the level of design for a specific discipline will vary as appropriate for support of Design-Build procurement. Regional Consultant (RC) will organize its PE4P into contract packages as directed by the Program Management Team (PMT).

PMT will review the PE4P documents for design compliance with the CHSTS technical requirements, compliance with federal and state regulatory requirements, and sufficiency of design to generate the Procurement level Construction Cost Estimate. Regional Consultants will confirm that the design developed during PE4P does not extend beyond the environmentally cleared project footprint.

Verification of the PE4P design will be achieved through reviews conducted by Engineering Management Team (EMT) at key stages of completion. The draft PE4P documents will undergo a constructability and bid-ability review by the PMT prior to release for use as part of the procurement package.

For design of facilities that are owned or operated by others, in addition to CHSTS criteria the RC will follow the requirements of the facility owner/operator, including appropriate review and approval processes.

1.2 ROLES AND RESPONSIBILITIES

Project participants will work on different and/or multiple high-speed train corridors and may be working at varying stages of project development concurrently. Recognizing that the development of the procurement documents involves the execution and coordination of a number of tasks, one of the critical issues is the assigning of roles and responsibilities for these tasks.

The primary project participants that have a role in preparing the PE4P are:

- California High-Speed Rail Authority (Authority)
- Program Management Team (PMT)
- Engineering Management Team (EMT)
- Regional Consultants (RC)



Table 1.1 identifies the primary tasks and areas of responsibility for each task, by participant, for the project's Preliminary Engineering for Procurement Design level.

Table 1.1 - Primary Tasks and Responsibilities for Preliminary Engineering for Procurement

Task	Task Description	Authority	PE4P Design Level		
			PMT	EMT	RC
1	Design Scope of Work (1)	R	R	S	P
2	Technical Memorandum	R	R/P	P	-
3	Design Criteria Manual	R	R/P	P	-
4	CADD Guidelines/Plan Preparation Manual	R	R	P	-
5. a	Directive and Standard Drawings	R	R	P	-
5. b	Design Drawings (2)	R	R	R/P	P
6	Survey and Mapping	-	-	R/P	P
7	Right-of-Way Assessment	R	R	-	P
8	Geotechnical Investigation	-	R	P	S
9.a	Specifications – Technical	R	R	P	-
9.b	Specifications – Performance (2)	R	R	P	-
9.c	Specifications – Special (2)	R	R	P	S
10	Reports	R	R	R	P
11	Design Variances	R	R	R	P
12	Agency Agreements and Permitting (2)	R	P	P/S	P
13	Construction Cost Estimating (3)	R	R/P	S	S
14	Construction Scheduling	R	P	R	S
15	Value Engineering (Level 3) (4)	R	R	S	P
16	Design Calculations (2)	-	R/P	R/P	P
17	Ancillary activities associated with the design development (e.g., risk management workshops, industry reviews, etc).	R	P	S	S
18	Design and System Integration (2)	-	R	R/P	P
19	Procurement Process	R	P/S	S	S

Legend: **P** = Prepares **R** = Reviews **S** = Supports

(1) Design Scope of Work will be based on the EMT-prepared outline and incorporate PMT/EMT-prepared standard language.

(2) The EMT will prepare general drawing (Abbreviations, Legend and Symbols), technical specifications, and basic design elements required for electrification, communication, and train control.

(3) The PMT will prepare construction cost estimates based on quantities prepared by the RCs in accordance with TM 1.1.22 Cost Estimating Methodology for 30% Design Level¹. EMT will prepare quantities for electrification, communication, and train control systems.

¹ In TM 1.1.22 30% Design shall be read as Preliminary Engineering for Procurement.



(4) RCs to conduct Level 3 Value Engineering in accordance with TM 100.07 Value Engineering Implementation Plan.

2.0 DEFINITION OF TECHNICAL TOPIC

This memorandum defines the basic scope for the engineering level required to prepare Preliminary Engineering for Procurement for the CHSTS. It identifies the design elements to be addressed, the minimum level of design effort, and the data and engineering outputs required to support the procurement process. The following parameters are used to develop the PE4P scope:

- Engineering Subsystems -- Preliminary Design will define requirements for Infrastructure, Systems, Rolling Stock, Operations, and Maintenance as necessary to design a safe and reliable operating high-speed railway that meets applicable regulatory requirements and achieves CHSTS performance requirements. Additionally, the TM 0.3 Basis of Design Report provides information regarding the CHSTS.
- Design Consistency -- PE4P will conform to the Basis of Design, applicable codes and regulations, CHSTS design guidelines, design practices adopted for procurement, and criteria prepared for the CHSTS operational and performance requirements.
- Regulatory -- PE4P will conform to the applicable Federal Railroad Administration (FRA) railroad safety CFRs and California Public Utility Commission (CPUC) regulations and with regulatory requirements as outlined in CHSTP Guidance Document of Required Safety Elements Necessary for FRA Regulatory Approval.
- Construction Cost -- Completion of PE4P will result in sufficient design unit costs, quantities, construction staging, and implementation information to allow for preparation of construction cost estimates. Additional information regarding the CHSTS Construction Cost Estimating will be found in the TM 1.1.22 Capital Cost Estimating Methodology for the 30% Design Level².
- Review and Acceptance -- PE4P will comply with design criteria presented in TMs and other guidance documents. RCs and EMT will submit PE4P deliverables and supporting data to the PMT who will review and coordinate with the Authority for transmittal to FRA for review, comment, and acceptance as to the applicable environmental, design, operational, and safety requirements. Concurrent reviews may be performed by state agencies and affected railroad owners and operators.

As each section of the HST system has unique characteristics, Regional Consultants will be responsible for performing additional engineering beyond the requirements defined in this document to address specific Construction Package issues, to achieve applicable permits, laws and regulations, confirm technical feasibility and constructability, provide schedule input and to prepare quantities for the construction cost estimates. Regional Consultants will confirm that the design included in the procurement documents does not extend beyond the environmentally cleared project footprint.

² In TM 1.1.22 30% Design shall be read as Preliminary Engineering for Procurement.



3.0 ASSESSMENT / ANALYSIS

3.1 ASSESSMENT

The Preliminary Engineering for Procurement will be based primarily on the 15% Design deliverables, with the following additions:

- New Mapping, aerial photography and digital terrain model
- Update alignment to verify clearance requirements with new base mapping
- Complete additional structural analysis for Complex and Non-standard structures
- Confirm/Update 15% Reports
- Supplement 15% Design to prepare a complete package in accordance with Table 6.1.

3.1.1 Analysis / Approach

The engineering requirements defined for the Preliminary Engineering for Procurement are guided by the previously developed Technical Memorandum (TM) 0.1 15% Design Scope Guidelines and review of representative Preliminary Engineering Plans prepared for other Design-Build transportation projects.

3.1.2 Applicability

The guidelines in this technical memorandum are applicable in the development of PE4P design for the CHSTS.

3.1.3 Codes, Regulations, Design Standards and Guidelines

Reference is made to TM 1.1.1 Codes, Regulations, Design Standards and Guidelines. The technical memorandum identifies system-wide regulations, codes, and design standards to be incorporated, as applicable, into the design. It is intended to be used by designers to ensure that the Preliminary Design addresses applicable design requirements. Regional and local regulations, codes and standards are to be identified and incorporated, as applicable, by designers using the latest codes in effect at the time of the procurement.

3.2 TECHNICAL MEMORANDA

The EMT has prepared Technical Memoranda (TMs) that define the design requirements and design criteria that guide and direct the Regional Consultants during the Preliminary Engineering phase. The TMs document the design criteria and used to assess design compliance during the preliminary engineering phase. The TMs will not be in effect for final design and will be superseded by the CHSTS Design Criteria Manual, unless otherwise directed. Additional project specific technical guidance to the RCs is provided in Notice to Designers (NTD).

3.3 DESIGN CRITERIA

The EMT will prepare a CHSTS Design Criteria Manual that includes the criteria requirements for development of the final design and construction documents. The CHSTS design criteria are supported by Directive Drawings, Standard Drawings, and Technical Specifications. The CHSTS design criteria will include infrastructure, facilities, electrification, communication, and train control elements. Requirements for rolling stock, operational plans, and maintenance plans are addressed in separate documents. The CHSTS Design Criteria Manual will be in effect only for the Final Design and Construction phases and will not be in effect during the Preliminary Engineering phase.

