

# California High-Speed Train Project



## TECHNICAL MEMORANDUM

### Design Life TM 1.1.2

Prepared by: Signed document on file 29 Apr 09  
Cecily Way Date

Checked by: Signed document on file 4 May 09  
John Chirco Date

Approved by: Signed document on file 8 Jun 09  
Ken Jong, PE, Engineering Manager Date

Released by: Signed document on file 9 Jun 09  
Anthony Daniels, Program Director Date

| Revision | Date      | Description         |
|----------|-----------|---------------------|
| 0        | 08 Jun 09 | Initial Release, R0 |
|          |           |                     |
|          |           |                     |

Note: Signatures apply for the latest technical memorandum revision as noted above.

This document has been prepared by *Parsons Brinckerhoff* for the California High-Speed Rail Authority and for application to the California High-Speed Train Project. Any use of this document for purposes other than this Project, or the specific portion of the Project stated in the document, shall be at the sole risk of the user, and without liability to PB for any losses or injuries arising for such use.

## 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 memorandums. 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 or the System Integration Manager.

System Level Technical Reviews by Subsystem:

|                 |  |                          |
|-----------------|--|--------------------------|
| Systems:        | <u>Signed document on file</u><br>Eric Scotson | <u>4 May 09</u><br>Date  |
| Infrastructure: | <u>Signed document on file</u><br>John Chirco  | <u>18 May 09</u><br>Date |
| Operations:     | <u>Signed document on file</u><br>Paul Mosier  | <u>28 May 09</u><br>Date |
| Maintenance:    | <u>Signed document on file</u><br>Paul Mosier  | <u>28 May 09</u><br>Date |
| Rolling Stock:  | <u>Signed document on file</u><br>Frank Banko  | <u>8 May 09</u><br>Date  |

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

# TABLE OF CONTENTS

**ABSTRACT ..... 1**

**1.0 INTRODUCTION ..... 2**

    1.1 PURPOSE OF TECHNICAL MEMORANDUM ..... 2

    1.2 STATEMENT OF TECHNICAL ISSUE ..... 2

    1.3 GENERAL INFORMATION..... 3

        1.3.1 Definition of Terms ..... 3

        1.3.2 Units of Measure ..... 3

**2.0 DEFINITION OF TECHNICAL TOPIC..... 4**

    2.1 GENERAL ..... 4

    2.2 LAWS AND CODES ..... 4

**3.0 ASSESSMENT/ANALYSIS..... 5**

    3.1 PRINCIPLES..... 5

    3.2 CHSTP DESIGN LIFE ELEMENTS ..... 5

    3.3 EXISTING DESIGN LIFE STANDARDS ..... 7

    3.4 CHSTP DESIGN LIFE ..... 9

**4.0 SUMMARY AND RECOMMENDATIONS ..... 10**

**5.0 SOURCE INFORMATION AND REFERENCES..... 11**

**6.0 DESIGN MANUAL CRITERIA ..... 12**

    6.1 MINIMUM DESIGN LIFE FOR INFRASTRUCTURE AND SYSTEMS ELEMENTS ..... 12

## ABSTRACT

This technical memorandum assesses and recommends the minimum design life - the period of time for which high-speed train design elements will perform while meeting minimum specifications under a particular maintenance regimen - for the permanent and temporary infrastructure and systems elements required to design and construct the California High-Speed Train Project (CHSTP). Design life will be used to advance the preliminary design, develop the system's maintenance activities and frequency, and inform design and development standards. This technical memorandum may also be used as a baseline document to develop and assess alternate materials, operational and maintenance requirements, procurement methods, and cost comparisons.

The minimum design life for the CHSTP will be based on precedent: the design lives for existing or planned high-speed train systems worldwide and major U.S. transportation infrastructure projects. Factors which influence the design life requirements of various key elements of infrastructure and systems, including difficulty and cost to modify and replace, technological obsolescence, capital and maintenance costs, safety and impact on performance and reliability, will be considered qualitatively in establishing design life requirements for the CHSTP. With system interdependencies, all elements of the high-speed train system must conform to their respective design life requirements in order to achieve the design life for the overall system.

The design elements considered in this document are:

### Infrastructure

- Civil Works and Track, including:
  - Site, earthwork, line layout, and storm drainage
  - Track, including rails, ties/clips, and ballast
  - Roadway, pavement, and parking facilities
  - Crossings and switches
  - Concrete slab
- Structures, including:
  - Underground structures and tunnels
  - Aerial structures and bridges
  - Above-grade facilities, including passenger stations, ventilation buildings and ancillary facilities
  - Movement joints and bearings
  - Retaining walls
- Mechanical, Electrical, Plumbing, Ventilation and Fire Protection Systems

### Systems

- Traction Power Facilities, including:
  - Traction power supply equipment
  - Traction power conduction
  - Overhead contact system (OCS) support structure
  - OCS conduction
  - Grounding, bonding, and lightning protection system
- Train Control Systems, including safety and security monitoring
- Communication Systems, including:
  - Train to central control (SCADA)
  - Passenger, public address
  - Fiber optic cables
- Other technology based systems

### Temporary Works

- Temporary tracks, staging facilities, traffic handling during construction

Rolling stock, operations and maintenance facilities are not considered in this document.

## 6.0 DESIGN MANUAL CRITERIA

### 6.1 Minimum Design Life for Infrastructure and Systems Elements

Minimum design life for CHSTP infrastructure and systems elements is presented in Table 6-1 and are intended as baseline requirements for use in defining and assessing design and development standards and requirements, alternative materials and designs, operational and maintenance activities and frequencies, procurement methods and cost comparisons. Design life is based on precedent from standards for existing and planned transportation infrastructure. All elements of the high-speed train system shall conform to their respective design life requirements in order to achieve the design life for the overall system.

**Table 6-1 – Minimum Design Life**

|  | CHSTP Minimum Design Life |
|--|---------------------------|
| <b>INFRASTRUCTURE</b>  |                           |
| Trackage and Civil Works, including: <ul style="list-style-type: none"> <li>• Site, earthwork, line layout, storm drainage</li> <li>• Crossings and switches</li> <li>• Concrete slab</li> </ul>   | 100 years                 |
| With the exception of: <ul style="list-style-type: none"> <li>• Roadway, pavement, parking facilities</li> <li>• Track, including rails, ties/clips, ballast</li> </ul>  | 50 years<br>30 years      |
| Structures, including:   |                           |
| <ul style="list-style-type: none"> <li>• Underground structures</li> <li>• Above-ground facilities, including bridges, passenger stations, ventilation buildings, ancillary facilities</li> <li>• Retaining Walls</li> </ul>                                       | 100 years                 |
| <ul style="list-style-type: none"> <li>• Movement joints, bearings</li> </ul>  | 50 years                  |
| Mechanical, electrical, plumbing, ventilation and fire protection systems  | 30 years                  |
| <b>SYSTEMS</b>   |                           |
| Traction Power Facilities, including: <ul style="list-style-type: none"> <li>• Traction power supply stations</li> <li>• Overhead contact system (OCS) support structures and conduction</li> <li>• Grounding, bonding, and lightning protection system</li> </ul> | 30 years                  |
| Train Control Systems, including structural safety and security monitoring   | 25 years                  |
| Communications System, including: <ul style="list-style-type: none"> <li>• Train to Central Control (SCADA)</li> <li>• Passenger, public address</li> <li>• Fiber optic cables</li> </ul>  | 25 years                  |
| Other technology based systems   | 10 years                  |
| <b>TEMPORARY WORKS</b>   |                           |
| Tracks, staging facilities, traffic handling during construction   | 10 years                  |