



**NOAA NESDIS  
CENTER for SATELLITE APPLICATIONS  
and RESEARCH**

**PEER REVIEW GUIDELINE**

**PRG-10  
CODE TEST REVIEW  
PEER REVIEW GUIDELINE  
Version 3.0**

# NOAA NESDIS STAR

PEER REVIEW GUIDELINE PRG-10

Version: 3.0

Date: October 1, 2009

TITLE: Code Test Review Peer Review Guideline

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TITLE: PRG-10: CODE TEST REVIEW PEER REVIEW GUIDELINE VERSION 3.0

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## CODE TEST REVIEW PEER REVIEW GUIDELINE VERSION HISTORY SUMMARY

Version	Description	Revised Sections	Date
1.0	No version 1		
2.0	New Peer Review Guideline (Code Unit Test Peer Review Guideline, PRG-13.1) by Ken Jensen (Raytheon Information Solutions)	New Document	4/1/2008
3.0	Renamed PRG-10 and revised by Ken Jensen (RIS) for version 3.		10/1/2009

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## LIST OF ACRONYMS

CICS	Cooperative Institute for Climate Studies
CIMSS	Cooperative Institute for Meteorological Satellite Studies
CIOSS	Cooperative Institute for Oceanographic Satellite Studies
CIRA	Cooperative Institute for Research in the Atmosphere
CL	Check List
CLI	Check List Item
CM/DM	Configuration Management/Data Management
CREST	Cooperative Remote Sensing and Technology Center
CTD	Code Test Document
CTR	Code Test Review
DDD	Detailed Design Document
DG	Document Guideline
DPP	Development Project Plan
EPG	Enterprise Process Group
EPL	Enterprise Product Lifecycle
IPT	Integrated Product Team
NESDIS	National Environmental Satellite, Data, and Information Service
NOAA	National Oceanic and Atmospheric Administration
OSDPD	Office of Satellite Data Processing and Distribution
PAL	Process Asset Library
PBR	Project Baseline Report
PRG	Peer Review Guideline
PRR	Project Requirements Review
QA	Quality Assurance
RAD	Requirements Allocation Document
SG	Stakeholder Guideline
SPSRB	Satellite Products and Services Review Board
SRR	System Readiness Review
STAR	Center for Satellite Applications and Research

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STP	System Test Plan
SWA	Software Architecture Document
TBD	To Be Determined
TD	Training Document
TG	Task Guideline
TRD	Test Readiness Document
TRR	Test Readiness Review
TRRR	Test Readiness Review Report
UTP	Unit Test Plan
UTR	Unit Test Report
VVP	Verification and Validation Plan

## 1. INTRODUCTION

The NOAA/NESDIS Center for Satellite Applications and Research (STAR) develops a diverse spectrum of complex, often interrelated, environmental algorithms and software systems. These systems are developed through extensive research programs, and transitioned from research to operations when a sufficient level of maturity and end-user acceptance is achieved. Progress is often iterative, with subsequent deliveries providing additional robustness and functionality. Development and deployment is distributed, involving STAR, the Cooperative Institutes (CICS, CIMSS, CIOSS, CIRA, CREST) distributed throughout the US, multiple support contractors, and NESDIS Operations.

NESDIS/STAR is implementing an increased level of process maturity to support the exchange of these software systems from one location or platform to another. Code Test Review (CTR) standards and guidelines are a part of this process improvement.

### 1.1. Objective

The objective of this Peer Review Guideline (PRG) is to provide STAR standards and guidelines for reviewing a project's compliance with requirements at a project CTR<sup>1</sup>. This PRG defines standards and guidelines for participation on a CTR review team. It contains all information needed to prepare for, conduct, and close the CTR.

The intended users of this PRG are the CTR reviewers.

### 1.2. Overview

This PRG contains the following sections:

Section 1.0 -	Introduction
Section 2.0 -	References
Section 3.0 -	Preparing For The Review
Section 4.0 -	Conducting The Review
Section 5.0 -	Closing The Review

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<sup>1</sup> Refer to the STAR EPL Process Guidelines (PG-1 and PG-1.A) for a description of the STAR EPL gates and reviews.

## 2. REFERENCE DOCUMENTS

The reference documents for the CTR include the recommended and optional process assets (c.f. Section 3.4) and the CTR artifacts (c.f. Section 3.5).

### 3. PREPARING FOR THE REVIEW

This section is concerned with how the CTR review team is selected and how the review team members should prepare for the CTR.

#### 3.1. Background – The STAR EPL Process

The CTR is a standard review that occurs at a well-defined stage in the STAR EPL process. It is important that the CTR reviewers understand this process well enough to be able to evaluate the project's status with respect to the CTR entry criteria, objectives and exit criteria.

The STAR EPL consists of 11 process steps that take a product from initial conception through development, operations, maintenance, and retirement. In this lifecycle, project stakeholders work together to enable a product to predictably mature as it progresses through the lifecycle steps.

The process steps are organized into nine project phases:

- Basic (step 1)
- Exploratory (steps 2 – 3)
- Plan (steps 4 – 5)
- Design (steps 6 – 8)
- Build (steps 9 – 11)

The implementation of the process steps can be tailored to be appropriate for the characteristics of a given project, but all steps must be followed to ensure that the products are developed from research to operations by a standard, repeatable process. Tailoring details for a given project should be documented in the project artifacts (c.f. Section 3.5).

The CTR reviewer is referred to the STAR EPL Process Guidelines (PG-1) and Appendix (PG-1.A) for a thorough treatment of the entire process.

The STAR EPL standards and process assets are managed by a STAR Enterprise Process Group (EPG). The EPG is responsible for maintaining the STAR EPL process standards, managing changes, and providing training and guidance to help stakeholders implement the standards. The CTR reviewers for a project are encouraged to contact the EPG with any questions or concerns as they prepare for and close the CTR. Use the following contact:

Ken Jensen  
Ken.Jensen@noaa.gov

### **3.2. The Code Test Review (CTR)**

The CTR is a Build phase Technical Review that occurs during step 10 (Code Test and Refinement) of the STAR EPL process.

The Build phase of the STAR EPL consists of process steps 9 – 11. The objectives of this phase are to develop, test, refine, and integrate pre-operational code to implement the algorithm design, develop operations documentation, determine whether the system performance meets project requirements and confirm that all required documentation is ready for operations and maintenance.

Step 9 (Code and Test Data Development) culminates with a TRR. The unit test plan and its supporting artifacts are established in step 9 and approved at the TRR.

Step 10 (Code Test and Refinement) culminates with a CTR. The unit test results, system test plan, and refined pre-operational code are established in step 10 and approved at the CTR.

Step 11 includes a System Readiness Review (SRR) and culminates with a Gate 5 Review. The integrated pre-operational product processing system is established in step 11 and approved at the SRR. The Gate 5 Review approves the system for delivery to operations.

The primary purposes of the CTR are to review the results from testing of the software units and to review the project's readiness for system integration and system testing. The software units are the Layer-2 elements that are defined in the system layer product software architecture, as described in the Software Architecture Document (SWA). To achieve these purposes, the development team will produce project artifacts (c.f. Section 3.5) that should demonstrate readiness for product integration and system testing to the satisfaction of the CTR reviewers.

In addition, the CTR should:

- Evaluate risks and proposed actions to mitigate risks
- Review the status of previous actions and new actions

### 3.3. Review Team

Responsibility for oversight of the project will have previously been assigned to a STAR Division and a specific STAR Branch within the Division,

The CTR Review Lead is nominally the STAR Branch Chief, but the Branch Chief may designate an alternative Lead, especially for relatively small projects). In deciding whether to lead or delegate, the Branch Chief should consider that the CTR is a technical review. Management issues (e.g., recommended modifications to the plan, resources, budget, and schedule) may be raised at the CTR, driven by risks that have developed since the TRR, but are not considered part of the normal technical review content and are not reflected in the review exit criteria except as they contribute to risk factors.

