Developing and Updating Process Development Diagram (PDD) Packages

Internal processes are developed by Structure Construction (SC) to produce products and perform services for SC customers. SC's business processes are identified by SC Top Management and assigned to SC Technical Teams (TT) for development. SC business processes are communicated to SC Staff by publishing Bridge Construction Memos (BCM) in the *Bridge Construction and Records Manual*, (*BCR&P Manual*). The following are instructions to SC TTs for developing a process using the PDD.

Process development consists of three these stages:

1. Process Development Planning
2. Develop the Draft PDD Package
3. PDD Package Submittal

PDDs are documents used to ensure conformance with the requirements for process development stated in the *SC Quality Manual*, Section 4.4, *SC's Business Processes*, and Section 8, *Operation*. PDDs contain the following sections, as stated in the *SC Quality Manual*, Section 8.1.3, *Development of Processes*:

1. Background
2. Inputs
3. Criteria
4. Resources, Responsibility and Authority
5. Organizational Risks and Opportunities
6. Procedure
7. Outputs/Deliverables/Records
8. Measurement & Evaluation
9. Improvement
10. Attachments

Bridge Construction Memos are the distilled version of the PDD and provide the essential sections for SC staff to complete the process. BCMs consist of the following sections of the PDD:

1. Background
2. Inputs

3. Procedure
4. Outputs/Deliverables/Records
5. Attachments

Process development has the following end product, referred to as the PDD Package, which has the following components:

1. Change Letter
2. Disposition of existing BCM(s), if any
3. PDD
4. Attachments, if any
5. PDD to BCM Matrix

The SC TT begins development of a process when a PDD template is received from the SC Technical Manual Manager (TMM). The PDD template provided by the SC TMM has the Background section filled out by the Quality Management Representative (QMR). This defines the scope of the process.

The SC TT is advised to review related processes to ensure information already documented is not repeated in the new process.

1. Process Development Planning (PDP)

Process development planning correlates to Step 1.1 of Attachment 4.1, *8-Step Development and Review Schedule - from PDD to Published BCM*.

Before beginning work on the draft PDD, the SC TT must plan for the process development activities by considering the following:

1. The nature, duration, and resources needed for process development, which is accomplished by answering the following questions:
    a. What is the scope of this process and how does it relate to other identified processes? To identify other related processes, obtain the file, “SC BCR&P processes Master.xls” aka “New to Old BCM table” from SC QMR as appropriate.
    b. What responsibilities and authorities are needed to develop the process per list item 3 below?
    c. How long will it take to develop the process?
    d. What resources will be required to complete development of the process?

2. The required process development stages, including applicable development reviews, includes:
    a. Researching existing documented and undocumented information, such as:
        i. Existing BCMs
        ii. Revised Standard Specifications
        iii. Applicable Standard Special Provisions (SSPs)
        iv. *Outline of Field Construction Practices*
        v. SC technical manuals
        vi. Winter Training presentations
        vii. Caltrans (CT) *Construction Manual*
        viii. Construction Policy Bulletins (not yet inserted into *Construction Manual*)
        ix. Construction Procedure Directives (CPDs)
        x. Director's Policies
        xi. Deputy Directives
        xii. *CT Safety and Health Manual*
        xiii. Other Caltrans manuals
        xiv. External agency requirements, such as California Code of Regulations (CCR) Title 8
        xv. The tribal knowledge of SC TT members and other stakeholders.
    b. Determining if the PDD is an SC process that should be developed into a BCM by using the *Justification to Delete or Combine a SC Process Development Diagram Memo*, which is referred to as a JTDC Memo. Use the latest JTDC Memo template from the SC PDD Library.
        i. If the SC TT determines the PDD should not be developed into a BCM, complete the JTDC Memo.
    c. Determining the logistics needed for the SC TT to combine the results of the research. Will there be SC TT meetings? If not, how will information be shared?
3. The responsibilities and authorities involved in process development, which is accomplished by answering the following questions:
    a. Which SC TT members will be responsible for each component of process development?
    b. What authority will each SC TT member have? Will individual SC TT members have the authority to edit the work of other SC TT members?

4. The internal and external resource needs for process development, which is accomplished by answering the following questions:
    a. Are stakeholders involved in the process?
    b. What responsibilities and authorities will stakeholders have in the development of the process?
    c. What are the outputs of the process, who are the customers of the outputs, and how should the customers be involved in the development of the process?
    d. Who are the users of the process and how should the users be involved in the development of the process?
5. Develop documented information needed to demonstrate that design and development requirements have been met and maintained. This can be accomplished by documenting:
    a. SC TT Meeting minutes documenting process development
    b. Review comments and track changes within the PDD
    c. Notes to SC TT within the PDD
    d. Conversations with customers and other stakeholders.

Once process development planning has been completed, proceed with developing the draft PDD package.

2. Develop the Draft PDD Package

Developing a draft PDD Package for each SC process correlates to Step 1.2 of Attachment 4.1, *8-Step Review and Development Schedule – from PDD to Published BCM*.

A process is defined as any activity or set of tasks that uses resources to transform inputs from stakeholders into outputs for customers. The SC TTs are responsible for identifying “the activity or set of tasks”, “resources”, “inputs”, and “outputs” for each process.

SC’s processes describe WHAT the person(s) performing the process is expected to do. SC’s technical manuals and process attachments describe HOW the user performs the process. Information ascribed to WHAT includes policy, process and procedure, or procedural steps SC staff are expected to perform. Information ascribed to HOW are the instructions, calculations, case studies, and other information that describe SC’s best practices for performing the process. The distinction between different types of documented information is described in detail in The WHAT and HOW Document. For

example, BCM A-2, *Structure Construction Technical Team Operation*, is the process which describes WHAT is required to develop SC's business processes using the Process Development Diagram. BCM A-2 references this attachment, which describes HOW to develop SC's business processes.

When information used to describe HOW to perform a procedural step within a process is contained in an SC technical manual or other source document, use hyperlinks within the PDD to link the technical document that contains the HOW as shown below:

1. To link to a form, add the hyperlink to the location only (not the title), of the document in the PDD as shown in the following example: Form CEM-3101, *Notice of Materials to be Used*.
2. To link to a BCM, add the hyperlink to the location only (not the title), of the document in the PDD as shown in the following example: BCM A-2, *Structure Construction Technical Team Operation*.
3. To link to a SC technical manual, add the hyperlink to the location only (not the title), of the document in the PDD as shown in the following example: *Foundation Manual,* Chapter 9, *Slurry Displacement Piles*.
4. If the specific portion of a technical document cannot be directly linked, reference the section of the technical document within the procedural step. For example, if the SC TT wanted to link a procedural step for Cast-In-Drilled-Hole pile acceptance to additional information in Chapter 9-9, *Pile Acceptance Testing*, of the *Foundation Manual*, the closest hyperlink available is to Chapter 9 of the *Foundation Manual*. In cases like this, use a reference, such as "Link to Chapter 9-9, *Pile Acceptance Testing*, of the *Foundation Manual*" in the procedural step. The actual hyperlink to the specific reference in Chapter 9-9 of the *Foundation Manual* will be established in SC HQ during the review and preparation for publication of the BCM.

When there is no technical manual that describes HOW to perform a procedural step within a process then an attachment is required to explain HOW to perform the procedural steps of the process. This process (BCM A-2) is a good example of a process that is unlikely to have an SC technical manual to provide the HOW, so attachments are necessary.

1. For Volume 1, the attachment will likely remain an attachment as the *Bridge Construction Records and Procedure* (*BCR&P) Manua*l is the reference document.
2. For Volume II, information in the attachment will be incorporated in a SC technical manual. Until the attachment is incorporated add a note in the:

   a. "Pending Revisions" section of the Change Letter,

b. SC TT's bin list, and

c. "Technical Team Notes" section at the end of the PDD, stating that the attachment will be incorporated into the technical manual.

When developing each process, write the PDD in accordance with the requirements of the *Style Guide for Structure Construction Technical Manuals*, and use the latest PDD template from the SC PDD Library each time.

When developing Volume I PDDs, occasionally it may be more suitable to apply the Volume II PDD template to a Volume I process (e.g., BCM C-11, *Shop Drawing Review of Temporary Structures*). This determination needs to be made by the SC TT on a case-by-case basis.

Be cognitive of language that will remove responsibility from the contractor or other stakeholders and place it on SC. Limit the use of words like "ensure" to actions and outcomes SC directly controls. "Confirm" or "verify" are preferred for actions or outcomes under the control of other stakeholders. When in doubt, contact the Caltrans Legal Division for an opinion.

Be sure to cite outside sources. In some cases where information is cited from outside Caltrans, permission may be required prior to using a link to their website in a PDD, in support of a BCM.

2.1 Develop the Draft Change Letter

The Change Letter is used to identify the current status of the documented information, and the scope of task required to complete required changes made to SC's documented information. The Change Letter provides a historical record of WHAT was changed, WHEN it was changed, and WHY it was changed. The Change Letter also conforms to the requirements for change management specified in the *SC Quality Manual*, Section 6.3, *Managing Changes to the QMS*.

Change Letter templates for *Bridge Construction Records and Procedures,* Volumes I and II, are available in the SC PDD Library. The Change Letter contains the following sections:

1. Revisions
2. General Revisions
3. Revisions Unique to Each Revised and/or Deleted BCM
4. New BCM
5. Pending Revisions

To follow is a description of how to complete each section of the Change Letter:

2.1.1 Revisions:

The "Revisions" section is a table (sample shown below) that depicts what changes are being made. The "EXISTING BCM (or portion of)" column identifies BCMs that are existing or currently published that will be revised, replaced, removed, or kept for now. The "New BCM or SC Technical Manual" identifies new or revised BCMs or Technical Manuals.

