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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><i>Signed document on file</i></u> Rick Schmedes	<u>22 June 11</u> Date
Infrastructure:	<u><i>Signed document on file</i></u> John Chirco	<u>07 June 11</u> Date
Operations:	<u><i>Signed document on file</i></u> Joe Metzler	<u>22 June 11</u> Date
Maintenance:	<u><i>Signed document on file</i></u> Joe Metzler	<u>22 June 11</u> Date
Regulatory Approvals:	<u><i>Signed document on file</i></u> Vladimir Kanevskiy	<u>29 June 11</u> Date

Note: Signatures apply for the technical memorandum revision corresponding to revision number in header and as noted on cover.



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**ABSTRACT**

This Technical Memorandum (TM) defines a minimum level of engineering design, referred to as Preliminary Engineering (30% Design), required for the procurement of final design and construction services for the California High-Speed Train Project (CHSTP) under a Design-Build procurement strategy. This technical memorandum identifies design elements, development level, and engineering outputs with the objective of providing a consistent approach in developing Preliminary Engineering documents for all sections of the CHSTP 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 and completing the 30% Design level deliverables as described in this TM to support the procurement of Design-Build Teams to complete design. Regional Consultants are required to assess their sections for additional engineering efforts, specific to the individual sections, and perform these efforts as required to complete the 30% Design deliverables.



## 1.0 INTRODUCTION

### 1.1 PURPOSE OF TECHNICAL MEMORANDUM

The California High-Speed Train Project (CHSTP) is organized into geographic regional sections to manage the planning, design, and implementation. 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 and to support development of a detailed construction cost estimates.

The 30% Design – Preliminary Engineering (PE) for each section will initiate once there is a high confidence level in the preference for a single alignment alternative. The 30% Design is guided by the previously developed 15% Design documents and provides additional detail required for a Design-Build Team to develop construction drawings.

The 30% Design refers to an overall level of design and recognizes that the level of design for a specific discipline may approach or exceed 30% Design as appropriate for support of Design-Build procurement.

Similar to the 15% Design level, the Program Management Team will review the 30% Design documents to verify design compliance with the CHSTP technical requirements, compliance with federal and state regulatory requirements, and sufficiency of design to generate the 30% Design level Construction Cost Estimate.

Verification of the 30% Design will be achieved through "In-Progress Reviews" conducted at key stages of completion by specific design elements to confirm compliance. The 30% Design documents will also undergo a detailed constructability and bid-ability review prior to release for use as a part of the procurement package.

It is important to note that this TM provides the minimum requirements for the 30% Design. Additional technical efforts may be required to support Preliminary Design development and acceptance.

### 1.2 ROLES AND RESPONSIBILITIES

Project participants will work on different and/or multiple high-speed train corridors and will 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 30% Design 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 30% Design level.

**Table 1.1. Primary Tasks and Responsibilities for 30% Design Level**

Task	Task Description	Authority	30% Design Level		
			PMT	EMT	RC
1	Design Scope of Work (1)	R	R	S	P
2	Technical Memorandum	R	R	P	-
3	Design Manual	R	R	P	-
4	CADD Guidelines	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
7	Right-of-Way Assessment	R	R	-	P
8.a	Specifications – Standard	R	R	P	-
8.b	Specifications – Procurement (2)	R	R	P	-
8.c	Specifications – Special Provisions (2)	R	R	R/P	P
9	Reports	R	R	R	P
10	Design Variances	R	R	R	P
11	Agency Agreements and Permitting (2)	R	R	P	P
12	Construction Cost Estimating (3)	R	P/R	S	S
13	Construction Scheduling	R	R	-	P
14	Value Engineering	R	R	S	P
15	Design Calculations (2)	-	R	R/P	P
16	Ancillary activities associated with the design development (e.g. risk management workshops, industry reviews, etc).	R	P	S	S
17	Design and System Integration (2)	-	R	R/P	P
18	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 EMT-prepared standard language.

(2) The EMT will prepare the basic design elements required for electrification, communication, and train control.

(3) The PMT will prepare cost estimates based on quantities prepared by the RCs. EMT will prepare quantities for electrification, communication, and train control systems.



## 2.0 DEFINITION OF TECHNICAL TOPIC

This memorandum defines the basic scope for the engineering level required to prepare a 30% Design (Preliminary Design) for CHSTP. It identifies the design elements to be addressed, the minimum level of design effort, and the base engineering outputs as part of the project's Preliminary Design in support of the procurement process. The following parameters are used to develop the 30% Design scope:

- Engineering Subsystems -- Preliminary Design will define requirements for the five subsystems (Infrastructure, Systems, Rolling Stock, Operations, and Maintenance) necessary to design a safe and reliable operating high-speed railway that meets applicable regulatory requirements and achieves CHSTP performance requirements. Additionally, the Basis of Design Report provides information regarding the CHSTP.
- Design Consistency -- 30% Design will conform to the Basis of Design, applicable codes and regulations, CHSTP design guidelines, design practices adopted as part of the procurement process, and criteria prepared for the CHSTP operational and performance requirements.
- Regulatory -- 30% Design will conform to the CHSTP System Requirements directly, and indirectly conform to the applicable Federal Railroad Administration (FRA) railroad safety CFRs and California Public Utility Commission (CPUC) regulations except where requirements are otherwise defined specifically for CHSTP operations. Exceptions to regulatory requirements will be identified, documented, and submitted for FRA and CPUC consideration.
- Construction Cost -- Completion of 30% Design 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 CHSTP Construction Cost Estimating will be found in the TM 1.1.22 Capital Cost Estimating 30% Methodology.
- Review and Acceptance -- 30% Design will comply with design criteria presented in TMs and other guidance documents. RCs will submit 30% Design 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 review 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 minimum requirements defined in this document as needed to address specific project issues, to support applicable local laws and regulations, confirm technical feasibility and constructability, and to prepare construction cost estimates.



## **3.0 ASSESSMENT / ANALYSIS**

### **3.1 ASSESSMENT**

#### **3.1.1 Analysis / Approach**

The engineering requirements defined for the 30% Design are guided by the previously developed Technical Memorandum 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 30% Design for the CHSTP.

#### **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 Engineering Management Team will prepare Technical Memoranda (TMs) that define the design requirements and design criteria that guides and directs the Regional Consultants during the Preliminary Design. The TMs document the development of the design criteria and are used to assess design compliance during the Preliminary Engineering phase. The TMs will be superseded by the CHSTP Design Manual and will not be in effect during the Design-Builder's final design.

### **3.3 DESIGN MANUAL**

The Engineering Management Team will prepare a CHSTP Design Manual that will include the criteria requirements for developing the Design-Build final design and construction documents. The Design Manual will identify and specify required elements and considerations to ensure a safe, reliable, and sustainable operating high-speed railway. The Design Manual will be supported by Directive Drawings, Standard Drawings, and Standard Specifications. The Design Manual is anticipated to include infrastructure, facilities, electrification, communication, and train control elements. Requirements for rolling stock, operational plans, and maintenance plans will be addressed in separate documents. The Design Manual will be in effect during the Design-Build Phase and will not be in effect during the Preliminary Engineering Design Phase.

### **3.4 CADD GUIDELINES**

Preliminary Engineering drawings shall be prepared in accordance with the basic parameters defined in TM 1.1.5 CADD Guidelines. 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 Design Drawings.

Directive Drawings. The Engineering Management Team will prepare 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.

DDs present mandatory design criteria to be followed by Regional Consultants during 30% Design.

Standard Drawings. The Engineering Management Team will prepare 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 as a constructed item to support operational or maintenance requirements. SDs are the only EMT generated documents to be signed and sealed by a registered engineer as they are intended for use in construction.

30% Design Drawings. 30% Design Drawings will serve as the basis 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

Regional Consultants will develop mapping for 30% Design as defined in TM 1.1.4 Engineering Survey and Mapping.

### 3.7 RIGHT-OF-WAY

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 acquisition of required real property interests and associated relocations as required.

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

### 3.8 SPECIFICATIONS

Three types of specifications will be prepared for Preliminary Design: Standard Specifications, Procurement Specifications, and Special Provisions.

Standard Specifications: The EMT will prepare Standard Specifications which will define the administrative (general) requirements and qualitative requirements for products, materials, and workmanship. The Standard Specifications will follow Construction Specifications Institute's (CSI) formats (CSI's MasterFormat™ 2004 edition and CSI's SectionFormat™ 2008 edition) and will include common sections applicable to all or most projects as identified at the 30% Design level.

Procurement Specifications: The EMT will prepare Procurement 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



Special Provisions: Regional Consultants will develop Special Provisions which will invoke, modify and augment the Standard Specifications for the specific requirements of their projects. The Special Provisions will be prepared in accordance with the specifications template developed by the EMT.

### 3.9 REPORTS

Regional Consultants will be responsible for the preparation of various reports, including:

1. Corridor Study reports for existing ROW
2. Right-of-Way Requirements Report
3. Report of Adjacent Parcel Identification
4. Alignment Reports with Track and Roadway horizontal and vertical Inroads data files
5. Constructability Assessment Memorandum
6. Station Report (including Station Sizing and Preliminary Foundation Memo)
7. Bridges and Elevated Structures Report (including Preliminary Foundation Memo)
8. Tunnel Report
9. Building(s) Reports (excluding Stations; includes Preliminary Foundation Memo)
10. Hydrology and Hydraulics Report
11. Floodplain Impacts Assessment Report
12. Storm Water Management Report (to identify ROW needs)
13. High Risk Utilities Conflict Memorandum
14. Final Geotechnical Data Report (GDR)
15. Draft Geotechnical Baseline Report (GBR)
16. Preliminary Geotechnical Design Recommendations
17. Seismic Design-Basis Memorandum

### 3.10 VARIANCE REQUESTS

Regional Consultants will be responsible for preparation of requests for approval of design variance for design elements that do not achieve minimum CHSTP design criteria. Approved Design Variances are required prior to finalizing the 30% Design Submittals. Refer to TM 1.1.18 Design Variance Guidelines.

