

California High-Speed Train Project



TECHNICAL MEMORANDUM

Design Variance Guidelines TM 1.1.18

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ABSTRACT

This technical memorandum establishes a procedure for identifying, preparing, requesting, and documenting a design variance from a Minimum design standard, standard drawing, standard specification, adopted standard or design guideline established for the California High Speed Train Project (CHSTP). It is intended to provide guidance for preparing a clear and concise record of the relevant design standard, required variance and rationale, assessment, review and approval of the variance. This process will be used through completion of the design and delivery of the project.

The design variance request process is comprised of the following steps:

- Identification and preliminary investigation of potential variances
- Assessment of Design Variance
- Preparation of Variance Request
- Approval of Variance Request
- Document Control

This technical memorandum also defines the roles and responsibilities associated with the requirements in requesting, approving and documenting the CHST project's design variances. This document includes forms for use in preparing, submitting, and documenting design variance requests.

Requests for a variance in CHSTP design criteria should be considered in light of the Authority's goal of providing safe and reliable high-speed intercity train operations. Variances to CHSTP criteria must be considered in keeping with this primary goal and through the use of sound engineering practices and judgment.

1.0 INTRODUCTION

1.1 PURPOSE

This technical memorandum establishes a procedure for identifying, preparing, requesting, and documenting a design variance from a Minimum design standard, standard drawing, standard specification, adopted standard, or design guideline established for the California High Speed Train Project (CHSTP). It is intended to provide guidance for preparing a clear and concise record of the relevant design standard, required variance and rationale, assessment, review, and approval of the variance. This process will be used through completion of the design and delivery of the project.

1.2 GENERAL

Applicability: CHSTP design criteria are typically described using three terms: Desirable, Minimum, and Exceptional standards. Design Variances are required for all design elements that do not meet a Minimum standard.

Justification: Typical justification for design variances could include avoidance of existing physical impediments, right-of-way acquisition, or substantial environmental or economic impacts that would significantly affect the project's implementation. Operational, maintenance, safety, and other key issues associated with the use of a design element that does not achieve the Minimum standard shall be clearly identified.

1.2.1 Definition of Terms

The following technical terms and acronyms used in this document have specific connotations with regard to California High-Speed Train project.

<u>Variance</u>	Approved design deviation, or exception, from a CHSTP Minimum design criteria or Minimum design standard.
<u>Desirable</u>	Standard which shall be equalled or exceeded where there are no constraints on the alignment.
<u>Minimum</u>	Standard which shall be equalled or exceeded where constraints on alignment make use of Desirable standards impracticable. The Desirable standard shall be approached as nearly as practical.
<u>Exceptional:</u>	Standard which shall be achieved only where Minimum standards are practicably unobtainable. Where Minimum standards are not obtainable, the Exceptional standards must absolutely be met based upon an approved design variance with adequate analysis and justifications.
<u>Non-Standard</u>	Design feature that does not meet Minimum criteria, also Exceptional.

Abbreviations / Acronyms

Authority	California High-Speed Rail Authority
AREMA	American Railway Engineering and Maintenance-of-Way Association
CHSTP	California High-Speed Train Project
CFR	Code of Federal Regulations
DPM	Designers Project Manager
EM	Engineering Manager
HSR	High-Speed Rail
RM	Regional Manager

2.0 DESIGN STANDARDS AND GUIDELINES

2.1 LAWS AND CODES

Initial high-speed rail design criteria will be issued in technical memoranda that provide guidance and procedures to advance the preliminary engineering. When completed, a Design Manual will present design standards and criteria specifically for the design, construction, and operation of the CHSTP high-speed railway.

Criteria for design elements not specific to high-speed rail (HSR) operations will be governed by existing applicable standards, laws, and codes. Applicable local building, planning and zoning codes and laws are to be reviewed for the stations, particularly those located within multiple municipal jurisdictions, state rights-of-way, and/or unincorporated jurisdictions.

In the case of differing values, the standard followed shall be that which results in the satisfaction of all applicable requirements. In the case of conflicts, documentation for the conflicting standard is to be prepared and approval is to be secured as required by the affected agency for which an exception is required, whether it be an exception to the CHSTP standards or another agency standards.