3.4 CADD/PLAN PREPARATION GUIDELINES

Preliminary Engineering drawings shall be prepared in accordance with the basic parameters defined in TM 1.1.5 CHSTS CADD Guidelines and TM 1.1.5.1 CHSTS Plan Preparation Manual. These guidelines are issued for use by Regional Consultants in advancing the design of the high-speed train system using uniform drawing parameters that promote quality and consistency across the project's disciplines and geographic regions.



3.5 DRAWINGS

Preliminary Design will include preparation of Directive Drawings, Standard Drawings, and Preliminary Design Drawings. The following information will be provided by the EMT to support development of the procurement package:

Directive Drawings. EMT prepares Directive Drawings (DD). Directive Drawings supplement the design guidance and criteria to ensure consistency during design for system wide elements and features. DDs complement TMs in providing design guidance for the preliminary engineering phase. DDs illustrate design requirements in a graphical format and may be used to expand on figures or tables included in the TMs. DDs may be carried forward as Final Design guidance to complement Design Criteria Manual.

During development of the PE4P Drawings, DDs present mandatory design criteria to be followed, as applicable, by Regional Consultants.

Standard Drawings. EMT prepares Standard Drawings (SDs). SDs will be prepared as a Final Design aid and are principally targeted for use during construction. Generally, SDs will be prepared for the high-speed train elements that require system wide consistency to support operational or maintenance requirements. SDs are EMT documents to be signed and sealed by a registered engineer as they are intended for use in construction.

During development of the PE4P Drawings, SDs present mandatory design criteria to be followed, as applicable, by Regional Consultants.

Preliminary Design Drawings. RC prepares Preliminary Design Drawings (PDDs). PDDs will serve as a reference for final design and construction of proposed improvements.

Table 6.1 summarizes the drawing types, content, and division of responsibility by PMT, EMT, and RC.

3.6 SURVEY AND MAPPING

The EMT or Regional Consultants will develop mapping for PE4P as defined in TM 1.1.4 Engineering Survey and Mapping.

3.7 RIGHT-OF-WAY

The Regional Consultant's primary responsibility for right-of-way (ROW) will be to identify, assess and document the property required to construct, operate, and maintain the high-speed train system. The Authority will be responsible for the acquisition of real property interests and associated relocations as required.

Additional requirements, if necessary, to support the right-of-way appraisals, acquisitions and relocations will be included in a separate document.

3.8 GEOTECHNICAL INVESTIGATION

The EMT will coordinate and oversee the site investigations and preparation of Geotechnical Data Reports, based on the Geotechnical Site Investigation Plan prepared by the Regional Consultant as part of the 15% Design.

Geotechnical Investigations and testing will be prioritized based on available funding, schedule, access, and other project considerations. Supplemental geotechnical investigations will be required subsequent to preliminary engineering in order to advance final design and construction.

The RC will use Geotechnical Data Reports and will prepare Geotechnical Baseline Report and PE4P design.

General protocols for site investigations typically include the following:

- Conduct Spectral Analysis of Surface Wave (SASW) or Multichannel Analysis of Surface Wave (MASW) or geophysical surveys/testing such as electrical resistivity profiling to generalize the subsurface conditions which is then followed by performing Cone Penetration Tests (CPTs) and drilling borings. The site investigations should be carried out in sequential phases as follows:



1. Geophysical testing/surveys to determine the general subsurface conditions.
2. CPTs: To confirm the general subsurface conditions.
3. Borings: To refine the general subsurface conditions after geophysical testing/surveys and CPTs are performed.
4. Trench mapping: To map traces of the fault over an identified fault crossing.

3.9 SPECIFICATIONS

Three types of specifications will be prepared for PE4P: Technical Specifications, Performance Specifications, and Special Specifications. The following information will be provided by the EMT to support development of the procurement package:

Technical Specifications: The EMT prepares Technical Specifications which define the administrative (general) requirements and qualitative requirements for products, materials, and workmanship. The Technical Specifications will follow Construction Specifications Institute's (CSI) formats (CSI's MasterFormat™ 2011 edition and CSI's SectionFormat™ 2009 edition) and will include common sections applicable to all or most projects as identified at the Preliminary Engineering for Procurement Design level.

Performance Specifications: The EMT prepares Performance Specifications for systems and rolling stock. Systems elements include:

- Communications
- Traction Electrification System including Traction Power and Overhead Contact Systems
- Train Control System
- Rolling Stock
- Electromagnetic Compatibility and Electromagnetic Interference

Special Specifications: The EMT will prepare Special Specifications based on a review of the Special and Unusual Conditions identified by the RC in the Design Baseline Report. The RC will itemize special additional coordination and technical requirements in the Design Baseline Report. This information will focus on unique, extraordinary coordination and/or technical knowledge that a Contractor would not otherwise be able to discern from the Technical Specifications, industry-wide data, and/ other readily available specifications. It is expected that the RC's technical information will therefore be focused on local conditions and/or technical issues specifically related to the proposed preliminary design.

3.10 REPORTS

Regional Consultants are responsible for preparing the following reports and updating as necessary the technical data prepared during the 15% Design, including:

1. Right-of-Way Requirements Report (with updated Estimate per Caltrans Right of Way Manual, Chapter 4)
2. Bridges and Elevated Structures Design Report (including Preliminary Foundation Memo)
3. Tunnel Report
4. Hydrology and Hydraulics Report
5. Floodplain Impacts Assessment Report
6. Storm Water Management Report
7. Utilities Inventory and Conflict Memorandum
8. Geotechnical Data Report (GDR)
9. Seismic Design Basis Memorandum
10. Design Baseline Report (include Locations of Environmental Mitigation Measures)



11. Preliminary Geotechnical Baseline Report (GBR) (to be authorized through Change Control)
12. Constructability Assessment Report (See Appendix A for an outline)

3.11 VARIANCE REQUESTS

Regional Consultants are responsible for preparation of requests for approval of design variances for preliminary design elements that do not achieve minimum CHSTS design criterion. Approved Design Variances are required prior to finalizing the PE4P Design Submittals. Refer to TM 1.1.18 Design Variance Guidelines and TM 0.7.1 Design Coordination, Submittal and Review Protocol Draft and Record Set Preliminary Engineering for Procurement Submittals.

Regional Consultants are responsible for obtaining design variance approval from the owner or agency having jurisdiction for non-HST design elements that do not achieve minimum requirements of the respective owner or agency including but not limited to State highways and railroads.

3.12 AGENCY AGREEMENTS AND PERMITTING

The PMT prepares statewide agency agreements with environmental resource agencies to support the environmental permitting required during the Design-Build phase. Memoranda of Understanding (MOU), Memoranda of Agreement (MOA), and Programmatic Agreements (PA) will identify the roles and responsibilities of the Regional Consultant teams in meeting the permitting requirements of the federal, state, and regional environmental resource agencies. The PMT will manage and review the permitting process.

Regional Consultants will prepare project-level permits and will meet the permitting requirements of the federal, state, and regional environmental resource agencies. Regional Consultants will identify permits to be prepared by Design-Builder and provide the list to the PMT.

If required, the PMT will utilize Regional Consultants to support the Authority in preparing agreements with local jurisdictions, authorities, agencies, and/or transit providers to address development of shared-use and connecting transportation operations.

3.13 CONSTRUCTION COST ESTIMATES

The PMT develops the work breakdown structure and provides it to Regional Consultants for preparation of quantity take-off estimates.

Regional Consultants will break down its quantity take-off estimates in accordance with contract packages as directed by the PMT, and will prepare quantity take-off in accordance with TM 1.1.22 Capital Cost Estimating Methodology for 30% Design Level³. Regional Consultants will provide quantity take-off to the PMT along with checked pertinent back-up data.

The PMT will develop project-specific unit prices and prepare construction cost estimates for each contract package and program-wide in accordance with TM 1.1.22.

3.14 CONSTRUCTION SCHEDULE

The PMT will compile overall project construction schedules based on input provided by Regional Consultants.

3.15 VALUE ENGINEERING

The Program Management Team will review Value Engineering (VE) studies prepared by Regional Consultants in accordance with TM 100.07 Value Engineering Implementation Plan.

3.16 DESIGN CALCULATIONS

Regional Consultants will prepare appropriate design calculations following an approved Quality Plan.

³ In TM 1.1.22 30% Design shall be read as Preliminary Engineering for Procurement.



In addition to review and update of design calculations prepared during the 15% Design submittal, RC will prepare structural calculations to confirm compliance with performance requirements.

3.17 ANCILLARY ACTIVITIES

Regional Consultants will participate and support the PMT in design activities required to support design development, including, but not limited to, constructability reviews, risk management workshops, industry reviews, etc.