Regional Consultants will be responsible for obtaining approval of design variances for non-HST design elements from the owner or agency having jurisdiction over the facility, including but not limited to State highways and railroads. Approval of all non-HST Design Variances may not be required prior to finalizing the 30% Design Submittals.

### 3.11 AGENCY AGREEMENTS AND PERMITTING

The Program Management Team will prepare 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 which begins during the preparation of the Final EIR/EIS.

Regional Consultants will prepare and be responsible for 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.

### **3.12 CONSTRUCTION COST ESTIMATES**

The Project Management Team will develop the work breakdown structure and provide it to Regional Consultants for preparation of quantity take-off estimates.

The 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 estimates in accordance with TM 1.1.22 Capital Cost Estimating 30% Methodology. Regional Consultants will provide quantity take-off estimates to the PMT along with checked pertinent back-up data.

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.

### **3.13 CONSTRUCTION SCHEDULE**

The Program Management Team will compile overall project construction schedules based on construction schedules prepared by Regional Consultants.

Regional Consultants will develop construction schedules for their respective geographic section. The RC will break down the Construction Schedule in accordance with contract packages as directed by the PMT.

### **3.14 VALUE ENGINEERING**

The Program Management Team will review Value Engineering (VE) studies prepared by Regional Consultants.

Regional Consultants will conduct Value Engineering during the 30% Design phase. Refer to SAVE International (<http://www.value-eng.org>) requirements for the purpose of scoping VE task.

### **3.15 DESIGN CALCULATIONS**

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

RC will prepare structural calculations for Complex and Non-Standard Structures. Calculations for Standard Structures will be prepared by EMT.

### **3.16 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.

### **3.17 DESIGN AND SYSTEM INTEGRATION**

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

### **3.18 DESIGN-BUILD CONTRACT PACKAGING**

The PMT will direct each Regional Consultant regarding the division of its 30% Design into contract packages, and the Regional Consultant will prepare 30% Design for each contract package accordingly. As requested, the Regional Consultants will support the PMT in determining the contract packaging breakdown.

Requirements for the preparation of Design-Build contract packages will be defined in a separate document.



### **3.19 DESIGN SUBMITTALS AND REVIEWS**

Refer to TM 0.7.1 30% Design Submittal Protocol, which is issued as a separate document.

#### **3.18.1 RESPONSE TO COMMENTS**

The PMT will review 30% Design Submittals using ProjectSolve Review Manager to provide an auditable trail that reviews have been completed and that comments are addressed.

The RC will provide written responses using ProjectSolve Review Manager to all comments received as a result of the 30% Design Review phase indicating whether the comment is to be incorporated or explaining the reason why it will not be incorporated.

### **3.20 PROJECTSOLVE WEBSITE**

The Project Management Team 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 30% Design submittals on ProjectSolve site and notify 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 30% Design level 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 Standard 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. Technical Memorandum 0.1 15% Design Scope Guidelines
5. TM 0.7.1 - 30% Design Coordination, Submittal and Review Protocol
6. TM 1.1.5 CADD Guidelines, TM 1.1.18 Design Variance Guidelines,
7. TM 1.1.22 Capital Cost Estimating 30% Methodology.



## **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 30% Design documents and generate a new construction cost estimate. The guidance in this technical memorandum will not be included in the CHSTP Design Manual.



**TABLE 6.1 - 30% DESIGN SCOPE GUIDELINES**

30% DESIGN SCOPE		DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
<b>General</b>	<p>RC Scope:</p> <p>Engineering and design to support an overall 30% design level:</p> <ul style="list-style-type: none"> <li>- Plan set(s) appropriate for design build procurement.</li> <li>- Construction cost estimate.</li> <li>- Construction schedule.</li> <li>- Prepare permit applications for approval.</li> <li>- Agreements and memoranda of understanding with third parties.</li> <li>- Design that conforms to requirements and commitments included in decision documents (FRA ROD; Authority Resolution, etc.)</li> <li>- LEED™ Certification, Silver, for Public Facilities (Stations and Maintenance Facilities).</li> <li>- Confirm that Advance Planning Study (APS) Report (15% Design) was developed.</li> <li>- Confirm that review comments for 15% Design were addressed and appropriately incorporated in the 30% Design.</li> <li>- Prepare deliverables, coordinate submittals, and perform work as required by the terms of the master agreements with Caltrans.</li> <li>- Prepare Reports.</li> <li>- Design variances assessment and submittal.</li> <li>- Identify enabling works to other owner facilities, including impacts assessment and mitigation recommendations, analysis and identify any major modifications and associated costs.</li> </ul> <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"> <li>- Engineering design developed for design/build procurement documents and updated cost estimate</li> <li>- Design and technical documentation prepared to support regulatory agency approvals</li> <li>- Prepare and submit requests for approval of Design Variances for HST elements not achieving minimum design criteria.</li> <li>- 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.).</li> <li>- Prepare project-level permits and meet the permitting requirements of the federal, state, and regional environmental resource agencies.</li> <li>- Identify permits to be prepared by Design-Builder.</li> <li>- Major cost elements identified and quantified</li> <li>- Risk assessment completed and reflected in construction costs</li> <li>- Value Engineering performed</li> <li>- LEEDTM Project Checklist, identifying possible points to achieve at Stations and Maintenance facilities, Silver Certification.</li> <li>- Calculations provided for design elements. Calculations checked and follow the CHSTP approved Quality Plan.</li> <li>- Drawings Required:                             <ul style="list-style-type: none"> <li>o Title Sheet</li> <li>o Index of Drawings</li> <li>o General Notes</li> <li>o Abbreviation and Symbols</li> <li>o Key Map</li> </ul> </li> <li>- Project Reports</li> <li>- Detailed project description identifying and defining overall 30% design elements for the segment.</li> </ul>	<ul style="list-style-type: none"> <li>- Standard Drawings</li> <li>- Directive Drawings</li> <li>- Standard Specifications</li> <li>- Design Criteria and Guidelines</li> <li>- Abbreviations Listing</li> </ul>	<ul style="list-style-type: none"> <li>- TM 0.6 Risk Management Plan</li> <li>- TM 1.1.5 CADD Guidelines</li> <li>- TM 1.1.18 Design Variance Guidelines</li> </ul>

30% DESIGN SCOPE		DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
<b>INFRASTRUCTURE</b>				
<b>Survey and Mapping</b>	<p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Prepare Design Level base and topographic mapping.</li> <li>- Supplement survey as required at stations, structures, and environmentally sensitive areas.</li> <li>- Identify wetlands and other environmentally sensitive areas. Identify areas with hazardous materials.</li> </ul>	<ul style="list-style-type: none"> <li>- Photogrammetric and mapping surveys</li> <li>- Orthorectified aerial photogrammetry</li> <li>- Planimetric mapping / topographic mapping</li> <li>- Digital Terrain Model</li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Survey Control Data Sheets</li> <li>o Existing Topography Plans (<i>composite with Alignment Plan</i>)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Survey and Mapping Standards</li> <li>- Survey Control Data</li> <li>- Survey Control Monument Records</li> </ul>	<ul style="list-style-type: none"> <li>- TM 1.1.4 Engineering Survey and Mapping</li> </ul>
<b>Right of Way</b>	<p>EMT Scope:</p> <ul style="list-style-type: none"> <li>- Confirm requirements for ROW acquisition and easements.</li> </ul> <p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Identify sites that have a high risk of impacting the project (i.e., areas of large excavation with contaminated soils, areas of de-watering with groundwater contamination) in both existing rail ROW and potential acquisition properties.</li> <li>- Confirm parcels and estimated valuation costs for:                             <ul style="list-style-type: none"> <li>o Full and partial takes</li> <li>o Permanent easements</li> <li>o Utility Easements</li> <li>o Construction areas</li> <li>o Temporary staging areas and easements</li> </ul> </li> <li>- Prepare right of way requirements report</li> <li>- Obtain and review land ownership maps and preliminary design profile</li> </ul>	<ul style="list-style-type: none"> <li>- Land ownership maps and preliminary design profile configurations (e.g., at-grade, tunnel, grade separations)</li> <li>- Map of Potential Site Impacts</li> <li>- <b>Reports Required:</b> <ul style="list-style-type: none"> <li>o <b>Corridor Study reports for existing ROW</b></li> <li>o <b>Right-of-Way Requirements Report</b></li> <li>o <b>Report of Adjacent Parcel Identification</b></li> </ul> </li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Key Map</li> <li>o Right-of-way Plan identifying Permanent and Temporary Easements</li> </ul> </li> <li>- <b>Special Provisions</b> describing schedule of right-of-way availability and schedule of right of entry or describe Design-Builder's scope in acquisition of ROW and easements.</li> </ul>	<ul style="list-style-type: none"> <li>- Confirm requirements for ROW acquisition and easements.</li> </ul>	<ul style="list-style-type: none"> <li>- TM 2.8.2 Control Access and Intrusion Protection for HST ROW &amp; Facilities</li> </ul>