The Review Lead selects the CTR review team. It is recommended that the following guidelines be followed for selecting the team:

Personnel who are on the project development team are excluded from the review team. There are no exceptions to this rule. The review is intended to be a dialogue between the developers and the reviewers, with the reviewers providing an objective evaluation of the project's test readiness. The membership of the project development team should be clearly documented in the project's DPP. Any additions to the development team since the TRR should be noted in Section 1 of the Code Test Document (CTD, c.f. Section 4.2.1 of this PRG).

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It is highly desirable to include the TRR reviewers on the CTR review team. They will already be familiar with the project, the actions that came out of the TRR, the CTR entry and exit criteria, and many of the reference artifacts that were TRR artifacts. The addition of new review team members is also recommended to provide “fresh eyes”.

Include a systems engineer who is familiar with the STAR EPL process, especially with regard to the iterative development of requirements, requirements allocation, design and coding. It is highly desirable that the same systems engineer who was a TRR reviewer be maintained on the CTR review team.

Include one or more software engineers who are familiar with the project's software architecture and the STAR EPL coding and test standards, or can familiarize themselves quickly. It is highly desirable that the same software engineers who were TRR reviewers be maintained on the CTR review team. If there has been some contention or controversy about the code coming out of TRR, or if substantial new actions have been placed upon the code as a result of the TRR, it is recommended that at least one new software engineer be added to the review team.

Include one or more representatives from STAR QA who are familiar with the project's QA history and the STAR EPL standards for QA, or can familiarize themselves quickly. It is highly desirable that the same QA personnel who were TRR reviewers be maintained on the CTR review team. If there has been some contention or controversy about QA coming out of TRR, or if substantial new actions have been placed upon QA as a result of the TRR, it is recommended that at least one new QA person be added to the review team.

Include one or more representatives from STAR CM/DM who are familiar with the project's CM/DM baseline and the STAR EPL standards for CM/DM, or can familiarize themselves quickly. It is highly desirable that the same CM/DM personnel who were TRR reviewers be maintained on the CTR review team. If there has been some contention or controversy about CM/DM coming out of TRR, or if substantial new actions have been placed upon CM/DM as a result of the TRR, it is recommended that at least one new CM/DM person be added to the review team.

Invite a technical representative from the intended operational organization (e.g. Office of Satellite Data Processing and Distribution (OSDPD)). Consult with that organization's management for the selection of its representative. Ideally, this person will become the project's Operations Lead.

Invite one or more representatives from the Satellite Products and Services Review Board (SPSRB). The STAR Branch Chief should consult with SPSRB management for the selection of SPSRB representatives.

The review team members will provide a diversity of skills and experience that can be usefully applied to the various aspects of the review. This will be detailed in Section 4.

The Review Lead should meet with the review team as soon as possible to plan the review preparation, including the assignment and scheduling of review preparation tasks (e.g. selection and study of process assets, review of reference artifacts, delivery dates of CTR artifacts, and review of specific CTR artifacts) and should subsequently monitor progress against the review preparation plan.

### 3.4. Process Assets

STAR EPL process assets are a set of process guidelines, stakeholder guidelines, peer review guidelines, review check lists, task guidelines, document guidelines and training documents that define the enterprise standards and best practices. They are established and maintained under Configuration Management (CM) by an EPG under the direction of a Steering Committee. They are contained in a STAR Process Asset Repository (PAR) on the STAR website:

[http://www.star.nesdis.noaa.gov/star/EPL\\_index.php](http://www.star.nesdis.noaa.gov/star/EPL_index.php)

Process assets that are relevant for CTR preparation are briefly described in this section. There are separate subsections for recommended process assets and optional process assets.

The process assets described in this section should be available to the CTR reviewers in the STAR EPL PAR.

The CTR reviewer is encouraged to refer to each process asset for a more detailed description as soon as possible. Any problems (e.g., lack of access, missing process assets, questions about content, inconsistencies between process assets) should be brought to the attention of the STAR EPG (c.f. Section 3.1) as soon as possible.

### 3.4.1 Recommended Process Assets

It is very important that the CTR reviewers be familiar with these process assets before conducting the CTR.

**CL-10: Code Test Review Check List** contains the standard CTR Check List Items (CLIs) that the CTR reviewers are required to complete, unless the list has been tailored for the specific project. Refer to the DPP to determine whether the CTR Check List has been tailored. In that case, use the tailored Check List in the DPP Appendix.

**SG-18: Technical Reviewer Guidelines** contains the stakeholder guidelines for Technical Review reviewers. The CTR reviewer will find general guidelines for conducting technical reviews. These complement the specific CTR guidelines contained in this PRG.

**TG-10: Code Test and Refinement Task Guideline** contains the task guidelines for the Code Test and Refinement step (10) of the STAR EPL process. The CTR reviewer will find guidelines for interaction between the CTR review team and other project stakeholders.

**DG-10.4: Code Test Review Report Guidelines** contains the standards and guidelines for writing the Code Test Review Report (CTRR). The CTR reviewers, who are responsible for writing this report, will find it highly useful to know the required report content in advance of the review, so they can ensure that the review content will provide them with the information they need for the report.

### 3.4.2 Optional Process Assets

The process assets designated as optional will be helpful to the CTR reviewers, but are not required. Typically, a CTR reviewer will refer to some of these, depending on the division of responsibilities within the review team.

**DG-1.2: Software Architecture Document Guideline** contains standards and guidelines for the Software Architecture Document (SWA). The SWA is a standard project artifact for the CTR (c.f. Section 3.5.5 of this PRG). The CTR reviewers who are responsible for ensuring that the project's SWA v2r1 complies with STAR standards should use DG-1.2 as a resource.

**DG-5.1: Development Project Plan Guideline** contains standards and guidelines for the DPP. The DPP is a standard project artifact for the CTR (c.f. Section 3.5.2 of this PRG).

The CTR reviewers who are responsible for ensuring that the project's DPP complies with STAR standards should use DG-5.1 as a resource.

**DG-5.4: Project Baseline Report Guideline** contains standards and guidelines for the Project Baseline Report (PBR). The PBR is a standard project artifact for the CTR (c.f. Section 3.5.13 of this PRG). The CTR reviewers who are responsible for ensuring that the project's PBR complies with STAR standards should use DG-5.4 as a resource.

**DG-6.2: Requirements Allocation Document Guideline** contains standards and guidelines for the Requirements Allocation Document (RAD). The RAD is a standard project artifact for the CTR (c.f. Section 3.5.4 of this PRG). The CTR reviewers who are responsible for ensuring that the project's RAD complies with STAR standards should use DG-6.2 as a resource.

**DG-6.3: Verification and Validation Plan Guideline** contains standards and guidelines for the Verification and Validation Plan (VVP). The VVP is a standard project artifact for the CTR (c.f. Section 3.5.7 of this PRG). The CTR reviewers who are responsible for ensuring that the project's VVP complies with STAR standards should use DG-6.3 as a resource.

**DG-8.1: Detailed Design Document Guideline** contains standards and guidelines for the Detailed Design Document (DDD). The DDD is standard a project artifact for the CTR (c.f. Section 3.5.6 of this PRG). The CTR reviewers who are responsible for ensuring that the project's DDD complies with STAR standards should use DG-8.1 as a resource.

**DG-9.1: Unit Test Plan Guideline** contains standards and guidelines for the preparation of the Unit Test Plan (UTP). UTP v1r0 is a project artifact for the CTR (c.f. Section 3.5.8 of this PRG). The CTR reviewers who are responsible for ensuring that the project's UTP complies with STAR standards should use DG-9.1 as a resource.