3.18 DESIGN AND SYSTEM INTEGRATION

Regional Consultants will ensure integration of designs within their sections and with adjacent sections. The PMT will ensure integration of the proposed system-wide elements (Traction Power, OCS, Train Controls, Communications, Operations, Maintenance) with the RC designs. RCs will need to accommodate system-wide elements as identified by the PMT.

3.19 DESIGN-BUILD CONTRACT PACKAGING

The PMT will direct each Regional Consultant regarding the organization of its Preliminary Design Drawings into construction packages, and the Regional Consultant will prepare Preliminary Design Drawings for each construction package accordingly. When requested, the Regional Consultants will support the PMT in determining the construction packaging breakdown.

3.20 DESIGN SUBMITTALS AND REVIEWS

Refer to TM 0.7.1 Design Coordination, Submittal and Review Protocol Draft and Record Set Preliminary Engineering for Procurement Submittals, which is issued as a separate document.

3.1.4 3.20.1 Response to Comments

The PMT will review In-progress and Draft Design submittals and provide an auditable trail that reviews have been completed and that comments have been addressed.

The RC will provide written responses to comments received as a result of the Design Review phase indicating whether the comment is to be incorporated or explaining the reason why it will not be incorporated.

3.21 PROJECTSOLVE WEBSITE

The PMT is responsible for maintenance of the ProjectSolve internet site used by the project team to facilitate information exchange among project participants.

Regional Consultants transmit hard copies and post PE4P design submittals on ProjectSolve site and notify the PMT. RCs shall refer to TM 0.7.1 Design Submittal Protocol for guidance on submittal requirements.

4.0 SUMMARY AND RECOMMENDATIONS

4.1 GENERAL

The recommended design scope guidelines for the PE4P are included in Section 6.



5.0 SOURCE INFORMATION AND REFERENCES

1. California Department of Transportation (Caltrans):
 - CADD Standards Users Manual
 - Highway Design Manual
 - Plans Preparation Manual
 - Project Development Procedures Manual (PDPM)
 - Right of Way Manual, and Forms and Exhibits
 - Standard Plans and Technical Specifications
 - Survey Manual
 - Storm Water Quality Handbook – Planning and Design Guide
2. LEED™ 2009 for New Construction and Major Renovations
3. SAVE International VM Standard
4. TM 0.1 15% Design Scope Guidelines
5. TM 0.3 Basis of Design Report
6. TM 0.7.1 Design Coordination, Submittal and Review Protocol Draft and Record Set Preliminary Engineering for Procurement Submittals
7. TM 1.1.1 Code, Regulations, Design Standards and Guidelines
8. TM 1.1.4 Engineering Survey and Mapping
9. TM 1.1.5 CADD Guidelines
10. TM 1.1.5.1 CHSTS Plan Preparation Manual
11. TM 1.1.18 Design Variance Guidelines
12. TM 1.1.22 Capital Cost Estimating Methodology for the 30% Design Level⁴
13. TM 2.10.4 Seismic Design Criteria, Structures Supporting High-Speed Trains
14. TM 2.10.10 Track-Structure Interaction
15. TM 100.07 CHSTS Value Engineering Implementation Plan
16. CSI MasterFormat 2011 Edition
17. CSI SectionFormat 2009 Edition

⁴ In TM 1.1.22 30% Design shall be read as Preliminary Engineering for Procurement.



6.0 DESIGN MANUAL CRITERIA

6.1 INFORMATION FOR INCLUSION IN DESIGN MANUAL

The purpose of this technical memorandum is to define a minimum level of engineering design required to develop the Preliminary Engineering for Procurement documents and generate a new construction cost estimate. The guidance in this technical memorandum will not be included in the CHSTS Design Manual.



TABLE 6.1 - PRELIMINARY ENGINEERING FOR PROCUREMENT SCOPE GUIDELINES

	PE4P DESIGN SCOPE	ENGINEERING OUTPUT
General	<p>RC Scope: Engineering and design to support Procurement documents:</p> <ul style="list-style-type: none"> - Plan set(s) appropriate for design build procurement - Construction cost estimate (quantity take-offs). - Assist with permit applications for signature - Design that conforms to requirements and commitments included in decision documents (FRA ROD; Authority Resolution, etc.) - Confirm that review comments for 15% Design were addressed and appropriately incorporated in the PE4P Submittal. - Prepare deliverables, coordinate submittals, and perform work as required by the terms of the master agreements with Caltrans, railroads, and others as required - Update Reports - Design Baseline Report - Design variances assessment and submittal. - Sustainability Checklist for Public Facilities (Stations and Maintenance Facilities) - Identify enabling works to other owner facilities, including impacts assessment and mitigation recommendations, analyze and identify any major modifications and associated costs. - Confirm that the design included in the procurement documents does not extend beyond the environmentally cleared project footprint. <p>These are minimum requirements. Additional detailed design, technical studies, and investigations are to be completed where necessary to achieve environmental, regulatory, other approval requirements.</p>	<ul style="list-style-type: none"> - Engineering design developed for design/build procurement documents and updated cost estimate - Design and technical documentation prepared to support regulatory agency approvals - Prepare and submit requests for approval of Design Variances for HST elements not achieving minimum design criteria. - Prepare and submit requests for approval of design variances for non-HST design elements from the owner of the facility (i.e. State highway, railroad, etc.).Prepare project-level permits and meet the permitting requirements of the federal, state, and regional environmental resource agencies. - Identify permits to be prepared by Design-Builder. - Major cost elements identified and quantified - Risk assessment completed and reflected in construction costs - Value Engineering performed as defined in TM 100.07 Value Engineering Implementation Plan. - Facilities Sustainability Criteria, identifying possible points to achieve established sustainability goals for Authority Stations and Maintenance facilities. - Calculations provided for design elements. Calculations checked and follow the CHSTS approved Quality Plan. - Drawings Required: <ul style="list-style-type: none"> - Title Sheet - Index of Drawings - Key Map (Consistent for all discipline) - Project Reports - Design Baseline Update report with project description identifying and defining overall Preliminary Engineering for Procurement Design elements for the segment Construction Packages. Include <u>approved</u> Design Variances and special and unusual conditions.



INFRASTRUCTURE	PE4P DESIGN SCOPE	ENGINEERING OUTPUT
Survey and Mapping	RC Scope: <ul style="list-style-type: none"> - Prepare base and topographic mapping (1-foot vertical accuracy). Supplement survey as required at critical constraints, and environmentally sensitive areas.	<ul style="list-style-type: none"> - Photogrammetric and mapping surveys - Orthorectified aerial photogrammetry - Planimetric mapping / topographic mapping - Digital Terrain Modeling Topography (<i>composite with Alignment Plan</i>)
Right-of-Way	Confirm requirements for ROW acquisition and easements. <ul style="list-style-type: none"> - Update ROW Requirements Report including: <ul style="list-style-type: none"> o Identify sites that have a high risk of impacting the project schedule or costs. o Full and partial takes o Permanent easements o Utility Easements o Construction areas o Temporary staging areas and easements - Environmental Database Review <ul style="list-style-type: none"> o On-ground field reconnaissance of alignment o Review of regulatory agency documentation and other applicable source documents - ROW plan completed. - ROW cost estimate prepared Hazmat categorization	<ul style="list-style-type: none"> - Land ownership maps and preliminary design profile configurations (e.g., at-grade, tunnel, grade separations) - Reports Required are 15% Deliverable Including: <ul style="list-style-type: none"> - Right-of-Way Requirements Report - Drawings Required: <ul style="list-style-type: none"> - Key Map - Right-of-way Plan identifying Permanent and Temporary Easements
Track Alignment (Plan and Profile)	RC Scope: <ul style="list-style-type: none"> - Update alignment drawings with new mapping - Confirm cross sections that identify clearances to water bodies, roadways, structures, access points, wayside equipment, etc. - Confirm right-of-way limits - Update type and limits of guideway type (embankment, tunnel, aerial, etc.) along the alignment - Confirm type and location of turnouts, crossovers and special trackwork - Identify locations for noise abatement / mitigation 	<ul style="list-style-type: none"> - Horizontal Alignment with Superelevation - Vertical Alignment showing key existing features (ground, water bodies, over and under crossings) - Clearances shall be confirmed and noted on plans - Delineate environmentally sensitive areas (ESA) and other areas that have restricted access - Alignment Data File (including horizontal and vertical inroads data files) <i>Electronic deliverable</i> - Typical cross sections identifying station to station geometrics, surface type and depth, slope information, and construction notes. Typical cross sections shall provide continuous coverage of the project. Identify limits (station to station) of cross sections. - Cross sections to be shown at appropriate intervals 500' and transition points along alignments so that guideway configurations and relation to adjacent infrastructure are fully represented. - Special Trackwork Locate and identify on horizontal alignment. (No detail design required) - Right-of-Way limits including temporary easements - Drawings Required: <ul style="list-style-type: none"> - Horizontal Alignment and Profile (Locate special track work) - Typical Cross Sections - Alignment Curve Data