INFRASTRUCTURE	30% DESIGN SCOPE	DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
	<p>configurations (e.g. at-grade, tunnel, grade separations)</p> <ul style="list-style-type: none"> <li>- Review Phase 1 screening-level assessment information and identify locations of potentially impacted soil and/or groundwater</li> <li>- Perform Corridor Study to identify properties in or adjacent to existing ROW that may have a high risk of impacting the project through                             <ul style="list-style-type: none"> <li>o Environmental Database Review</li> <li>o On-ground field reconnaissance of alignment</li> <li>o Review of regulatory agency documentation and other applicable source documents</li> </ul> </li> <li>- ROW plan completed.</li> <li>- ROW cost estimate prepared.</li> <li>- Right of entry for project investigations obtained.</li> </ul>			
<p><b>Track Alignment (Plan and Profile)</b></p>	<p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Update alignment with design-level mapping prepared for 30% design</li> <li>- Develop cross sections that identify clearances to water bodies, roadways, structures, access points, wayside equipment, etc.</li> <li>- Define right of way limits</li> <li>- Identify type and limits of guideway type (embankment, tunnel, aerial, etc.) along the alignment</li> <li>- Identify type and location of turnouts, crossovers and special trackwork</li> <li>- Identify locations for noise abatement / mitigation</li> </ul>	<ul style="list-style-type: none"> <li>- Horizontal Alignment with Superelevation</li> <li>- Vertical Alignment showing key existing features (ground, water bodies, over and under crossings)</li> <li>- Clearances shall be confirmed and noted on plans</li> <li>- Delineate environmentally sensitive areas (ESA) and other areas that have restricted access</li> <li>- <b>Alignment Report</b> (including horizontal and vertical inroads data files)</li> <li>- Typical cross sections identifying station to station geometrics, surface type and depth, slope information, and construction notes. At minimum provide:                             <ul style="list-style-type: none"> <li>o Typical cross section for at-grade facilities</li> <li>o Typical cross section In cut areas</li> <li>o Typical cross section for elevated facilities</li> <li>o Typical cross section for tunnel facilities</li> </ul> </li> <li>- Cross sections to be shown at appropriate intervals along alignments so that guideway configurations and relation to adjacent infrastructure are fully represented. Identify limits (station to station) of cross sections.</li> <li>- Right-of-Way limits including temporary easements</li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Abbreviation and Symbols (as needed to supplement General Drawings)</li> <li>o Notes (as needed to supplement General Drawings)</li> <li>o Key Map (as needed to supplement General Drawings)</li> <li>o Typical Cross Sections</li> <li>o Cross Sections</li> <li>o Alignment Curve Data</li> <li>o Horizontal Alignment and Profile</li> <li>o Track Chart</li> </ul> </li> <li>- Special Trackwork (Turnout, crossings, ties) <i>(No detail design required. Locate and identify on horizontal and vertical alignment)</i></li> <li>- Identify and accommodate noise mitigations</li> <li>- <b>Special Provisions</b></li> </ul>	<ul style="list-style-type: none"> <li>- Standard Drawings                             <ul style="list-style-type: none"> <li>o Direct fixation track</li> <li>o Ballasted track</li> <li>o Floating slab track</li> </ul> </li> <li>- Directive Drawings</li> <li>- Design Criteria via TMs.</li> </ul>	<ul style="list-style-type: none"> <li>- TM 1.1.8 Proposed Methodology For Demarcation Of Territorial Subdivisions and Milepost Numerics</li> <li>- TM 2.1.2 Alignment Design Standards for High-Speed Train Operation</li> <li>- TM 2.1.3 Turnouts and Station Tracks</li> <li>- TM 2.1.5 Track Design</li> <li>- TM 2.1.7 Rolling Stock and Vehicle Intrusion Protection for High-Speed Rail and Adjacent Transportation Systems</li> <li>- TM 2.1.8 Turnouts and Yard Tracks</li> </ul>
<p><b>Roadway Work (Over and underpasses)</b></p>	<p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Update alignment with design-level mapping prepared for 30% design</li> <li>- Develop typical sections that identify clearances to tracks, structures, access points, etc.</li> <li>- Define right of way limits</li> <li>- Identify limits of roadway structure along the alignment</li> <li>- Coordinate with Caltrans as required (See <b>Bridges and Elevated Structures</b>)</li> <li>- Prepare Structural Plans for grade separations (for local roadways over HST trackway)</li> </ul>	<ul style="list-style-type: none"> <li>- Horizontal Alignment. Superelevation designed only for State Highways (not local roadways).</li> <li>- Vertical Alignment showing key existing features (ground, water bodies, over and under crossings)</li> <li>- Clearances shall be confirmed and noted on drawings</li> <li>- Design to provide and maintain access (pedestrian and vehicular).</li> <li>- <b>Alignment Report</b> (including horizontal and vertical InRoads/InRail data files)</li> <li>- Typical cross sections identifying station to station roadway geometrics, surfacing type and depth, slope information, guardrail, vertical cut locations and construction notes.</li> <li>- Cross sections at intervals along roadway alignments so that major work elements and limits are depicted.</li> <li>- Right-of-Way limits including temporary easements</li> </ul>	<ul style="list-style-type: none"> <li>- Information regarding which structures will be designed by Caltrans</li> </ul>	<p>—</p>



INFRASTRUCTURE	30% DESIGN SCOPE	DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
		<ul style="list-style-type: none"> <li>- Indicate required driveway relocations</li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Abbreviation and Symbols (as needed to supplement General Drawings)</li> <li>o Notes (as needed to supplement General Drawings)</li> <li>o Key Map (as needed to supplement General Drawings)</li> <li>o Typical Cross Sections</li> <li>o Alignment Curve Data</li> <li>o Grade Separation Structures for crossroads (APS Level only)</li> <li>o Alignment Plan and Profile</li> </ul> </li> </ul>		
<b>Temporary Construction Facilities</b>	<p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Develop design to a level where the feasibility of construction can be confirmed i.e., plan and profile level studies.</li> <li>- Confirm construction methods, staging, laydown, tunnel mucking, shaft and access requirements</li> <li>- Identify and assess and suitable disposal sites</li> <li>- Develop roadway/highway traffic control requirements</li> <li>- Determine temporary construction easements</li> <li>- Identify utility requirements – associated with construction needs and lay-down areas.</li> </ul>	<ul style="list-style-type: none"> <li>- Construction staging plans as needed to determine limits and to characterize temporary impacts during construction</li> <li>- Temporary construction/staging measures, sites and facilities</li> <li>- Mitigation Design</li> <li>- Temporary Construction easements to be included in the Right-of-Way Drawings</li> <li>- Indicate utility requirements during construction staging including water, sewer, power, etc.</li> <li>- Identify enabling works to other owner facilities on Staging plans</li> <li>- <b>Constructability Assessment Memorandum</b></li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Suggested Sequence of Construction (may be schematic figures and notes)</li> <li>o Maintenance and Protection of Traffic for Roadway Work (Over and underpasses) (may be schematic figures and notes)</li> </ul> </li> <li>- <b>Special Provisions</b></li> </ul>	-	-
<b>Stations</b>	<p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Station and site layouts for selected site including:                             <ul style="list-style-type: none"> <li>o Platforms &amp; concourses</li> <li>o Station support areas</li> <li>o Vertical and horizontal passenger circulation</li> <li>o Paid / Unpaid Zones</li> <li>o Intermodal connections and pedestrian/bicycle/transit/vehicular circulation</li> <li>o Pick-up, drop off, access, and egress roadways and facilities.</li> <li>o Context and connectivity</li> </ul> </li> <li>- Prepare Station Report with justification for site, layout, sizing, vertical circulation elements, code compliance</li> <li>- Civil, Architectural, and Structural Concept Design</li> <li>- Confirm Code Assessment</li> <li>- LEED™ Silver Certification Implementation Plan</li> <li>- Support development of intermodal and shared-use facility</li> <li>- Integration of environmental mitigation measures</li> </ul>	<ul style="list-style-type: none"> <li>- Preliminary Design (30%) including:</li> <li>- <b>Station Report</b> <ul style="list-style-type: none"> <li>o Station                                     <ul style="list-style-type: none"> <li>▪ Basis of Design</li> <li>▪ Structure importance classification (i.e. important or ordinary, etc)</li> <li>▪ Space Program Validation, including floor areas, capacities, adjacencies, circulation routes.</li> <li>▪ Compliance with system wide architectural guidance</li> <li>▪ CBC and Applicable Code Compliance</li> </ul> </li> <li>o Site                                     <ul style="list-style-type: none"> <li>▪ Design and site constraints (geotechnical and topographic)</li> <li>▪ Station site access, circulation, intermodal connections (pedestrian, bicycle, transit, automobile). Include circulation beyond site including access from major roads, highways, transit, and bike and pedestrian routes.</li> <li>▪ Parking, bus, bike, taxi, rental car requirements</li> <li>▪ Context and connectivity</li> <li>▪ Drainage Concept (<i>Refer to Hydrology/ Hydraulics/ Drainage</i>)</li> </ul> </li> <li>o Station and Site                                     <ul style="list-style-type: none"> <li>▪ Establish Paid / Unpaid Zones</li> <li>▪ Vertical and horizontal circulation</li> <li>▪ Identify and accommodate noise mitigations</li> <li>▪ Provisions for the disabled</li> </ul> </li> <li>o Sustainability opportunities and considerations using <b>LEED™ Checklist</b>, identify points to achieve LEED™ Silver Certification</li> <li>o Utilities and service connections, including:                                     <ul style="list-style-type: none"> <li>▪ Electrical and mechanical - power supplies (high voltage, low voltage, emergency), lighting, grounding, HVAC, standby generators, switchboards, uninterrupted power systems, substations, etc.</li> <li>▪ Plumbing and fire protection – general and fire protection water</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Architectural Guidelines for station architecture, way finding, lighting, drainage, utilities, landscaping, station operations, etc.</li> <li>- Directive Drawings</li> <li>- Standard Drawings</li> <li>- Standard Specifications</li> <li>- Structure Design Criteria</li> <li>- Seismic Design Criteria</li> <li>- Station ridership, peak volumes based on demand and operating plan, and mode splits</li> </ul>	<ul style="list-style-type: none"> <li>- TM 1.1.1 Codes, Regulations, Design Standards and Guidelines</li> <li>- TM 2.1.3 Turnouts and Station Tracks</li> <li>- TM 2.2.2 Station Program Design Guidelines</li> <li>- TM 2.2.3 High-Speed Train Passenger Station Site Design Guidelines</li> <li>- TM 2.2.4 Station Platform Geometric Design</li> <li>- TM 2.5.1 Structural Design of Surface Facilities and Buildings</li> <li>- TM 2.10.4 Seismic Design Criteria Bridges and Aerial Structures, Tunnels and Underground Structures, Passenger Stations and Building Structures</li> <li>- TM 4.2 Phase 1 Service Plan</li> <li>- Geotechnical TMs</li> </ul>