Table 1. Revisions Table from the Change Letter

EXISTING BCM (or portion of)	Issue Date		NEW BCM or SC Technical Manual	Issue Date
BCM 162-2.0, *Concrete Barriers on Structures*	07-01-99		BCM 83-3, *Railings and Barriers – Concrete Barriers*	09-30-21
BCM 3-8.0, *Hydraulic Reports*	12-01-95		BCM 5-1.36.0, *Control of Work – Property and Facility Preservation*	04-22-19
BCM 49-3.02B, Attachment 1, *CIDH Concrete Piling - Materials*	08-30-19		*Foundation Manual*, Chapter 9, *Slurry Displacement Piles*, Section 9-4, *Sampling and Testing Drilling Slurry*, and Section 9-5, *Types of Slurry*	xx-xx-xx
BCM 10-7.0, *Personnel – Expense Allowances*	09-17-04		--	
			BCM 72-11, *Slope Protection – Slope Paving*	10-15-21
BCM 112-4.0, *Friction Testing of Bridge Decks*	11-30-20		BCM 60-3.03B, *Existing Structures – Structure Rehabilitation – Methacrylate Resin Bridge Deck Treatment*	07-15-21

There are five types of revisions that could be identified in the revision table, they are:

1. Revision Type #1: An existing BCM is completely or partially replaced by a new BCM. This occurs when "WHAT" information from an existing BCM is moved to a new BCM. "WHAT" information is policy or procedure that informs the user WHAT to perform for a process. For example, in the revision table above:
    a. BCM 162-2.0, *Concrete Barriers on Structures*, which was issued 07-01-99, was completely replaced by BCM 83-3, *Railings and Barriers – Concrete Barriers*, which was issued on 09-30-21.
        i. When an existing BCM is completely replaced by a new BCM, the disposition does not need to include specific edits to the existing BCM as shown in the example above. Instead, for the disposition, add a note to the top of the existing BCM stating, "This BCM was replaced by BCM 83-3, *Railings and Barriers – Concrete Barriers*, on 09-30-21." The

disposition of the existing BCM is archived upon publication of the new process.

b. BCM 3-8.0, *Hydraulic Reports*, which was issued on 12-01-95, was partially replaced by BCM 5-1.36, *Control of Work – Property and Facility Preservation*.

i. When an existing BCM is partially replaced by a new BCM, information from an existing BCM is being incorporated into several new BCMs. When this occurs, the disposition of the existing BCM informs the SC TMM and the other SC TT using this BCM what conclusions were made by the SC TT in their review of the existing BCM. For example:

1. This information is incorrect or outdated.

2. The existing BCM remains published until all the information is incorporated into other future BCMs or SC technical manual as explained in the "Pending Revisions" section of the Change Letter.

2. Revision Type #2: An existing BCM is completely or partially replaced when "HOW" information from an existing BCM is moved to or is identified as already included in an SC technical manual. "HOW" information is commentary, examples, or calculations which informs the user HOW to perform a process. For example, in the revision table above:

a. BCM 49-3.02B, Attachment 1, *CIDH Concrete Piling – Materials*, which was issued on 08-30-19, will be completely replaced when the *Foundation Manual*, Chapter 9, *Slurry Displacement Piles*, Section 9-4, *Sampling and Testing Drilling Slurry*, and Section 9-5, *Types of Slurry*, is issued. The information in this row will be included in the revision table when the *Foundation Manual* is revised. Until then it is included in the "Pending Revisions" section of the Change Letter and in the SC TT's bin list.

b. When this occurs, the disposition of the existing BCM informs the SC TMM and the other SC TTs using this BCM what conclusions were made by the SC TT from reviewing the existing BCM.

3. Revision Type #3: An existing BCM is being deleted because the information is outdated, incorrect, superfluous, incorporated into the specifications, and/or not needed. For example, in the revision table above:

a. BCM 10-7.0, *Personnel – Expense Allowances*, is being deleted. The reason is provided in the "Revisions Unique to Each Revised and/or Deleted BCM" section of the Change Letter, and the disposition of the existing BCM.

4. Revision Type #4: New information that is being added to a new BCM. For example, in the revision table above:

a. BCM, 72-11, *Slope Protection – Slope Paving*, is a new BCM that was issued on 10-15-21.

5. Revision Type #5: Information from an existing BCM that needs to remain in the BCM until a later date when the information is updated/incorporated into the new BCM or moved to/included in a technical manual. For example, in the revision table above:

   a. BCM 112-4.0, *Friction Testing of Bridge Decks*, which was issued on 11-30-20, contains information that was incorporated into BCM 60-3.03B on 07-15-21, and has information that will be incorporated into BCM 51-1.01. Thus, BCM 112-4.0 is being kept until BCM 51-1.01 is published.

2.1.2 General Revisions

The "General Revisions" section is used to describe revisions that are common to all BCMs that are being revised. Some general revisions are included in the Change Letter template. This section is not needed when new BCMs are issued or there are not revisions common to all revised BCMs. If it is not needed, enter "None".

2.1.3 Revisions Unique to Each Revised and/or Deleted BCM

This section communicates to the reader what changes were made to an existing BCM. Information for each BCM identified in the column of the revision table titled, "EXISTING BCM (or portion of)", is included in the section of the Change Letter. The format always starts with the number, followed by the title of the existing BCM, followed by a description of what is being changed. For example, referencing the fourth row of revision table above, the following information will be included:

BCM 10-7.0, *Personnel – Expense Allowances*, is being deleted because this is not an SC process. Additionally, expense allowance information is found in the *Travel Guide*, and the SC intranet.

Note that the description in the Change Letter is the same description that is shown on the disposition of BCM 10-7.0, *Personnel – Expense Allowances*.

2.1.4 New BCM

The "New BCM" section is used to identify and describe what the new process is. The format is always the same. It starts with the BCM number, followed by the title of the BCM, followed by a description of what the process is, which is copied from the "Background" section of the new PDD. For example, referencing the fifth row of revision table above, the following information will be included:

BCM 83-3, *Railings and Barriers – Concrete Barriers*, establishes SC responsibilities and procedures for submittals, quality assurance, materials, construction, and payment for concrete barriers.

If information from an existing BCM is incorporated into the new BCM, then that would be identified after the description of the new process.

2.1.5 Pending Revisions

The "Pending Revisions" section is used to describe pending or future revisions. For example, in the revision table above BCM 49-3.02B, Attachment 1, *CIDH Concrete Piling – Materials*, which was issued on 08-30-19, will be completely replaced when the *Foundation Manual*, Chapter 9, *Slurry Displacement Piles*, Section 9-4, *Sampling and Testing Drilling Slurry*, and Section 9-5, *Types of Slurry*, is issued. The row will be included in the revision table when the *Foundation Manual* is revised. Information from the "Pending Revisions" section of the Change Letter should be added to the SC TT's bin list.

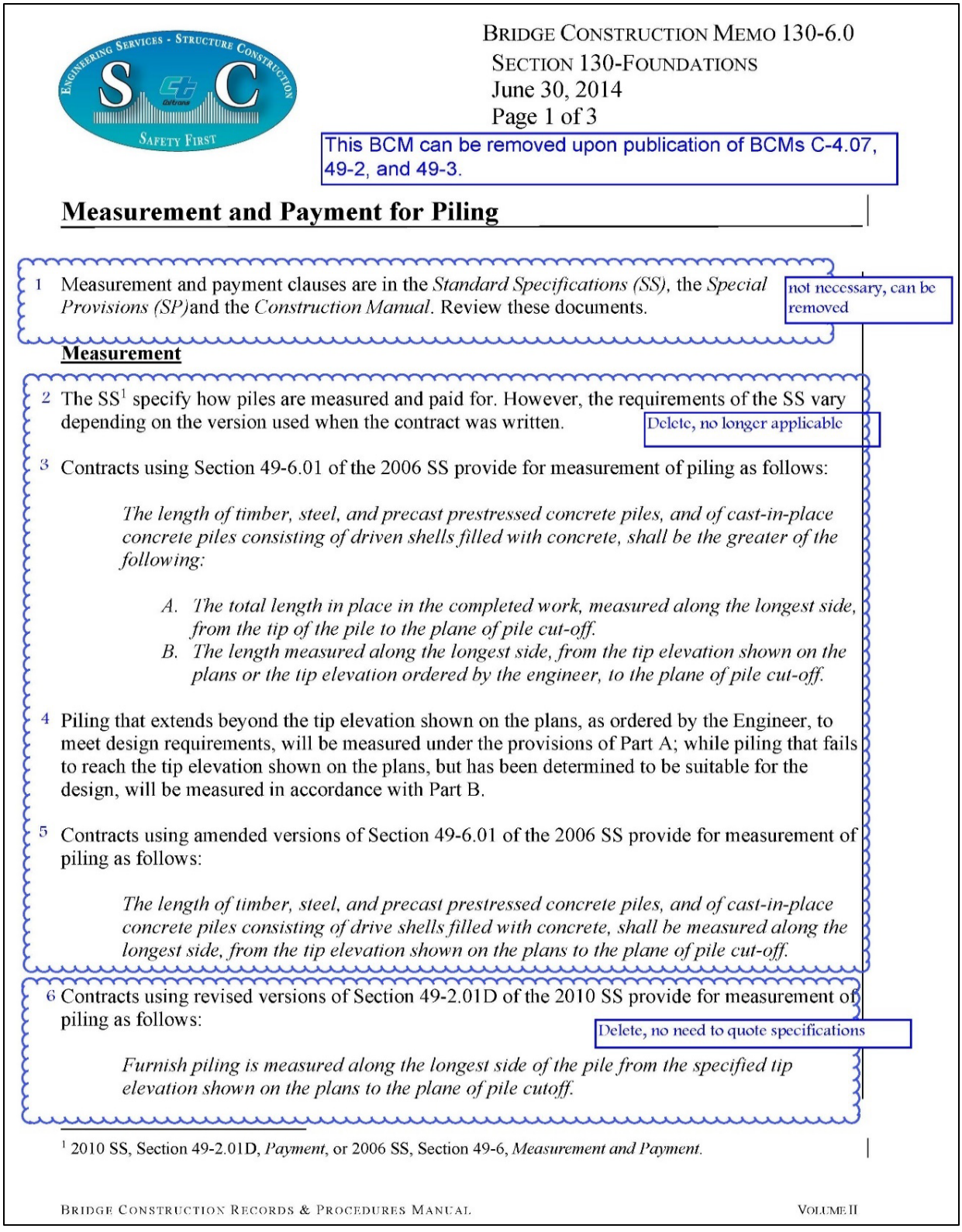
2.2 Develop Disposition(s) to Existing BCM(s)

To develop a disposition for an existing BCM, obtain a copy of the existing BCM. Markup the existing BCM to inform the SC TMM of the disposition of information from the existing BCM. The markup on the disposition of an existing BCM must clearly delineate:

1. What information is being kept in the existing BCM?
2. What information is being discarded from the existing BCM?
3. What information is being transferred to the new process (BCM)?
4. What information is being transferred to an attachment to the new process or to an SC technical manual?