**DG-10.1: Unit Test Report Guideline** is a STAR EPL process asset that contains standards and guidelines for the preparation of the UTR. The UTR is a project artifact for the CTR (c.f. Section 3.5.9 of this PRG). The CTR reviewers who are responsible for ensuring that the project's UTR complies with STAR standards should use DG-10.1 as a resource.

**DG-10.2: System Test Plan Guideline** is a STAR EPL process asset that contains standards and guidelines for the preparation of the STP. The STP is a project artifact for the CTR (c.f. Section 3.5.10 of this PRG). The CTR reviewers who are responsible for ensuring that the project's STP complies with STAR standards should use DG-10.2 as a resource.

**DG-10.3.A: Code Test Document Appendix Guideline** contains Microsoft PowerPoint slide templates for the standard TRD presentation slides. The CTR reviewer can use this document to become familiar with the expected content and format of the review.

**TD-11.1: FORTRAN Coding Standards** is a STAR EPL process asset that contains the STAR EPL standards and guidelines for FORTRAN programming. The CTR reviewers who are responsible for ensuring that the project's pre-operational FORTRAN code complies with STAR standards should use TD-11.1 as a resource.

**TD-11.2: C Coding Standards** is a STAR EPL process asset that contains the STAR EPL standards and guidelines for C programming. The CTR reviewers who are responsible for ensuring that the project's pre-operational C code complies with STAR standards should use TD-11.2 as a resource.

### 3.5. Project Artifacts

Project artifacts are a set of items that are produced by the appropriate stakeholders during the product life cycle to support the reviews. They are maintained under CM in a project artifact repository.

The following CTR artifacts should be established in the project artifact repository via Baseline Build 3.2:

- Code Test Document
- Development Project Plan v3.x
- Test Readiness Review Report
- Requirements Allocation Document v1.4
- Software Architecture Document v2.3
- Detailed Design Document v1.2
- Verification and Validation Plan v1.4
- Unit Test Plan v1.1
- Unit Test Report v1.0
- System Test Plan v1.0
- Refined Pre-Operational Code

- Refined Pre-Operational Test Data
- Project Baseline Report v3.2

The CTR artifacts should be available to the CTR reviewers at least one week in advance of the date scheduled for the CTR in the project artifact repository. The project plan for some projects may call for some or all of these artifacts to be available to the reviewers earlier than one week in advance of the CTR. Consult the project plan for this information. If an artifact is not available on schedule, contact the Development Lead to resolve any problems that may be caused by late access to the artifacts.

### **3.5.1 Code Test Document**

The Code Test Document (CTD) consists of the CTR presentation slides. The CTD is described in detail in Section 4.2.

### **3.5.2 Development Project Plan**

The Development Project Plan (DPP) documents the plan for the development, testing, review, and transition to operations for the project, including stakeholders, tasks, work breakdown structure (WBS), schedule and resources. It contains the project objectives, tasks, milestones, stakeholders, and schedule. This information will be useful for the CTR reviewer in reviewing Section 1 of the CTD, and will be needed by the review team for determining a review preparation schedule (c.f. Section 3.7 of this PRG).

The DPP includes the CTR review objectives, which may or may not be tailored from the standard STAR EPL objectives for a CTR (c.f. Section 4.1 of this PRG). This information will be useful for the CTR reviewer in reviewing Section 1 of the TRD.

### **3.5.3 Test Readiness Review Report**

The Test Readiness Review Report (TRRR) is the approved report of the TRR reviewers. This artifact will be useful for the CTR reviewer in reviewing Section 2 of the CTD.

The TRRR should include the approval status for each TRR requirement, in the form of a check list where each check list item (CLI) has a disposition status (Pass, Conditional Pass, Defer, Waive, or Not Applicable (N/A)).

CLIs with “Conditional Pass” status must have associated actions that should be closed prior to TRR. CLIs with “Defer” status also must have associated actions. Most items with “Defer” status at TRR will have been deferred to the CTR, though some items may be deferred to later in the product lifecycle. The actions associated with items deferred to the CTR must be addressed at the CTR.

The TRRR should also include an assessment of risk items, with recommendations for risk mitigation. In most cases, these recommendations will result in actions.

The TRRR should summarize the CLIs and risks with a list of actions. Each action item should include a description, an association with a CLI and/or a risk, an assignment, and an intended closure date. The CTR reviewers are responsible for ensuring that the status of all TRR actions is reviewed and disposed of at the CTR.

The TRRR should include the CTR entry criteria and CTR exit criteria. The CTR reviewers are responsible for ensuring that CTR entry and exit criteria are met.

### **3.5.4 Requirements Allocation Document**

The RAD contains the basic and derived requirements for the work products and the allocation of the requirements to system components and product components. This information will be useful to the CTR reviewer in reviewing Sections 3 and 5 of the CTD.

RAD v1r2, produced for the CDR, should have documented the requirements and requirements allocation at the end of the Design phase of the STAR EPL. Often, the RAD must be revised for TRR (v1r3) and CTR (v1r4) to document revisions to the requirements allocation that are needed to reflect detailed design changes that occur during pre-operational code development and unit testing.

### **3.5.5 Software Architecture Document**

The SWA, a project artifact, contains the software architecture and data flows for the project algorithm. This information will be useful for the CTR reviewer in reviewing Section 3 of the CTD.

At the detailed design level of maturity, the software architecture should describe four layers of data flows:

- Layer 0 (Context-Layer) consists of the external interfaces to the software system.
- Layer 1 (System-Layer) consists of the flows between the software units that comprise the software system
- Layer 2 (Unit-Layer) consists of the flows within each software unit
- Layer 3 (Sub-Unit-Layer) consists of the flows within sub-units

The SWA should document all of these data flows with figures (data flow diagrams) and tables that provide a complete description of all software components and their input, internal, and output data flows.

### **3.5.6 Detailed Design Document**

The Detailed Design Document (DDD) describes the product design and the design components at a level of detail that is sufficient for the development programmers to be able to use as a reference for writing fully functional pre-operational code. This information will be useful for the CTR reviewer in reviewing Section 3 of the CTD. A separate DDD is produced for each software unit that is part of the product processing system. The software units are the Layer-2 elements that are defined in the system layer product software architecture, as described in the SWA.

DDD v1r0, produced for the CDR, should have described the detailed design as it exists at the completion of the Design Phase of the STAR EPL. Often, the DDD must be revised for TRR (v1r1) and CTR (v1r2) to document revisions to the detailed design that occur during pre-operational code development and unit testing.

### **3.5.7 Verification and Validation Plan**

The Verification and Validation Plan (VVP) describes the work products to be verified and validated, the requirements for each selected work product and the verification and validation methods for each selected work product. This information will be useful for the CTR reviewer in reviewing Section 5 of the CTD.

The VVP is initially written during step 6 for the Project Requirements Review (PRR), and is revised for each subsequent Technical Review to reflect the maturation of design, code, test data, and test results. VVP v1r4, an artifact for the CTR, reflects the plan as it exists at the conclusion of unit testing.

### **3.5.8 Unit Test Plan**

The UTP contains the test plan for each software unit in the project's product processing system. The UTP, a complement to the project's VVP, focuses on the specifics of the software units and the testing of their functionality and performance. This information will be useful for the CTR reviewer in reviewing Sections 3 and 4 of the CTD.

The UTP should document the purpose and function of each unit, its traceability to the project requirements, unit data flows, unit components and unit functions to be tested, a test data description, planned test methods and test sequences and identified test risks.