INFRASTRUCTURE	30% DESIGN SCOPE	DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
		<ul style="list-style-type: none"> <li>supply; storm, sewer and waste water discharge, etc.</li> <li>o Identification of issues affecting station design, operation or safety</li> <li>o Calculations for station sizing, passenger flow, circulation, LOS analysis and pedestrian modeling,</li> <li>o Calculations for utility service loads</li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Architectural Drawings: Site plan, floor plans, roof plan, elevations and sections                             <ul style="list-style-type: none"> <li>▪ Building footprint limits and size, including layout of program spaces and circulation routes, entrances, fare collection, queuing, etc.</li> <li>▪ Existing facility modifications plan (pedestrian, roadway, highway, railroad), major utility relocations</li> </ul> </li> <li>o Civil Drawings: Site plan, typical sections</li> <li>o Structural Drawings:                             <ul style="list-style-type: none"> <li>▪ Layout and notes, legends.</li> <li>▪ Column and footing locations.</li> <li>▪ Retaining walls limits and height.</li> </ul> </li> </ul> </li> <li>- <b>Special Provisions</b></li> <li>- <b>Renderings:</b> Renderings to establish station massing and character (minimum 2 exterior and 2 interior, concourse and platform)</li> <li>- Agreements/plans for shared space and connecting/integrated services with other operators</li> </ul>		
<p><b>Bridges and Elevated Structures</b></p>	<p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Bridges and Elevated Structures Report</li> <li>- Civil and Structural Design for Complex and Non-Standard Structures. Refer to TM 2.10.4 for definition of Technical Classifications.</li> <li>- Structural Design Calculations for Complex and Non-Standard Structures. Refer to TM 2.10.4 for definition of Technical Classifications.</li> <li>- Confirm preliminary foundation design for standard structures based on geotechnical investigations.</li> <li>- Preliminary foundation design for non-standard structures based on geotechnical investigations.</li> <li>- Drawings and calculations required to support resource agency permits (i.e., COE 404, COE 408, etc), as applicable.</li> </ul> <p>Note: 30% 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 30% Design Geotechnical Investigation Program data. See TM 1.1.22 for 30% Design Cost Estimating Methodology.</p>	<ul style="list-style-type: none"> <li>- <b>Bridges and Elevated Structures Report</b> including:             <ul style="list-style-type: none"> <li>o Key design and site constraints (marginal soils, geologic and hydraulic issues)</li> <li>o Limits of Standard Bridge Design, Complex and Non-Standard Bridge Design</li> <li>o Construction methods assessment (i.e., balanced precast segmental cantilever construction, drop in spans by overhead gantry, cast in place, etc.)</li> <li>o Identify temporary construction loadings</li> <li>o Identify temporary construction easements</li> <li>o Traffic or pedestrian diversion and control</li> <li>o Drainage concept (identify permits or requirements)</li> <li>o Inspection, service and maintenance access (EMT provided)</li> <li>o Utilities affected and disposition</li> <li>o Hydrological issues: scour protection, tidal surge mitigation, wetlands mitigation, salt spray</li> <li>o Identify noise mitigation locations</li> <li>o Compliance with system wide bridge aesthetics features</li> </ul> </li> <li>- <b>Preliminary Foundation Memo</b> (included in <i>Bridges and Elevated Structures Report</i>)             <ul style="list-style-type: none"> <li>o Feasible Foundation Types (prelim);</li> </ul> </li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Abbreviations, Legends, and Symbols (EMT provided)</li> <li>o Key Map (as needed to supplement General Drawings)</li> <li>o Structural notes (document basis of design)</li> <li>o Refine / revise Horizontal and vertical alignments based on, topography, clearances, existing and proposed utilities;</li> <li>o Span layout: length, width, depth, maximum height, number of spans, , expansion joint locations; for complex and non-standard structures</li> <li>o Structural elevations: illustrating finish grade and pier heights, minimum vertical and horizontal clearance.</li> <li>o Bridge superstructure cross sections (including structure depth, construction type.</li> <li>o Typical Bents: column / footing locations, spread footings and/or drilled</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Standard and Directive Drawings</li> <li>- Standard Specifications</li> <li>- Track type: direct fixation or ballast track</li> <li>- Passenger comfort criteria (Rolling Stock Dynamic Analysis)</li> <li>- Time Dependent Analysis (creep &amp; shrinkage) methodology</li> <li>- Standard 30% Design Drawings (APS level) for HST Elevated Structures, including:             <ul style="list-style-type: none"> <li>o Typical superstructure standardized cross sections, expansion joint articulation, etc.</li> <li>o Typical column cross sections</li> <li>o Typical Expansion Joint details</li> </ul> </li> <li>- Seismic information for three (3) levels of earthquake: spectra, motions, near source effects;</li> <li>- Track Structure Interaction Guidelines</li> <li>- Transition Structure Typical</li> </ul>	<ul style="list-style-type: none"> <li>- TM 2.3.3 Design Guidelines for High-Speed Train Aerial Structures</li> <li>- TM 2.3.2 Structural Design Loads</li> <li>- TM 2.10.4 Seismic Design Criteria Bridges and Aerial Structures, Tunnels and Underground Structures, Passenger Stations and Building Structures</li> <li>- TM 2.10.6 Seismic Fault Rupture and Crossings</li> <li>- TM 2.10.10 High-Speed Train and Track Structure Compatibility</li> </ul>



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		<ul style="list-style-type: none"> <li>o pier, column type, approximate size; Identify areas where supports or foundations are prohibited.</li> <li>o Transition structure locations and Type (i.e., at-grade to bridge, bridge to tunnel, etc.), based on EMT guidance.</li> <li>o Retaining wall limits (extent and height) of walls and foundations). Shown on structural layout plans;</li> <li>o Indicate requirements for existing facility modifications (pedestrian, roadway, highway, railroad), major utility relocations.</li> <li>o .</li> <li>o RC to review 15% Design Submittal and make a determination of Complex and Non-Standard Structure classification in coordination with the RM and EMT.</li> </ul> <p>- <b>Special Provisions</b></p> <p>- <b>Structural Design Calculations (30%) for Complex or Non-Standard Structures including:</b></p> <ul style="list-style-type: none"> <li>o Complex and Non-Standard Structures are defined in TM 2.10.4 Interim Seismic Design Criteria.</li> <li>o Preliminary design as required to confirm feasibility.</li> <li>o Train-Structure Interaction per TM 2.10.10: structural frequency, passenger comfort, vertical deflections, lateral deformations, and live load impact;</li> <li>o Seismic Design: Prepare calculations as required to confirm feasibility to design criteria.</li> </ul>		
<p><b>Tunnels</b></p>	<p>EMT Scope:</p> <ul style="list-style-type: none"> <li>- Identify requirements for local first responders</li> <li>- Considerations for train operations, fire and life safety requirements, OCS, and other required equipment</li> </ul> <p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Refine / revise tunnel type, locations and length</li> <li>- Refine / revise portal location and extent</li> <li>- Develop site and access requirements for ventilation facilities</li> <li>- Assess tunnel portal facilities and site requirements and develop project footprint needs as required (i.e., structures, access, shafts, egress, etc.).</li> <li>- Refine / revise constructability including methods, temporary construction areas, access, muck disposal, etc.</li> <li>- Tunnel Report (30%) includes key design issues, construction issues, cost estimates, compliance to system wide design philosophy and aesthetics</li> <li>- Civil Design</li> <li>- Structural Design</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Tunnel Report</b> including:                         <ul style="list-style-type: none"> <li>o Tunnel cross sections including considerations for train operations, fire and life safety requirements, OCS, and fixed equipment (EMT provided)</li> <li>o Key design and site constraints (ground characteristics, rock classification, marginal soils, geologic issues, etc.)</li> <li>o Construction method assessment (i.e., NATM, bored tunnels, cut &amp; cover)</li> <li>o Temporary construction easements</li> <li>o Temporary power requirements</li> <li>o Traffic or pedestrian diversion and control (for urban tunnels)</li> <li>o Ventilation Structures based on EMT guidance</li> <li>o Cross passages based on EMT guidance</li> <li>o Concept drainage design for portals</li> <li>o Access and evacuation provisions</li> <li>o Emergency and Maintenance facilities, based on EMT guidance.</li> <li>o Utilities point of service</li> </ul> </li> <li>- Seismic mitigation requirements</li> <li>- Preliminary lining type and thickness for drained and undrained tunnels</li> <li>- Preliminary design calculations for tunnel types (TBM, mined, cut-and-cover) to confirm feasibility. Detailed modeling not required.</li> <li>- Portal and ventilation structures and facilities, functional and aesthetic assessment, based on EMT guidance.</li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Tunnel and portal cross sections</li> <li>o Horizontal and vertical alignments (can be shown on overall alignment drawings)</li> <li>o Transitions structure locations (i.e., at-grade to tunnel, bridge to tunnel, etc.), based on EMT guidance.</li> <li>o Retaining wall limits (extent and height)</li> <li>o Structural notes to document basis of design</li> <li>o Existing facility modifications plan (pedestrian, roadway, highway, railroad), major utility relocations</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Design Train Loadings</li> <li>- Standard and Directive Drawings</li> <li>- Standard Specifications</li> <li>- Tunnel portal facilities requirements</li> <li>- Fire and Life Safety Report</li> <li>- Tunnel Ventilation Concepts Report</li> <li>- Typical Transition Structure</li> <li>- Aesthetic treatment for tunnel portals</li> </ul>	<ul style="list-style-type: none"> <li>- TM 2.3.2 Structural Design Loads</li> <li>- TM 2.4.2 Basic Tunnel Configuration</li> <li>- TM 2.4.5 Tunnel Structure Design</li> <li>- TM 2.4.6 Portals, Entrances, Ramps</li> <li>- TM 2.4.8 Service and Maintenance Requirements</li> <li>- TM 2.5.1 Structural Design of Surface Facilities and Buildings</li> <li>- TM 2.10.4 Interim Seismic Design Criteria Bridges and Aerial Structures, Tunnels and Underground Structures, Passenger Stations and Building Structures</li> <li>- TM 2.10.6 Seismic Fault Rupture and Crossings</li> </ul>