Electronic edits were used in the example below, but the SC TTs can use handwritten edits if preferred. The important thing is to clearly delineate the disposition of the information in the existing BCM.

Below is an example of disposition of existing BCM 130-6, *Measurement and Payment for Piling*, which was identified as partially replaced by PDD 49-2, *Piling – Driven Piling*.



BRIDGE CONSTRUCTION MEMO 130-6.0
SECTION 130-FOUNDATIONS
June 30, 2014
Page 1 of 3

This BCM can be removed upon publication of BCMs C-4.07, 49-2, and 49-3.

Measurement and Payment for Piling

1 Measurement and payment clauses are in the *Standard Specifications (SS)*, the *Special Provisions (SP)*and the *Construction Manual*. Review these documents.

not necessary, can be removed

Measurement

2 The SS[1] specify how piles are measured and paid for. However, the requirements of the SS vary depending on the version used when the contract was written.

Delete, no longer applicable

3 Contracts using Section 49-6.01 of the 2006 SS provide for measurement of piling as follows:

> *The length of timber, steel, and precast prestressed concrete piles, and of cast-in-place concrete piles consisting of driven shells filled with concrete, shall be the greater of the following:*
>
> *A. The total length in place in the completed work, measured along the longest side, from the tip of the pile to the plane of pile cut-off.*
> *B. The length measured along the longest side, from the tip elevation shown on the plans or the tip elevation ordered by the engineer, to the plane of pile cut-off.*

4 Piling that extends beyond the tip elevation shown on the plans, as ordered by the Engineer, to meet design requirements, will be measured under the provisions of Part A; while piling that fails to reach the tip elevation shown on the plans, but has been determined to be suitable for the design, will be measured in accordance with Part B.

5 Contracts using amended versions of Section 49-6.01 of the 2006 SS provide for measurement of piling as follows:

> *The length of timber, steel, and precast prestressed concrete piles, and of cast-in-place concrete piles consisting of drive shells filled with concrete, shall be measured along the longest side, from the tip elevation shown on the plans to the plane of pile cut-off.*

6 Contracts using revised versions of Section 49-2.01D of the 2010 SS provide for measurement of piling as follows:

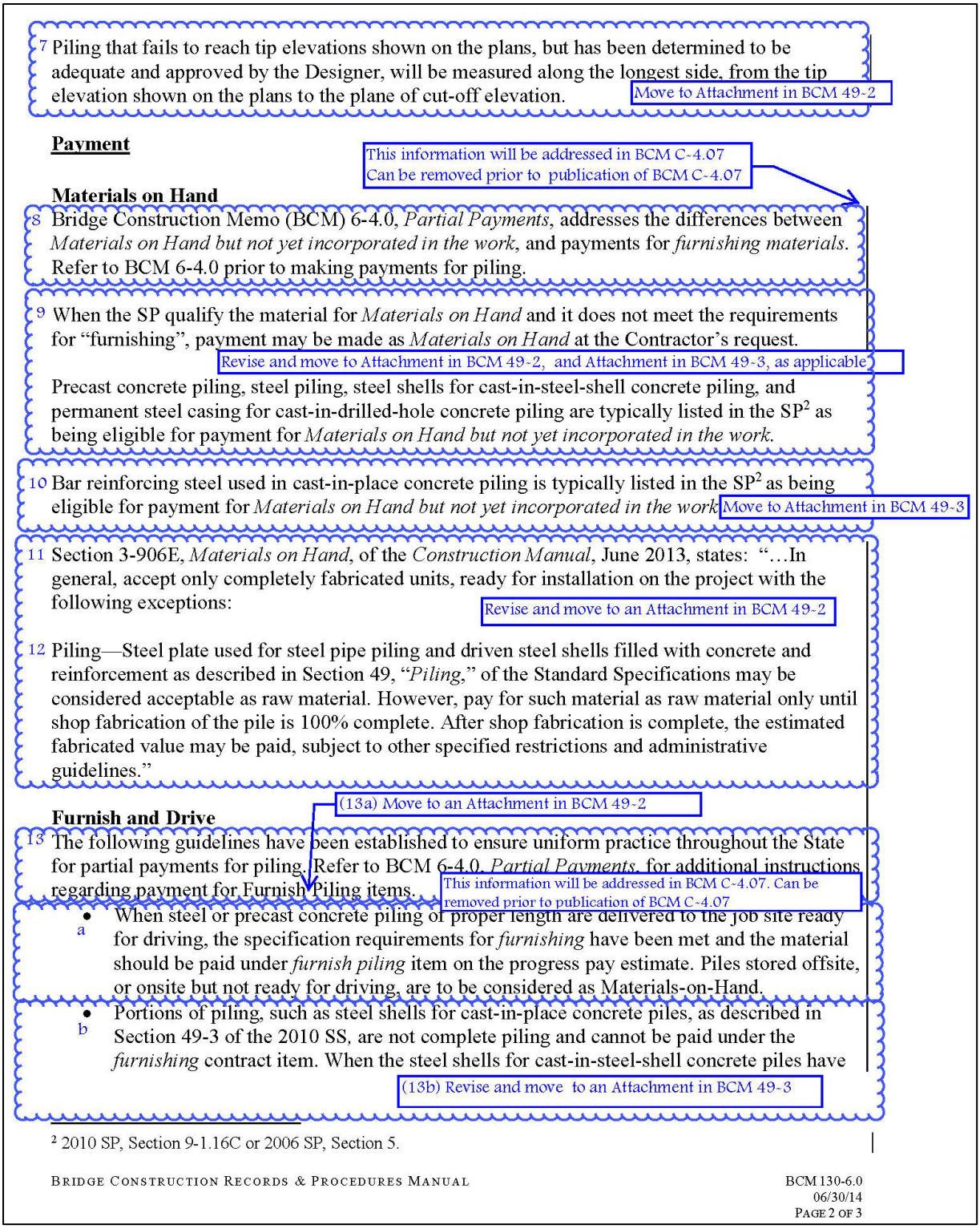
Delete, no need to quote specifications

> *Furnish piling is measured along the longest side of the pile from the specified tip elevation shown on the plans to the plane of pile cutoff.*

[1] 2010 SS, Section 49-2.01D, *Payment*, or 2006 SS, Section 49-6, *Measurement and Payment*.

BRIDGE CONSTRUCTION RECORDS & PROCEDURES MANUAL VOLUME II

Figure 1. Page 1 of the disposition of existing BCM 130-6, *Measurement and Payment for Piling*, which is being replaced by BCM 49-2, BCM 49-3, and BCM C-9.



7 Piling that fails to reach tip elevations shown on the plans, but has been determined to be adequate and approved by the Designer, will be measured along the longest side, from the tip elevation shown on the plans to the plane of cut-off elevation.

Move to Attachment in BCM 49-2

Payment

This information will be addressed in BCM C-4.07
Can be removed prior to publication of BCM C-4.07

Materials on Hand

8 Bridge Construction Memo (BCM) 6-4.0, *Partial Payments*, addresses the differences between *Materials on Hand but not yet incorporated in the work*, and payments for *furnishing materials*. Refer to BCM 6-4.0 prior to making payments for piling.

9 When the SP qualify the material for *Materials on Hand* and it does not meet the requirements for "furnishing", payment may be made as *Materials on Hand* at the Contractor's request.

Revise and move to Attachment in BCM 49-2, and Attachment in BCM 49-3, as applicable

Precast concrete piling, steel piling, steel shells for cast-in-steel-shell concrete piling, and permanent steel casing for cast-in-drilled-hole concrete piling are typically listed in the SP[2] as being eligible for payment for *Materials on Hand but not yet incorporated in the work.*

10 Bar reinforcing steel used in cast-in-place concrete piling is typically listed in the SP[2] as being eligible for payment for *Materials on Hand but not yet incorporated in the work*

Move to Attachment in BCM 49-3

11 Section 3-906E, *Materials on Hand*, of the *Construction Manual*, June 2013, states: "…In general, accept only completely fabricated units, ready for installation on the project with the following exceptions:

Revise and move to an Attachment in BCM 49-2

12 Piling—Steel plate used for steel pipe piling and driven steel shells filled with concrete and reinforcement as described in Section 49, "*Piling*," of the Standard Specifications may be considered acceptable as raw material. However, pay for such material as raw material only until shop fabrication of the pile is 100% complete. After shop fabrication is complete, the estimated fabricated value may be paid, subject to other specified restrictions and administrative guidelines."