The initial version of the UTP (v1r0) is produced for the TRR. Often, the UTP must be revised for TRR (v1r1) to document revisions to the plan that occur during unit testing.

### **3.5.9 Unit Test Report**

The Unit Test Report (UTR) documents the results of testing of each software unit to verify that the requirements allocated to the unit's software components are satisfied. This information will be useful for the CTR reviewer in reviewing Section 4 of the CTD.

The UTR should identify the requirements that have been allocated to components of each unit's software architecture and list the components of each unit's software architecture that are traceable to the requirements.

The UTR should explain the purpose of each unit, identify all unit components that have been selected for testing, list and describe all data files that will be used as input files, describe the sequence of test actions, and state the test success criteria.

The UTR should describe the results of each unit test in a way that demonstrates the verification of the requirements allocated to components of the software unit, show how the results demonstrate that the requirements allocated to the software units are satisfied, and note any requirements allocations whose verification is incomplete or questionable.

### **3.5.10 System Test Plan**

The System Test Plan (STP) contains the plan for testing to ensure that the requirements specified for the product processing system are satisfied by the completed system (Verification) and that the final developed system will satisfy the users' needs and expectations (Validation). This information will be useful for the CTR reviewer in reviewing Section 5 of the CTD.

The STP should list the identified product users and state the identified needs for each user. The STP should state the organizations that will operate and maintain the product processing system and state the identified operations and maintenance needs.

The STP should describe the algorithm that is implemented by the product processing system and identify all items that have been selected for the system test. Test items include system components, product components, test data, and truth data.

The STP should describe the system test methods, test environments, and the planned sequence of test actions to verify that the system will satisfy requirements and validate the needs of users and operators.

### **3.5 11 Refined Pre-Operational Code**

The Refined Pre-Operational Code consists of all software components of the detailed design that was approved at the CDR (step 8) and unit tested in step 10. The code is a post-unit test refinement of the Pre-Operational Code, refined to correct bugs and other deficiencies that are revealed by unit testing.

It is expected that SPSRB coding standards will be applied to the pre-operational code. Currently, coding standards exist for Fortran, C, and C++ code, and general programming standards exist for all code. These standards are found on the SPSRB web site at [http://projects.osd.noaa.gov/spsrb/standards\\_prog.htm](http://projects.osd.noaa.gov/spsrb/standards_prog.htm). This requirement may be waived if the circumstances of a specific project provide a compelling reason for a waiver. Waivers should be agreed to as early as possible, included in the project plan, and accepted by operations prior to unit testing.

### **3.5 12 Refined Pre-Operational Test Data**

Pre-Operational Test Data are the data files used for unit testing of the Pre-Operational Code, including the input data and output data identified in the current baseline version of the SWA. These files may have been revised and/or upgraded during unit testing, to apply to the refined code.

### **3.5.13 Project Baseline Report**

The Project Baseline Report (PBR) v3r2 includes the change history, approval status, and location of every Configuration Item in the project's baseline for Baseline Build 3.2.

## 3.6. Entry Criteria

The CTR reviewers should ensure that all CTR entry criteria have been met before commencing the review. The CTR entry criteria should have been established at the TRR and documented in the TRRR. Note that entry criteria may be tailored from the standard STAR EPL set of CTR entry criteria. In that case, the TRRR should provide a rationale for deviations from the standard set.

The standard STAR EPL set of CTR entry criteria, listed in the standard CTR check list (CL-10), includes:

- Entry # 1 - A Test Readiness Report (TRRR) has been written. The CTR reviewers have access to the current baseline version of the TRRR.
- Entry # 2 -A Development Project Plan (DPP) has been written. The CTR reviewers have access to the current baseline version of the DPP.
- Entry # 3 - A Requirements Allocation Document (RAD) has been written. The CTR reviewers have access to the current baseline version of the RAD.
- Entry # 4 - A Software Architecture Document (SWA) has been written. The CTR reviewers have access to the current baseline version of the SWA.
- Entry # 5 - Detailed Design Documents (DDD) have been written for each software unit in the software architecture. The CTR reviewers have access to the current baseline version of each DDD.
- Entry # 6 – A Unit Test Plan (UTP) has been written. The CTR reviewers have access to the current baseline version of the UTP.
- Entry # 7 – Pre-operational code units, external interfaces, ancillary data, unit test data and unit test results are in the development test environment. The CTR reviewers have access to this code, test data and test results.
- Entry # 8 – A Unit Test Report (UTR) has been written. The CTR reviewers have access to the current baseline version of the UTR.
- Entry # 9 - A Verification and Validation Plan (VVP) has been written. The CTR reviewers have access to the current baseline version of the VVP.
- Entry # 10 - A System Test Plan (STP) has been written. The CTR reviewers have access to the current baseline version of the STP.
- Entry # 11 - A Project Baseline Report (PBR) has been written. The CTR reviewers have access to the current baseline version of the PBR.

- Entry # 12 - A Code Test Document (CTD) has been written. The CTR reviewers have access to the current baseline version of the CTD.

Project documents DPP, RAD, SWA, DDD, VVP, and UTP were reviewed and approved at TRR, though risks and actions concerning them may still be carried to the CTR and changes to these documents since the TRR must be reviewed and approved. Assessment of the quality of the new documents (TRRR, UTR, STP) and approval of refinements to code and test data is the main business of the CTR.

It is the responsibility of both the development team and the review team to ensure that CTR entry criteria have been met prior to the CTR. The CTR Review Lead and the Development Lead should be in communication during the entire step 10 process to identify and resolve issues affecting the CTR entry criteria well in advance of the scheduled CTR date.

### 3.7. Review Team Preparation

The sequence of steps that should be taken by the CTR review team in preparing for the CTR is as follows:

- The STAR Branch Chief selects the Review Lead, in consultation with the Division Chief
- The Review Lead selects the Review Team, following the guidelines in Section 3.3 of this PRG.
- The Review team meets to plan review preparation. The initial meeting should accomplish the following:
  - Assemble the necessary review tasks and assign them to review team members. These tasks include:
    - Review PRG-10 (this document), focusing on the sections that pertain to the areas you have been assigned to review.
    - Review the project's CTR check list. This will be available as a DPP Appendix or, if there has been no tailoring, as the process asset CL-10. Note CLIs, focusing on the sections that pertain to the areas you have been assigned to review. Refer to these CLIs when reviewing the project artifacts. All team members should do this.

- Review the project's DPP. Guidelines for the DPP review are in Section 4.2.1 of this PRG.
- Review the TRRR for the project. Guidelines for the TRRR review are in Section 4.2.2 of this PRG.
- Review the project's unit test plan, documented in the UTP. Guidelines for the unit test plan review are in Section 4.2.3 of this PRG.
- Review the unit test results, documented in the UTR. Guidelines for the review of the unit test results are in Section 4.2.4 of this PRG.
- Review the project's system test plan, documented in the STP. Guidelines for the system test plan review are in Section 4.2.5 of this PRG.
- Review the status of project risks. Guidelines for the review of project risks are in Section 4.2.6 of this PRG.
- Review the status of project actions. Guidelines for the review of project actions are in Section 4.2.6 of this PRG.
- Identify contacts with the development team and with other stakeholders, using the DPP to identify the relevant stakeholders. Assign the relevant contacts to the review team members, based on their assigned tasks.
- Determine the time, place, frequency, required attendees and optional attendees of CTR review team meetings.
  - The time should be based on the convenience to the review team.
  - The place usually should be at the site of the Review Lead. For cases where a majority of the required attendees are located at a different site than the Review Lead, this site can be selected as an alternative place. The selected site should have the infrastructure for hosting video and/or teleconferencing for off-site attendees.
  - The frequency should be determined by the project timeline, the size of the project, and the size of the review team. Short project timelines large-size projects and large review teams typically require more frequent review team meetings. Also, decide whether CTR review team meetings will be held on a regular basis or on an "as needed" basis. It is recommended that meetings initially be held on a regular basis until it is determined that "as needed" meetings will suffice.