INFRASTRUCTURE	PE4P DESIGN SCOPE	ENGINEERING OUTPUT
Roadway Work (Over and Underpasses)	RC Scope: <ul style="list-style-type: none"> - Verify clearances - Update drawing with new mapping if required. - Confirm typical sections that identify clearances to tracks, structures, access points, etc. - Confirm right-of-way limits - Confirm limits of roadway structure along the alignment - Confirm Structural Plans for grade separations (for local roadways over HST trackway). For each structure provide justification if 15% design requires updating based on new mapping. 	<ul style="list-style-type: none"> - Horizontal Alignment. Superelevation designed only for State Highways, not local roadways. - Vertical Alignment showing key existing features (ground, water bodies, over and under crossings) - Clearances shall be confirmed and noted on drawings - Design to provide and maintain access (pedestrian and vehicular). - Alignment Data Files (including horizontal and vertical InRoads/InRail data files) Electronic Deliverable - Typical cross sections identifying station to station roadway geometrics, surfacing type and depth, slope information, guardrail, vertical cut locations and construction notes. - Cross sections at intervals along roadway alignments so that major work elements and limits are depicted. - Right-of-Way limits including temporary easements - Indicate required driveway relocations - Drawings Required are 15% Deliverables Including: <ul style="list-style-type: none"> - Alignment Plan and Profile - Typical Cross Sections - Alignment Data Files
Temporary Construction Facilities	RC Scope: <ul style="list-style-type: none"> - Review and update Constructability Assessment Report to confirm feasibility of construction, i.e., plan and profile level studies. - Update Constructability Assessment Report per EMT outline 	<ul style="list-style-type: none"> - Update Constructability Assessment Report per EMT outline - Drawings Required: - Suggested Sequence of Construction Diagram to confirm feasibility (as needed) - <i>To be included in Report.</i>
Stations	RC Scope: <ul style="list-style-type: none"> - Confirm Station and site layouts based on updated mapping - Sustainability Implementation Plan Support development of intermodal and shared-use facility	<ul style="list-style-type: none"> - Sustainability opportunities and considerations developed using the Facilities Sustainability Criteria provided by the PMT to be included with Design Baseline report - Drawings Required: <ul style="list-style-type: none"> - 15% Design Architectural Drawings (including Site Plan, floor plans, elevations, sections, and renderings)



INFRASTRUCTURE	PE4P DESIGN SCOPE	ENGINEERING OUTPUT
<p>Bridges and Elevated Structures</p>	<p>RC Scope:</p> <ul style="list-style-type: none"> - Bridges and Elevated Structures Report - Civil and Structural Design for Complex and Non-Standard Structures. Refer to TM 2.10.4 for definition of Technical Classifications. - Structural Design Calculations for Complex and Non-Standard Structures. Refer to TM 2.10.4 for definition of Technical Classifications. - Confirm preliminary foundation design for standard structures based on geotechnical investigations. - Preliminary foundation design for non-standard structures based on geotechnical investigations. - Drawings and calculations required to support resource agency permits (i.e., COE 404, COE 408, etc), as applicable. <p>Note: Preliminary Engineering for Procurement Design Cost Estimate for Structures will be generated using quantity/unit price basis. Design for structures is to be supplemented by foundation assessments using the PE4P Design Geotechnical Investigation Program data. See TM 1.1.22 for 30% Design Cost Estimating Methodology.</p>	<ul style="list-style-type: none"> - For all structures determine classification as Standard, Complex and Non-Standard as defined in TM 2.10.4. For Standard structures provide justification if 15% design requires updating based on new mapping. - For Complex and Non-Standard Structures Develop the Aerial Structural Plan and Elevation Plans and prepare a Design Report: <ul style="list-style-type: none"> o Geometries coordinated and fixed based on updated mapping. o Design concept fixed for foundation, substructure, superstructure preliminary analysis and design. o The level of the design shall reach the level that designer can substantiate the proposed structural is compliance with CHST design requirements. o Construction Method for the proposed alternative in order to identify the construction activities meets the requirements in the environmental documents. o Construction schedule and sequence to confirm compatibility with construction method and permit application. o Develop the substructure types and sizes detailed enough for quantity take off. o Determine bearing types and sizes detailed design not required for the proposed alternative. o Determine expansion joint types, and sizes detailed design not required for the proposed alternative. o Determine preliminary bridge drainage including inlet types, sizes, and locations. o Preliminary foundation Layout: <ul style="list-style-type: none"> ▪ Perform a preliminary foundation design in accordance with the site specific preliminary geotechnical investigation and hydraulics reports. ▪ Determine types and sizes of the foundations. ▪ Consistent with environmental documents ▪ Supports quantity take-off. o Temporary structures: <ul style="list-style-type: none"> ▪ One feasible method for the temporary structure must be identified for the proposed alternative. ▪ Supporting details shall be consistent with environmental documents. - Compliance with system wide bridge aesthetics features Structural Design Calculations (PE4P) for Complex or Non-Standard Structures including:



INFRASTRUCTURE	PE4P DESIGN SCOPE	ENGINEERING OUTPUT
<p>Bridges and Elevated Structures (continued)</p>		<ul style="list-style-type: none"> ○ Complex and Non-Standard Structures are defined in TM 2.10.4 Interim Seismic Design Criteria. ○ Preliminary design as required to confirm feasibility. ○ Track-Structure Interaction per TM 2.10.10: structural frequency, passenger comfort, vertical deflections, lateral deformations, and live load impact; ○ Seismic Design: Prepare calculations as required to confirm feasibility to design criteria. - Drawings Required for Complex and Non-Standard: <ul style="list-style-type: none"> ○ Structural notes (document basis of design) ○ Span layout: length, width, depth, maximum height, number of spans, expansion joint locations; for complex and non-standard structures ○ Structural elevations: illustrating finish grade and pier heights, minimum vertical and horizontal clearance. ○ Bridge superstructure cross sections (including structure depth, construction type. ○ Typical Bents: column / footing locations, spread footings and/or drilled pier, column type, approximate size; Identify areas where supports or foundations are prohibited. ○ Transition structure locations and Type (i.e., at-grade to bridge, bridge to tunnel, etc.), based on EMT guidance. ○ Retaining wall limits (extent and height) of walls and foundations. ○ Indicate requirements for existing facility modifications (pedestrian, roadway, highway, railroad), major utility relocations. - RC to review 15% Design Submittal and make a determination of Complex and Non-Standard Structure classification in coordination with the RM and EMT.



INFRASTRUCTURE	PE4P DESIGN SCOPE	ENGINEERING OUTPUT
<p>Seismic</p>	<p>RC Scope:</p> <ul style="list-style-type: none"> - Documentation that Seismic Performance Criteria satisfied as part of Bridge and Elevated Structures scope. 	<ul style="list-style-type: none"> - Seismic Design-Basis-Memorandum for Complex and Non-Standard Structures including: <ul style="list-style-type: none"> - Documentation of compliance with Seismic Performance Criteria; - Documentation of soil-structure interaction (methodology, seismic wave field, foundation layering and 3-D effects, foundation basemat and wall flexibility, embedment effects, strain compatible soil shear modulus and damping); - Documentation of foundation response (i.e., rocking, uplift) used for energy dissipation; - Documentation of pre-determined location of damage (i.e., at column top or bottom, pile cap, etc.), level of expected inelasticity; - Documenting expected differential settlement meets criteria; - Documentation of expansion joint capacity versus demands (force and/or displacement capacities). - Seismic Design Calculations: including special seismic design considerations (i.e., special seismic features, fault crossings, near source effects, marginal soil conditions, soil-structure interaction consideration).
<p>Tunnels</p>	<p>EMT Scope:</p> <ul style="list-style-type: none"> - Identify requirements for local first responders - Considerations for train operations, fire and life safety requirements, OCS, and other required equipment <p>RC Scope:</p> <ul style="list-style-type: none"> - Confirm tunnel type, locations and length based on new mapping - Refine / revise portal location and extent based on new mapping - Confirm site and access requirements for ventilation facilities - Confirm tunnel portal facilities and site requirements (i.e., structures, access, shafts, egress, etc.). - Confirm constructability including methods, temporary construction areas, access, muck disposal, etc. - Update Tunnel Report including key design issues, construction issues, quantity estimates, compliance to system wide design philosophy and aesthetics 	<p>Update Tunnel Report based on updated mapping and geotechnical site investigation data, and HST fire life safety criteria.</p> <ul style="list-style-type: none"> - Drawings Required are 15% Deliverables Including: <ul style="list-style-type: none"> o Typical tunnel and portal cross sections o Horizontal and vertical alignments (can be shown on overall alignment drawings) o Transitions structure locations (i.e., at-grade to tunnel, bridge to tunnel, etc.) o Retaining wall limits (extent and height)