(13a) Move to an Attachment in BCM 49-2

Furnish and Drive

13 The following guidelines have been established to ensure uniform practice throughout the State for partial payments for piling. Refer to BCM 6-4.0, *Partial Payments*, for additional instructions regarding payment for Furnish Piling items.

This information will be addressed in BCM C-4.07. Can be removed prior to publication of BCM C-4.07

a • When steel or precast concrete piling of proper length are delivered to the job site ready for driving, the specification requirements for *furnishing* have been met and the material should be paid under *furnish piling* item on the progress pay estimate. Piles stored offsite, or onsite but not ready for driving, are to be considered as Materials-on-Hand.

b • Portions of piling, such as steel shells for cast-in-place concrete piles, as described in Section 49-3 of the 2010 SS, are not complete piling and cannot be paid under the *furnishing* contract item. When the steel shells for cast-in-steel-shell concrete piles have

(13b) Revise and move to an Attachment in BCM 49-3

[2] 2010 SP, Section 9-1.16C or 2006 SP, Section 5.

BRIDGE CONSTRUCTION RECORDS & PROCEDURES MANUAL

BCM 130-6.0
06/30/14
PAGE 2 OF 3

Figure 2. Page 2 of the disposition of existing BCM 130-6, *Measurement and Payment for Piling*, which is being replaced by BCM 49-2, BCM 49-3, and BCM C-9

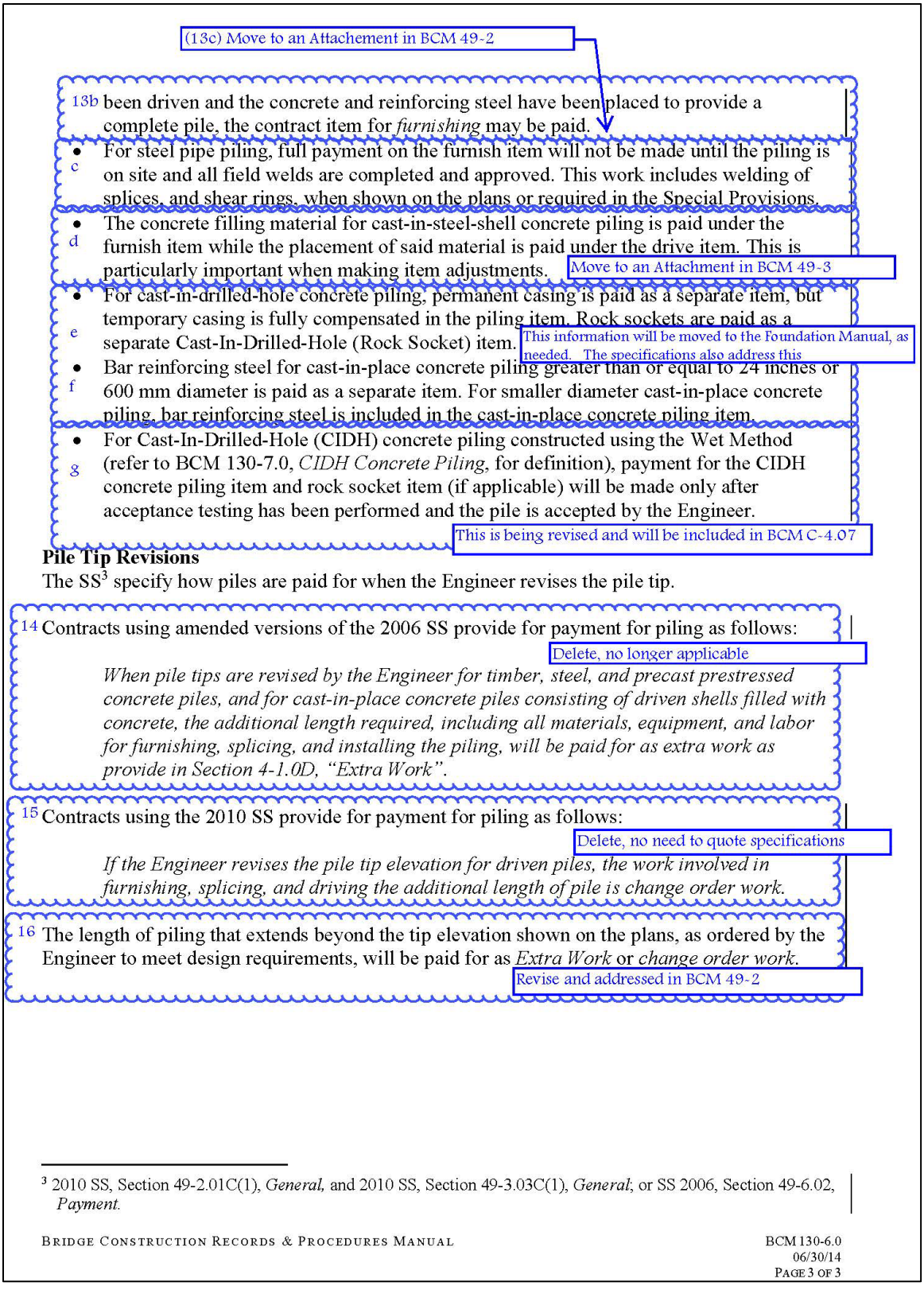


Figure 3. Page 3 of the disposition of existing BCM 130-6, *Measurement and Payment for Piling*, which is being replaced by BCM 49-2, BCM 49-3, and BCM C-9.

2.3 PDD

To follow is information that describes how to develop each section of the draft PDD.

2.3.1 Background

The Background section of the draft PDD is used to identify the scope of the process and any Caltrans policy addressed within the process. The scope of the process can be narrow, such as the process for administering a Contract Standard like Welding Quality Control. The scope of the process can also be wide, such as the process for SC TT operation.

The Background section is developed by the SC QMR after the process has been identified by SC Top Management. The SC QMR submits the Background section to the SC TMM for delivery to the appropriate SC TT.

The SC TT can add information to the Background section, but they should not alter the language provided without authorization from the SC QMR. The language provided is in conformance with the *Style Guide for Structure Construction Technical Manuals* and is intended to provide consistency with other SC processes. For some PDDs, it may be appropriate to change the background statement. The SC TT can and should change the Background statement when they deem appropriate. Any proposed edits must be authorized by the SC QMR and should be shown in red font and strikethrough only; do not delete any text.

Below (in blue text) is an example of a Background statement from PDD 49-2, *Piling – Driven Piling*:

> This process establishes Structure Construction (SC) responsibilities and procedures for review and authorization of driven piling submittals, quality assurance, materials, construction and payment that apply to all driven piling specified in Section 49-2 of the *Contract Specifications*.
>
> Additional unique requirements for this process are detailed:
>
> - BCM 11-2, *Welding – Welding Quality Control*
> - BCM 49-1, *Piling – General*
>
> Prior to reviewing this BCM, it is essential to review the *Contract Specifications*, Section 49-2, *Piling – Driven Piling*, that this BCM is based on as identified in the title block above. The information in the contract specifications typically will not be repeated in the text of this BCM.

2.3.2 Inputs

Process inputs signals the start of a process. Process inputs can be physical objects, such as a submittal or test samples. Process inputs can also be informational, such as a contract requirement or an event. In either case, process inputs are often the result of outputs from a precedent process. For example, a submittal is the input for a review process, and the output of that process is the authorized submittal. The authorized submittal then becomes the input for the materials acquisition, fabrication, or construction processes.

List all process inputs in bullet form. Include submittals that are received before construction begins. If the contract specifications require a "work plan" instead of submittal, list "work plan" as an input.

Below (in blue text) is an example of inputs from PDD 49-2, *Piling – Driven Piling*:

1. Contract work requiring the use of driven piling
2. All Driven Piling:
    a. Form CEM-3101, *Notice of Materials to be Used*
    b. Form TL-0029, *Report of Inspection of Material*
    c. Pile and Driving Data form submittals for each hammer
    d. Authorized Pile Handling Plan submittal from the contractor
    e. Driving System Submittal for each hammer, when specified
    f. Printed hammer energy readouts from the Contractor
3. Steel Pipe Piling:
    a. Shop drawings for pile handling devices
    b. Driven steel pipe piling submittals
    c. Field welding submittals
    d. Inspection request form
    e. Certificates of compliance
4. Structural Shape Steel Piling:
    a. Structural shape steel pile submittals
    b. Field welding submittals
    c. Certified material test report
    d. Certificates of compliance
5. Precast Prestressed Concrete Piling:

    a. Shop drawings (when requested)

Following (in blue text) are several of the inputs for this process (PDD A-2):

1. New or significant changes to the Contract Specifications. A new specification or a significant change to an existing specification signals the beginning of the SC Technical Team Operation process. Whether the new specification results in a new or revised SC business process depends on the results of the procedural steps performed by the SC TT.
2. Project inquiries, issues, and Lessons Learned. These are often the raw material that result in draft specifications, but they may also provide input for identification of a process improvement that results in a new or revised PDD.
3. DES and/or SC Top Management direction. Management direction can be the result of a change of Caltrans or FHWA policy, a regulatory change, or anything else that provides a reason to change a SC business process.

2.3.3 Criteria

Criteria for a process provides the basis for how the process will be judged and is used to evaluate whether the process achieved the intended requirements.

Most criteria are based on laws, regulations, contract standards, and/or policy guidance in manuals. When for example, for most construction field processes, the criteria for the process is the contract documents. Did the process achieve the requirements of the contract documents? Other examples include CCR Title 8 regulations. Did the process achieve the safety goals and requirements of the regulations?

Criteria supports the Procedure section of the PDD. The SC TT must review the criteria when writing procedural steps to verify the process achieves the intended requirements.