- The required attendees should be determined by the Review Lead on a meeting-by-meeting basis, depending on the meeting's agenda and current issues. Usually, all review team members are required attendees, though some may be designated as optional attendees for a meeting whose agenda and issues are not relevant to their role and responsibilities. The Review Lead may invite members of the development team to a meeting whose agenda and issues will benefit from their involvement.
- Review preparation plan is iterated, finalized, communicated to stakeholders.
- The review preparation schedule and risks are finalized, in consultation with the relevant stakeholders. The schedule should include a schedule of deliveries of project artifacts, drawn up in consultation with the Development Lead. It is recommended that informal deliveries of project artifacts in draft condition be included in the schedule. It should be understood that informally delivered "as is" draft artifacts are solely for the purpose of helping the reviewers prepare for the review and are not reviewable items. Reviewers are encouraged to provide feedback to the development team to assist them in improving the artifacts prior to their final pre-review delivery.
- The schedule for closing the review is finalized. This involves the writing and delivery of a CTR Report (TRRR, c.f. Section 5.3 of this PRG).
- Review Lead communicates the proposed review schedule and risks to project management and to the Development Lead.
- Review Lead communicates requests for deliveries to the Development Lead, according to the review preparation schedule.
- Review tasks and schedule are finalized, in consultation with project management, and are folded into the DPP.
- Review team members, and relevant stakeholders identified on the review preparation schedule, work their assigned tasks according to the schedule.
- Review Lead monitors the status of the review preparation schedule and risks, and communicates issues to program management and the Development Lead. Review Lead, Development Lead, and program management collaborate in resolving any issues that arise. If necessary, the project plan may be modified to accommodate the resolution of issues.

## 4. CONDUCTING THE REVIEW

### 4.1. Review Objectives

The CTR objectives should be established in the DPP. Nominally, these will be the STAR EPL standard objectives for a CTR. The CTR objectives may be tailored for a specific project, in which case the DPP should document the tailored objectives. If there is no tailoring, it is sufficient for the DPP to state that the standard objectives apply, and note that these are specified in this PRG, as follows:

The STAR EPL standard objectives for a CTR are:

- Identify relevant stakeholders and document their involvement according to the project plan.
- Provide all applicable technical data, including:
  - Pre-operational code and test data
  - Unit test plan
  - Unit test report
  - System test plan
- Review the unit test plan, focusing on changes since the TRR.
- Review the unit test results
- Review the system test plan
- Identify and evaluate risks. Recommend risk mitigation activities.
- Document the closing of all action items since TRR. Make recommendations for open actions and new actions.

### 4.2. The Code Test Document

The CTD, a Microsoft PowerPoint file, is the presentation document for a project's CTR.

The CTD and its accompanying artifacts should accomplish the CTR objectives stated in Section 4.1 of this PRG.

The intended target audience is the CTR reviewers. Typically, the CTD is prepared by the project's development team under the direction of the Development Lead.

The CTD presentation slides are organized into seven sections. These sections, described in DG-10.3 and illustrated in DG-10.3.A., are:

- Introduction
- Test Readiness Review Report
- Unit Test Plan
- Unit Test Results
- System Test Plan
- Risks and Actions
- Summary and Conclusions

A description of these sections is provided in the following seven subsections, taken from the CTD Document Guidelines (DG-10.3), for the benefit of CTR Reviewers who have been assigned the task of reviewing the corresponding CTD section.

## **4.2.1 Section 1 – Introduction**

The CTD shall include an Introduction Section. This section should be organized as follows:

- 1.0 INTRODUCTION
  - 1.1 Development Project Plan
  - 1.2 Project Objectives
  - 1.3 Project Stakeholders
  - 1.4 Project Timeline
  - 1.5 Project Plan Changes
  - 1.6 Stakeholder Involvement
  - 1.7 CTR Guidelines and Check List
  - 1.8 CTR Report
  - 1.9 Review Objectives

- **Section 1.1: Development Project Plan**
  - Confirm that the TRD provides a pointer to the DPP. CTR reviewers should be able to obtain the DPP by using this pointer. A pointer to the DPP Document Guidelines (DG-5.1) should also be provided.
  
- **Section 1.2: Project Objectives.**
  - Confirm that the project objectives are consistently identified in the CTD and the DPP.
  
- **Section 1.3: Project Stakeholders.**
  - Confirm that stakeholder roles have been identified. Stakeholder roles are identified in Section 4.2.1 of the STAR EPL Process Guidelines (PG-1). Stakeholders should be named when known. There may be more than one name for a stakeholder role. Unspecified stakeholders should be identified by role with a TBD. Unspecified stakeholders constitute a project risk that should be addressed in Section 6 of the CTD. The ensemble of roles and named personnel constitute the Integrated Product Team (IPT).
  - Confirm that a description of the tasks expected for each stakeholder is documented at a level of detail sufficient to give you a good sense of the IPT. This can be done explicitly in the CTR presentation slides and/or by reference to other project artifacts (e.g. DPP).
  
- **Section 1.4: Project Timeline**
  - Confirm that project milestones have been identified in the CTD and the DPP. Milestones should include the STAR EPL standard reviews (with the CTR highlighted) and associated review dates.
  - Confirm that a timeline of project tasks and schedule of milestones has been included in the CTD and the DPP. It is recommended that an illustration of the project tasks and schedule be shown (e.g. a Gantt chart taken from a Microsoft Project file of the project plan). In particular, the tasks and schedule for the Build phase should be clearly illustrated, with the CTR milestone indicated.

- **Section 1.5: Project Plan Changes**
  - Confirm that any modifications to the Project Plan since the TRR are clearly explained, including the rationale and documentation of management concurrence.
  
- **Section 1.6: Stakeholder Involvement**
  - Confirm stakeholder involvement according to the project plan. Stakeholder involvement should be described in a way that shows the project plan is being followed.
  
- **Section 1.7: CTR Guidelines and Check List**
  - This section should provide pointers to the CTR Peer Review Guidelines (PRG-10, this document) and CTR Check List (CL-10).
  
- **Section 1.8: CTR Report**
  - This section should provide a pointer to the CTR Report Document Guidelines (DG-10.4).
  
- **Section 1.9: Review Objectives**
  - Ensure that the stated review objectives are satisfactory. Nominally, these objectives will be the STAR EPL standard objectives for a CTR. The standard objectives capture the standard sections of the review (c.f. Section 3).
  - Tailoring of review objectives is permissible. If the development team wishes to drop standard objectives or add other objectives, it is the responsibility of the Development Lead to consult with the CTR reviewers well enough in advance of the review to obtain reviewer buy-in for deviations. In that case, the CTD should note all deviations and note any impacts on exit criteria. Impacts on exit criteria will be common, since the standard objectives are designed to meet the standard exit criteria.

## 4.2.2 Section 2 – Test Readiness Review Report

The CTD shall include a Test Readiness Review Report Section. This section should be organized as follows:

### 2.0 TEST READINESS REVIEW REPORT

#### 2.1 Test Readiness Review Report

#### 2.2 TRR Check List Items

#### 2.3 TRR Exit Criteria

#### 2.4 TRR Risks and Actions

#### 2.5 CTR Entry Criteria

#### 2.6 CTR Exit Criteria

- **Section 2.1: Test Readiness Review Report**

- The TRRR is an essential artifact for the CTR, because it documents the baseline from which to assess project progress since the last review. The CTD should provide a pointer to this document. Access to this document is part of the CTR entry criteria. If the CTR reviewer cannot obtain access to the TRRR by using this pointer, and cannot otherwise obtain access to the current baseline version of the report, the reviewer should notify an appropriate person (e.g. Review Lead, Development Lead, Program Manager, STAR Web Developer) to obtain access.

- **Section 2.2: TRR Check List Items**

- The status of the project coming out of TRR is described by the status of the TRR CLIs.
- Confirm that the CTD summarizes the status of the TRR CLIs and provides a rationale and risk assessment for all TRR items that have been waived.

- **Section 2.3: TRR Exit Criteria**

- It is important that the exit criteria for the previous review, the TRR, have been properly disposed of. Confirm that this section of the CTD reviews the status of the TRR exit criteria, noting any open actions associated with deferred exit criteria. These actions must be addressed in Section 6 of the CTD.

- **Section 2.4: TRR Risks and Actions**

- If there are any risks and actions that are still open after TRR, these should be documented in the TRRR and should be addressed at the CTR.
- Confirm that the CTD states the number of open risks and actions from the TRRR and notes that these will be addressed in Section 6 of the CTD.

- **Section 2.5: CTR Entry Criteria**

- The TRRR establishes the entry criteria for the CTR. These may be the standard STAR EPL entry criteria (c.f. Section 3.6 of this PRG), documented in CL-10, or they may be tailored for this project. In either case, they should be listed in the TRRR.
- Confirm that the CTR entry criteria are listed completely and correctly in the CTD.
- Look for examples where the entry criteria listed in this section differ from the set that was established at the TRR, as documented in the TRRR. For these examples, the CTD should provide a convincing rationale for deviations, including tailored entry criteria and waived entry criteria. The TRR reviewers must approve any deviations. It is the responsibility of the Development Lead to consult with the CTR reviewers well enough in advance of the review to obtain reviewer buy-in for the deviation. If approved, the modified entry criteria should be documented in the CTRR with the modifications and rationale explicitly noted.
- For cases where advance reviewer buy-in for entry criteria deviations has not been obtained, the reviewers must decide whether the review should be delayed until the discrepancy is resolved or can continue with an action to resolve the discrepancy after the review.
- Confirm that each CTR entry criteria item is satisfied. Use the CTR artifacts as references for deciding on the status of each entry criteria item.

- **Section 2.6: CTR Exit Criteria**

- The TRRR establishes the exit criteria for the CTR. These may be the standard STAR EPL exit criteria (c.f. Section 5.1 of this PRG), documented in CL-10, or they may be tailored for this project. In either case, they should be listed in the TRRR.
- Confirm that the CTR exit criteria are listed completely and correctly in the CTD.

- Look for examples where the exit criteria listed in this section differ from the set that is documented in the TRRR. For these examples, the CTD should provide a convincing rationale for the deviations, including tailored exit criteria and waived exit criteria. The CTR reviewers must approve any deviations. It is the responsibility of the Development Lead to consult with the CTR reviewers well enough in advance of the review to obtain reviewer buy-in for the deviation. If approved, the modified exit criteria should be documented in the CTRR with the modifications and rationale explicitly noted.
- For cases where advance reviewer buy-in for exit criteria deviations has not been obtained, the reviewers must decide whether the review should be delayed until the discrepancy is resolved or can continue with an action to resolve the discrepancy after the review.
- Confirm that each CTR exit criteria item is satisfied. Use the CTR artifacts as references for deciding on the status of each exit criteria item.

#### **4.2.3 Section 3 – Unit Test Plan**

The CTD shall include a Unit Test Plan Section. The purpose of this section is to provide the context for the test results that will be discussed in Section 4. Most of the content for this section should be obtained directly from the UTP. This section should be organized as follows:

#### **3.0 UNIT TEST PLAN**

- 3.1 Unit Test Plan Documentation
- 3.2 Requirements Allocation Changes
- 3.3 Code Design Changes
- 3.4 Unit Test Plan Changes

- **Section 3.1: Unit Test Plan Documentation**

- This section should introduce the UTP and provide a pointer to the latest version of the project UTP. Confirm that the CTD notes whether or not the UTP has been revised since the TRR.

- **Section 3.2: Requirements Allocation Changes**

- This section should list changes to requirements and requirements allocation that have resulted in changes to the unit test plan. Confirm that the CTD provides an overview of the RAD and a pointer to the project RAD.
- Confirm that the CTD lists and describes each new requirement since the TRR. New requirements should be documented in a RAD revision. New requirements may have been approved at a delta Project Requirements Review (PRR). In that case, the CTD should note this. If not the case, the CTD should explain the rationale for the new requirements, note potential effects on the project plan, document the agreement of affected stakeholders, note new or modified risks, and note any recommended actions. Armed with this information, the CTR reviewers should decide whether or not to approve the new requirements.
- Confirm that the CTD lists and describes each requirement change since the TRR. Requirements changes should be documented in a RAD revision. Requirements changes may have been approved at a delta Project Requirements Review (PRR). In that case, the CTD should note this. If not the case, the CTD should explain the rationale for the requirements changes, note potential effects on the project plan, document the agreement of affected stakeholders, note new or modified risks, and note any recommended actions. Armed with this information, the CTR reviewers should decide whether or not to approve the requirements changes.
- Confirm that the CTD lists and describes each requirements allocation change since the TRR. Requirements allocation changes should be documented in a RAD revision. Requirements allocation changes may have been approved at a delta Project Requirements Review (PRR). In that case, the CTD should note this. If not the case, the CTD should explain the rationale for the requirements allocation changes, note potential effects on the project plan, document the agreement of affected stakeholders, note new or modified risks, and note any recommended actions. Armed with this information, the CTR reviewers should decide whether or not to approve the requirements allocation changes.

- **Section 3.3: Code and Test Data Refinement**

- This section should describe refinements to the code and/or test data that have occurred during step 10 as a result of unit testing.

- Confirm that the CTD provides an overview of the SWA and a pointer to the project SWA.
  - Confirm that the CTD provides an overview of the DDD and a pointer to each project DDD.
  - Confirm that the CTD, SWA, and DDDs consistently and satisfactorily describe all code design changes since TRR.
  - Review the UTP and the refined pre-operational code to confirm that refinements to pre-operational code and test data since TRR are satisfactorily documented.
- **Section 3.4: Unit Test Plan Changes**
    - This section should describe any changes to the unit test plan since TRR. Unit test plan changes are typically the result of requirements, design, code and test data refinements that were discussed in Sections 3.2 and 3.3.
    - Confirm that changes to the unit test plan are described in a revised UTP. The CTR reviewers should decide whether or not to approve the test plan changes.

#### 4.2.4 Section 4 – Unit Test Results

The CTD shall describe the test results for each software unit. The purpose is to demonstrate that the software units satisfy all requirements and are ready for integration and system testing. Typically, the System-Layer process flow has some sequential order to it, with outputs from one unit feeding other units. In that case, it is useful for the development team to present the unit test results in a sequential order that is consistent with the System-Layer sequential process flow. This order should be consistent with the order adopted in the UTP.

This section should be organized as follows:

- 4.0 UNIT TEST RESULTS
  - 4.1 Code Test Documentation
  - 4.2 <Unit 1> Unit Test Results
  - 4.3 <Unit 2> Unit Test Results
  - 4.4 .....

## 4.N+1 <Unit N> Unit Test Results

- **Section 4.1: Code Test Documentation**

- This section should provide an overview of the UTR and a pointer to the latest version of the project UTR.

- **Section 4.2: <Unit 1> Unit Test Results**

- This section should report the results from the first unit test, Using figures, graphs, tables as warranted for clarity.
- Confirm that the CTD and UTR consistently and satisfactorily report the results from each step of the unit test. Unit test results should include:
  - Requirements tested
  - Expected results (from the UTP)
  - Actual results
  - Demonstration that code functionality is verified, or an analysis of any shortcomings
  - Demonstration that requirements are satisfied, or an analysis of any shortcomings
- Confirm that the CTD and UTR consistently and satisfactorily demonstrate that the results from each step of the unit test verify that the code functions as designed.
- Confirm that the CTD and UTR consistently and satisfactorily demonstrate that the results from each step of the unit test verify that each code unit meets all requirements allocated to its components, as documented in the RAD.
- Confirm that the unit test results meets the success criteria stated in the UTP.

- **Section 4.3: <Unit 2> Unit Test Results**

- Typically, a product processing system will include more than one unit. The number of units included in this project's system is identified in Section 3 of the CTD and the UTP.
- Section 4.2 of the CTD addressed a single software unit. If there are multiple units, each individual unit should be addressed in its own Section 4 subsection. In that case, Section 4.3 of the CTD would repeat the Section 4.2 format with material appropriate for the second unit, Section 4.3 would repeat the Section 4.2 format with material appropriate for the third unit, etc.

## 4.2.5 Section 5 – System Test Plan

The CTD shall include a System Test Plan Section. The purpose of this section is to demonstrate that the system test will test whether the requirements specified for the product processing system are satisfied by the completed system and whether the final developed system will satisfy the needs and expectations of the users and operators. Most of the content for this section should be obtained directly from the STP. This section should be organized as follows:

### 5.0 SYSTEM TEST PLAN

- 5.1 System Test Overview
- 5.2 System Readiness for Users
- 5.3 System Readiness for Operations and Maintenance
- 5.4 System Test Items
- 5.5 Requirements Trace
- 5.6 System Test Data
- 5.7 System Test Environment
- 5.8 System Test Configuration
- 5.9 System Test Methods
- 5.10 System Test Sequence
- 5.11 System Test Risks

- **Section 5.1: System Test Overview**

- This section should explain the purpose of the system test, the system test plan, and the CTR review of the STP
- Confirm that the CTD explains the concepts of verification and validation.
- Confirm that the CTD provides an overview of the VVP and a pointer to the project VVP.
- Confirm that the CTD provides an overview of the STP and a pointer to the project STP.

- **Section 5.2: System Readiness for Users**

- This section should describe the plan for testing the system's ability to satisfy the customer/user needs and expectations.
- Confirm that the CTD lists the product users and the product components to be delivered to each user, consistent with the VVP.
- Confirm that the CTD states the identified needs of each user, including product-related needs, consistent with the VVP. User needs typically include:
  - Product components – data formats
  - Product component quality and latency
  - Tools and training for the use of products
  - Delivery and notification procedures
  - Support services
  - Documentation
- Confirm that the CTD and STP explain how the system test will validate each user need, including product-related needs.

- **Section 5.3: System Readiness for Operations and Maintenance**

- This section should describe the plan for testing the system's ability to satisfy the operations and maintenance needs and expectations.
- Confirm that the CTD identifies the organization and personnel that will operate and maintain the operational product processing system.
- Confirm that the CTD states the identified operator needs, consistent with the VVP. Operator needs typically include:
  - Procedures for normal operations
  - Procedures for special operations
  - Maintenance procedures
  - Monitoring and diagnostic procedures
  - Security procedures
  - Tools and training for operations and maintenance
  - Delivery and notification procedures
  - Configuration management
  - Documentation
- Confirm that the CTD and STP explain how the system test will validate each operator need.

- **Section 5.4: System Test Items**
  - This section should list all system components and product components that have been selected for the system test, Confirm that the CTD lists these components, consistent with the STP.
  
- **Section 5.5: Requirements Trace**
  - Confirm that the CTD and STP list the requirements allocated to each system test item that is listed in the STP and in Section 5.4 of the CTD, consistent with the RAD.
  
- **Section 5.6: System Test Data**
  - This section should list all data files that will be used as input files for the system test. "Test data" includes sensor data (real, proxy, or simulated), ancillary data, control files, parameter files, and look up tables.
  - System test data also includes all "truth" data sets that will be used to assess system performance. Truth data can be obtained from real observations of appropriate environmental parameters for a test scene consisting of real or proxy sensor data, or it can be constructed by simulations of appropriate environmental parameters associated with simulated sensor data (e.g. forward modeling). Confirm that the CTD and STP consistently list all "truth" data sets that will be used in the system test.
  - The CTD and STP should explain how each real or proxy truth data set has been obtained and how each simulated truth data set has been constructed. Confirm that the "truth" data sets have been satisfactorily obtained or constructed.
  
- **Section 5.7: System Test Environment**
  - This section should describe the environment in which the system test will be performed, consistent with the STP, and demonstrate that the planned test environment complies with the project's test environment requirements, as documented in the RAD.
  
- **Section 5.8: System Test Configuration**
  - Confirm that the CTD and STP identify all configuration items that will be used in the system test, including code modules, test data sets, utilities, and libraries.

- Confirm that each item in the test configuration has been placed in the project baseline under configuration control, as documented in the PBR.
- **Section 5.9: System Test Methods**
  - This section should describe the method or methods that will be used to test each test item. Confirm that the methods selected for verification of each system test item will address the requirements to be verified for that item, as documented in the VVP.
- **Section 5.10: System Test Sequence**
  - This section should describe the planned sequence of test actions in sufficient detail that a reviewer can confirm that all test items are exercised, all test data is utilized, and all planned test methods are used as planned. This description should be consistent with the STP. Confirm that the planned sequence of test actions is sufficient to determine whether all relevant requirements are satisfied.
- **Section 5.11: System Test Risks**

Confirm that the CTD and STP consistently identify and evaluate all risks to successful implementation of the system test plan.

#### 4.2.6 Section 6 – Risks and Actions

The TRD shall include a Risks and Actions section. The purpose of this section is to provide an updated description of the status of identified project risks and associated actions for reviewer assessment and concurrence.

This section should be organized as follows:

- 6.0 RISKS AND ACTIONS
  - 6.1 TRR Risks and Actions
  - 6.2 New Risks and Actions
  - 6.3 Risk Summary

- **Section 6.1: TRR Risks and Actions**

- The status of project risks and associated actions at TRR should have been reported in the TRRR. The CTD should provide an updated assessment of the TRR risks and actions.
- Confirm that the CTD correctly reports, in sufficient detail, the status of each risk identified in the TRRR. Each risk should be reported as follows:
  - Risk Statement – the description of the risk
  - Assessment – the results from analysis of the risk. The assessment should include quantitative evaluation of Severity and Likelihood of Occurrence
  - Mitigation – the plan to mitigate the risk
  - Actions – actions to implement the mitigation plan
- Confirm that the CTD correctly reports, in sufficient detail, the status of all actions identified in the TRRR with sufficient detail to allow the CTR reviewers to assess the current status of the TRR risks and actions. Each action should be reported as follows:
  - Action statement
  - Closure Criteria
  - Closure Plan
  - Status – status of the action, with respect to the closure plan

- **Section 6.2: New Risks and Actions**

- Confirm that the CTD reports the status of each risk that has been identified since TRR in sufficient detail for the reviewers to be able to assess the development team's recommended actions to mitigate the risks. Each new risk should be described in the CTD as follows:
  - Risk Statement – the description of the risk
  - Assessment – the results from analysis of the risk. The assessment should include evaluation (e.g. High, Medium, Low)
  - Mitigation – the plan to mitigate the risk
  - Actions – list of actions to implement the mitigation plan

- Confirm that the CTD correctly reports, in sufficient detail, the status of all new actions with sufficient detail to allow the CTR reviewers to assess the current status of new risks and actions. Each action should be reported as follows:
  - Action statement
  - Closure Criteria
  - Closure Plan
  - Status – status of the action, with respect to the closure plan
- **Section 6.3: Risk Summary**
  - Confirm that the CTD provides a list of risks that can be closed.
  - Confirm that the CTD provides a list of risks that remain open, in priority order (HIGH, then MEDIUM, then LOW).
  - Confirm that the CTD lists all actions that must be closed to reduce outstanding risk to an acceptable level, with closure plans and estimated closure dates.
  - The CTR reviewers' assessment of outstanding risks and actions should be documented in the CTR Report.