INFRASTRUCTURE	PE4P DESIGN SCOPE	ENGINEERING OUTPUT
Support Facilities	RC Scope: <ul style="list-style-type: none"> - Confirm footprint based on general program of functions for the following: <ul style="list-style-type: none"> o Operations Control Center, Regional Control Centers o Maintenance facilities (Level 1/2/3/4/5 Rolling Stock Maintenance) o Line side facilities for maintenance-of-way - Access, parking, utility services for facilities as required to define right-of-way requirements. - Confirm Civil and Architectural Design Drawings - Sustainability Implementation Plan 	<ul style="list-style-type: none"> - Sustainability opportunities and considerations developed using the Facilities Sustainability Criteria provided by the PMT to be included with Design Baseline report - Drawings required are 15% Deliverables.
Earthwork, Retaining Walls	RC Scope: <ul style="list-style-type: none"> - Confirm cut and fill slope profile and limits based on geotechnical recommendations and seismic analysis and design guidelines - Confirm extent of retaining structures as required to reduce ROW requirements and/or mitigate impacts - Confirm temporary construction requirements - Confirm earthwork and construction materials criteria and volumes based on new mapping - 	<ul style="list-style-type: none"> - Based on new mapping <ul style="list-style-type: none"> o Cut and fill slope catch points included on alignment plans o Retaining wall locations and extents (lengths and heights) o Permanent and construction easement requirements o Grading to confirm right-of way requirements. o Earthwork sections showing of cut and fill slopes, limits, catch points, etc. developed from alignment files and digital terrain model. Hard copy drawings not required. All cross sections will be made available in electronic format. Earthwork sections to be developed at nominal 500 foot intervals and identified by station location. <p>Information to be included on Alignment, Structure and Tunnel drawings.</p>
Hydrology/ Hydraulics/ Drainage/ Grading	RC Scope: <ul style="list-style-type: none"> o Update Hydrology and Hydraulic studies o Type, location and cost of major drainage facilities or modifications as well as their footprint and costs. o Incorporate rise in tidal waters (and expansion of tidal waters) based on recommendations by EMT. o Confirm storm water runoff water quality issues and reflect best management practices. o Confirm floodplain impacts and mitigation. 	<ul style="list-style-type: none"> - Update and confirm major drainage facilities - Develop on-site drainage concepts - Incorporate rise in tidal waters (and expansion of tidal waters) based on EMT guidance. - Confirm Reports: <ul style="list-style-type: none"> - Hydrology and Hydraulics Report (Include Drainage Concepts with Drainage Areas drawings) - Floodplain Impacts Assessment Report - Storm Water Management Report (to identify ROW needs)
Utilities	RC Scope: <ul style="list-style-type: none"> - Confirm the 15% utility scope has been performed. If not, perform the 15% utility scope and confirm proposed utility dispositions are within the environmental footprint. - If the dispositions of the utilities substantially varies from those identified in the 15% design, provide a listing of those utilities, the extent of work, and cost estimate to the Authority. Upon approval by the Authority, perform additional detailed utility investigations in accordance with the 15% utility scope. - Prepare Notice to Relocate letters to utility owners for the utilities in conflict with the project (the preferred alternative) for transmittal to utility owners. - Confirm conflicts and disposition, ownership and rights for utilities affected by the proposed 	<ul style="list-style-type: none"> - Utilities Inventory and Conflict memo - Coordinate with Utility Companies on relocation/protection/mitigation - Support PMT for Utility Agreements - Drawings Required: <ul style="list-style-type: none"> o Composite Utility Plans with disposition of conflicts, and proposed relocations (inclusive of track alignment, local roadway, facilities)



	<p>improvements.</p> <ul style="list-style-type: none">- Confirm the utility dispositions in critical areas are within the established environmental footprint. If not, conduct additional environmental studies as required. Critical areas are the areas within the project limits where the presence of utilities could significantly impact the project environmental footprint, construction cost, or overall project schedule- Provide technical support to the Authority for preparation of Utility Agreements,- Update relocation options and prepare matrix of responsibilities and estimated costs for major utilities and utility relocations in critical areas.- Identify required HSR new utility services (except for traction power systems and local connection points), and prepare necessary special provisions for D/B to implement.- Work shall be performed in accordance with TM 2.7.5 Utility Requirements for 30% Design Level.	
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INFRASTRUCTURE	PE4P DESIGN SCOPE	- ENGINEERING OUTPUT
<p>Geotechnical</p>	<p>Geotechnical scope will be managed by PMT. As part of a separate scope to be authorized through change control, the RC may be requested to:</p> <ul style="list-style-type: none"> - Perform subsurface investigations for special circumstances where additional geotechnical information is required to confirm technical feasibility, reduce schedule impacts, or to establish a reasonable construction cost estimate. - Prepare preliminary geotechnical design memos and reports. - Prepare preliminary geotechnical design recommendations based on available geotechnical data. 	<p>RC may be requested to provide:</p> <ul style="list-style-type: none"> - Geotechnical investigation exploration and laboratory work plans - Completed assessment and initiation of on-site field testing as required - Hydrogeologic data and recommendations - Recommendations for supplemental geotechnical investigations, exploration and testing for final design - Reports Required: <ul style="list-style-type: none"> - Geotechnical Data Report (GDR) - Draft Geotechnical Baseline Report (GBR) - Preliminary Geotechnical Design Recommendations - Drawings Required: <ul style="list-style-type: none"> - Boring Logs



SYSTEMS	PE4P DESIGN SCOPE	ENGINEERING OUTPUT
General	Refer to Appendix B - EMT Systems Coordination and Integration of Systems Design with Regional Consultants	
Traction Power	RC Scope: - Civil (Site, Roadway, Grading, and Permanent and Construction Easements) for Traction Power Facilities (Traction Power Substations, Switching Stations and Paralleling Stations) and Wayside Power Cubicles (WPC) based on the Standard and Directive Drawings and relevant TMs, EMT memos and direction issued by EMT.	Required Information to be shown on RC Drawings: <ul style="list-style-type: none"> o Site Layouts (including alternatives) including graded and paved areas o Identify footprint for Main and Strain Gantry Arrangements manholes and ductbanks and similar features o Easements (as applicable) o Access Roadway Layout o Retaining Wall locations
Power Utility Company/ HV Electric Power Connections	RC Scope: - Civil (Site, Roadway, Grading, and Permanent and Construction Easements) plans for the HV interconnection facility for Traction Power Substations based on the Standard and Directive Drawings and relevant TMs, EMT memos and direction issued by EMT. - Location and configuration of HV connections, including access to HST mainline facilities will be coordinated by EMT.	Required Information to be shown on RC Drawings: <ul style="list-style-type: none"> o Connection arrangement between HV Utility Lines and Traction Power Substation (EMT). o Site Layout of HV Connections to the HV Utility Network (EMT). o Ductbank and Manhole/Overhead Feeder Circuit Layout for HV Lines from HV Utility network to CHSTS SS (EMT). o Site footprint and easement locations, access and footprint requirements
Overhead Contact System (OCS)	RC Scope: None	Required Information to be shown on RC Drawings: <ul style="list-style-type: none"> o EMT OCS typical configurations shown on RC sections o Clearance to fixed structures
Trackside Services /Train Control	RC Scope: - Location and configuration of equipment houses, cabinets, troughs, manholes, ductbanks, gantries and other wayside equipment, etc., for each interlocking and yard will be coordinated by EMT. - Civil (Site, Roadway, and Grading,) plans for each interlocking and yard showing provisions for location of train control facilities and equipment houses, cabinets, troughs, manholes, ductbanks, gantries and other wayside equipment, etc. . - -	Required Information to be shown on RC Drawings: <ul style="list-style-type: none"> o For each interlocking: <ul style="list-style-type: none"> - Access roads - Site layout including grading for train control sites. - Identify footprint for manholes, ductbanks and similar features o For each Yard: <ul style="list-style-type: none"> - Areas for house and equipment sites, site provisions for signals and related structures) - Control tower and equipment room locations
Communications	RC Scope: - Civil (Site, Roadway, and Grading) plans for communication shelters and tower sites	<ul style="list-style-type: none"> - Identify footprint space (including site alternatives) for communications shelters, towers, grading, and access roads. - Identify footprint for manholes, ductbanks and similar features - Confirm feasibility of grounding (rod/grid) for communication compounds and rooms as required per EMT guidance.