List all criteria in bullet form. For example, “contract documents” is adequate for describing all criteria that may be included within the hierarchy of documents listed in *Standard Specifications*, Section 5-1.02, *Contract Components*.

Below (in blue text) is an example of Criteria from PDD 49-2, *Piling – Driven Piling:*

1. Contract documents
2. Project Code of Safe Practices (COSP)
3. Project information Handout:
    a. Foundation Reports
    b. Railroad requirements
4. Resident Engineer (RE) Pending File

5. Water Pollution Control Plan (WPCP) and other environmental requirements
6. *Foundation Manual*, Chapter 7, *Driven Piles*, Appendix E, *Driven Piles*, and Appendix K1, *Driven Piling Construction Checklists*
7. American Welding Society (AWS) D1.1
8. Cal/OSHA CCR Title 8, Chapter 4, *Division of Industrial Safety*, Subchapter 4, *Construction Safety Orders*
9. (Caltrans) Department's Authorized Facility Audit list

When a manual is listed as criteria, reference must be made to the applicable chapter or section of the manual.

2.3.4 Resources, Responsibilities and Authorities

2.3.4.1 Resources

Resources are the people, infrastructure, and environment needed to complete the process. List the resources needed to complete the process including only those resources unique to the process that have an associated task in the Procedure. Refer to the *SC Quality Manual*, Section 7.1, *Resources*, for additional information.

Resources should be known and acquired in advance of performing the process. Without the necessary resources, the process might abruptly stop. The resource, people, includes the persons who perform the process. Typical persons include the Structure Representative, Assistant Structure Representative, the Bridge Construction Engineer, and the Area Construction Manager. The resource, people, may also include the Designer, the Geoprofessional, other staff from Materials Engineering and Testing Services (METS) or Geotechnical Services (GS), District staff, and stakeholders who have a role in the process.

However, it is not enough just to list the persons who perform the process. Per the *SC Quality Manual*, Section 7.1, *Resources*, and Section 7.2, *Competence*, the persons must be competent and be able to perform the process. Competence and ability are achieved through education, training, counseling, and experience, which are used by SC Staff to perform the tasks of each process; such that the contract requirements, and SC policies and procedures are met.

The resource, infrastructure, includes the physical facilities and equipment necessary to perform the process. Examples of infrastructure include office space, electronic communication equipment, computers, and vehicles, but can also include testing equipment, personal protective equipment, survey equipment, and other

tools. However, each PDD should only list the equipment and tools that are unique to the process (i.e., paint inspection kit, profilograph machine, etc.).

The resource, environment, includes the physical environment the process is performed in. Consider the job site – is there safe access to perform the process? Other environmental factors may apply, such as weather conditions. However, each PDD should only list environment that is unique to the process (i.e., safe walkway and work platform, confined space, etc.).

2.3.4.2 Responsibilities and Authorities:

Under each resource, identify their responsibility for the tasks within the Procedure and the authority they must have to carry them out.

Resources, Responsibilities and Authorities support the Procedure section of the PDD. The SC TT must review the resources, responsibilities and authorities when writing procedural steps to verify the process includes all needed resources.

List all required resources, responsibilities and authority in bullet form for each category (People, Infrastructure, and Environment.)

Below (in blue text) is an example of Resources, Responsibilities and Authority from PDD 49-2, *Piling – Driven Piling*:

1. People:
    a. Structure Representative:
        i. Review and authorize submittals in accordance with the requirements of the contact documents.
        ii. Coordinate with Materials Engineering and Testing Services (METS) representatives for field welding of structural shape steel piling and for fabrication and field welding of steel pipe piling.
        iii. Coordinate with FTI for review of driving system submittal, field dynamic monitoring, and bearing acceptance criteria.
        iv. Communicate status of field welding requirements to Assistant SRs.
        v. Perform calculations and prepare pile acceptance charts using Form SC-4809, *Pile Driving (US Customary) Blows Per Foot using Gates Formula (when Gates Formula is allowed)*.
        vi. Determine driven pile acceptance in the field.

vii. Prepare Material on Hand payment based on Form CEM-3101, *Notice of Materials to be Used*, and Form TL-0029, *Report of Inspection of Material*.

viii. Prepare contract item payment based upon completed Form SC-4803, *Pile Quantity and Driving Record (Driven Piles)*, and Form SC-4806, *Pile Layout Sheet*.

ix. Prepare change orders for payment of piling beyond specified tip elevation.

b. Assistant Structure Representative:

i. Inspect field work performed in accordance with the requirements of the contract documents.

ii. Determine if field welding performed on structural shape steel piling and steel pipe piling is in accordance with the requirements of the contract documents.

iii. Assist SR in determining pile acceptance in the field.

iv. Assist SR in reviewing submittals.

v. Assist SR with calculations and preparing pile acceptance charts using Form SC-4809, *Pile Driving (US Customary) Blows Per Foot using Gates Formula (when Gates Formula is allowed)*.

vi. Assist SR preparing Material on Hand payment based on Form CEM-3101, *Notice of Materials to be Used*, and Form TL-0029, *Report of Inspection of Material*.

vii. Assist SR in preparing contract item payment based upon completed Form SC-4803, *Pile Quantity and Driving Record (Driven Piles)*, and Form SC-4806, *Pile Layout Sheet*.

viii. Assist SR with preparing change orders for payment of piling beyond specified tip elevation.

c. Structural and Geotechnical Designers:

i. Provide construction support (e.g., revise pile design due to fabrication issues, raise or lower tip elevation).

ii. Review and provide information regarding the foundation design.

d. SC Substructure Engineer:

i. Provide guidance and assistance to the Structure Representative when requested.

e. METS Representative:

i. Provide source inspection and field welding support.

f. Foundation Testing and Instrumentation (FTI):

i. Review and provide comments to the Driving Systems submittal.

ii. Perform dynamic monitoring.

iii. Provide bearing acceptance criteria when required.

2. Infrastructure (Tools, physical assets unique to this process):

a. None

3. Environment (Physical, social, safety & health unique to this process):

a. Hearing protection.

2.3.5 Risks and Opportunities

Risk in this context is any uncertainty that can affect our ability to perform the process. Risk management is how we evaluate and address each risk. Risks generally have negative connotations, but can also have positive connotations, which become opportunities. In both cases, uncertainty is involved, both in knowing when or if a risk will come to pass and how it will affect us.

In this context, consider only those risks and opportunities that affect each individual process. What could possibly go wrong (or right) during the performance of the process?

For example, submittal review is a common process. One of the risks associated with submittal review is not being able to complete the review in the required timeframe. Your task as a SC TT is to assess the following:

1. What is the probability of this risk occurring and what is the impact?
2. How could the performer of the process assess whether this risk arises?
3. How is this risk addressed?

For submittal review, the probability of not completing the review in the required timeframe is low, but the impact to the contract schedule could be high if the submittal review is on the critical path. Assessing whether this risk arises is straight-forward if the submittal review is within our control, but some submittals are reviewed by others.

Addressing this risk requires tracking submittal review progress and communication with all parties involved with review of the submittal. These considerations are documented in the table included in this section.

Risks and opportunities are used to support the Procedure section of the PDD. The SC TT must review the risks and opportunities inherent to the process and address them. When writing procedural steps, include possible actions to address risks and opportunities. How is the risk avoided or minimized? How are opportunities capitalized?

List all risks and opportunities in the table as shown (in blue text) in the example from PDD 49-2, *Piling – Driven Piling*, below, including probability, impact, assessment, and mitigation for each risk or opportunity

Table 2. Risk and Opportunity Table

R/O	Description	Probability	Impact	Assessment Method (if applicable)	Mitigation
		<number from 1-5, 5 being highest probability >	*<number from 1-5, 5 being highest impact>*	*How could you determine whether the risk or opportunity arises?*	*How is the risk or opportunity addressed? Action/task taken to reduce risk.*
R1	Missed Environmental work window	*3*	*5*	Track schedule/Attend PDD Meetings	Monitor/Change schedule to meet environmental window prior to bid.
R2	Notice of Materials to be Used not submitted in a timely fashion.	*1*	*2*	Check beginning of job submittals for form.	Monitor/Change schedule to meet environmental window prior to bid.
R3	Submittal is incomplete	*4*	*3*	Timely review.	Coordinate with FTI to quickly perform the review for completeness.
R4	Submittal not reviewed in a timely manner.	*3*	*5*	Track submittal/contract schedule.	Monitor submittal/review status/Coordinate with FTB to quickly perform review.
R5	Miscalculation of Gates Formula.	*2*	*4*	Driving of piles is not as anticipated or settlement of structure.	Have the calculations verified by another engineer.

R6	Adjustments to Gates formula not made for battered piles	*3*	*4*	Driving of piles is not as anticipated or settlement of structure.	Have the calculations verified by another engineer.
R7	Shop welding certifications expired.	*2*	*4*	Inspection of welding documents.	Get shop recertified.
R8	Material certification papers don't correlate to the piles delivered to the job site.	*1*	*4*	Check material delivered to the jobsite in a timely fashion. Check lot numbers against accepted certifications.	Call METS to verify the materials and what materials have been certified. Collect Inspection tags.
R9	Disagreements regarding Material on Hand payment	*2*	*3*	Progress Payment dispute.	Develop consensus with the contractor prior to.
R10	Field Welder certifications expired.	*3*	*3*	Inspection of welding documents.	Get welder recertified.
R11	Energy delivered by the hammer exceeds pile capacity.	*2*	*5*	Pile crushes or fractures.	Revise driving system submittal or Pile and Driving data.
R12	Pile driving too soft.	*4*	*4*	Blow counts are low at tip.	Revise pile specified tip elevation, install pile lugs, allow time for pile to set, call GD and SD.
R13	Pile driving too hard.	*4*	*4*	High blow counts above tip.	Consult with GD, incorporate driving aids such as drilling, jetting or driving tips, possibly revise pile specified tip elevation.
R14	Since driven piling is not a "Final Pay" item, there may be disagreements between the Contractor and the Structures Representative	*3*	*3*	Difference in item quantity when reviewing contractors' wish-list.	Keep pile logs accurate.