#### **4.2.7 Section 7 – Summary and Conclusions**

The CTD shall include a Summary and Conclusions Section. This section is organized as follows:

#### **7.0 SUMMARY AND CONCLUSIONS**

- 7.1 Review Objectives Status
- 7.2 Issues, Actions and Risks
- 7.3 Next Steps
- 7.4 Open Discussion

- **Section 7.1: Review Objectives Status**

- Confirm that all review objectives have been addressed by the CTD. Look for notable conclusions from each CTD section to be summarized here.

- **Section 7.2: Issues, Actions and Risks**
  - Confirm that the CTD lists all outstanding issues, actions and risks that require attention. Look for notable conclusions from each issue, action and risk to be summarized here.
  
- **Section 7.3: Next Steps**
  - Confirm that the CTD lists the recommendations of the development team for the next steps after the CTR, including preparation for the SRR.
  
- **Section 7.4: Open Discussion**
  - The CTD states here that the review is open for free discussion. Note: If the development team has prepared for and conducted the review in accordance with standards and if the reviewers have prepared for the review in accordance with standards, there should be no need for additional discussion.

## 5. CLOSING THE REVIEW

### 5.1. Exit Criteria

The CTR reviewers should ensure that all CTR exit criteria have been met before closing the review. The CTR exit criteria should have been established at the TRR and documented in the TRRR. Note that exit criteria may be tailored from the standard STAR EPL set of CTR exit criteria. In that case, the TRRR should provide a rationale for deviations from the standard set. The standard STAR EPL set of CTR exit criteria, listed in the standard CTR check list (CL-10), includes the following 14 items:

- Exit # 1 - TRR "Conditional Pass" items have been satisfactorily disposed of.
- Exit # 2 - TRR "Defer" items have been satisfactorily disposed of.
- Exit # 3 – Changes to the project plan since TRR are approved.
- Exit # 4 - Requirements allocation changes since TRR are approved.
- Exit # 5 - Changes to external interfaces since TRR are approved.
- Exit # 6 - Changes to the software architecture since TRR are approved.
- Exit # 7 - Changes to the detailed design since TRR are approved.
- Exit # 8 - Changes to the verification and validation plan since TRR are approved.
- Exit # 9 – Code units and unit test data are satisfactory
- Exit # 10 – Unit test results and UTR are satisfactory
- Exit # 11 - The system test plan and STP are satisfactory
- Exit # 12 - The project baseline and PBR are satisfactory.
- Exit # 13 - The CTRR documents updated status of project risks and actions.
- Exit # 14 - Project risks and actions are acceptable. The project is ready for system integration and system testing.

The interpretation of the terms “satisfactory” and “acceptable” in the exit criteria is subjective. That is, an item is “satisfactory” or “acceptable” if the reviewers find it satisfactory or acceptable to them. The reviewers are encouraged to refer to the set of relevant process assets (c.f. Section 3.4 of this PRG) to assist them in determining what their criteria for “satisfactory” and “acceptable” should be.

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Note that several exit criteria pertain to changes in requirements, design, and verification plan since the TRR. These are necessary to ensure project control. Prior to the Build phase of the STAR EPL, these changes are expected and customary. Therefore, previous Technical Reviews (Project Requirements Review (PRR), Preliminary Design Review (PDR), and CDR) are expected to review planned updates to the project artifacts that document these changes. After CDR, changes to requirements, design, and verification plan are not expected and customary. Therefore, there are no planned updates to these project artifacts (RAD, SWA, DDD, and VVP). To ensure project control of these changes, it is necessary to include approval of these changes as explicit CTR exit criteria. If there are no changes that apply to a given exit criteria CLI, the CTR reviewers can dispose of the CLI with a "N/A" designation.

Note also that exit criteria item # 13 applies to the CTRR. This document (c.f. Section 5.3 of this PRG) is the responsibility of the CTR reviewers. The CTR is not properly closed until a CTRR has been written that satisfies exit criteria item # 13.

## 5.2. CTR Check List

The CTR check list is an essential item that must be completed to close the review. It contains the CLIs that must be checked off by the CTR reviewers. Checking off a CLI involves recording one of the following dispositions for each item:

- Pass – The item is approved.
- Conditional Pass – The item is approved conditionally. The condition or conditions typically involve one or more specific actions that must be closed to pass the item. If there are a sufficient number of Conditional Pass items, the CTR reviewers may require a delta CTR to approve the closure of these actions.
- Defer – The item is deferred for consideration at a later review (e.g. SRR), often with recommended actions to be addressed prior to that review.
- Waive – The item has been excused for this project's lifecycle. It is expected that a rationale for waiving an item be provided in the CTRR.
- Not Applicable (N/A) – The item is not applicable to this project's lifecycle. This disposition will only occur if the item was mistakenly included in the project's CTR check list or if the item refers to potential changes that do not occur. The distinction between this disposition and the "Waive" disposition is that "Waive" items are applicable to the project's lifecycle, though they have been excused for some reason.

In addition, the check list includes the following Columns to be filled in for each CLI:

- Risk – A risk evaluation pertaining to the item (e.g. Red/Yellow/Green/Blue or High/Medium/Low/None). An item with a risk evaluation of Medium or worse should generate at least one action. Low risk items may also generate actions, at the discretion of the reviewers.
- Actions (Y/N) – Note (Yes or No) whether there are open actions pertaining to this item.
- Comments – Include any explanatory comments (e.g. rationales for the designation of the item, rationales for the risk evaluation, description of open actions, identification of the review that should address the actions).

The CTR reviewers can use the standard check list provided in the CTR Check List spreadsheet (STAR EPL process asset CL-10) to record their disposition of the CLIs, if the check list for this project's CTR has not been modified. If there has been a modification, the CTR reviewers should use a modified spreadsheet that includes the CTR CLIs that have been agreed to. The CTR CLIs that have been approved for a specific project should be included in the project plan (DPP). Any modifications to the check list must be approved by project management and should be documented in a DPP revision and in the TRRR.

Typically, each member of the review team is assigned a subset of the check list to check off, and some items may be assigned to more than one review team member. The Review Lead is responsible for collecting the finished check lists from each review team member, resolving conflicts between team members, and producing a unified check list with all items checked off. The CTRR (c.f. Section 5.3 of this PRG) typically includes a copy of this unified CTR check list.

### 5.3. CTR Report

The CTRR is the one project artifact that is the responsibility of the CTR review team. Responsibilities for writing parts of the CTRR should be assigned to review team members by the Review Lead. These should be agreed upon well in advance of the review, during review preparation meetings.

Standards and guidelines for the CTRR can be found in STAR EPL process asset DG-10.4 (Code Test Review Report Guidelines). The CTR review team should follow the standards and guidelines in DG-10.4, unless there are tailored standards and guidelines specific to

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this project. In that case, the DPP should either note the tailored standards and guidelines or should provide a reference to a document where these are noted.

The CTRR should be updated to record the closing of “Conditional Pass” and “Defer” items after the CTR. CTRR updates should include a change history. Details can be found in DG-10.4.

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END OF DOCUMENT