2.2 APPLICABILITY TO CODE OF FEDERAL REGULATIONS (CFR)

Not applicable

3.0 ASSESSMENT AND ANALYSIS

Request for variance in CHSTP design criteria should be considered in light of the Authority's goal of providing safe and reliable high-speed intercity train operations. Variances to CHSTP criteria must be considered in keeping with this primary goal and through the use of sound engineering practices and judgement.

3.1 DESIGN VARIANCE REQUEST PROCESS

The design variance request process is comprised of the following steps:

- Identification and preliminary investigation of potential variances
- Assessment of Design Variance
- Preparation of Variance Request
- Approval of Variance Request
- Document Control

3.1.1 Identification of Potential Variances

The DPM shall identify non-standard design elements that require variances early in the design process and submit these findings to the RM. If the RM, after discussion with the DPM, agrees that a potential variance warrants consideration, the DPM shall conduct an investigation of the implications associated with the design exception.

The initial investigation should include identification of CHSTP systems, performance, safety, operations and maintenance factors, and cost considerations affected by the introduction of a design element that does not achieve the Minimum standard. The specific location(s) where a potential design variance would be introduced must be clearly identified as part of the initial investigation.

Early identification and discussion with the RM regarding a potential design variance is recommended.

3.1.2 Assessment of Design Variance

Assessment of the design variance shall be conducted by the DPM. The DPM shall prepare appropriate qualitative and quantitative analysis of the impact of the variance and initiate coordination with affected parties. Included in this effort is an assessment of applicable standards for affected municipalities, agencies, rail and roadway owners, and operators associated with the design variance. The assessment may include identification of proposed design mitigations that may be implemented in conjunction with the introduction of an element that does not achieve a Minimum standard.

3.1.3 Request for Approval of a Design Variance

1. Only those non-standard design elements that were previously identified and discussed with the RM shall proceed to the stage of a formal request for approval.
2. If the same design variance is requested in multiple locations, one Design Variance Request Form may be submitted for multiple locations. Each occurrence where a minimum design criterion is not met shall be uniquely identified. Each variance shall reference the applicable design criteria.
3. Non-standard features identified after the approval of a design variance may require preparation of an amendment to the original Design Variance Request or submittal of a new Design Variance Request for approval.
4. Design Variances shall be approved before incorporation into submittals transmitted for review.

3.2 ROLES AND RESPONSIBILITIES

Responsibilities defined in this section will be performed by a person in responsible charge.

DPM

- Application of appropriate design standards
- Early identification of non-standard design features
- Communication of non-standard design elements to the RM
- Assessment of alternative design solutions or appropriate mitigations
- Coordination with stakeholder, permitting, operating, and other affected agencies
- Determination of sufficient justification to warrant a variance
- Preparation and transmittal of the Design Variance Request to RM
- Response and resolution to review comments from RM and EM
- Preparation and transmittal of required documentation
- Obtain required approvals
- Archive completed Design Variance Request
- Design variance implementation

RM

- Early assessment of the proposed Design Variance
- Review of the Design Variance Request
- Discussion of variance with EM discipline leads, as appropriate
- Provide review comments to DPM
- Recommend Design Variance Request to EM for review and approval
- Archive appropriate documentation

EM

- Standardization of Design Variance Request Form
- Review of the Design Variance Request
- Discussion of variance with CHSRA staff, as appropriate
- Provide review comments to DPM
- Approval of Design Variance Request
- Archive appropriate documentation


3.3 DESIGN VARIANCE REQUEST FORM

3.3.1 Required Data

The Design Variance Request Form shall be used for all variance requests. The Design Variance Request Form is a stand-alone document and must contain exhibits and drawings that show proposed non-standard features. A completed Design Variance Cover Sheet shall accompany the final variance request. Templates for the Design Variance Request Form and Design Variance Cover Sheet are included in Sections 6.8 and 6.9, respectively.

Design Variance Requests transmitted for approval shall include:

1. Date of the Request
2. Number of the Request (generated in a sequential manner)
3. Name and title of the DPM requesting, name of contract, contract number, the specific variance requested and why, a clear reference or link to the design criteria

- 
4. Identification of variance with regard to the Minimum standard and its relevance to the Desirable standard. No variances may be requested against the Exceptional Standard.
 5. Description of the specific design element and the applicable criteria.
 - o Reference the CHSTP Design Manual Section, Topic and Tables that apply. It is not necessary to restate the entire design standard; only state the portion that applies to the exception request
 6. Rationale for the need for the variance, identification of effects to the high-speed rail system, and justification for the request and the location(s and/or length) where the variance may be applied.
 - o Limitations in project scope are generally not appropriate reasons for exception from a design standard.
 - o The cost of providing a full standard design may be a supportive factor for approving a non-standard feature
 - o Project schedule should not typically be used as a reason to justify a non-standard feature but can be used as a supportive factor in terms of delay of benefits.
 7. Seal and signature of a professional engineer licensed in California

3.3.2 Supporting Documentation

The DPM shall provide appropriate and specific documentation to allow review, assessment, concurrence, and approval of the Design Variance Request. Supporting information may consist of but not limited to:

1. Supporting drawings and/or details as required to describe the proposed non-standard feature(s) and reference plans, typical sections and/or sketches. If several non-standard features are proposed, reference a table summarizing the location and nature of the non-standard elements. Only identical non-standard elements should be compiled in this manner. Different non-standard elements require separate variance requests.
2. Identify potential and reasonable mitigations to maintain or improve performance or operations. Commitments to implementing potential mitigations are generally not appropriate for inclusion. Mitigations may be an operational rule, such as a speed restriction at the location of the non-standard feature. The Design Variance Request process is specifically established for “design” features and not exceptions to either operations or maintenance standards. If an operational or maintenance procedure is the resulting mitigation for the design variance, this operational restriction has to be automatically included into the operations and maintenance procedures and contract documents.
3. Calculations
4. Risk and cost factors and corresponding mitigations
5. Provide a reasonable cost estimate summary required to achieve desirable and minimum standards for each element for which an exception is requested. Costs should be presented by major cost elements (i.e., rail, structures, right-of-way, utility, environmental).
6. Listing of people/agencies that have reviewed and commented on the design exception. Include his/her title, the design exception he/she reviewed and the date of review or concurrence.

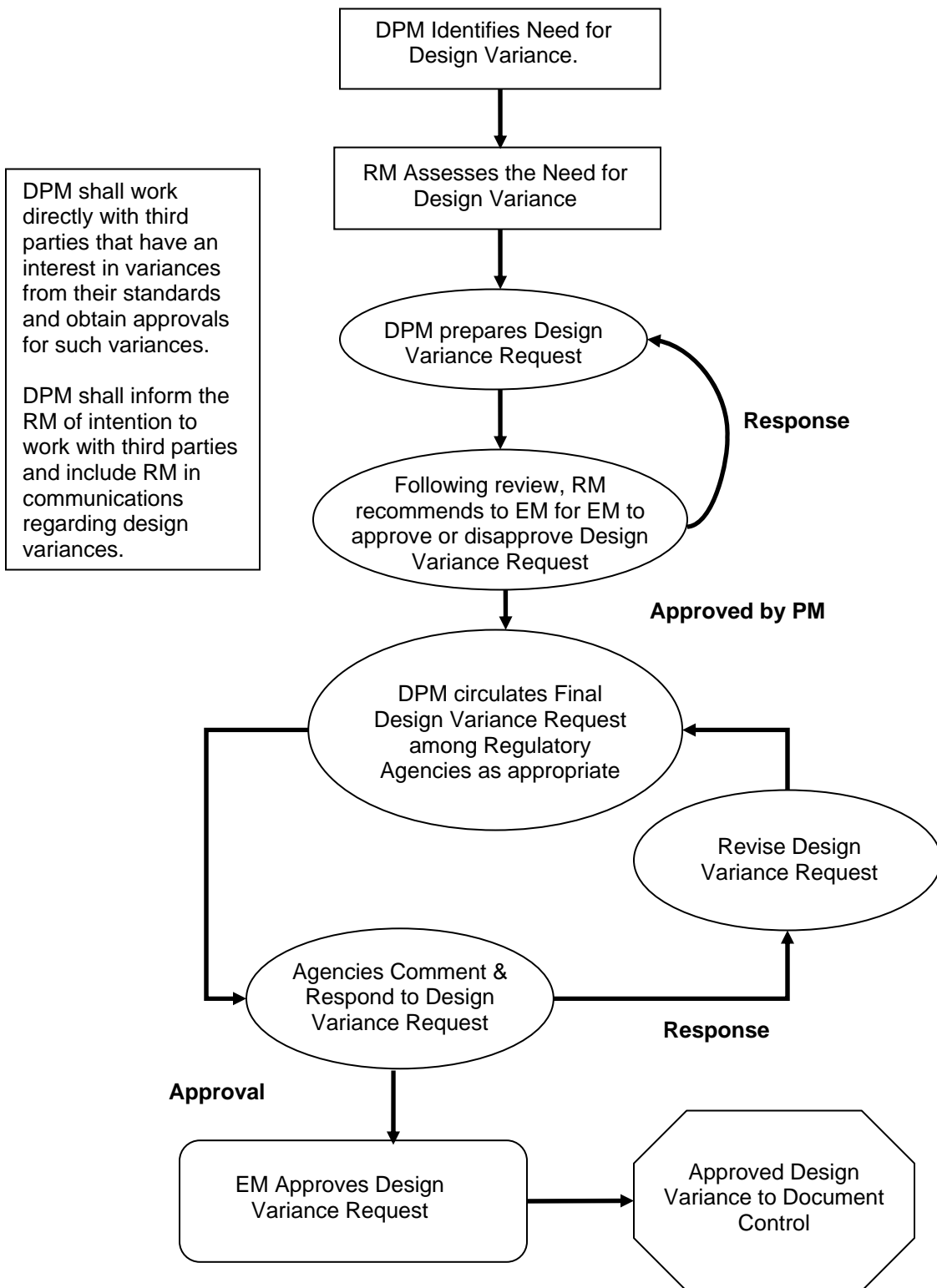
3.4 DOCUMENTATION

The DPM shall document each design variance request. The EM shall document all approved design variances.

1. Design variances must be approved prior to transmittal of design documents for review
2. DPM to maintain a copy of Design Variance Request

3. DPM to maintain inventory of all design variances for communication to potential bidders in the construction / design-build contract documents. The DPM must include this aspect in their QA/QC procedures.
4. EM to archive Approved Design Variances
5. Original approval documents to be filed in the CHSRA files

3.5 DESIGN VARIANCE APPROVAL PROCESS



DPM shall work directly with third parties that have an interest in variances from their standards and obtain approvals for such variances.

DPM shall inform the RM of intention to work with third parties and include RM in communications regarding design variances.



4.0 SUMMARY AND RECOMMENDATIONS

Section 6.0 presents the recommended guidelines for the identification, assessment and approval of requests for Design Variances for design elements that do not achieve CHSTP Minimum design standards.

5.0 SOURCE INFORMATION AND REFERENCES

1. Manual for Railway Engineering of the American Railway Engineering and Maintenance-of-Way Association (AREMA Manual)
2. Federal Railroad Administration Code of Federal Regulations (CFR)
3. California Department of Transportation, Manuals and Standards:
 - Highway Design Manual, Chapter 80: Application of Design Standards (September 1, 2006)
 - Project Development Procedures Manual, Chapter 21: Exceptions to Design Standards (July 1, 1999)

6.0 DESIGN CRITERIA MANUAL

Design Variances

Request for variance in CHSTP design criteria should be considered in light of the Authority's goal of providing safe and reliable high-speed intercity train operations. Variances to CHSTP criteria must be considered in keeping with this primary goal and through the use of sound engineering practices and judgement.

6.1 DESIGN VARIANCE REQUEST PROCESS

The design variance request process is comprised of the following steps:

1. Identification and preliminary investigation of potential variances
2. Assessment of Design Variance
3. Preparation of Variance Request
4. Approval of Variance Request
5. Document Control

6.2 IDENTIFICATION OF POTENTIAL VARIANCES

The DPM shall identify non-standard design elements that require variances early in the design process and submit these findings to the RM. If the RM, after discussion with the DPM, agrees that a potential variance warrants consideration, the DPM shall conduct an investigation of the implications associated with the design exception.

The preliminary investigation should include identification of CHSTP systems, performance, safety, operations and maintenance factors, and cost considerations affected by the introduction of a design element that does not achieve the Minimum standard. The specific location(s) where a potential design variance would be introduced must be clearly identified as part of the initial investigation.

Early identification and discussion with the RM regarding a potential design variance is recommended.

6.3 ASSESSMENT OF DESIGN VARIANCE

Assessment of the design variance shall be conducted by the DPM. The DPM shall prepare appropriate qualitative and quantitative analysis of the impact of the variance and initiate coordination with affected parties. Included in this effort is an assessment of applicable standards for affected municipalities, agencies, rail, and roadway owners and operators associated with the design variance. The assessment may include identification of proposed design mitigations that may be implemented in conjunction with the introduction of an element that does not achieve a Minimum standard.

6.4 DESIGN VARIANCE REQUEST

6.4.1 Variance Request Form

The Design Variance Request Form shall be use for all variance requests. The Design Variance Request Form is a stand-alone document and must contain exhibits and drawings that show proposed non-standard features. A completed Design Variance Cover Sheet shall accompany the final variance request. Templates for the Design Variance Request Form and Design Variance Cover Sheet are included in Sections 6.8 and 6.9, respectively.

Each Design Variance Requests transmitted for approval shall include:

1. Date of the Variance Request
2. Number of the Variance Request (generated in a sequential manner)

3. Title of the Variance Request
4. Name of the DPM requesting, name of contract, contract number, the specific variance requested and why, a clear reference or link to the design criteria
5. Identification of variance with regard to the Minimum standard and its relevance to the Desirable standard. No variances may be requested against the Exceptional Standards.
6. Description of the specific design element and the applicable criteria, i.e., General Criteria, Standard Drawing, Specification or Minimum Design Standard.
7. Rationale and justification for the request and the location(s) and/or length where the variance may be applied.
8. Identification of effects of the variance to the high-speed rail system operations and maintenance, if any, and appropriate potential mitigation measures.
9. Supporting documentation per Section 6.4.2.
10. Seal and signature of a professional engineer licensed in California

6.4.2 Supporting Documentation

The DPM shall provide appropriate and specific documentation to allow review, assessment, concurrence, and approval of the Design Variance Request. Supporting information may consist of but not limited to:

1. Supporting drawings and details
2. Calculations
3. Risk and cost factors and corresponding mitigations
4. Other impacts: environmental, constructability, etc.
5. Proper documentation for inclusion in the contract procurement documents

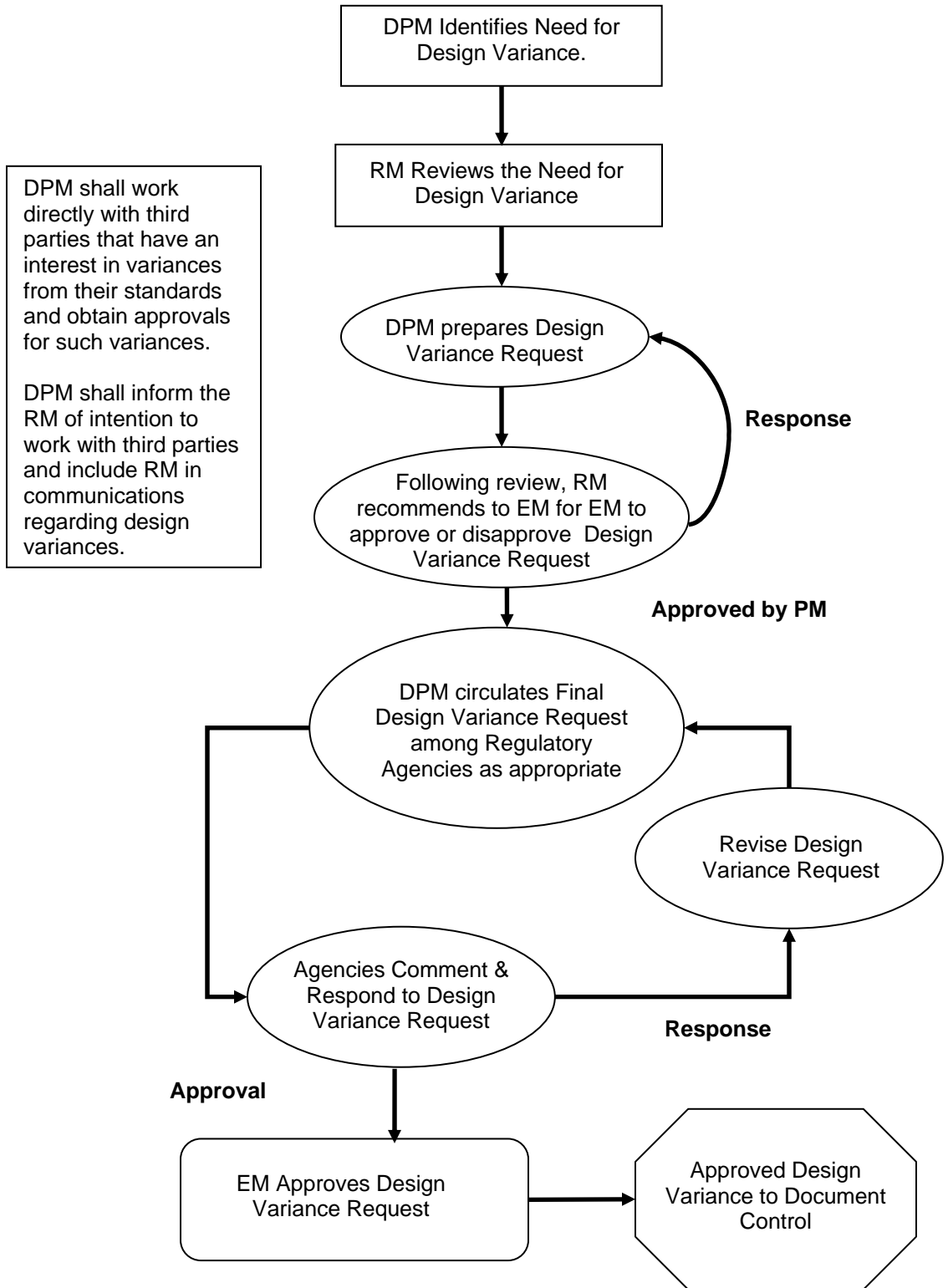
6.5 APPROVAL OF VARIANCE REQUEST

1. Only those non-standard design elements that were previously identified and discussed with the RM shall proceed to the stage of a formal request for approval.
2. If the same design variance is requested in multiple locations, one Design Variance Request Form may be submitted for multiple locations. Each occurrence where a minimum design criterion is not met shall be uniquely identified. Each variance shall reference the applicable design criteria.
3. Non-standard features identified after the approval of a design variance may require preparation of an amendment to the original Design Variance Request or submittal of a new Design Variance Request for approval.
4. Design Variances shall be approved before incorporation into submittals transmitted for review.

6.6 DOCUMENT CONTROL

1. DPM to maintain a copy of Design Variance Request
2. DPM to maintain inventory of all design variances for communication to potential bidders in the construction / design-build contract documents
3. EM to archive Approved Design Variances
4. Original approval documents to be filed in the Authority's files

6.7 DESIGN VARIANCE APPROVAL PROCESS



DPM shall work directly with third parties that have an interest in variances from their standards and obtain approvals for such variances.

DPM shall inform the RM of intention to work with third parties and include RM in communications regarding design variances.





6.8 CHSTP DESIGN VARIANCE COVER SHEET



California High-Speed Train Project

DESIGN VARIANCE COVER SHEET

Design Variance Request Number:

Design Variance Request Title:

Prepared by:

Design Project Manager

Date

Recommended By:

Regional Manager

Date

Approval:

Systems

Date

Infrastructure

Date

Operations

Date

Maintenance

Date

Rolling Stock

Date

Approval:

Engineering Manager

Date

Agency Concurrence: (if required)

Agency Project Manager

Date



6.9 CHST DESIGN VARIANCE REQUEST

DPM Team - Requestor's Name: DPM Team - Requestor's Title:



Date :

Project Segment:

Location or Station (length) where Variance is requested:

Design Criteria or Standards Reference number: (include hyperlink to source)

Design Detail Description:

Feature Requiring an Exception:

Reason for Requesting Variance:

Potential Operations and Maintenance Impacts of this Variance:

Potential Mitigations:

Approximate Cost Estimate to meet Minimum Standard:

Additional Documentation:

- Drawings
- Calculations
- Applicable Standards
- Expert Testimonies