2.3.6 Procedure

Procedures are a step-by-step list of tasks that set forth WHAT needs to be done to convert process inputs into process outputs.

Keep in mind all procedures listed are those which SC staff need to do to perform the process – NOT what the contractor does. Each of the precedent sections of the PDD establish what goes in this section. The "Background" section sets the scope of the process. The "Inputs" section establishes what can be expected to initiate or continue the process. The "Criteria" section establishes the parameters or requirements of what the process is to achieve. The "Resources, Responsibility and Authority" section establishes the people, infrastructure, and environment needed to perform the process, and establishes the responsibilities and authorities of each person that participates in the process. The "Risks and Opportunities" section establishes the potential risks and opportunities inherent in the process and what can be done to address them. Your task as a SC TT is to capture this information in a step-by-step list of procedural tasks.

Attachment 4.2, *PDD to BCM Turtle Diagram*, illustrates the interdependent relationship of the PDD sections.

The procedural steps must be written:

- Using complete sentences.
    - Using transition text from the main text to each bullet point. Text cannot be written as an outline or PowerPoint slide. Refer to the text format and content used in the *Contract Specifications* for example (e.g., Refer to *Contract Specifications*, Section 49-2.01A(3)(b), *Piling – Driven Piling – General – General – Submittals – Driving System Submittal*
- Without using personal pronouns.
- Using "*Contract Specifications*" instead of "*Standard Specifications*" when referencing the specifications; and includes the specification number and title.

For additional guidance refer to the Style Guide for SC Technical Manuals.

In general, processes associated with the performance of the construction contract, listed in *Bridge Construction Records and Procedures, Volume II*, are organized in subsections as follows:

1. Before construction begins
2. During construction
3. Following construction (if needed)

The subsection “Before construction begins” pertains to all tasks associated with the process that take place before construction begins. These include preparatory procedures, such as review criteria documents, technical manuals, etc., preconstruction meetings, submittal reviews, materials fabrication and release, discussions with the contractor, and preparation of forms and other documentation needed for construction. For submittals received before construction begins, include a procedural step that states: Review and authorize (or return for resubmittal) the following submittals that are required by the *Contract Documents*. If appropriate identify specific items to verify in the submittal.

The subsection “During construction” pertains to all tasks associated with the process that take place during construction. These include completion of forms and other documentation based on construction performed, inspection of the work performed, any testing performed during construction, and writing the daily reports.

The subsection “Following construction” pertains to all tasks associated with the process that take place after construction is completed. These include filing forms and documents in the project records and any measurement and payment requirements associated with the process.

Below (in blue text) is an example of a procedure from PDD 49-2, *Piling – Driven Piling*:

1. All work associated with this process is charged as Project Direct – Construction.
2. Inspection of field work for this process is:
    a. Benchmark for:
        i. Inspection of piling delivered to the project.
    b. Continuous for:
        i. Field welding of steel piling.
        ii. Inspection of the pile driving operation.
        iii. Determining pile acceptance during pile driving.
3. Before construction begins:
    a. Review the following documents:
        i. Contract documents for:
            1. Noise and vibration requirements.
            2. Difficult pile installation conditions per BCM 49-1, *Piling – General*.
        ii. R.E. Pending File, Foundation Report, and Project Information Handout for applicable environmental commitments and railroad requirements.

iii. Project-specific Code of Safe Practices and the requirements of Cal/OSHA Title 8, Chapter 4, Subchapter 4, *Construction Safety Orders*, for driven piling construction, including but not limited to:

1. Article 6, *Excavations*
2. Article 9, *Derricks, Cranes, Boom-type Excavators*
3. Article 12, *Pile Driving and Pile Extraction*
4. Article 15, *Cranes and Derricks in Construction*
5. Article 24, *Fall Protection*

b. Coordinate action with the following:

i. Discuss with Resident Engineer (RE) and contractor any existing facilities concerns and agency requirements, such as overhead power lines, underground utilities, and the railroad requirements. Call DigAlert (Underground Service Alert), if applicable.

ii. Notify Foundation Testing and Instrumentation (FTI) of pile driving requirements for the project.

iii. Discuss definition of hard driving, soft driving and redrive with the SC Substructure Engineer and the Geotechnical Designer and how it applies to construction.

iv. Discuss with and concur on the definition of "refusal" and remedial measures with the Geotechnical Designer, FTI, and the contractor. Refer to *Foundation Manual*, Chapter 7, Driven Piles, Section 7-7, *Driving Challenges*.

c. Review and authorize each submittal required by Contract Specifications for this process, as follows:

i. Discuss requirements for Pile and Driving Data forms and Driving Systems Submittal (DSS) requirements during the preconstruction meeting per the *Foundation Manual*, Chapter 7, Driven Piles, Section 7-5, *Nominal Resistance/Bearing Capacity.*

ii. Review and authorize or reject the submitted Pile and Driving Data forms:

1. Discuss any questions about the Pile and Driving Data forms with FTI.
2. Discuss issues preventing authorization of the Pile and Driving Data forms with the contractor.

iii. If a DSS is required, perform an initial review of the submitted DSS for completeness:

1. Review the DSS with the RE to verify compliance with any additional project requirements and request contingency plan from the contractor as needed.
2. Request additional information from the contractor if needed until the DSS is complete.
3. Forward the complete DSS to FTI for review, per the instructions on the FTI website. Authorize or reject the DSS based on FTI recommendation. Refer to the *Foundation Manual*, Section 7-5, *Nominal Resistance/Bearing Capacity,* and Appendix K1, *Driven Piling Construction Checklist*.
4. Notify the contractor in writing of rejection or authorization of the DSS.

iv. If not previously authorized, perform a concurrent review of the Pile Handling Plan submitted per BCM 49-1, *Piling – General*, and verify compatibility of the Pile Handling Plan, Pile and Driving Data forms, and the DSS.

v. For steel pipe piling:

1. Verify with the Materials Engineering and Testing Services (METS) Representative the proposed steel pipe piling fabrication facility is on the Department's Authorized Facility Audit list.
2. Review AWS D1.1 requirements.
3. Discuss shop drawing review and authorization, certificates of compliance, steel pipe piling fabrication, welding certifications for Class N steel pipe piling, and field welding requirements with the contractor and METS Representative.
4. Review certificates of compliance and verify that materials match certification documents.

vi. For structural shape steel piling and precast prestressed concrete piling:

1. Review submittals and notify the contractor in writing of rejection or authorization of the steel piling and/or concrete piling submittals.

d. Review Materials, as follows:

i. Review and discuss with the METS Representative any materials to be inspected and released via Form CEM 3101, *Notice of Materials to be Used*, and Form TL-0029, *Report of Inspection of Material*, and which materials are to be field released via Form SC-4102, *Material Inspected and Released on Job*. Utilize the forms to justify any materials on hand payments.

1. Confirm steel that meets the contract requirements is being procured and that METS has been notified.

ii. For field welding of steel piling, verify Welding Quality Control Plan and welder certification requirements have been met per BCM 11-2, *Welding Quality - Control*.

iii. Perform timely field verification that the materials delivered meet contract requirements and were not damaged in shipping:

iv. Collect orange Inspection Tags and match them with the appropriate Form TL-0029, *Report of Inspection of Material.*

v. Verify material condition meets the requirements of the contract documents.

e. Preparing for Construction:

i. Coordinate with FTI if dynamic monitoring or pile load tests are required per BCM 49-1, *Piling – General*.

ii. Discuss the possibility of installing driven piles using a vibrating hammer, and if so, to what elevation, with the Structural and Geotechnical designers.

iii. Prepare Form SC-4803, *Pile Quantity and Driving Record (Driven Piles)*, Form SC-4805, *Log Pile Sheet*, and Form SC-4806, *Pile Layout Sheet*, for all locations with driven piling. See *Foundation Manual*, Chapter 7, *Driven Piles*, Section 7-6, *Preparing to Drive Piles* and Appendix K1.

iv. Prepare bearing acceptance criteria:

1. For driven piling to be accepted using the Gates Formula, prepare pile acceptance charts for each authorized hammer using Form SC-4809, *Pile Driving (US Customary) Blows Per Foot using Gates Formula*, as described in Attachment 2, *Driven Piling – Acceptance Criteria*, with modifications as required to account for battered piling.

2. For driven piling to be accepted using bearing acceptance criteria determined by dynamic monitoring, verify bearing acceptance criteria has been received from FTI.

v. Review the project specific Code of Safe Practices (COSP) for personal protective equipment requirements and safety hazards associated with the pile driving operation. See *Foundation Manual*, Section 7-8, *Driven Piles, Safety*.

vi. Review the pile driving equipment and verify it matches the authorized DSS and/or Pile and Driving Data Form per the *Foundation Manual*, Section 7-6 and Appendix K1.

vii. Verify the pile driving crane meets the requirements of Title 8 CCR Chapter 4, *Division of Industrial Safety*, Subchapter 4, *Construction Safety Orders*, Article 15, *Cranes and Derricks in Construction*. See *Foundation Manual*, Section 7-8, and Appendix K1.

