Large Synoptic Survey Telescope (LSST)

Change Control Process

George Angeli and Robert McKercher

LPM-19

Latest Revision Date: December 10, 2015

Change Record

Release	Date	Description	Owner name
1	5/4/2009	Initial Version superseding Document-478	Chuck Claver & Ruth Kneale
2	6/19/2011	General Updates for NSF PDR	Victor Krabbendam
3	2/6/2013	Initial draft of a wholesale change to reflect recently adopted changes to change control processes and procedures. The changes simplify and streamline the process and provide a procedure document that is more clear and concise.	George Angeli
3.1	2/10/2013	Incorporated comments from C. Claver and Brian Selvy	G. Angeli
3.2	2/15/2013	Additional comments incorporated	G. Angeli
3.3	2/23/2013	Process clarified	G. Angeli
3.4	2/24/2013	Section 5 added and document formatted to project standard	R. McKercher
3.5	5/17/2013	Added Section 4.1 describing the web-based workflow.	R. McKercher
3.6	7/1/2013	General Editing	V. Krabbendam
3.7	9/2/2013	Editing	S. Kahn
3.8	9/3/2013	Implementation of LCR-135	R. McKercher
3.9	9/30/2013	Inter-document consistency fixes, formatting and typo corrections. No content changed. Changes approved via LCR-154	R. McKercher
	10/4/2013	Implementation of LCR-157	R. McKercher
4	12/10/2015	Updated to include formal descriptions of processes and procedures already being followed. Improved grammar, syntax and clarified descriptions throughout. Substantive	R. McKercher

| | | changes are: a) added subsystem chief engineers to CCB membership; b) streamlined workflow diagram and updated it to include "PMCS-related" and "Approval Pending NSF branches;" c) added Section 3.1 Types of Change Request Submissions to formally acknowledge deviation requests and information items; d) divided Section 4 into "Voting Issues Workflow" and "Information Items Workflow" and added descriptions of PMCS-related workflow for both voting issues and information items; e) added Section 5: Voting with explanation that voting may be done at any time, defining three vote options, and explaining that not voting at all will be assumed to be "No Objection;" f) in Section 6 Change Control Board Meetings (was Section 5), added third Wednesday of the month as regularly scheduled meeting date and added expectation that Chair will advertise items for resolution at CCB meeting at least one week in advance. | |
| | 2/1/2016 | Implementation of LCR-523 | R. McKercher |

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Summary

The LSST Change Control Process enumerates the rigorous methodology used by the project to establish and maintain project baselines (technical, cost, and schedule) in a way that ensures transparency and broad project representation in the consistent management of the system configuration. This policy applies to Project Office and Project Systems Engineering configuration items. The process is also used to review the activities of the subsystem's configuration control to ensure project level concurrence with low level changes and to promote transparency within the Project.

A key element of the LSST Change Control Process is the Change Control Board (CCB). The CCB has broad project representation and has the responsibility to process all changes and recommend the appropriate action. The recommendation is provided to the LSST Project Manager who is responsible for managing the Project planning to accommodate the changes. Working within the delegated authorities, the Project Manager is responsible to work with the subsystem managers, the appropriate Contracts Departments and when DOE camera costs, schedule and scope are affected, with the SLAC Camera Project Manager to develop plans. All actions are reported to, and approved by the LSST Director, and all actions will follow the authorities defined within the LSST Project Execution Plan and the DOE LSST Camera Project Execution Plan.

This document supersedes Document-478, "Change Control and Configuration Management Process."