INFRASTRUCTURE	30% DESIGN SCOPE	DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
<p><b>Buildings</b></p>	<p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Develop footprint based on general program of functions for the following:                             <ul style="list-style-type: none"> <li>o Operations Control Center, Regional Control Centers</li> <li>o Maintenance facilities (Level 1/2/3/4/5 Rolling Stock Maintenance)</li> <li>o Line side facilities for maintenance-of-way</li> <li>o Access, parking, utility services for facilities as required to define right-of-way requirements.</li> </ul> </li> <li>o</li> <li>- Buildings Report (30%)</li> <li>- Civil and Architectural Design Drawings</li> <li>- LEED™ Silver Certification</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Building(s) Report</b> including:                             <ul style="list-style-type: none"> <li>o Key design and site constraints</li> <li>o Temporary construction easements</li> <li>o Traffic or pedestrian diversion and control</li> <li>o Service and Maintenance access</li> <li>o Drainage concepts</li> <li>o Utility services requirements</li> <li>o Compliance with system wide aesthetics features</li> <li>o CBC and Applicable Code compliance</li> <li>o Sustainability opportunities and considerations using <b>LEED™ Checklist</b>, identify points to achieve LEED™ Silver Certification</li> </ul> </li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Civil and Architectural Drawings (30%) including:                                     <ul style="list-style-type: none"> <li>▪ Site and access plan</li> <li>▪ Notes documenting basis of design</li> <li>▪ Building footprint limits and size, based on EMT Guidance.</li> <li>▪ Floor Plans, based on EMT Guidance</li> <li>▪ Site/Building Elevations showing relationship of tracks to buildings</li> <li>▪ Retaining wall limits and heights</li> <li>▪ Existing facility modifications plan (pedestrian, roadway, highway, railroad), major utility relocations</li> </ul> </li> <li>o Building Systems (MEP and Communications) Diagrammatic Drawings:                                     <ul style="list-style-type: none"> <li>▪ Service connections identified (type and locations);</li> <li>▪ Power requirements.</li> </ul> </li> </ul> </li> <li>- <b>Special Provisions</b></li> </ul>	<ul style="list-style-type: none"> <li>- Standard and Directive Drawings</li> <li>- Standard Specifications</li> <li>- Architecture / Aesthetic Requirements</li> <li>- Structure Design Criteria</li> <li>- Seismic Design Criteria</li> <li>- <b>Space Program</b> for activities and functional requirements for an Operations Center, Heavy and Light Maintenance Facility.</li> <li>- <b>Building Floor Plan</b> for an Operations Center, Heavy and Light Maintenance Facility.</li> </ul>	<ul style="list-style-type: none"> <li>- TM 2.2.3 High-Speed Train Passenger Station Site Design Guidelines</li> <li>- TM 2.5.1 Structural Design of Surface Facilities and Buildings</li> <li>- TM 2.8.2 Control Access and Intrusion Protection for HSR ROW &amp; Facilities</li> <li>- Geotechnical TMs</li> </ul>
<p><b>Earthwork, Retaining Walls and Borrow Sites</b></p>	<p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Determine cut and fill slope profile and limits based on geotechnical recommendations and seismic analysis and 30% design guidelines</li> <li>- Identify retaining structures as required to reduce ROW requirements and/or mitigate impacts</li> <li>- Determine retaining wall type, locations, lengths and heights</li> <li>- Identify temporary construction requirements</li> <li>- Determine earthwork and construction materials criteria and volumes</li> <li>- Identify candidate borrow sites to generate required earthwork and construction materials</li> <li>- Provide candidate borrow and disposal sites to environmental team members to address planning, permitting, and contaminated soil or groundwater site requirements</li> </ul>	<ul style="list-style-type: none"> <li>- Cut and fill slope catch points included on alignment plans</li> <li>- Retaining wall locations and extents (lengths and heights)</li> <li>- Retaining wall type (standard, MSE, tie-back, etc.)</li> <li>- Permanent and construction easement requirements</li> <li>- Grading to confirm right-of way requirements.</li> <li>- Borrow Site Evaluations and identification of candidate sites.</li> <li>- Earthwork sections showing of cut and fill slopes, limits, catch points, etc. developed from alignment files and digital terrain model. 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.</li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Retaining Wall Layout, Elevation, and Typical Section (included in Structural and Tunnels Drawings)</li> </ul> </li> <li>- <b>Special Provisions</b></li> </ul>	<ul style="list-style-type: none"> <li>- Specifications for materials (Suitability and Reuse)</li> <li>- Standard Specifications</li> </ul>	<ul style="list-style-type: none"> <li>- TM 2.9.1 Geotechnical Investigation Guidelines</li> <li>- TM 2.9.2 Geotechnical Reports Preparation Guidelines</li> <li>- TM 2.9.3 Geologic and Seismic Hazard Analysis Guidelines</li> <li>- TM 2.9.10 Geotechnical Analysis and Engineering Design Criteria Guidelines</li> </ul>
<p><b>Hydrology/ Hydraulics/ Drainage/ Grading</b></p>	<p>EMT Scope:</p> <ul style="list-style-type: none"> <li>- Assess and make recommendation for RC consideration of rise in tidal waters (and expansion of tidal waters).</li> </ul> <p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Complete Hydrology and Hydraulic studies:                             <ul style="list-style-type: none"> <li>o Type, location and cost of major drainage facilities or modifications as well as their footprint and costs.</li> <li>o Incorporate rise in tidal waters (and expansion of tidal waters).</li> <li>o Environmental methodologies for hydrology and design practices to reduce impacts or improve water quality.</li> <li>o Design to consider storm water runoff water quality issues and reflect best management practices.</li> </ul> </li> <li>- Confirm floodplain impacts and mitigation.</li> </ul>	<ul style="list-style-type: none"> <li>- Update and confirm major drainage facilities</li> <li>- Develop on-site drainage concepts</li> <li>- Incorporate rise in tidal waters (and expansion of tidal waters) based on EMT guidance.</li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Drainage Areas</li> <li>o Grading and Drainage Concepts</li> </ul> </li> <li>- <b>Reports Required:</b> <ul style="list-style-type: none"> <li>o Hydrology and Hydraulics Report</li> <li>o Floodplain Impacts Assessment Report</li> <li>o Storm Water Management Report (to identify ROW needs)</li> </ul> </li> <li>- <b>Special Provisions</b></li> </ul>	<ul style="list-style-type: none"> <li>- Assess rise in tidal waters (and expansion of tidal waters)</li> </ul>	<ul style="list-style-type: none"> <li>- TM 2.6.4 Floodplain</li> <li>- TM 2.6.5 Hydraulics and Hydrology Design Guidelines</li> </ul>