1. If the pile driving crane is used for tasks other than pile driving, verify the operator certification meets the requirements of the Construction Safety Orders.

viii. Determine pile position and alignment requirements and determine rejection criteria for piling driven "materially out of line". See *Foundation Manual*, Section 7-7.3, *Driven Piles, Driving Challenges, Alignment of Piles*.

ix. Confirm how the hammer stroke will be measured during driving.

x. Verify pile lengths for the given location where piles are to be driven. See *Foundation Manual*, Section 7-6, and Appendix K1.

xi. Verify reference staking hubs locations where piles are to be driven to provide pile cutoff elevations during driving. See *Foundation Manual*, Section 7-6, and Appendix K1.

xii. Verify pile marking at 1-foot intervals to measure penetration during driving. See *Foundation Manual*, Section 7-6, and Appendix K1.

xiii. Check that the contractor's pile layout meets contract requirements. See *Foundation Manual*, Section 7-6, and Appendix K1.

4. During construction:

a. Inspect piling delivered to the job site, as follows:

i. Review materials as they are delivered to the job site.

1. Collect orange inspection release tags and match them to Form TL-0029.

2. Collect certificates of compliance for the steel reinforcement.

3. Complete Form SC-4101, *Materials Release Summary*, and Form SC-4102, *Material Inspected and Released on Job.*

ii. Reject damaged precast concrete piling per *Foundation Manual,* Section 7-6.2.1*, Driven Piles, Preparing to Drive Piles, Precast Concrete Piles*.

b. Discuss driven piling operations in a Tailgate Safety meeting before field operations begin:

i. Ensure personal protective equipment, including hearing protection, is available and ready for use.

c. If drilled or predrilled holes are required, verify dimensions of the holes.

d. Use Form SC-4806, *Pile Layout Sheet*, to verify the pile location at the start of driving.

e. Verify the vertical alignment (plumb or battered) of the pile at the start, and during driving.

f. Monitor and log the blow count, hammer stroke, and pile penetration during driving on Form SC-4803, *Pile Quantity and Driving Record (Driven Piles)* and Form SC-4805, *Log Pile Sheet*. See *Foundation Manual*, Section 7-6.

   i. Apply corrections for battered piling. See *Foundation Manual*, Section 7-5.4, *Driven Piles, Nominal Resistance/Bearing Capacity, Battered Piles* and Appendix E, *Driven Piles*.

g. Monitor noise and vibration due to pile driving to ensure compliance with the requirements of the contract documents.

h. Monitor the hammer performance during driving for proper operation.

i. For double-acting pile driving hammers or other hammer types where the ram stroke cannot be visually observed:

   i. Receive the printed readout of hammer energy for each pile during driving operations from the contractor.

   ii. Determine pile acceptance using the printed readout hammer energy delivered at the pile specified tip elevation.

j. Verify piles are driven to the correct position and alignment. See *Foundation Manual*, Section 7-7.3:

   i. If hard driving is encountered, address contractor's request for use of driving aids such as drilling, spudding, jetting, or raising the specified tip elevation. See *Foundation Manual*, Section 7-7, and Appendix K1.

      1. Consult with Geotechnical Services before authorizing contractor requests.

      2. Consider if the hammer is not operating properly. Consult with FTI.

   ii. If soft driving is encountered, implement the use of pile lugs in accordance with Attachment 1, *Driven Piling – Steel H-Pile Lugs*, lower the specified tip elevation, or re-drive the pile. See *Foundation Manual*, Section 7-7, and Appendix K1.

   iii. Consult with Geotechnical Services before authorizing changes.

k. Check the reference staking hubs periodically to verify elevation is not changing due to soil heave during pile driving. See *Foundation Manual*, Section 7-6.

l. Confirm field welded splices meet the requirements of the contract documents.

   i. Coordinate inspection of field welded splices with the METS Representative as needed.

m. For rejected piling proposed for use, the contractor must propose a repair plan in writing. Coordinate review of the repair plan with both Structure and Geotechnical Designers.

n. Contact Structure and Geotechnical Designers for pile design revisions, if needed due to:

   i. Fabrication issues.

   ii. Proposals to raise or lower tip elevation.

   iii. Pile relocation.

   iv. Other unforeseen issues.

o. Use the pile driving acceptance criteria chart for the impact hammer used to drive each pile to determine whether each driven pile can be accepted for bearing.

p. Accept driven piling that is in the correct position and alignment and achieves proper bearing and specified tip.

q. Keep accurate pile logs and field documentation to ensure:

   i. Good documentation for claim disputes and record audits.

   ii. Sufficient information for progress payments.

r. Document all inspection, construction, and quality assurance activities, pertinent to this BCM, in the daily reports per BCM C-7, *Daily and Weekly Reports.*

5. Measurement and Payment:

   a. Prior to each progress payment, compare Materials on Hand vs. Furnish Piling requirements per Attachment 3, *Driven Piling – Measurement & Payment*.

   b. Prior to authorizing payment for Furnish Piling:

      i. Review Attachment 3, *Driven Piling – Measurement and Payment*.

      ii. Inspect piling delivered to the job site.

      iii. Reject damaged precast concrete piling per *Foundation Manual,* Section 7-6.2.1, *Precast Concrete Piles*.

   c. Prior to authorizing payment for Drive Piling:

i. Review Attachment 3, *Driven Piling – Measurement and Payment*.

ii. Verify accurate completion of Form SC-4803, *Pile Quantity and Driving Record (Driven Piles),* and Form SC-4806, *Pile Layout Sheet.*

d. After consulting with the Structural and/or Geotechnical Designer, prepare change order(s) per BCM C-10, *Change Orders*, for piling driven beyond the specified tip elevation, if applicable.

e. File all payment records in the appropriate category in the project records as specified in the *Construction Manual*, 5-102, *Organization of Project Documents*.

6. Following construction:

a. Complete applicable Forms SC-4803, SC-4805, and SC-4806.

b. File all forms, test results and Daily Reports in the appropriate category in the project records as specified in the *Construction Manual*, 5-102, *Organization of Project Documents*.

In general, processes associated with the requirements of SC, listed in *Bridge Construction Records and Procedures, Volume I*, are organized in subsections as follows:

1. SC Staff
2. SC Supervisors
3. SC Managers

The subsection “SC Staff” pertains to all tasks associated with the process that are completed by SC staff.

The subsection “SC Supervisors” pertains to tasks associated with the process that are completed by the SC supervisor.

The subsection “SC Managers” pertains to tasks associated with the process that are completed by SC managers.

Below (in blue text) is an example of a procedure for PDD C-8, *Correspondence with the Contractor*, from Volume I, which does not have a field inspection component. Note in this example, instead of using the template subsection “SC Staff”, the subsection “Structure Representative” is used. If the Technical Team determines this is appropriate, this change can be made:

1. All work associated with this process is charged as Project-Direct – Construction.

2. Structure Representative will:

   a. Prepare project correspondence for structure work. Before preparing any project correspondence, meet with the Resident Engineer (RE) and obtain an electronic copy of the RE's current authorized letterhead and format for official correspondence with the contractor. Although letter format may vary slightly with each RE, the format will include the current authorized letterhead and the RE's name at the bottom of each letter. As stated in the *Construction Manual,* 3-502*, Engineer's Authority*, the RE is the lead for contact and correspondence with the contactor. Structure Construction is responsible for the technical control of structure work per the *Construction Manual,* 1-104, *Structure Construction Organization*.

   b. Address all correspondence between the State and the contractor to the primary contractor, even when the subject matter is of direct concern only to a subcontractor. Written instructions are given to the subcontractors by means of copies of letters to the primary contractor.

   c. Prepare and send documentation to the contractor as needed to document the following:

      i. Concurrence with contractor activities.

      ii. Deficiencies with contractor activities.

      iii. Discussions with the contractor. As a follow-up to contractor activities and discussions with the contractor, prepare and send a letter that documents the key points of the discussion.

      iv. Response to contractor submittals.

      v. Response to information requests.

      vi. For assistance in defending and mitigating disputes with the Department, correspondence should accurately establish and document current submittal status and project conditions, along with advisements, warnings, and prohibitions for future operations.

   d. When preparing correspondence:

      i. Include references to contract documents as needed to emphasize correspondence.

      ii. Review the *Construction Manual* and the SC *Bridge Construction Records and Procedures Manual* for technical guidance to assist correspondence preparation. For example, BCM C-11, *Shop Drawing Review of Temporary Structures*, includes a template for the *Temporary Structure Analysis Report*.

iii. Include the project E.A. (Expenditure Authorization) in the subject heading when sending correspondence by email.

iv. Review correspondence with the RE prior to sending correspondence to the contractor.

e. Inform the RE when correspondence is sent the contractor.

f. Assist the RE as needed to maintain complete and accurate project records for Structure Construction activities. All correspondence must go through the RE and be filed according to the RE's protocol and as specified in the *Construction Manual*, 5-102C, *Description of Categories*.

3. SC Supervisors:

   a. Periodically review correspondence for adherence to format, tone, and content requirements.

4. SC Managers:

   a. Audit staff communications as needed.

There are many possible procedure steps that could be identified as part of a process. As the SC TT members tribal knowledge, as well as knowledge of previously documented procedures is essential to fully capture the procedures necessary to fulfill the requirements of the process.

It is important to differentiate between informational/background reading versus required action:

- "Review document X" could be informational reading
- "Perform work in accordance with document X," emphasizes required, mandatory conformance.

2.3.7 Outputs/Deliverables/Records

Process outputs signal the conclusion of a process. Like process inputs, outputs can be physical objects, such as an authorized contractor submittal or test samples. Process outputs can also be informational, such as a contract requirement or an event. In either case, process outputs are often the inputs for the subsequent process.

The customer of the process output must be identified, as well as the customer's expectations for the process output. Customer expectations cannot be assumed. They are derived from communication with the customer.

List all process outputs in bullet form.