Reference Documents

The following documents are applicable to the development or implementation of this CCP:

1) LPM-54, "LSST Project Execution Plan"

2) LPM-51, "LSST Document Management Plan"

3) LSE-90, "LSST Technical Baseline Classified Index"

4) Document-9224, "Change Controlled Document Cover Page and Style Guide"

5) US DOE Office of Science "LSSTCam Preliminary Project Execution Plan"

Acronyms and Definitions of Terms

- Glossary of Abbreviations (Document-11921)

- Glossary of Definitions (Document-14412)

The LSST Change Control Process

1   Introduction

The primary objective of the LSST Change Control Process is to establish and maintain project technical, cost, and schedule baselines through a rigorous methodology that ensures transparency and broad project representation in the consistent management of the system configuration. This policy applies to Project Office and Project Systems Engineering configuration items. The process is also used to review the activities of the subsystems' configuration control to ensure project level concurrence with low level changes and to promote transparency within the Project.

The LSST technical configuration consists of system and subsystem requirements, interface control documents, selected design documentation, drawings and design models and software. This configuration information is archived in four electronic databases, depending on their nature: (i) DocuShare, (ii) shop drawing and solid model database (PDMWorks), (iii) software version control, and (iv) project management controls system (PMCS). The Project Manager and Systems Engineering Manager specify the subset of configuration material to place under formal control. The project cost and schedule baselines and project guidelines and procedures are also maintained centrally and subject to the change control process.

The Subsystem Managers can make changes to their subsystems up to their delegated authority level, unless a particular change affects system level controlled information, including subsystem requirements and interfaces between subsystems. The Subsystem Managers may set up subsystem change control boards to advise their decisions. Changes made by the Subsystem Managers are regularly reported to the project Change Control Board.

Project controlled documents may not be changed without proper processing through the change control workflow. Project controlled documents have specific handle designations for common and immediate recognition. Software and model control status is managed within the specific management tools but changes are still processed though this policy.

2   Change Control Board (CCB)

The Change Control Board (CCB) is an advisory body to the Project Director and the Project Manager. The Project Manager is responsible for further disposition of (approve, reject, or promote) a change request. The Project Manager will act within her/his decision authority level and promote to higher levels any change outside her/his authority. Specifically, the Project Manager is responsible to work with the subsystem managers, the appropriate contracts departments, and when DOE camera costs, schedule, and scope are affected, with the SLAC Camera Project Manager to develop plans. All actions are reported to, and approved by the LSST Director, and all actions will follow the authorities defined within the LSST Project Execution Plan and the DOE LSST Camera Project Execution Plan.

Members of the Change Control Board are expected to offer comments and recommendations regarding the change requests discussed. The comments and recommendations may be provided in

writing before or after the meeting in a well-defined time period, or verbally during the meeting.

The members of the Change Control Board are:

- Systems Engineering Manager (Chair)
- Project Scientist
- Systems Scientist
- Head of Safety
- Subsystem Managers
- Subsystem Scientists
- Subsystem Systems Engineers
- Subsystem Chief Engineers

The Director, Deputy Director, Chief Scientist, and Project Manager are included in all CCB communication and invited to participate in any CCB meeting.

3   The Process

The change control process is uniform for technical, budget, and schedule changes, as well as for any combination of these. Every change control action starts with the submission of an LSST Change Request (LCR) form to the Chair of the Change Control Board, declaring the need for change, as well as the initial expected consequences of the change. The LCR serves as the single ticket for this change; it documents the process by capturing the notes, impact analysis and decisions associated with the change.

A change control request (LCR) needs to be initiated

- To establish controlled documentation defining the baseline requirements, interfaces, design, budget, and schedule of the project and the subsystems (Telescope and Site, Camera, Data Management, as well as Education and Public Outreach), and
- To change the established, controlled documentation.

The version/revision control processes for the drawing and solid model database and software version control can initiate a formal change control request, if the new version violates formally controlled information ("form, fit, or function" in system or subsystem requirements, interfaces between subsystems, or controlled design). In these cases, the LCR can accompany the version submission, or can be requested by Systems Engineering, based on its analysis during the version update process.

Each request is uploaded to the project archive, DocuShare, in a separate collection with all the necessary supporting documents. As the request matures, its entire collection is moved through the appropriate DocuShare collections: "Proposed," "Studied," "Pending," "Approval Pending," and "Approved" or "Rejected."