INFRASTRUCTURE	30% DESIGN SCOPE	DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
<p><b>Utilities</b></p>	<p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Contact utility companies for data collection (except for Systems).</li> <li>- Identify conflicts and disposition, ownership and rights for utilities affected by the proposed improvements.</li> <li>- Identify planned new High-Risk utilities that could conflict with alternatives.</li> <li>- Identify relocation/mitigation options, responsibilities and costs for high risk utilities.</li> <li>- Identify required new utility services and locate connection point, and prepare Special Provisions for D/B to implement, except for Traction Power System.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>High Risk Utilities Conflict memo</b></li> <li>- Coordinate with Utility Companies on relocation/protection/mitigation</li> <li>- Executed Utility Agreements</li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Notes</li> <li>o Key Plan</li> <li>o Composite Utility Plan along track alignment</li> <li>o Composite Utility Plan at local roadways</li> <li>o Composite Utility Plan at facilities</li> <li>o Utility Protection &amp; Relocation Plan and Profile (for High Risk Utilities)</li> </ul> </li> <li>- <b>Special Provisions</b></li> </ul>	<ul style="list-style-type: none"> <li>- Standard Specifications</li> </ul>	<ul style="list-style-type: none"> <li>- TM 1.1.5 CADD Guidelines</li> <li>- TM 2.7.5 - Utilities Requirements for 30% Design</li> </ul>
<p><b>Geotechnical</b></p>	<p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Research available literature and geotechnical studies within the project limits to identify and resolve geotechnical related design and cost issues.</li> <li>- Update geotechnical investigation workplan and recommendations to support 30% Design, if required</li> <li>- 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.</li> <li>- Prepare preliminary geotechnical design memos and reports.</li> <li>- Prepare preliminary geotechnical design recommendations based on available geotechnical data.</li> </ul>	<ul style="list-style-type: none"> <li>- Geotechnical investigation exploration and laboratory workplans</li> <li>- Completed assessment and initiation of on-site field testing as required</li> <li>- Hydrogeologic data and recommendations</li> <li>- Recommendations for supplemental geotechnical investigations, exploration and testing for final design</li> <li>- <b>Reports Required:</b> <ul style="list-style-type: none"> <li>o Final Geotechnical Data Report (GDR)</li> <li>o Draft Geotechnical Baseline Report (GBR)</li> <li>o Preliminary Geotechnical Design Recommendations</li> </ul> </li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Boring Logs</li> </ul> </li> <li>- <b>Special Provisions</b></li> </ul>	<ul style="list-style-type: none"> <li>- Available Geologic/Seismic/Hydrogeologic (GIS) data</li> </ul>	<ul style="list-style-type: none"> <li>- TM 2.9.1 Geotechnical Investigation Guidelines</li> <li>- TM 2.9.2 Geotechnical Reports Preparation Guidelines</li> <li>- TM 2.9.3 Geologic and Seismic Hazard Analysis Guidelines</li> <li>- TM 2.9.4 Prelim Capable Fault Locations and Design Considerations</li> <li>- TM 2.9.5 Prelim Design Earthquake Guidelines for 30% Design</li> <li>- TM 2.9.6 Ground Motions for MCE, DBE &amp; LDBE</li> <li>- TM 2.9.7 Acceleration Response Spectra</li> <li>- TM 2.9.10 Geotechnical Analysis and Engineering Design Criteria Guidelines</li> </ul>
<p><b>Seismic</b></p>	<p>RC Scope:</p> <p>Seismic design and engineering to support an overall project-level 30% design for Complex and Non-Standard structures (stations, bridges, aerial structures, tunnels, buildings):</p> <ul style="list-style-type: none"> <li>- Research available literature for faults and seismicity issues and obtain LIDAR survey data at fault crossings.</li> <li>- Documentation that 30% scheme will meet Project Seismic Design Criteria via Advanced Planning Study Report</li> <li>- Locations of expected damage, severity of damage, and means of inspection and repair</li> <li>- Documentation that Seismic Performance Criteria satisfied.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Seismic Design-Basis-Memorandum for Complex and Non-Standard Structures</b> including: <ul style="list-style-type: none"> <li>o Documentation of compliance with Seismic Performance Criteria;</li> <li>o 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);</li> <li>o Documentation of foundation response (i.e., rocking, uplift) used for energy dissipation;</li> <li>o Documentation of pre-determined location of damage (i.e., at column top or bottom, pile cap, etc.), level of expected inelasticity;</li> <li>o Documenting expected differential settlement meets criteria;</li> <li>o Documentation of expansion joint capacity versus demands (force &amp;/or displacement capacities).</li> </ul> </li> <li>- <b>Seismic Design Calculations:</b> including special seismic design considerations (i.e., special seismic features, fault crossings, near source effects, marginal soil conditions, soil-structure interaction consideration).</li> </ul>	<ul style="list-style-type: none"> <li>- Standard Structure Designs which conform to Seismic and Track Structure Interaction criteria</li> <li>- Technical Advisory Panel (TAP) Summaries</li> <li>- Active fault crossing locations and limits, offsets</li> <li>- Geologic/Seismic/Hydrogeologic (GIS) data</li> <li>- Seismic Design Criteria</li> <li>- Ground Motions</li> <li>- Fault Rupture Displacements</li> <li>- Seismic Repair Criteria: acceptable "down" time post DBE or MCE event</li> </ul>	<ul style="list-style-type: none"> <li>- TM 2.9.1 Geotechnical Investigation Guidelines</li> <li>- TM 2.9.2 Geotechnical Reports Preparation Guidelines</li> <li>- TM 2.9.3 Geologic and Seismic Hazard Analysis Guidelines</li> <li>- TM 2.9.4 Prelim Active/Capable Fault Locations and Design Considerations</li> <li>- TM 2.9.5 Prelim Design Earthquake Guidelines</li> <li>- TM 2.9.10 Geotechnical Analysis and Engineering Design Criteria Guidelines</li> <li>- TM 2.10.4 Interim Seismic Design Criteria – Structures Supporting High-Speed Trains</li> <li>- TM 2.10.5 Seismic Design Bench Mark</li> <li>- TM 2.10.6 Fault Crossing Design Criteria and Guidance</li> <li>- TM 2.10.10 Track-Structure Interaction</li> </ul>
<p><b>Contaminated Soil or Groundwater Sites</b></p>	<ul style="list-style-type: none"> <li>- Perform assessment of potentially contaminated soil or groundwater sites identified in 15% Phase I Site Assessments</li> <li>- Integrate geotechnical mitigation requirements for team segment and adjacent segments</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Cost Estimates:</b> Develop quantities and mitigation for potential contaminated soils and groundwater for purposes of confirming handling requirements and costs.</li> </ul>	<p>–</p>	<p>–</p>



SYSTEMS	30% DESIGN SCOPE	DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
<p><b>Traction Power</b></p>	<p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Determine and finalize (the latter with the approval of EMT) site locations including access, parking, utility services, earthwork, retaining walls, drainage, grading, paving, foundations, easement and fencing for all 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 and EMT memos issued by EMT.</li> <li>- In coordination with the local utility company, RC to identify connection for LV power supply required for the Traction Power Facility and Wayside Power Cubicle based on the requirements as specified by EMT.</li> </ul>	<ul style="list-style-type: none"> <li>- Identification and finalization (the latter with the approval of EMT) of land plots for location of Traction Power Facilities (Traction Power Substations, Switching Stations and Paralleling Stations) and Wayside Power Cubicles (WPC), Alternative Analysis, and EIA for the same.</li> <li>- Identify alternative sites for all facilities to provide options for final facility placement to minimize risks in the property acquisition, environmental clearance and design processes.</li> <li>- Produce a site survey report for each alternative site to detail the constructability of the site, observed site conditions, surrounding area, accessibility, and suitability of the site for construction of a critical facility.</li> <li>- Site Plans, Grading and Paving Plans, Composite Utility Plans and Utility Relocation Plans, Retaining Walls, Foundations, and Permanent and Construction Easements for every Traction Power Facility and Site Plans for every WPC.</li> <li>- Main and Strain Gantry Arrangements for every Traction Power Facility</li> <li>- Plan for LV power supply for every Traction Power Facility and Wayside Power Cubicle.</li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>- For every Traction Power Facility (refer to <b>Buildings</b>)                             <ul style="list-style-type: none"> <li>o Site Layout including graded and paved areas</li> <li>o Main and Strain Gantry Arrangements</li> <li>o Duct Bank and Manhole Layout (as applicable)</li> <li>o Easements (as applicable)</li> <li>o Access Roadway Layout and Profile, Parking Facility</li> <li>o Composite Utility Plan and Utility Relocation Plan</li> <li>o Typical Foundation Plans and Details including Transformer, Oil Containment Structure</li> <li>o Drainage concept</li> <li>o Retaining Wall locations, extents and heights</li> <li>o Site Layout for Wayside Power Cubicles</li> </ul> </li> </ul> </li> <li>- <b>Low voltage power supply for facilities:</b> Point of service and availability shall be identified switching and paralleling stations, wayside power cubicles and other trackside facilities.</li> <li>- <b>Special Provisions</b></li> </ul>	<ul style="list-style-type: none"> <li>- Standard and Directive Drawings</li> <li>- Provisional locations of Traction Power Facilities (Traction Power Substations, Switching Stations and Paralleling Stations) and determination of final location of Traction Power Facilities in consultation with RC.</li> <li>- Specifications - Prepare Procurement Specifications for each design, supply, install, test and commission contract.</li> <li>- Utilities Requirements for 30% Design TM (TBD)</li> <li>- ROW Fence – Typical layouts and sections</li> </ul>	<ul style="list-style-type: none"> <li>- TM 2.1.3 Turnouts and Station Tracks (Directive Drawings 2.1.3 – Interlock A and 2.1.3. – Interlock B</li> <li>- TM 2.8.2 Control Access and Intrusion Protection for HSR ROW &amp; Facilities</li> <li>- TM 3.1.1.1 Traction Power 2x25kv Autotransformer Electrification System</li> <li>- TM 3.1.1.3 Traction Power Facility Sites</li> <li>- TM 3.1.5.3 Utility Power Supply</li> <li>- Directive Drawings</li> </ul>
<p><b>Power Utility Company/ HV Electric Power Connections</b></p>	<p>EMT Scope:</p> <ul style="list-style-type: none"> <li>- Identify and confirm HV power supply points and connection requirements in coordination with the Utility Companies; RC to assist EMT in this work.</li> <li>- EMT to identify and confirm HV Utility connection type; Direct connection to an existing HV Line, Loop through connection to an existing HV Line, connection to an extension to an existing HV Line , etc. RC to assist EMT in this work.</li> </ul> <p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Identify and confirm (the latter with the approval of EMT) site locations for the HV interconnection facility including access, parking, utility services, earthwork, retaining walls, drainage, grading, paving, foundations, easement and fencing for all Traction Power Substations based on the Standard and Directive Drawings and relevant TMs issued by EMT.</li> </ul>	<ul style="list-style-type: none"> <li>- Identification and finalization (the latter with the approval of EMT) of land plots for HV Utility facilities required for Traction Power Substations including underground/overhead HV feeder circuits, Alternative Analysis and EIA for the same Site.</li> <li>- Identify alternative sites for all facilities to provide options for final facility placement to minimize risks in the property acquisition, environmental clearance and design processes.</li> <li>- Produce a site survey report for each alternative site to detail the constructability of the site, observed site conditions, surrounding area, accessibility, and suitability of the site for construction of a critical facility.</li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>For HV connections to every Traction Power Substation (SS)                             <ul style="list-style-type: none"> <li>o Connection arrangement between HV Utility Lines and Traction Power Substation.</li> <li>o Site Layout of HV Connections to the HV Utility Network including graded and paved areas</li> <li>o Duct Bank and Manhole/Overhead Feeder Circuit Layout for HV Lines from HV Utility network to CHSTP SS.</li> <li>o Easements.</li> <li>o Access Roadway Layout and Profile.</li> <li>o Typical Sections.</li> </ul> </li> </ul> </li> <li>- <b>Special Provisions</b></li> </ul>	<ul style="list-style-type: none"> <li>- Standard and Directive Drawings</li> <li>- Locations of Traction Power Substations.</li> <li>- Coordination with HV Power Supply Utilities and identification and finalization of type of connection requirement and supply point.</li> <li>- Approval of the site location for HV supply point identified by the RC</li> <li>- Specifications - Prepare Procurement Specifications for each design, supply, install, test and commission contract.</li> </ul>	<ul style="list-style-type: none"> <li>- TM 3.1.1 Traction Power 2x25kv Autotransformer Electrification System</li> <li>- TM 3.1.1.3 Traction Power Facility Sites</li> <li>- TM 3.1.5.3 Utility Power Supply</li> <li>- TM 3.2.6 TES Grounding, Bonding, and Protection from Electric Shock</li> <li>- Directive Drawings</li> </ul>