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OPERATIONS	PE4P DESIGN SCOPE	ENGINEERING OUTPUT
<p>Operations Facilities</p>	<p>EMT Scope:</p> <ul style="list-style-type: none"> - Confirm activities and functional requirements for an operations center - Confirm requirements for redundancy of the operations facilities - Confirm locations and size of operations facilities <p>RC Scope - none</p>	<ul style="list-style-type: none"> o Refer to Support Facilities.
<p>Operations Concept</p>	<p>EMT Scope:</p> <ul style="list-style-type: none"> - Confirm operational parameters to provide a train service that supports the projected Ridership - Develop operational rules for use in preparing the FRA Rule of Particular Applicability that will allow revenue service operations including worker safety, operational conditions, and perturbation management. <p>RC Scope - none</p>	

MAINTENANCE	PE4P DESIGN SCOPE	ENGINEERING OUTPUT
<p>Rolling Stock Maintenance Facility</p>	<p>Maintenance Facility design shall include the following design elements:</p> <ul style="list-style-type: none"> - Toilet manifold systems - Water service - Aisles - All roads, parking lots, walkways and outdoor storage areas based on building locations and yard operations - Fixed equipment in the shops including: DC Power, overhead/jib cranes, drop tables, pits, hoists and lifts, bench test equipment, turntables, and roof/pantograph platforms, retractable OCS - Track, switches and catenary systems - Utility Plans, including: ultrafiltration system, waste treatment plant, site storm drainage, sanitary sewer, floor drains/oil water separator lines, storage tanks - Electrical, communications, domestic water, fire mains, gas - Yard security elements, including: perimeter fencing, guard booth, access control for personnel at critical locations, detection systems (cameras), yard lighting - Identify dewatering treatment <p>EMT Scope:</p> <ul style="list-style-type: none"> - Confirm list of activities and functions for a Heavy Maintenance/Repair facility - Confirm list of activities and functionality for the layup, storage, and periodic maintenance facilities located near terminal stations - Finalize facility requirements for rolling stock maintenance facilities - Finalize track layout and access requirements for central maintenance and repair facility (Heavy Maintenance /Repair) and terminal maintenance facilities (Lay-up, Storage and Periodic Maintenance) <p>RC Scope:</p> <ul style="list-style-type: none"> - Confirm footprint and access requirements with EMT - Noise, vibration mitigations 	<ul style="list-style-type: none"> - Confirm footprint and access requirements - Drawings Required : <i>Access points and roads to be included on Right-of-Way Drawings</i> o Civil/Site: <ul style="list-style-type: none"> ▪ Overall Site Plan (indicating yard boundary, building footprint, roadways, grading, drainage concepts, parking, walkways, building access, and outdoor storage, fencing). o Easement Details (as applicable) o Access Roadway Layout and Profile, Parking Facility o Typical Foundation Plans including Transformer Oil Containment o Retaining Wall locations, extents and heights (as applicable) o Track: <ul style="list-style-type: none"> ▪ Yard plans including track alignment (horizontal and vertical) o Systems: <ul style="list-style-type: none"> ▪ Coordinate Catenary Plans for buildings and yards with EMT ▪ Coordinate Yard Control - Signaling Plan with Operations and EMT ▪ Facility Substation Plan (refer to Traction Power) ▪ Manholes, ductbanks and similar features o Security Plans: <ul style="list-style-type: none"> ▪ Yard surveillance security layout plan, include layouts showing methods to limit site access to authorized employees and vehicles.



MAINTENANCE	PE4P DESIGN SCOPE	ENGINEERING OUTPUT
Maintenance of Way	<p>EMT Scope:</p> <ul style="list-style-type: none"> - Confirm maintenance-of-way (MOW) program and associated activities. - Identify and describe potential hazardous material generation. - Identify range of staffing levels. - Identify energy demand. - Identify water and sewer demands. - Finalize maintenance of way equipment, and associated storage requirements. <p>RC Scope:</p> <ul style="list-style-type: none"> - Confirm footprint and access requirements with EMT. - Noise, vibration mitigations 	<ul style="list-style-type: none"> - Confirm footprint and access requirements. - Drawings Required: Access points and roads to be included on Right-of-Way Drawings For Building drawings refer to Support Facilities scope. <ul style="list-style-type: none"> o Demolition Plans o Overall Site Plan (indicating boundary, tracks, building(s) footprint, access roadways, parking, site lighting, building access ways, and outdoor storage). ▪ Systems features including manholes, ductbanks and similar features

SYSTEM INTEGRATION	PE4P DESIGN SCOPE	ENGINEERING OUTPUT
Utility Interfaces	<p>RC Scope:</p> <ul style="list-style-type: none"> - Ensure the design of utility relocation and new utility service designs correlate with the design standards / requirements, as stated by the respective utility owners, and the relocations are within environmental footprint of the project 	<ul style="list-style-type: none"> - Drawings (Refer to <i>Utilities</i>)
Third Party Improvements	<p>RC Scope:</p> <ul style="list-style-type: none"> - Ensure the design of third party improvements to adjacent properties (to the Authority's ROW) complies with the design standards / requirements of the applicable property owner(s) 	<ul style="list-style-type: none"> - Special and Unusual Conditions to be included in Design Baseline Report
System Safety Requirements	<p>RC Scope:</p> <ul style="list-style-type: none"> - Confirm compliance with applicable system safety design requirements as identified by the PMT in the Certifiable Elements and Hazards Log (CEHL). 	<ul style="list-style-type: none"> - Provide documentation of compliance in conformance with the Verification and Validation Management Plan (VVMP).
Interface coordination	<p>RC Scope:</p> <ul style="list-style-type: none"> - Complete Interface coordination at both ends of the section. - Complete interface coordination with Civil (Clearance, sound wall, emergency stair way, utility relocation) & Track. - Complete interface coordination with Core System (Train Control, Signaling, and communication, OCS, Tracking and Power). - Complete interface coordination with Operations & Maintenance. Requirements for the above interfaces are identified in the V&V Interface Register. 	<ul style="list-style-type: none"> - Provide documentation of compliance in conformance with the Verification and Validation Management Plan (VVMP).

PROJECT CONTROLS	PE4P DESIGN SCOPE	ENGINEERING OUTPUT
Construction Cost Estimate	<p>- RC Scope:</p> <p>Prepare construction cost estimates for design per CHSTS 30% Design Construction Cost Guidelines.</p>	<ul style="list-style-type: none"> - Provide quantity take-off estimates to the PMT along with checked pertinent back-up data. - Prepare quantity take-off estimates in accordance with contract packages as directed by the PMT.
Construction Schedule	RC Scope - none	-



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APPENDIX A - CONSTRUCTABILITY ASSESSMENT REPORT – OUTLINE CONSTRUCTABILITY ASSESSMENT REPORT

(Section Report – Identify Construction Package)

Table of Contents

List of Figures and Tables

Abbreviations and Acronyms

1.0 Executive Summary (1 Page)

2.0 Introduction (1 Page)

2.1 Purpose

Include Figure showing Precast Operations Yards, Construction Staging and Layout Areas

2.2 Project Description

Identify preferred alignment.

3.0 Segment Construction Packaging (2-3 Pages)

Provide overall Construction Packaging for Segment. Identify Construction Package addressed.

Include Figure showing segment packages.

Include table indicating Limits with Stationing and distances.

CONSTRUCTION PACKAGE	LIMITS		STATIONING		Miles
	Start	End	Start	End	
CP1	North of Stanislaus Street	East American Avenue	S 10806+00	S 10970+00	3.1

4.0 Construction Staging and Sequencing (4-10 Pages)

Provide description (bulleted format) of Suggested Construction Staging for Construction Package.

Include Figure showing Precast Operations Yards, Construction Staging and Layout Areas.

Include table listing for Precast Operations Yards, Construction Staging and Layout Areas Access points.

#	Location	Type ⁽¹⁾	Name	Size (acres)	Construction Access Points
2	1 mile southwest of the city of Fresno	L	HW CL2	26	Central Valley Hwy/SR 43 or SR 41 to Excelsior Ave and north on 13 Ave

(1) L: Construction Layout Area; P: Precast Operations Yard; S: Construction Staging Area

4.1 Sites for Precast Operations Yard

4.1.1 Description of Site

4.1.2 General Size, Shape, and Location

Include figure.