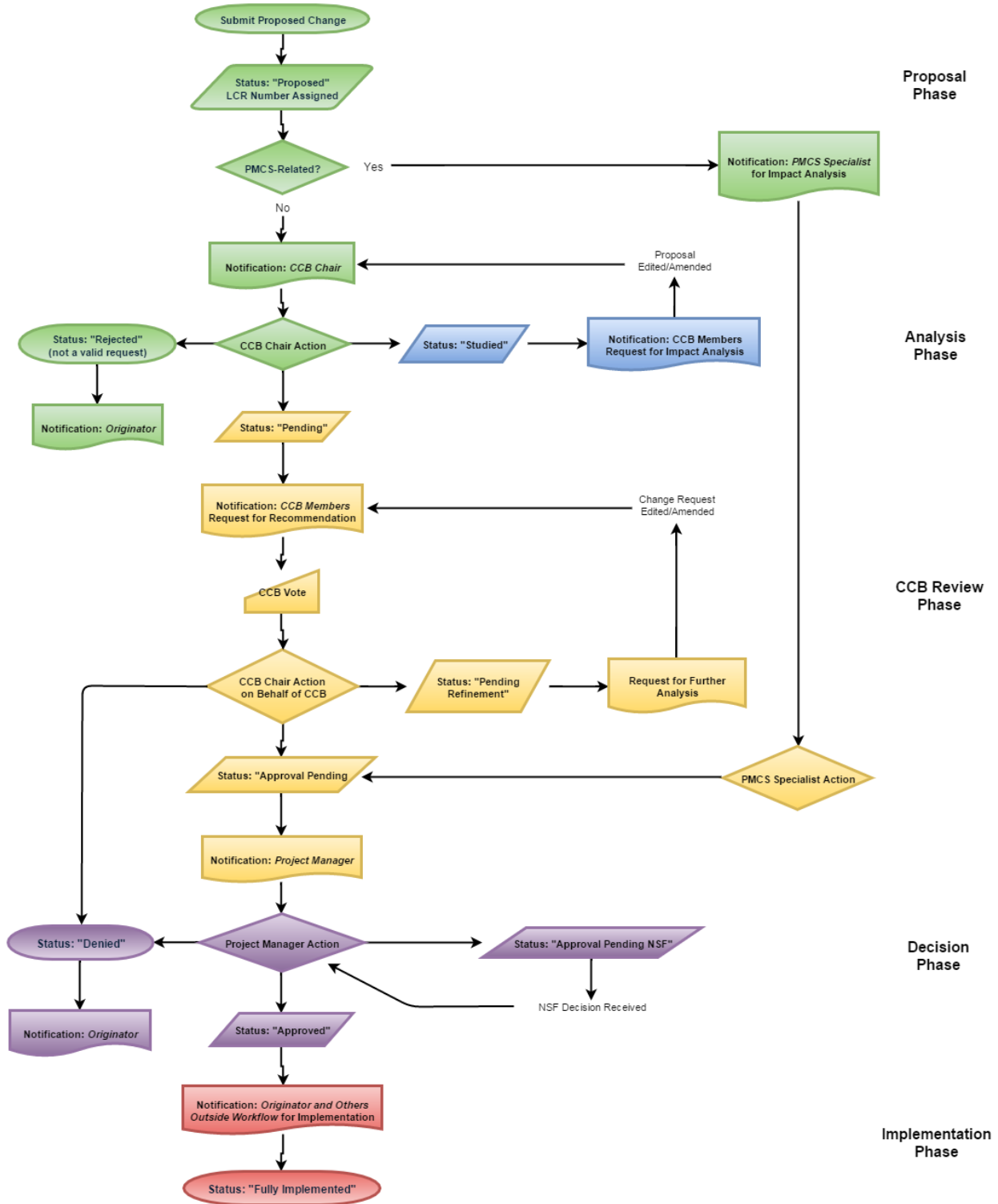The change control process workflow is shown in the following flowchart.