SYSTEMS	30% DESIGN SCOPE	DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
<p><b>Overhead Contact System (OCS)</b></p>	<p>EMT Scope:</p> <ul style="list-style-type: none"> <li>- Conceptual design for OCS schematics.</li> <li>- OCS structural requirements, OCS requirements, pantograph envelope, and grounding and bonding requirements.</li> <li>- OCS typical arrangements</li> <li>- Identify approximate overlap and phase break locations</li> <li>- OCS design criteria</li> <li>- Typical platform, viaduct, and tunnel grounding design</li> <li>- Typical overhead bridge protection design</li> </ul> <p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Develop OCS plans (showing typical arrangements) based on conceptual design developed by EMT, for complex or difficult locations where OCS layout feasibility needs to be confirmed.</li> </ul> <p><i>(The EMT will provide typical arrangements and schematics for the RCs to use in developing the 30% OCS drawings and address specific design conflicts and confirm feasibility.)</i></p> <ul style="list-style-type: none"> <li>- Verify and coordinate with utility owners and local agencies any potential conflicts</li> </ul>	<ul style="list-style-type: none"> <li>- Verify the OCS clearances to existing structures.</li> <li>- Verify flight path clearance restrictions with the consideration of OCS structures and clearance.</li> <li>- Investigate any overhead utility/underground conflicts through coordination with utility owners, and provide the surveying of the crossing and parallel overhead utility within ROW.</li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o OCS Drawings (cross sections and layout plans) for open route territory are not required.</li> <li>o OCS cross sections showing the application of standard OCS configuration as defined by EMT shall be produced at selected areas as follows:                             <ul style="list-style-type: none"> <li>▪ Show provisional OCS poles on cross-section drawings for viaducts, trench areas, at grade multiple track areas, and passenger stations to confirm adequate clearances have been provided between these infrastructure elements and OCS components. Multiple cross section or layout plans are typically not required for common infrastructure configurations. In most cases a single cross section drawing per typical infrastructure element (eg. Viaduct) is sufficient to demonstrate adequate clearances.</li> <li>▪ Show the OCS, negative feeder, and pantograph clearance envelope for tunnel and bridge cross-sections to confirm adequate clearances as stated above.</li> </ul> </li> <li>o Design the infrastructure with sufficient OCS clearance and pantograph clearance envelope.</li> <li>o Provide an overhead structure clearance table which shows all the clearance dimensions for existing and new overhead bridges and other fixed structures. The table shall include the clearance dimensions over all future tracks, the side clearances from the tracks to the abutments, the width of the structure along track, the skew angle, and any other relevant information to the OCS, pantograph and plate gauge clearance envelopes.</li> <li>o Identify any unique infrastructure constraints which would require a non-typical OCS arrangement. Provide the flexibility of OCS pole or attachment locations on viaducts, in tunnels, and at grade along the tracks. Incorporate typical platform, viaduct, and tunnel grounding design into the design package.</li> <li>o Incorporate typical overhead bridge protection screening and barrier design in the design package.</li> <li>o Confirm feasibility of typical grounding and bonding details for wayside metallic structures per EMT guidance. This may include protective screens, barriers, fences, and other infrastructure elements.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Provisional locations of phase breaks: Coordinate Insulated Overlaps with feeding arrangements at Supply, Switching and Parallel Stations.</li> <li>- Develop conceptual design for OCS schematics.</li> <li>- Develop standard drawings for OCS typical structures, OCS general arrangements, and typical OCS assemblies.</li> <li>- Develop OCS design criteria.</li> <li>- OCS grounding and bonding guidelines and standard plans.</li> </ul>	<ul style="list-style-type: none"> <li>- TM 3.2.1 OCS Requirements</li> <li>- TM 3.2.2 OCS Structural Requirements</li> <li>- TM 3.2.3 Pantograph Clearance Envelope</li> <li>- TM 3.2.6 TES Grounding, Bonding, and Protection from Electric Shock</li> <li>- Directive Drawings</li> </ul>
<p><b>Train Control</b></p>	<p>EMT Scope:</p> <ul style="list-style-type: none"> <li>- Functional and performance specifications for ATC system including Central Control (Office). Specifications to include design, supply, install, test, and place in service tasks.</li> <li>- Functional and performance specifications for Yard signal and control system(s).</li> <li>- Form, fit, and function specifications for ATC elements with interfaces to other systems including Rolling Stock</li> <li>- Interface definition documents between ATC and Rolling Stock.</li> <li>- Design approach for train control elements for main lines; equipment housing and access requirements, track circuit length limits, restrictions on switch locations, etc.</li> <li>- Design approach to function and performance level for Automatic Train Supervision (office) subsystem.</li> <li>- Design approach for Yard signaling elements, including local control and interface requirements at transition points between main line and Yard systems.</li> <li>- Standard drawings for train control system architecture, typical interlockings, and other key ATC and Yard signaling elements.</li> <li>- Typical drawings showing each type of interlocking equipment layout,</li> </ul>	<ul style="list-style-type: none"> <li>- Develop plans for each interlocking and yard showing provisions for location of train control enclosures and antenna masts within systems compounds.</li> <li>- Produce a site survey report for each site to detail the constructability of the site, observed site conditions, surrounding area, accessibility, and suitability of the site for construction of a critical facility.</li> <li>-</li> <li>- For each interlocking:             <ul style="list-style-type: none"> <li>o Track plan and site provisions for systems compounds (incorporates areas for house and equipment sites, site provisions for signals and related structures)</li> <li>o Access roads to each interlocking location</li> <li>o Power supply provisions to systems compound. Point of service and availability of power shall be identified.</li> <li>o Site preparation, grading, drainage concepts, and fencing for train control compounds.</li> <li>o Cable ducting and conduit routing plans for train control sites</li> </ul> </li> <li>- For each Yard:             <ul style="list-style-type: none"> <li>o Track plan and site provisions (areas for house and equipment sites, site provisions for signals and related structures)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Develop functional and performance criteria for ATC system</li> <li>- Develop criteria for track circuit boundary locations and any additional space requirements these generate</li> <li>- Develop functional and performance specifications for ATC main line system including Central Control (Office). Specifications to include design, supply, install, test, and place in service tasks</li> <li>- Develop form, fit, and function requirements for ATC elements with interfaces to Rolling Stock subsystem.</li> <li>- Develop standard drawing package</li> </ul>	<ul style="list-style-type: none"> <li>- TM 2.1.3 Turnouts and Station Tracks (Directive Drawings 2.1.3 – Interlock A and 2.1.3. – Interlock B)</li> <li>- TM 3.3.1 Train Control System Configuration</li> <li>- TM 3.3.2 Train Control Site Requirements</li> <li>- TM 3.3.3 Train Control Wayside Location Power Supply Options</li> <li>- TM 3.3.4 Grounding and Bonding Requirements for Train Control and Communication</li> <li>- TM 3.4.2 Communication Site Requirements</li> <li>- Directive Drawings</li> </ul>