4.2 Construction Staging Area



4.2.1 Description of Site**4.2.2 General Size, Shape, and location**

Include figure.

4.2.3 Required Area Calculations

Include table addressing Construction Staging Area Requirements, including: Material Storage; Equipment Storage; Office Space and Parking; Additional Facilities Space; Waste Storage Space. Provide Area Requirement Summary.

4.3 Construction Laydown Areas**4.3.1 General Location****4.3.2 Accessibility****4.3.3 Size**

Include figure.

4.4 Skewed Crossing Layout Areas**4.4.1 General Location****4.4.2 Accessibility****4.4.3 Size**

Include figure.

5.0 General Construction Methods (2-4 Pages)

Identify critical issues and provide recommendations.

5.1 Demolition**5.2 Clearing and Grubbing****5.3 Earthwork****5.4 Roadway****5.5 Drainage****5.6 Structures****5.6.1 Aerial Structures****5.6.2 Open Trench Excavation****5.6.3 Cut and Cover Tunnel****5.6.4 Bored Tunnels**

Identify Tunnel Work Space and Portals construction needs.

5.6.5 Retaining Walls**5.6.6 Utility Relocation/ Adjustments/ Construction****5.6.7 Trackwork****5.6.8 Systems****6.0 Traffic Control and Detours (1 Page)**

- 6.1 **Construction Access and Traffic**
- 6.2 **Pedestrian detouring and access**
- 7.0 **Construction Utilities (1 Page)**
 - 7.1 **Construction Power**
 - 7.2 **Construction Water**
- 8.0 **Third-Party Coordination and Agreements (1-2 Pages)**
 - 8.1 **Utilities**
Identify in table.
 - 8.2 **Railroads**
Identify issues and provide recommendations.
 - 8.2.1 **Union Pacific Railroad**
 - 8.2.2 **BNSF Railway**
 - 8.2.3 **Other**
 - 8.3 **Local Jurisdictions**
- 9.0 **Potential Excavation Hazards (1 Page)**
 - 9.1 **Flammable Gasses and Hydrocarbons Cobbles and Boulders**
 - 9.2 **Tunneling through Fault Zones**
 - 9.3 **Contamination**
 - 9.4 **Obstructions**
 - 9.5 **Existing Openings**
- 10.0 **Right-of-Way Acquisition (< 1 Page)**
- 11.0 **Groundwater Management (< 1 Page)**
- 12.0 **Construction Pollution Control (1 Page)**
Identify concerns with respect to dust/dirt; noise; vibration and provide recommendations.
- 13.0 **Construction Permits (1 Page)**
Preliminary Listing of anticipated permits that may be acquired:
Provide table of Construction Permits

Jurisdiction	Permit Required
- 14.0 **LIST OF ATTACHMENTS (< 1 Page)**
May include bar chart schedule



APPENDIX B – EMT SYSTEMS COORDINATION AND INTEGRATION OF SYSTEMS DESIGN WITH REGIONAL CONSULTANTS

Background

The PMT proposes to reassign the lead responsibility for Systems Preliminary Engineering (PE) to the EMT Systems Group to accomplish the 15% PE and PE for Procurement (PE4P) design. The change will result in a more integrated development of the Systems Tasks with the increased EMT involvement in the Systems Design. The intent of this proposal is to efficiently establish an appropriate system site definition for inclusion in the program's environmental assessment and preliminary design for use in preparation of procurement documents.

General Approach

The Regional Consultants will provide existing site and design information, including base mapping, alignment alternatives, track plan and profile, property parcel data, survey, right-of-way, geotechnical, utility, environmental footprint (if available), systems sites locations (if available) and other information to EMT in hardcopy and softcopy suitable for importing into and manipulating within a GIS software tool .

The RC shall deliver data suitable for import into ArcGIS.DGN format (in correct state plane coordinate system and project datum), showing the latest versions of the elements below (as available and applicable to the route section):

- Color coded (differentiating at-grade, tunnel, trench, aerial) alignment alternatives (including horizontal and vertical alignment data)
- Systems sites, site alternatives and access roads
- Maintenance facilities, passenger stations, tunnel portals and other facilities
- Environmental Area of Potential Effect ("APE") mapping
- Existing topography and proposed track grading
- 100-year floodplain with base flood elevation
- Utilities
- Property parcels
- Seismic Fault Lines

Updated data shall be provided on a monthly basis, as required, to reflect design revisions associated with the preliminary design.

EMT will locate systems sites and features, perform site visits, assess and develop site-specific conceptual site designs, as necessary. The Regional Consultant staff will participate in systems site visits and incorporate the conceptual site designs into the preliminary plans and environmental documents.

The Regional Consultant will retain responsibility for all existing data, property research, historical and biological environmental assessments and surveys, access road routing, environmentally clearing EMT placed systems sites and features and conducting utility surveys.

The EMT will perform quantity takeoffs, unit costs and overall system costs for the capital cost estimates. The RC will develop civil/infrastructure quantity take offs.



The EMT will attend RC progress and coordination meetings during the design development period.

Specific Direction for Systems Task 4.2

4.2.1 Traction Power System (TPS) 15% design level and Preliminary Engineering for Procurement (PE4P)

- A. The RC will, as per present practice, develop and produce the relevant alignment background mapping, property maps and plan and profile designs showing track and infrastructure details.
- B. RC shall transmit the above information to the EMT Systems engineering group.
- C. The PMT/EMT will perform TPF site identification work and/or verify sites previously identified by EMT/RC. EMT will then identify conceptual site locations for TPF, WPC and HV interconnection sites on the plans, based on the design guidelines.
- D. EMT will perform 15% engineering designs for the Systems elements (with subsequent confirmation at PE4P). EMT will transmit conceptual site locations to RC for incorporation into the plan sets.
- E. The RC will perform site design engineering to incorporate the conceptual locations of systems sites into the RC's design. The RC will identify precise site locations, alternatives and access on the plan sets based on RC's local knowledge and information gathered. The RC will also coordinate with adjacent sections to quantify and report TPF site spacing on key plans.
- F. RC will conduct follow-up actions with respect to the identified sites. RC responsibilities include identification of property impacts, property to be acquired, access road routing to public road connection, utility relocations, impacts, etc.
- G. The RC will support the field visits for site identification with personnel and data on property, utility, and environmental information, etc., as has been obtained during track alignment alternatives development. Minimal support effort is anticipated during field surveys. EMT comments to be addressed and incorporated
- H. RC will conduct environmental investigations on the sites identified by the EMT and incorporate the sites into the design package and EIR/EIS documents.
- I. RC is required to coordinate the previous activities with the EMT to ensure the sites which are identified will comply with engineering guidelines, and are constructible with minimal environmental impact and minimal cost.

4.2.2 Public Utility Company (PUC) Connections 15% Design and PE4P levels

- A. The EMT has identified major electric transmission lines to determine supply points along the CHSTS corridor. The EMT will continue to perform coordination activities with Utilities to determine the needed facilities, the routing of HV lines to the TPF, and interconnection details.
- B. EMT will determine footprint size and location for the utility switching station for interconnection adjacent to the railway TPF. EMT will determine sites and options in conjunction with the Utility
- C. EMT will coordinate with the Utility to manage the engineering of the site plans including orientation of major components, access roads and clearance buffer zones routing of power lines overhead or underground from Utility grid substations/transmission network to the utility switching station and onto



the traction substation, and the routing of 25 kV feeders from TPF to the track alignment in case of TPF

- D. EMT/Utility will perform 15% design (with subsequent confirmation at PE4P), and EMT will transmit the site information and easements for the routing of power lines to the RC for incorporation into the plan sets.
- E. The RC will support the field visits for site identification with personnel and data on property, utility, and environmental information, etc., as has been obtained during track alignment alternatives development. Minimal support effort is anticipated during field surveys. EMT comments to be addressed and incorporated.
- F. RC will conduct follow up actions with respect to the identified sites. RC responsibilities include identification of property to be acquired, access road routing to public road connection, utility relocations, impacts, etc.
- G. RC will conduct environmental investigations on the sites identified by the EMT and incorporate the sites into the design package and EIR/EIS documents.
- H. RC to conduct field survey of overhead utilities located within or adjacent to the right-of-way as part of Task 4.1.10 Utilities, and identify conflicts based on the OCS configuration in the area. As per current practice, the RC will coordinate with the utility owner to identify removal or relocation requirements and details and include this information in the design package.