Figure 1: Change Control Workflow Diagram

3.1   Types of Change Request Submissions

- **Voting Issue:** Proposals upon which CCB members are expected to vote. Examples of voting issues might be (i) replacing ICD TBDs with real specifications or (ii) adding new requirements to the Observatory System Specifications (LSE-30).

    - **Deviation Request:** A subset of voting issues, these are requests for authorization to depart from an established requirement or specification, rather than a request to change said requirement or specification, prior to creation of a configuration item. An example might be a request to depart from a specification in order to allow a vendor to use an alternative technical solution with equivalent performance but increased manufacturability.

- **Information Item:** Any proposal where the Project Manager has decided NOT to ask the CCB for a recommendation. While the Project Manager has the authority to make cost, schedule, and technical changes without requesting a CCB vote, information items follow the full change control process for transparency and in order to maintain a record of the change and its justification. Examples of information items might be (i) a change to the PMCS project plan directed by the NSF or (ii) a project-level policy change that has no impact on cost, schedule, or technical requirements.

3.2   Process Phases

3.2.1   Proposal Phase

If the proposed change is not valid – for example it proposes a change to a document not under formal change control – the CCB Chair can reject the change request at submission. Also in this phase, the CCB Chair can also request additional information and/or revisions from the Originator.

The objective is to prepare the LCR for project-wide distribution and analysis.

3.2.2   Analysis Phase

The Change Control Board is officially notified about the request. Project Systems Engineering, with the active support of the subsystem teams led by their respective CCB members, initiates and manages impact studies. Optionally, a draft of the affected document is prepared with the proposed changes incorporated.

The objective is to adequately prepare the LCR for timely Change Control Board action.

3.2.3   CCB Review Phase

The request is considered by the CCB. Members of the board are expected to provide feedback ("recommend," "not recommend," or "no objection" statements with as much comment as deemed necessary). The comments and votes are open; they are available for the rest of the CCB during the process and included in the public Minutes. The CCB can request further studies.

The objective is to advise project baseline decisions.

3.2.4   Decision Phase

As described in Section 2, the Project Manager, in consultation with the Director, takes the necessary steps to approve or reject the Change Request. Before disposing the request, the Project Manager can also request further studies, clarification and/or revision.

The objective is to make project baseline decisions.

3.2.5   Implementation Phase

Project Systems Engineering implements approved changes to documents controlled at project level. The flow down of these changes into subsystem controlled information is the responsibility of the respective subsystems. The LCR is required to list all potentially affected documents, including those under subsystem configuration control.

An approved change does not necessarily trigger a new release of the affected document(s), unless the updated document was approved by the CCB. However, a clear and evident link must be established between the original document and the approved change request, representing a "red lined" section of the document. Upon a new release, the Change Record of the document will explicitly reference the LCRs authorizing the changes. New releases of controlled documents will be announced to the CCB.

The objective is to close the Change Control Action by fully implementing the approved changes or reconciling the potential consequences of a rejection.

4   Change Control Workflow

Processing of Change Requests (LCRs) is managed through a workflow on the password-protected Change Control Board website (https://www.lsstcorp.org/groups/ccb/). The workflow tracks status, records comments, and notifies users of required actions. The workflow also restricts the ability to perform certain actions to only those parties with the authority to do so. The CCB Chair is responsible for ensuring that the workflow progresses to the appropriate conclusion in a timely manner. Each change in workflow status triggers email notifications that alert relevant parties to their required actions. At the workflow's conclusion, the Document Specialist saves the LCR's workflow history, which includes the initial submission, comments, and CCB member's votes, and uploads a PDF to the appropriate LCR-specific collection in DocuShare.

Anyone with LSST Project credentials can submit a change request. The person who submitted the request, the Chair, and the website administrator can edit the original submission. Once a request has been submitted, the workflow status updates to "Proposed," and the Chair receives an email notification. The Chair may request additional information, reject the proposal without further consideration, or assign an LCR number and advance the workflow for impact analysis.