SYSTEMS	30% DESIGN SCOPE	DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
	signal arrangements, and impedance bond installations. RC Scope: - Plans for each interlocking and yard showing provisions for location of train control enclosures and antenna masts.	<ul style="list-style-type: none"> <li>o Control tower and equipment room locations</li> </ul>		
OPERATIONS	30% DESIGN SCOPE	DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
<b>Operations Facilities</b>	EMT Scope: - Confirm activities and functional requirements for an operations center - Confirm requirements for redundancy of the operations facilities - Confirm locations and size of operations facilities	- Refer to <b>Buildings</b> .	- <b>Space Program</b> activities and functional requirements for an operations center - <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Site Layout</li> <li>o Building Floor Plan</li> </ul>	- CHSTP Concept of Operations
<b>Operations Concept</b>	EMT Scope: - 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.	-	- CHSTP Concept of Operations	- CHSTP Concept of Operations
MAINTENANCE	30% DESIGN SCOPE	DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
<b>Communications</b>	EMT Scope: - System-wide functional and performance Design Criteria for communications system. - Single line drawings for communications subsystems. - System-wide fiber optic backbone topology drawings. - Identify, acquire and coordinate radio frequencies with agencies having jurisdiction. - Standard communications site equipment requirements and space planning documents. - Wayside Optical Network Interface documents and standard drawings. - Communications Interface Matrix detailing expected dependencies between Communications and other system disciplines. RC Scope: - Identify sites for communication shelters and towers - Provide Cable and Conduit routing per the Communications Systems document.	<ul style="list-style-type: none"> <li>- Site preparation, grading, drainage concepts, and fencing for communications compounds.</li> <li>- Identify cable duct and conduit routes within the communication site footprints for space planning purposes. Ductbank and conduit details are not required. Provide cable ducting and conduit routing plans for all communications sites</li> <li>- Identify footprint space for communications shelter pads, and towers.</li> <li>- Confirm feasibility of grounding (rod/grid) for communication compounds and rooms as required per EMT guidance.</li> <li>- <b>Drawings and Documentation Required</b></li> <li>- Identify alternative sites for all facilities to provide options for final facility placement to minimize risks in the property acquisition, environmental clearance and design processes.</li> <li>- Produce a site survey report for each alternative site to detail the constructability of the site, observed site conditions, surrounding area, accessibility, and suitability of the site for construction of a critical facility.</li> </ul>	<ul style="list-style-type: none"> <li>- Develop communications system topology drawings at regional level.</li> <li>- Provide communications equipment and site requirement plans.</li> <li>- Provide location parameters (or within 1/2 mile radius) of desired radio system tower/antenna structures.</li> <li>- Provide height requirements for antenna towers.</li> <li>- Provide standard equipment rack footprint and layout requirements and drawings for communications sites.</li> <li>- Provide standard CIC layout for TPSS stations and Train Control bungalows.</li> <li>- Develop communication equipment and data capacity expansion contingency</li> <li>- Provide Yard Communications Facility equipment list and standard drawings.</li> <li>- Prepare, submit and provide local, county, state and federal construction permits for radio towers.</li> <li>- Provide matrix of radio sites and specific lat/long coordinates for each antenna.</li> <li>- Develop Fiber optic layout, access points, node location and lateral ducting and interconnection to other facilities.</li> </ul>	<ul style="list-style-type: none"> <li>- TM 3.3.4 Grounding and Bonding Requirements for Train Control and Communication</li> <li>- TM 3.4.2 Communication Site Requirements</li> <li>- Single-line block drawings for field communications subsystems.</li> <li>- Standard Fiber Optic Duct Bank and Equipment Layout</li> <li>- High-level Regional Communications System Topology Block Diagram</li> <li>- Cable and Conduit Requirements for Communications Systems document.</li> <li>- Standard Communications Site Equipment Requirements and Space Planning document.</li> <li>- Provide Communications Interface Matrix detailing the required interface issues with other disciplines.</li> </ul>
<b>Rolling Stock Maintenance Facility</b>	- Maintenance Facility design shall included the following design elements: - 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	<ul style="list-style-type: none"> <li>- Confirm footprint and access requirements</li> <li>- <b>Drawings Required:</b> <i>Access points and roads to be included on Right-of-Way Drawings</i> <i>For Building drawings refer to Buildings scope.</i> <ul style="list-style-type: none"> <li>o Civil/Site:                             <ul style="list-style-type: none"> <li>▪ Demolition Plans</li> <li>▪ Overall Site Plan (indicating yard boundary, building footprint, roadways, grading, drainage concepts, parking, walkways, , building access, and outdoor storage, fencing).</li> </ul> </li> <li>o Easement Details (as applicable)</li> <li>o Access Roadway Layout and Profile, Parking Facility</li> <li>o Typical Foundation Plans including Transformer Oil Containment</li> <li>o Retaining Wall locations, extents and heights (as applicable)</li> </ul> </li> <li>o Track:                             <ul style="list-style-type: none"> <li>▪ Yard plans including track alignment (horizontal and vertical)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Refer to <b>Buildings</b> scope</li> <li>- <b>Space Program</b> activities and functional requirements for an operations center</li> <li>- <b>Drawings Required:</b> <ul style="list-style-type: none"> <li>o Site Layout and Typical Sections</li> <li>o Building Floor Plan</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- TM 2.8.2 Control Access and Intrusion Protection for HSR ROW &amp; Facilities</li> <li>- TM 5.1 Terminal and Heavy Maintenance Facility Guidelines</li> <li>- Directive Drawings</li> </ul>



	<p>(cameras), yard lighting</p> <ul style="list-style-type: none"> <li>- Identify dewatering treatment</li> </ul> <p>EMT Scope:</p> <ul style="list-style-type: none"> <li>- Confirm list of activities and functions for a Heavy Maintenance/Repair facility</li> <li>- Confirm list of activities and functionality for the layup, storage, and periodic maintenance facilities located near terminal stations</li> <li>- Finalize facility requirements for rolling stock maintenance facilities</li> <li>- 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)</li> </ul> <p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Confirm footprint and access requirements</li> <li>- Noise, vibration mitigations</li> </ul>	<ul style="list-style-type: none"> <li>o Systems: <ul style="list-style-type: none"> <li>▪ Coordinate Catenary Plans for buildings and yards with EMT</li> <li>▪ Coordinate Yard Control - Signaling Plan with Operations and EMT</li> <li>▪ Facility Substation Plan (refer to <b>Traction Power</b>)</li> </ul> </li> <li>o Security Plans: <ul style="list-style-type: none"> <li>▪ Yard surveillance security layout plan, include layouts showing methods to limit site access to authorized employees and vehicles.</li> </ul> </li> </ul> <p>- <b>Special Provisions</b></p>		
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MAINTENANCE	30% DESIGN SCOPE	DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
<b>Maintenance of Way</b>	<p>EMT Scope:</p> <ul style="list-style-type: none"> <li>- Confirm maintenance-of-way (MOW) program and associated activities.</li> <li>- Identify and describe potential hazardous material generation.</li> <li>- Identify range of staffing levels.</li> <li>- Identify energy demand.</li> <li>- Identify water and sewer demands.</li> <li>- Finalize maintenance of way equipment, and associated storage requirements.</li> </ul> <p>RC Scope:</p> <ul style="list-style-type: none"> <li>- Finalize siding locations, configurations and dimensions for MOW maintenance facilities.</li> <li>- Finalize HST railway maintenance and access points to the right of way from local roads including easement.</li> <li>- Noise, vibration mitigations</li> </ul>	<ul style="list-style-type: none"> <li>- Confirm footprint and access requirements.</li> <li>- <b>Drawings Required:</b> <i>Access points and roads to be included on Right-of-Way Drawings</i> <i>For Building drawings refer to <b>Buildings</b> scope.</i></li> <li>o Demolition Plans</li> <li>o Overall Site Plan (indicating boundary, tracks, building(s) footprint, access roadways, parking, site lighting, building access ways, and outdoor storage).</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Space Program</b> activities and functional requirements.</li> </ul>	<ul style="list-style-type: none"> <li>- TM 2.8.2 Control Access and Intrusion Protection for HSR ROW &amp; Facilities</li> <li>- TM 5.2 MOW Maintenance Plan and Facility Requirements</li> </ul>

SYSTEM INTEGRATION	30% DESIGN SCOPE	DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
<b>Utility Interfaces</b>	<ul style="list-style-type: none"> <li>- Ensure the design of utility relocation and new utility service designs correlate with the design standards / requirements as stated by the respective utility owners</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Drawings</b> (Refer to <i>Utilities</i>)</li> <li>- <b>Special Provisions</b></li> </ul>	-	-
<b>Third Party Improvements</b>	<ul style="list-style-type: none"> <li>- 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)</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Special Provisions</b></li> </ul>	-	-
<b>System Safety Program (SSP)</b>	<ul style="list-style-type: none"> <li>- Identify SSP requirements for all CHSTP systems (building from the SR task).</li> <li>- Preliminary Design Phase SSP Design Assessment <ul style="list-style-type: none"> <li>o Confirm SSP design criteria in Regional and System designs</li> <li>o Perform Preliminary Design Safety Hazard Analysis</li> </ul> </li> <li>- Develop SSP requirements for Bid Specifications</li> </ul>	<ul style="list-style-type: none"> <li>- Confirm compliance with SSP design requirements</li> </ul>	<ul style="list-style-type: none"> <li>- Project-Level System Safety Program Plan (SSPP)</li> <li>- SSP Design Criteria. Ensure that SSP parallels or incorporates Design Criteria to the extent possible to avoid inconsistencies.</li> <li>- Develop SSP check list.</li> </ul>	-



PROJECT CONTROLS	30% DESIGN SCOPE	DESIGNER'S RESPONSIBILITY	PMT/ EMT RESPONSIBILITY	PMT/EMT GUIDANCE DOCUMENT
<b>Construction Cost Estimate</b>	<ul style="list-style-type: none"> <li>- Prepare construction cost estimates for all design alternatives per CHSTP 30% Design Construction Cost Guidelines.</li> </ul>	<ul style="list-style-type: none"> <li>- Provide quantity take-off estimates to the PMT along with checked pertinent back-up data.</li> <li>- Prepare quantity take-off estimates in accordance with contract packages as directed by the PMT.</li> </ul>	<ul style="list-style-type: none"> <li>- Technical Memorandum</li> <li>- EMT will prepare quantities for electrification, communication, and train control systems.</li> <li>- Project Management Team will develop work breakdown structure and project-specific unit prices, and prepare construction cost estimates for each contract package and program-wide.</li> </ul>	<ul style="list-style-type: none"> <li>- TM 1.1.22 CHSTP 30% Capital Cost Guidelines</li> </ul>
<b>Construction Schedule</b>	<ul style="list-style-type: none"> <li>- Produce a cost loaded design and construction schedule</li> </ul>	<ul style="list-style-type: none"> <li>- Produce Construction Schedule.</li> </ul>	<ul style="list-style-type: none"> <li>- Guidance and methodology for developing construction schedules</li> </ul>	<ul style="list-style-type: none"> <li>- Construction Schedule Methods TM</li> </ul>