Below (in blue text) is an example of process outputs from PDD 49-2, *Piling – Driven Piling*:

1. Submittals:
    a. Authorized Pile and Driving Data forms:
        i. Customers: Structure Representative, District
        ii. Customer Expectations: Timely review, can be used for pile construction and acceptance
    b. Authorized Driving System Submittal, if applicable:
        i. Customers: District, Contractor, Assistant Structure Representatives
        ii. Customer Expectations: Contract requirements are met, timely review and authorization
    c. Authorized pile submittals for steel pipe piling, structural shape steel piling, precast prestressed concrete piling, and steel sheet piling:
        i. Customers: District, Contractor
        ii. Customer Expectations: Timely and accurate authorization of submittals in conformance with the requirements of the contract documents
2. Materials:
    a. Form TL-0029, *Report of Inspection of Material*, and matching orange tags:
        i. Customers: District, all interested parties
        ii. Customer Expectations: Materials inspected and released by METS are the same materials installed at the job site
    b. Completed Form SC-4101, *Materials Release Summary*, and Form SC-4102, *Material Inspected and Released on Job:*
        i. Customers: District
        ii. Customer Expectations: All materials used are inspected and released for construction
3. Construction:
    a. Completed pile driving acceptance criteria charts:
        i. Customers: Assistant SR, District
        ii. Customer Expectations: Accurate pile driving acceptance charts ready for use to accept driven piling
    b. Completed Forms SC-4803, SC-4805, and SC-4806:
        i. Customers: Districts, SC HQ

ii. Customer Expectations: Accurate project records for contract payment and project archives

c. Daily Reports:

i. Customers: Districts

ii. Customer Expectations: Timely and accurate description of the construction work performed

Following are two of the process outputs (in blue text) for this process (PDD A-2):

1. Review comments on draft specifications:
   a. Customers: Structure and Engineering Services, Offices of Structure Quality Management (SQM) and Structure Specification Research and Development (SSR&D); DES Technical Committees
   b. Customer Expectations: Thorough and timely review comments
2. New or revised SC processes:
   a. Customers: SC Technical Manual Manager (TMM), SC employees, other project sponsors and stakeholders
   b. Customer Expectations: Useful descriptions of processes and procedures they are expected to adhere to

2.3.8 Measurement & Evaluation

Measurements determine if the process is performing as expected – or is being performed as expected. Evaluation compares the actual results from the measurement with the intended results of the process and identifies if there is a gap in a process.

There are three parameters the SC TT is expected to address in this section:

1. Intended results of the process
2. Measurements needed to evaluate the process
3. Evaluation of the process

The intended results of the process identify what the process is trying to achieve. For example, this process (PDD A-2) intends for SC TTs to produce a scheduled number of PDDs within each fiscal year. The number of PDDs expected is measurable. However, for some processes, the intended results are more subjective and may require some thought about how to determine measurements that are meaningful.

The measurements needed to evaluate the process are necessary to determine the actual results of the process. For example, a measurement for this process (PDD A-2)

that corresponds to the intended results is the actual number of PDDs produced by SC Technical Teams within each fiscal year. Again, for some processes, measuring the actual results may be difficult if the results are subjective.

The evaluation of the process determines if the process is working as intended and is the difference between the actual measured results and the intended results for each measurement tool.

To evaluate a process, start with the measurement tools SC already uses. For example, Project and Office Audit performed per BCM F-3, *SC Audit Program* uses the *Project Record Review* form to measure various parameters that are common to many SC processes. There are other measurement tools in SCEMS and VISION that can also be used to measure the results of SC processes. The SC TTs do not need to reinvent measurement tools, unless one does not currently exist for the process.

Below is an example of measurement and evaluation from PDD 49-2, *Piling – Driven Piling:*

1. Intended results of the process:
    a. Completed in-place driven piling.
    a. Accurate and complete driven piling records.
2. Measurements needed to evaluate the process:
    a. Project and Office Audit performed per BCM F-3, *SC Audit Program.*
3. Evaluation of the process:
    a. SC Top Management review of project and office audits.

List all intended results of the process, measurements needed to evaluate the process, and evaluation of the process in bullet form under the respective parameter.

2.3.9 Improvement

Improvement is a critical part of the Plan Do Check Act (PDCA) cycle. This section is intended to address more general categories of future improvement. Could the process be made more efficient, perhaps through a Lean-6 Sigma analysis? Could the process be simplified to reduce nonconformities? Could the process be revised to address enterprise-level risks and SC Top Management review? These are items that the SC TT may not be able to immediately address but can be listed as considerations for future development.

Below is an example of improvement from PDD 49-2, *Piling – Driven Piling:*

1. Process continual improvement based on the results of SC Top Management review.

List all improvement categories in bullet form within this section.

2.3.10 Attachments

Recall from above that PDDs address the WHAT, while attachments and SC's technical manuals address the HOW. Attachments to PDDs are intended to capture instructions and other information that is necessary for release of the new or revised PDD. Attachments can be used as an intermediate step to capture technical information that cannot be immediately transferred to a technical manual. Attachments are a great way to capture tribal knowledge and other organizational information that might otherwise be lost.

What if there is no technical manual that supports the process? Then attachments are required to explain HOW to perform the procedural steps of the process. This process (PDD A-2) is a good example of a PDD that is unlikely to have an SC technical manual to provide the HOW, so attachments are necessary.

Attachments can provide a variety of information, including:

1. Information on HOW to perform the procedural step.
2. Information on HOW to fill out forms and other documents.
3. Sample calculations in support of the procedural step.
4. Commentary on the governing specifications or other requirements.
5. Case studies describing how the process was performed on other projects.
6. Historical information on the origins of the process.

Attachments must always be referenced in the Procedure section of the PDD, and include the following components:

1. A title
2. An introduction which states the purpose of the attachment
3. Text that provides information needed to explain HOW to perform the procedural step that references the attachment

Below is an example of an attachment. It is Attachment 3, *Driven Piling – Measurement & Payment*, from PDD 49-2, *Piling – Driven Piling*.

Driven Piling – Measurement & Payment

Driven piling that fails to reach tip elevations shown on the plans but has been determined to be adequate and approved by the Designer, is measured along the longest side, from the tip elevation shown on the plans to the plane of cut-off elevation.

Materials on Hand

When the contract special provisions qualify the material for *Materials on Hand* and it does not meet the requirements for "furnishing", payment may be made as *Materials on Hand* at the Contractor's request.

Steel piling and precast concrete piling are typically listed in the contract special provisions as being eligible for payment for *Materials on Hand*, but not yet incorporated in the work.

Determine eligibility for *Materials on Hand* payments per the *Construction Manual*, Section 3-906E, *Materials on Hand*.

Furnish and Drive Piling Contract Item Payment

When steel or precast concrete piling of proper length are delivered to the job site ready for driving, the specification requirements for *furnishing* have been met and the material should be paid under *furnish piling* item on the monthly progress pay estimate. Piles stored offsite, or onsite but not ready for driving, are to be considered as *Materials on Hand*.

For steel pipe piling, full payment on the furnish item will not be made until the piling is on site and all field welds are completed and approved. This work includes welding of splices, and shear rings, when required in the contract documents.

The length of piling that extends beyond the tip elevation shown on the plans, as ordered by the engineer to meet design requirements, will be paid for as Extra Work or change order work.

There is no "one size fits all" type of attachment. When attachments are necessary, each PDD will have attachment(s) that are unique to the process.

Ultimately, the goal is to eventually migrate information contained in attachments into the respective SC technical manual – unless there is no SC technical manual that supports the process.

2.4 PDD to BCM Matrix

The PDD to BCM Matrix is a step-by-step check to verify that the PDD conforms to the Turtle Diagram and that no information is lost when converting the PDD to the BCM.

To complete the PDD to BCM Matrix, follow the steps below. Refer to Figure 4.

1. Populate all items in columns labeled as “Inputs, Criteria, Resources, Responsibility & Authority, Risks & Opportunities, Outputs & Deliverables & Records” (columns c-g in the template file).
2. Indicate the corresponding procedural step number in columns labeled as “Where is it? Procedure” or “Where is it? Attachments” (columns i and j in the template file) for each item in step 1. Sometimes the item is not in Procedure section but is mentioned in an Attachment to the PDD.
3. If an item in step 1 is not identified in Procedure or Attachment(s), then ask:
   a. Is it out of scope?
   b. Does it add value?
   c. Is it unique to the process?
4. Revise the PDD as needed then fix the matrix.
5. You must have a completed PDD to BCM Matrix as part of the PDD package.

Below is an example of a PDD to BCM Matrix:

1. Criteria #2 of the PDD appears in Procedure number 3b and 3d.
2. Criteria #3 of the PDD is not addressed in any of the Procedure steps. The PDD must be revised to either remove Criteria #3 or add a procedure that references the relevance of Criteria #3.

Although the Input section and the Outputs section of the PDD is Published, most often (but not always) they will be repeated in the Procedure or Attachment section of the PDD

Sections Published			Sections NOT Published			Sections Published			
Identified Process	Identified Process Title	Inputs	Criteria	Resources, Responsibility & Authority	Risks & Opportunities	Outputs & Deliv & Rec		Where is it? Attachments	Where is it? Procedure
49-2.01D	Driven Piling - General - Payment								
		1							3a
		2							3b; 3d
			1						3c
			2						3c
			3						x

common errors:
- not unique
- no value

Figure 4. View of the PDD to BCM Matrix

Available for use is the PDD Package Checklist to verify the PDD Package is complete.

3. PDD Package Submittal

Completing the draft PDD package correlates to Step 1.2 of Attachment 4.1, *8-Step Development and Review Schedule - from PDD to Published BCM*. At the end of Step 1, (Step 1.6), the SC TT Sponsor will submit the PDD Package to the SC Technical Manual Manager.