4.2.3 Overhead Contact System (OCS) 15% design and PE4P levels

- A. The EMT has developed clearance guidelines and standard configurations for the OCS, overhead bridge barriers, grounding and bonding of structures and other fixed elements.
- B. RC shall maintain OCS clearance requirements to existing and new structures as well as CHSTS infrastructure elements. As per current practice, the RC shall apply typical OCS configurations to bridge, tunnel, station and other cross-sections to demonstrate conformance with clearance requirements to infrastructure elements for typical OCS arrangements.
- C. RC shall identify any non-conforming or atypical clearance areas and elements and provide this information to EMT. EMT will perform site specific design analysis and determine if any unique OCS configurations or arrangements are warranted and required. This type of analysis would typically be developed as part of the assessment and approval of a design variances for reduced clearances as requested by the RC.
- D. The EMT will provide RC with specific designs or design requirements where warranted. RC to apply the specific designs to cross-sections included in the design package. No separate specific submittal is required.
- E. RC will identify the locations for typical overhead bridge protection barriers or screens into the preliminary design.
- F. No specific OCS design submittal, arrangement drawings or layout plans are required from the RC.

4.2.4 Trackside Services/Train Control System (TS/TCS) 15% design and PE4P

- A. The RC will, as per present practice, develop and produce the relevant alignment background mapping, property maps and plan and profile designs.



- B. RC shall transmit the above information to the EMT Systems group.
- C. The PMT/EMT will perform TS/TCS site identification work or evaluate previously identified sites by the RC. EMT will then identify conceptual TS/TCS sites on these plans based on the design guidelines and coordination with the PMT's Operations, Maintenance and Safety groups.
- D. Crossovers and Station turnouts will be based on alignment data and other information provided by the RC. .
- E. The EMT will perform 15% engineering designs (with subsequent confirmation at PE4P). EMT will transmit site information to RC for incorporation into the plan sets.
- F. The RC will support the field visits for site identification with personnel and data on property, utility, and environmental information, etc., as has been obtained during track alignment alternatives development. Minimal support effort is anticipated during field surveys. EMT comments to be addressed and incorporated.
- G. RC will conduct follow-up actions with respect to the identified sites. RC responsibilities include identification of property to be acquired, access road routing to public road connection, utility relocations, and impact identification, etc.
- H. RC will conduct environmental investigations on the sites identified by the EMT and incorporate the sites into the design package and EIR/EIS documents.
- I. RC is required to coordinate the previous two activities with the EMT to ensure sites are identified that will provide compliance with engineering guidelines, and are constructible with minimal environmental impact and minimal cost.
- J. Generally, separate TS/TCS plans will not be developed. Except for unique instances, all TS/TCS related layout and site work will be shown on the civil plans.

4.2.5 Communications (COM) 15% design level and PEP

- A. The RC will, as per present practice, develop and produce the relevant alignment background mapping, property maps and plan and profile designs.
- B. RC shall transmit the above information to the EMT Systems engineering group.
- C. COM radio towers and shelters are to be co-located with TPF, tunnel portal and train control master interlocking facility sites and will be placed independently as stand-alone radio sites (SRSs) at midpoint locations. All COM sites (both co-located and SRS) are to contain a 100ft. radio tower, communications shelter and associated equipment.
- D. The RC will identify and report to EMT spacing between co-located COM sites TPF, tunnel portal and train control master interlocking sites. EMT will then identify and conceptually place the SRS COM sites on these plans based on the design guidelines.
- E. EMT will perform 15% designs (with subsequent confirmation at PEP). EMT will transmit site information on GIS background maps to RC for incorporation into the plans.
- F. The RC will perform site design preliminary engineering to incorporate the conceptual locations of SRS into the RC's design. The RC will identify precise SRS site locations, alternatives and access on the plan sets based on RC's local knowledge and information gathered.



- G.** The RC will support the field visits for site identification with personnel and data on property, utility, environmental, etc. information - as has been obtained during track alignment alternatives development. Minimal support effort is anticipated during field surveys. EMT comments to be addressed and incorporated.
- H.** The RC will conduct follow up feasibility actions with respect to the identified sites. RC responsibilities include identification of property to be acquired, access road routing to public road connection, utility relocations, flight path analysis and impact identification, etc. As part of the flight path analysis the RC shall use the FCC online tool TOWAIR to identify which antenna structures require FAA approval and FCC registration.

TOWAIR can be found at the following URL:

<http://wireless2.fcc.gov/UlsApp/AsrSearch/towairSearch.jsp>. The Regional Teams shall use the following input data:

Latitude:	Site specific
Longitude:	Site specific
Measurement System:	Feet
Overall Structure Height:	105
Support Structure Height:	100
Site Elevation:	Site specific
Structure Type selection:	MTOWER - Monopole

The Regional Teams shall report to the PMT whether a tower requires registration or does not require registration. This information, along with tower nomenclature and latitude and longitude shall be tabulated and included within Regional Teams' EIR/EIS document. Additionally, the TOWAIR output is to be captured electronically and transmitted to the PMT CADD team for convenient incorporation into a GIS tool.

- I.** The RC will conduct environmental investigations on the sites identified by the EMT and incorporate the sites into the design package and EIR/EIS documents.
- J.** The RC is required to coordinate the previous two activities with the EMT to ensure sites are identified will provide compliance with engineering guidelines, and are constructible with minimal environmental impact and minimal cost.
- K.** Generally separate communications plans will not be developed. Except for unique instances, all communications related layout and site work will be shown on the civil plans including spacing between sequential radio towers (co-located and SRS).



27 December 2013

PMT-CHSRA-03922

Frank Vacca
Chief Program Manager
California High-Speed Rail Authority
770 L Street, Suite 800
Sacramento, CA 95814

RE: Request for Authority Review and Concurrence of:
TM 0.1.1 Preliminary Engineering for Procurement Guidelines, R3

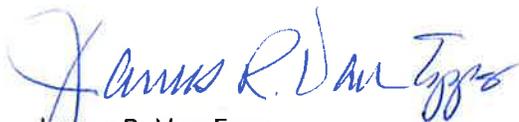
To Frank Vacca,

Revised TM 0.1, 15% Design Scope Guidelines, Rev. 3 is enclosed for your review and concurrence. This TM presents design guidance for establishing a minimum level of engineering required to support procurement of design-build infrastructure contracts.

This revision of the TM incorporates the Design-Build Decision Team recommendation to provide additional utility investigation and coordination in critical areas of the project to either confirm sufficiency of environmental footprint as defined in FEIR/FEIS or amend it for utilities that may become external to the environmental footprint as a result of more advanced design. It also allows improved definitions of the utility disposition in critical areas where lack of clarity in could significantly impact project schedule or cost.

It is understood that this is a living document and will be updated as required. If this meets with your requirements, please sign below acknowledging your concurrence for adoption and use on the program.

Regards,



James R. Van Epps
Program Director

California High-Speed Rail Authority
Concurrence



Frank Vacca, Chief Program Manager

Date: 12/31/2013

Enclosure: TM 0.1.1 Preliminary Engineering for Procurement Guidelines, R 3



SIGNATURE/APPROVAL ROUTING SHEET

1257

DOCUMENT(S) INFORMATION	
To: Jennifer Thommen	
From: Kris Livingston	
Subject: TM 01.1.1 Preliminary Engineering for Procurement Guidelines – Revision 3	
Description of Enclosed Document(s): The Technical Memo 0.1.1 Preliminary Engineering for Procurement Guidelines, Revision 3 is attached for your review and concurrence.	
<input type="checkbox"/> Expedite	Due Date:

REVIEWER INFORMATION		
Reviewer #1 Name (Print): Jim Van Epps	Reviewer's Initial/Date: <i>JVE 27 Dec 13</i>	Comments:
Reviewer #2 Name (Print): Frank Vacca	Reviewer's Initial/Date: <i>FV 12/31/13</i>	Comments:
Reviewer #3 Name (Print):	Reviewer's Initial/Date:	Comments:
Reviewer #4 Name (Print):	Reviewer's Initial/Date:	Comments:
Reviewer #5 Name (Print):	Reviewer's Initial/Date:	Comments:

- | | |
|--|--|
| <input type="checkbox"/> Approval/Signoff (initials) | <input type="checkbox"/> Information |
| <input checked="" type="checkbox"/> Signature | <input type="checkbox"/> Do Not Release – Call When Signed |
| <input checked="" type="checkbox"/> Hand Carry or Call for Pick up
Name: Kris Livingston Ext.: 384-9515 | <input type="checkbox"/> Release When Signed |

Executive Office Control No.:	Name of Contact Person:
	Phone Number:
	Office:
	Office Control No.: