Appendices

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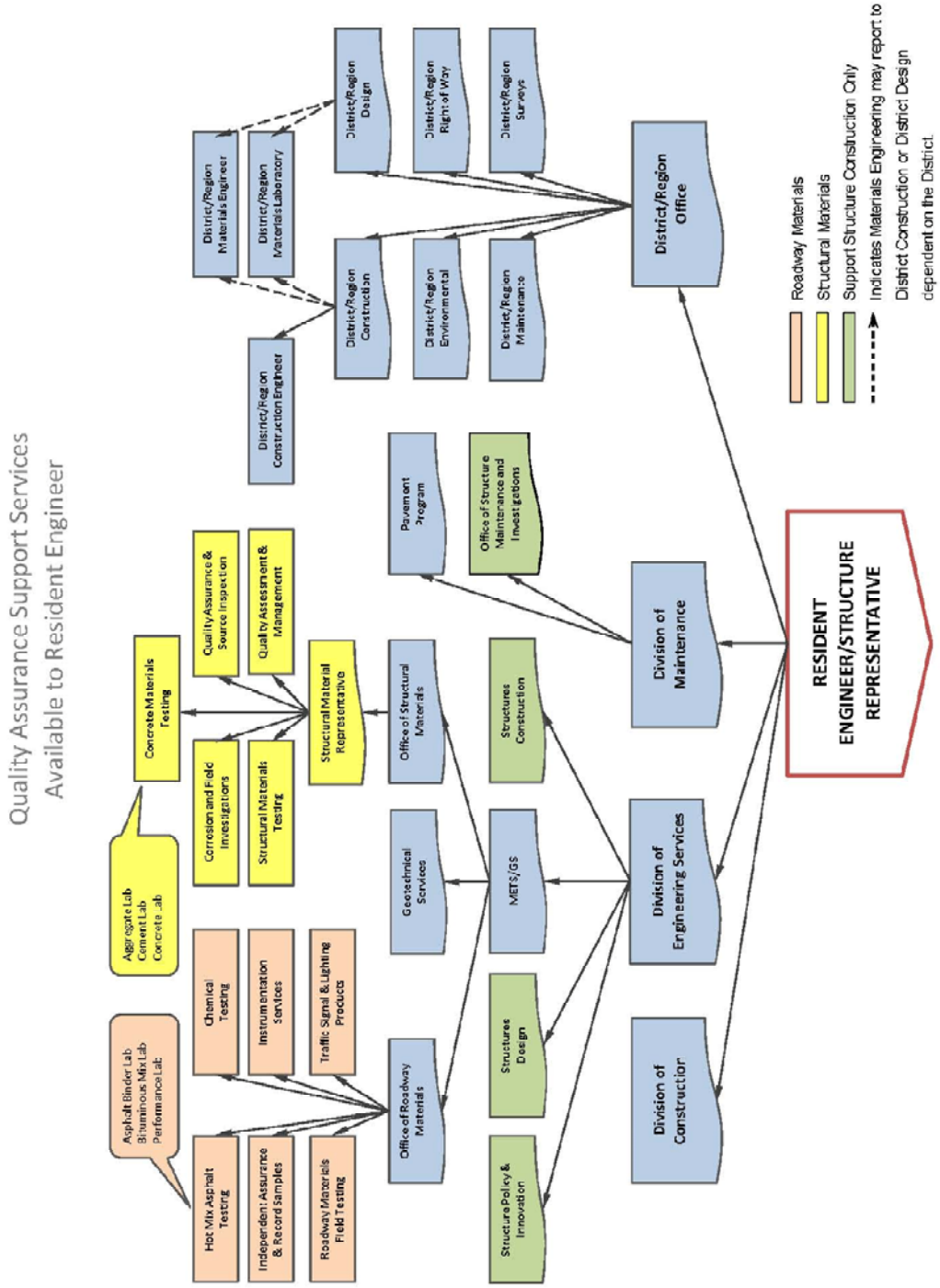
B	Quality Assurance Support Services Available to Resident Engineer
C	Contract Administration Process Evaluation (CAPE)
D	Quality Assurance Program Bulletin
E	IT Concept Statement Form
F	Features of Performance-Related Specifications

1. *2010 Standard Plans*. http://www.dot.ca.gov/hq/esc/oe/construction_standards.html
2. *2010 Standard Special Provisions*. http://www.dot.ca.gov/hq/esc/oe/construction_standards.html
3. *2010 Standard Specifications*. http://www.dot.ca.gov/hq/esc/oe/construction_standards.html
4. *Bridge Construction Records and Procedures*, *Volume 1* and *Volume 2*. http://www.dot.ca.gov/manuals.htm
5. *Bridge Deck Construction Manual*. http://www.dot.ca.gov/manuals.htm
6. California Test Methods. http://www.dot.ca.gov/hq/esc/ctms/
7. *Concrete Technology Manual*. http://www.dot.ca.gov/hq/esc/construction/manuals/
8. *Construction Manual*. http://www.dot.ca.gov/manuals.htm
9. Deputy Directive 90, *Funding of Quality Management Work on State Highway Projects*, December 2006. http://admin.dot.ca.gov/bfams/admin_svcs/sw_policy/dd/dd_by_number.html
10. Deputy Directive 75, *Training*, July 2003, http://admin.dot.ca.gov/bfams/
11. *Design-Build Demonstration Program, Quality Manual Outline.* http://www.dot.ca.gov/hq/oppd/designbuild/madera99rfp/Book2/Exhibit-2-A-Quality-Manual-Template.pdf
12. *Falsework Manual.* http://www.dot.ca.gov/manuals.htm
13. *Foundation Manual.* http://www.dot.ca.gov/manuals.htm
14. *Independent Assurance Manual, Procedures for Accreditation of Laboratories and Qualification of Testers*, July 2005. http://www.dot.ca.gov/hq/esc/Translab/ormt/IA_reports/index.htm
15. *Material Plant Quality Program.* http://www.dot.ca.gov/hq/construc/hma/
16. METS Authorized Materials List. http://www.dot.ca.gov/hq/esc/Translab/index.htm
17. *Office of Structures Materials, Practice and Procedures Manual* (OSMPP) http://www.dot.ca.gov/hq/esc/Translab/OSM/agencyresources.htm
18. Quality Control Manual for Hot Mix Asphalt for the Quality Control Quality Assurance Process, June 2009. http://www.dot.ca.gov/hq/construc/hma/


Quality Assurance Support Services
Available to Resident Engineer
RESIDENT ENGINEER/STRUCTURE REPRESENTATIVE
District/Region Office
Division of Maintenance
Division of Engineering Services
Division of Construction
District/Region Design
District/Region Right of Way
District/Region Surveys
District/Region Construction
District/Region Environmental
District/Region Maintenance
District/Region Materials Engineer
District/Region Materials Laboratory
District/Region Construction Engineer
Pavement Program
Office of Structure Maintenance and Investigations
Office of Structural Materials
Structures Construction
Structures Design
Structure Policy & Innovation
Geotechnical Services
METS/GS
Office of Roadway Materials
Structural Material Representative
Quality Assurance & Source Inspection
Quality Assessment & Management
Concrete Materials Testing
Corrosion and Field Investigations
Structural Materials Testing
Aggregate Lab
Cement Lab
Concrete Lab
Asphalt Binder Lab
Bituminous Mix Lab
Performance Lab
Chemical Testing
Instrumentation Services
Traffic Signal & Lighting Products
Hot Mix Asphalt Testing
Independent Assurance & Record Samples
Roadway Materials Field Testing
Roadway Materials
Structural Materials
Support Structure Construction Only
Indicates Materials Engineering may report to District Construction or District Design dependent on the District.

Caltrans Division of Construction
CHARTER: Contract Administration Process Evaluation (CAPE)

BACKGROUND:
In 2000, the Caltrans Division of Construction (Construction) initiated its first process evaluation of contract administration guidance and practices. Construction's executive management meets each year to compile a list of potential contract administration topics for evaluation. Typically, these topics are areas of concern where there may be a lack of contract enforcement, a lack of understanding by resident engineers, or contractor disputes. Each year, Construction chooses approximately three to four topics for evaluation.

Once topics are selected, a CAPE evaluation plan is developed. The plan consists of the problem statements, objectives, estimates of resources needed, and identifies the managers and team leaders. The team leaders are typically Construction's subject matter experts. The plan is used as a scoping document to help guide the investigating team members in performing the CAPE. Each district and region provides team members for each CAPE topic. The teams investigate and evaluate the effectiveness of current contract administration processes by interviewing resident engineers in each district and region. The information and findings are collected and compiled into the CAPE report, which identifies strengths, weaknesses and suggested improvements provided for each district and region. Construction also uses the findings as an opportunity to improve policies, guidance and develop needed training. The CAPE report and the associated findings for each topic are shared with the Deputy District Directors and Region Division Chiefs of Construction. Each district and region then prepares an action plan that contains planned managerial or training actions and proposed corrections for the suggested improvements. After two years, a self-evaluation or look back is prepared by each district and region to evaluate the effectiveness of the implemented training or corrective actions taken to improve the contract administration processes.

OBJECTIVE:
Evaluate the current state of contract administration methods, guidance material and processes to identify strengths, weaknesses and suggested improvements. This periodic review of current business practices improves the construction and project delivery process. The proposed changes and process improvements help streamline construction processes and achieve success in the delivery of construction projects.

DESIRED DELIVERABLES:

1. Evaluate each CAPE topic for each district and region. Identify strengths, weaknesses and suggested improvements for each CAPE topic. Compile the results in the annual CAPE report.
2. Develop district and region action plans to address suggested improvements identified in the CAPE. Monitor and implement the action plans.
3. Where appropriate, improve contract administration policy, processes, guidance material, specifications and administration by field staff.

RESOURCES:
Individual CAPE teams are made up of Caltrans staff from headquarters and supporting team members from the districts and regions. Consultants may participate in each topic team to aid in collecting data and then preparing the final CAPE report. Travel is authorized as needed to conduct the interviews.

SPONSORS:

Scott A Jarvis 12-7-12		Mark Leja 12/7/12	
SCOTT JARVIS	DATE	MARK LEJA	DATE
Assistant Chief, Division of Construction		Chief, Division of Construction	

December 6, 2012

Quality Assurance Program Bulletin

QAPB YY-nn Quality Assurance Program Bulletin Style Sheet
The QAPB title should fit on one line and clearly describe the contents.
When possible, list references in the order they appear in the body of the QAPB.

References:	Reference titles here	Cite the number and section title of the reference. If the information wraps to the next line, indent ¼ inch.
	Additional reference titles here	Stack information about additional references here. If the information wraps, indent ¼ in.
(Example):	*Standard Specifications*	Section 6-3.04, "Quality Control" Section 15-2.02B, "Quality Control, Inspection and Testing"
	Construction Quality Assurance Program Manual	Section 1-3.2, "Acceptance Criteria for Materials and Workmanship" Section 1-7 "Inspection and Testing"

Effective Date: Day after the approval date

Approved: _____
XXXX XXXX
Chief
Division of Construction

Approval Date: Seven to ten days in the future

Background

In the "Background" section, introduce the subject and provide summary information. Help the reader understand that the Division of Construction is changing an existing process or implementing a new one.

The summary usually provides two or more of the following:

- Information about circumstances, such as changes in the law, that led to the creation of the QAPB.
- A description of problems or common errors that required the QAPB.
- A brief explanation of how the new procedure improves the old procedure or what impact the new procedure will have.

The "Background" section rarely contains as much information as the "New Procedure" section.

Existing Procedure

This section cites references to existing procedures and provides summary information being changed or replaced.

"Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability"

Avoid providing details about existing procedures. Readers can check the references you provide if they want to see details.

New Procedure

The "New Procedure" section begins with an introduction to the procedure. It provides details about each function that must be performed in the new procedure, identifies the titles of the persons responsible for performing the function(s), and frequently provides timeline information.

- **Provide the information the reader will need to perform the new procedure but not more information than necessary. Remember the reader is in the field with limited access to reference materials.**
- **Write the QAPB as it should read in the *Construction Quality Assurance Manual*. Doing so now will reduce the time spent in the future to update the manual.**

Provide a closing statement that includes the contact person's name, "Division of Construction," email address, and telephone number.

IT Concept Statement Form

Release:	1.0
Date:	October 1, 2003

A. Naming, Contact, and Approval Information

A.1 Proposed project name, submitter, and contact

Project Name:	Materials Certification and QCQA System	**Date:**	June 26, 2009
Submitted By:	Division of Construction	**Phone:**	
Office:	Division of Construction		
Contact Name:	Chuck Suszko	**Phone:**	916 227-7314

A.2 Approvals

The following personnel have reviewed and approved the contents of this concept proposal and ensure that the business and financial information is consistent with the program area business objectives/charter.

FSR Sponsor signature(s) and date	1. Mark Leja
For Mark Leja, Robert F. Effenberger	
Deputy Director signature and date	Richard Land
6/26/09	

Information Technology Management Committee (ITMC)	Approved		Denied		Date	
ITMC Chair signature and date	Not currently required					

Caltrans Organization:

IT Concept Statement Form

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B. Concept Description (see instructions)

B.1 Business Problem or Opportunity

Certain materials incorporated into construction projects must be certified or tested to ensure that they meet contract requirements. A log of material certifications is to be kept on file with each project. These logs have not always been kept up to date or are not readily available during audits. The Federal Highway Administration has requested that such logs be made available to them.

Additionally, the Department is heading to a Quality Control/Quality Assurance process on materials where the contract must establish control mechanism to ensure quality products and the Department assures that the contractor is performing quality work. This process requires frequent and lengthy data transfers to ensure a statistical correlation between the tests. This is currently done with paper forms the often require re-entering data. This leads to errors and, sometimes, lengthy and expensive disputes.

B.2 Solution Research Methodology

The goal would be to develop a web-based application that would allow both the contractor and the Caltrans field staff to enter data onto an electronic form specific to each project. The application would perform the necessary calculations to arrive at the applicable adjustment or notify the parties when correlation cannot be achieved. The process would result in more efficient data entry and calculations and allow for the logging of the results. This automatic logging would also solve the first issue identified above.

B.3 Success Factors

Success would be

- Quicker comparisons of QC and QA to allow corrections while materials are still being placed , which allows for improved material quality instead of penalties for poor products.
- Fewer disputes over entered information
- More accurate data
- Automatic tracking of data

B.4 Strategic Information

Please answer the following questions by marking "Yes" or "No" and provide narrative as appropriate.	**Yes**	**No**
Is the project consistent with Caltrans and/or program area Strategic Plan?	☒	☐

Briefly explain: Material testing and quality are essential to long-life infrastructure. Accurate and responsive testing will allow for better quality material and lower expenditure of resources.

Is the project identified in the Caltrans and/or program area IT tactical and/or strategic plans?	☒	☐

The need for automating testing and record keeping has been known for some time. The addition of QCQA is accentuating this problem by increasing the amount and detail of data being developed.

Caltrans Organization:

IT Projects Methodology Management Ct Caltrans Standards

IT Concept Statement Form

Release:	1.0
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B.5 Constraints

System must allow for tracking materials on approximately 700 contracts.

System must be able to be accessed by both external personnel/entities as well as department staff.

C. Concept Scope

C.1 Integration Information

Please answer the following questions by marking "Yes" or "No" and provide narrative as appropriate.	**Yes**	**No**
Will this project upgrade or enhance an existing system (s)?	☐	☒
If so, provide name of system (s): _____		
Will this project replace an existing system (s)?	☐	☒
If so, provide name of system (s): _____		
Will this project exchange data (i.e. interface) with an existing system (s)?	☒	☐

If so, provide name of system (s): CMS – necessary to pull project specific data and, possibly, to allow pay factors to be included.

C.2 Business Processes Impacted

This section describes the high-level business functions that this system supports. Check all appropriate functions.

☐ Plan Transportation Solutions	☐ Maintain Transportation Systems	☒ Manage IT	☐ Manage the Enterprise
☐ Specify Transportation Solutions	☐ Manage Transportation Information	☒ Manage Stakeholders	☐ Manage Projects
☐ Implement Transportation Solutions	☐ Manage Human Resources	☐ Manage Departmental Assets	☒ Manage Operational Requirements
☐ Manage Transportation systems	☐ Manage Finances	☐ Manage Procurements	☒ Manage Contracts

Caltrans Organization:

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IT Projects Methodology Ct Caltrans Management Standards

IT Concept Statement Form

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C.3 Cost estimates

Please check the appropriate cost estimate:

Will the cost, excluding operations and maintenance, of the project be between $50,001 and $500,000?	☒
Will the cost, excluding operations and maintenance, of the project be between $500,001 and $5,000,000?	☐
Will the cost, excluding operations and maintenance, of the project be between $5,000,001 and $10,000,000?	☐
Will the cost, excluding operations and maintenance, of the project be over $10,000,000?	☐
Unable to provide cost estimates at this time	☐

C.4 Funding (see instructions)

The creation and establishment of the system is funded through the cost report. The maintenance will be funded through the Capital and Maintenance operational expenditures.

C.5 Organizational Sizing

Estimate number of users per area.

AREA	DISTRICT												HQ	STATEWIDE
	1	2	3	4	5	6	7	8	9	10	11	12		
Administrative/Facilities														
Construction	10	20	50	90	30	70	80	50	10	20	40	30		500
Design														
Engineering Services - A&E	3	4	7	14	5	11	13	7	1	4	6	5		80
Environmental														
Equipment														
Financial														
General Public – Contractors														3,500
Information Technology														
Maintenance														

Caltrans Organization:

IT Concept Statement Form

Release:	1.0
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AREA	DISTRICT												HQ	STATEWIDE
	1	2	3	4	5	6	7	8	9	10	11	12		
Other Government Agencies														
Permits														
Planning														
Project Management														
Right of Way														
TMC														
Traffic Operations														
Other:														

D. FSR Development and Planning Information

Who will lead the FSR Study team if this concept is approved?

Chuck Suszko

Who will participate in the FSR study team?

TBD

Please describe the FSR effort in quantitative terms. Ex. Do you expect three people to work on it for a quarter of their time for 3 months? Two people working half time for 5 months?

Three people working on the FSR for a quarter of their time for 6 months.

When do you estimate the FSR being completed?

March, 2010

Caltrans Organization:

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1.1. Distinguishing Features of Performance-related Specifications

1.1.1. Acceptance based on key quality characteristics that have been found to correlate with fundamental engineering properties that predict performance.

1.1.2. Mathematical models used to quantify the relationship between key materials and construction quality characteristics and product performance.

1.1.3. Price adjustments related to the expected life-cycle cost (LCC) of the constructed transportation facility.

1.2. Components of Performance-related Specifications

1.2.1. Identification of owner's needs or goals

In the application of PRS, the owner defines its needs at the highest possible level. For example, for pavements such goals are safety, comfort, accessibility, and capacity. Lower level requirements, such as material or manufacturing properties, are included only when necessary and where definitions for desired performance cannot otherwise be expressed in clear and unambiguous terms.

1.2.2. Performance parameters

Performance parameters are functional requirements that can be measured or tested to ensure that the owner's project goals are satisfied. For example, possible performance parameters for an asphalt pavement include smoothness, in-place density, and asphalt content.

1.2.3. Measurement or testing technique

PRS identifies a measurement strategy for each performance parameter. For example, pavement smoothness could be measured using a high-speed profilograph. The most desirable performance parameters are measurable.

1.2.4. Performance value or threshold

For each performance parameter, PRS sets a performance value, expressed in terms of ranges (minimum/maximum), thresholds, or a rating system. For example, a performance value associated with pavement smoothness could be expressed as a maximum International Roughness Index (IRI) in inches/mile.

1.2.5. Verification tests or inspection

PRS requires the contractor to develop, submit, and implement a plan to control the quality of materials and construction. Even though the contractor may assume more responsibility for inspection and testing under PRS, this in no way relieves Caltrans of its responsibility to perform its own oversight and independent verification to ensure that the product meets or exceeds the stated objective or standard.

1.2.6. Price adjustment

Unlike method specifications, PRS allows the parties to acknowledge a range of acceptable work quality through the use of price adjustments that reflect the value of the work received. Pay adjustments are based upon the analysis of both As-Designed and As-Constructed life-cycle costs (LCC).

As-Designed LCC is determined by using the target values of the specified quality characteristics as inputs to the Models. As-Constructed LCC is determined by using the actual measured values of a construction project's quality characteristics as input. The difference between As-Designed LCC and As-Constructed LCC is the basis for any pay adjustment. Since price adjustments are based on a lifecycle cost analysis, a negative pay adjustment covers the cost of future maintenance and rehabilitation due to the construction not meeting the designed level of quality while a positive adjustment reflects the savings in maintenance and rehabilitation due to the higher level of initial quality.

1.3. Development of Performance-related Specifications

Basic requirements for development of PRS include:

1.3.1 Products that are viable candidates for PRS are identified. The use of PRS is considered for those products for which the end product performance is measurable; the specified testing is rapid, available, and economical; and for those which the contractors are willing to assume performance risk because they are in a position to control the risk or are attracted to the possibility of increased profit.

1.3.2. In-service performance requirements are organized and prioritized for each of the identified products.

1.3.3 Specification language is developed or existing specifications modified to accommodate the use of PRS for those products that have performance clearly identified.

1.3.4. Mechanistic-empirical models are developed and/or actual performance data is assembled that clearly link design factors to performance. Factors that are under the direct control of the designer and those that are under the direct control of the contractor are identified.

1.3.5. Non-destructive tests are developed and implemented that link more directly to performance and focus on 100 percent sampling and/or continuous sampling of the in situ product.

1.3.6. Critical quality characteristics should be readily measurable and clearly tied to product performance. Construction contractors should be held accountable only for those quality characteristics under their control.

1.3.7. Prediction tools, including modeling and databases, are verified, calibrated, validated, and otherwise made appropriate for local conditions.

1.3.8. Life cycle cost analyses (LCCA) are used to compare the as-designed product section to the as-built section. The LCCA is based on a clear, well-documented, and realistic preservation, rehabilitation, and maintenance decision process. User costs are considered in developing appropriate pay factors.

1.3.9. Acceptance plans are statistically based with clearly defined risks. If necessary, pay determinations are completed in a timely fashion to allow for prompt corrective action. Sampling and testing plans properly address material, operator, and testing variability and improve confidence in the results.

1.3.10. Performance-related specifications are written simply, clearly, and concisely.

1.3.11. As PRS end-result criteria are added to a contract for a specific quality characteristic, they are accompanied by a corresponding reduction in prescriptive or method elements, giving the contractor more freedom to innovate, improve quality, and clarify roles and responsibilities.

1.3.12. Testing requirements incorporate standardized tests using nondestructive techniques to measure the product in situ, better quantifying the quality characteristics and enhancing 24 to 48-hour, if not instant, turnaround of information through the use of computer technology.

1.3.13. The contractor is given reasonable latitude to develop and implement a quality control plan that can be verified by Caltrans, especially for those quality characteristics included in the acceptance plan.

1.3.14 Performance prediction techniques used in PRS are based on mechanistic models and are the same models used in the design process. Asset management systems track the same assumptions used in both the design and construction process.

1.4. Implementation of Performance-related Specifications

The ability to both develop and implement PRS is dependent upon Caltrans having reasonable Performance-Prediction Models and Maintenance-cost Models. Performance-Prediction Models predict when and to what extent a construction product (such as a pavement) will exhibit a given type of distress, such as fatigue cracking or joint spalling. Maintenance-cost Models estimate the post-construction life-cycle cost (LCC), which is the cost of maintenance and rehabilitation necessary throughout the projected life of the product. Inputs for these models include design variables such as traffic loading, climatic factors, drainage, and soil factors and quality characteristics such as asphalt binder content and air voids, concrete permeability and strength, and ride smoothness. These models can only be developed and validated through good quality data, including pavement and bridge performance, construction quality, construction cost, and maintenance cost.

Construction and Engineering Information Management Systems (Pavement, Bridge and Maintenance) are used to collect this data and generate the required Performance-Prediction Models and Maintenance-cost Models.

1.5. Advantages of Performance-related Specifications

1.5.1. PRS directly connects design requirements with construction, provides a critical link between the construction and engineering management systems, and improves overall design-to-construction communication.

1.5.2. PRS uses a more rational and defensible approach in developing pay factors for adjusting contractor pay when quality is above or below desired levels.

1.5.3. Testing requirements focus more on those characteristics that relate to performance giving Caltrans the capability to target and economize inspection programs.

1.5.4. Performance, quality, and costs are uniquely connected through modeling and life cycle cost analyses providing an improved way to analyze tradeoffs.

1.5.5. Improved understanding of those quality characteristics that relate more directly to product performance and more accurately translate design intent into construction requirements.

1.5.6. Improvement in the focus on the overall quality of the product in areas that caused problems previously.

1.5.7. PRS clarifies changes in roles and responsibilities between Caltrans and the contractor and, at the same time, defines the levels of risk for each party.

By being less prescriptive, PRS creates an environment that encourages contractor innovation. Contractors have the flexibility to select materials, techniques, and procedures to improve the quality or economy, or both, of the end product.