4.1   Voting Issue Workflow

During the Analysis Phase, managers and scientific and technical staff should record statements of support, objections, or concerns through the workflow comments. However, formal support documents such as impact analyses or delta versions of documents affected by the proposed change shall be

uploaded to the appropriate LCR-specific collection in DocuShare.

If the proposed change(s) would result in changes to the project plan in PMCS, the originator will answer "Yes" to the "PMCS Related?" field when submitting the request. In addition to those normally notified by the system, the PMCS Specialist and the Project Manager receive email notifications when PMCS-related LCRs are entered. The PMCS Specialist will record his or her impact analysis in the workflow comments and provide links to any support files uploaded to DocuShare.

Following impact analysis and any adjustments to the LCR resulting from same, the Chair advances the workflow to "Pending" status and adds the LCR to an upcoming CCB meeting agenda. CCB members receive email notifications that the LCR is ready for their consideration. CCB members shall record their votes using the workflow's voting mechanism.

If the CCB recommends approval of the LCR, the Chair advances the workflow status to "Approval Pending." The Project Manager receives an email notification that the LCR is ready for a decision. He or she may select "Approve" or "Denied."

However, changes that would result in use of contingency funds or loss of schedule beyond certain thresholds require an additional step prior to the Project Manager's decision. The Project Manager will prepare an NSF approval form to be emailed to LSST's NSF Program Officer then advance the workflow to "Approval Pending NSF." When the Project Manager receives the agency's decision, he or she will upload the returned, completed approval form to the appropriate LCR-specific collection in DocuShare and advance the workflow to "Approve" or "Denied" as appropriate.

The LCR's lifecycle ends either when the LCR has been "Denied" or follow-up action items have been completed and the workflow administrator advances the workflow status to "Fully Implemented."

4.2   Information Item Workflow

Proposals are designated as information items at submission by selecting "No" in the "Voting Allowed" field.

The Chair advances the workflow to "Pending" status and adds the LCR to an upcoming CCB meeting agenda. CCB members receive email notifications that the LCR will be presented at a future meeing. Prior to the meeting at which the information item will be presented, CCB members and other scientific and technical staff should record any statements of support, objections, or concerns through the workflow comments.

Following the meeting at which the information item is presented, the Chair advances the workflow status to "Approval Pending." The Project Manager receives an email notification that the LCR is ready for a decision. He or she may select "Approve" or "Denied."

However, changes that would result in use of contingency funds or loss of schedule beyond certain thresholds require an additional step prior to the Project Manager's decision. The Project Manager will prepare an NSF approval form to be emailed to LSST's NSF Program Officer then advance the workflow to "Approval Pending NSF." When the Project Manager receives the agency's decision, he or she will upload the returned, completed approval form to the appropriate LCR-specific collection in DocuShare

and advance the workflow to "Approve" or "Denied" as appropriate.

The LCR's lifecycle ends either when the LCR has been "Denied" or follow-up action items have been completed and the workflow administrator advances the workflow status to "Fully Implemented."

4.2.1 PMCS-Related Information Items Workflow

If the information item would result in changes to the project plan in PMCS, the originator will answer "Yes" to the "PMCS Related?" field when submitting the request. In addition to those normally notified by the system, the PMCS Specialist and the Project Manager receive email notifications when PMCS-related LCRs are entered.

Following impact analysis by the PMCS Specialist (the results of which will be uploaded to the appropriate LCR-specific collection in DocuShare), he or she will advance the workflow status to "Approval Pending." The Project Manager receives an email notification that the LCR is ready for a decision. He or she may select "Approve" or "Denied."

However, changes that would result in use of contingency funds or loss of schedule beyond certain thresholds require an additional step prior to the Project Manager's decision. The Project Manager will prepare an NSF approval form to be emailed to LSST's NSF Program Officer then advance the workflow to "Approval Pending NSF." When the Project Manager receives the agency's decision, he or she will upload the returned, completed approval form to the appropriate LCR-specific collection in DocuShare and advance the workflow to "Approve" or "Denied" as appropriate.

The LCR's lifecycle ends either when the LCR has been "Denied" or follow-up action items have been completed and the workflow administrator advances the workflow status to "Fully Implemented."

5   Voting

CCB members shall record their votes using the workflow's voting mechanism.

Members need not attend a CCB meeting to record a vote nor do they need to wait until after a CCB meeting to record a vote. At any time the member is comfortable with his/her vote (until the voting deadline lapses), the vote can be recorded. Therefore, there is no need for proxies.

Members may vote

- Recommend – agreeing the proposed change(s) should be approved,
- Not Recommend – voting for the proposed change(s) to be denied, or
- No Objection – having insufficient stake in the issue to either recommend or object to approval. In balance, "No Objection" is considered a favorable vote.

The Chair sets the voting deadline during the associated CCB meeting, and the workflow administrator registers a comment to each LCR to be voted on, thereby triggering an email notification to all CCB members, including any who were unable to attend the CCB meeting. Any votes not registered by the deadline are assumed to be "No Objection."

6   Change Control Board Meetings

Change Control Board meetings are called by the Chair, who is responsible for preparing the agenda and material for the meetings and documenting the comments and recommendations of the Board, as well as the potential action items requested by the Board. The Chair is assisted in these functions by the Document Specialist.

The Change Control Board meets regularly to consider proposed changes to the technical, cost, and schedule baselines. CCB meetings occur the third Wednesday of each month. If a change request is urgent, a special meeting of the CCB can be called. If in a particular month, no change requests are ready to be voted on by the membership, the Chair may cancel the meeting for that month.

The CCB meetings are run by the Chair. At least one (1) week in advance of the CCB meeting, the chair will notify the CCB membership by email of the change requests on which votes will be expected. Regular agenda items include

- Setting voting deadlines for LCRs ready for a CCB decision,
- Introducing new requests,
- Reviewing the status of action items and ongoing impact studies,
- Reporting on the implementation of approved changes, and
- Reporting and discussing subsystem level changes.

Minutes of each CCB meeting will be taken as necessary to augment the approval, rejection, impact assessment, and notification comments that are recorded on the Change Request Form. Minutes are posted to the CCB website, uploaded to DocuShare, and emailed to the membership for review.

LCR processing is administered through a web-based system that imposes the appropriate workflow and captures and archives (i) the change request with references to relevant documents, (ii) the comments and recommendations of CCB members, and (iii) the decision. Upon concluding the change control action, the web site generates a document file equivalent to the current Change Request Form that will be posted in the DocuShare collection of the request.

All documents under formal change control must be designated as such in their respective databases.

7   Change-Controlled Document Archiving

When a document has been placed under change control, the Document Specialist will apply the LSST standard controlled document formatting as demonstrated in Document-9224. He or she will (i) locate the document within the appropriate sub-collection of DocuShare Collection-1821, (ii) ensure that permissions are properly set, and (iii) notify the Subsystem Managers that the document has been placed under change control.

Change-Controlled documents are archived in one of four sub-collections of DocuShare Collection 1821.

1. Design Documents (Change-Controlled) – Collection 2809
2. Interface Control Documents (Change-Controlled) – Collection 2807

3. Plans, Policies, Procedures (Change-Controlled) – Collection 2806
4. Requirements Documents (Change-Controlled) – Collection 2808

Collection 1821 is the home collection for change-controlled documents; however, the Documents may be co-located in other collections. If this is the case, the permissions settings for Collection 1821 prevail regardless of the co-location.

Permissions to upload new versions, change the preferred versions, or edit any of the change-controlled documents' DocuShare properties are restricted to members of the Controlled Documents Membership group. The members of this group are

- CCB Chair,
- Project Manager,
- Project Director, and
- Document Specialist.