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Verification and Validation of Computer Programs



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Verification and Validation of Computer Programs

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Verification and Validation of Computer Programs

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Verification and Validation of Computer Programs

1.0 PURPOSE

The purpose of this document is to ensure that a computer program meets requirements and specifications and that it fulfills its intended purpose and gives the intended results. It defines the methods for verifying, validating, documenting, and controlling of computer programs used by Engineering, Architecture or other departments for performing calculations and analyses. Such computer programs will be named Controlled Computer Programs (CCPs).

2.0 SCOPE

This procedure applies to Commercial Off-the-Shelf (COTS) computer programs, non-commercial (public domain) software, and computer programs developed internally or external for the Entity, A/E or 3rd party consultant performing calculations or analyses. Each organization is responsible for performing their own V&V however, the project Entity Quality Assurance representative shall verify that the A/E or other consultants have verified and validated their calculation and analysis software programs including their existing CCP software. The A/E project Quality Assurance representative shall ensure that their contractors and consultants have verified and validated their software.

Other computer programs used by the Entity will not be subject to this procedure but will still need to be verified and validated according to requirements determined by the Entity or the A/E's or consultant's internal process. It is preferred that commercial off-the-shelf (COTS) computer programs are used on Entity projects.

3.0 ACRONYMS AND DEFINITIONS

Definitions	Description
A/E	Architectural/Engineering Contractor
CCP	Controlled Computer Program
CE	Chief Engineer
COTS	Commercial Off-the-Shelf
CCP	Controlled Computer Program
CCPEI	Controlled Computer Program Error Identification
CCPEN	Controlled Computer Program Error Notification
DMD	Document Management Department
ECMS	Electronic Content Management System
ICT	Information and Communications Technology
IEEE	Institute of Electrical and Electronics Engineers
Non-COTS	Non-Commercial Off-the-Shelf
QA	Quality Assurance
Validation	The testing performed by the end user to ensure that an installation of the application is functioning as intended
Verification	The process of providing objective evidence that the software conforms to requirements (e.g., for correctness, completeness, consistency, accuracy). This is the formal testing of the software to ensure that the software meets the program requirements.

4.0 REFERENCES

Reference	Description
EPM-KE0-RG-000009	List of Commonly Used Design and Engineering Software
EPM-DP0-RG-000002	Industry available Project Management Tools Listing



5.0 RESPONSIBILITIES

5.1 Program Principals

Each Controlled Computer Program (CCP) shall have individuals assigned to ensure compliance with this procedure, these Principals will perform the following roles: Program Sponsor, Technical Specialist, and Program Maintainer/Documentation Preparer. As determined by the Program Sponsor, individuals may function in multiple Program Principal roles.

By their review of this procedure, CCP Principals shall be considered to have fulfilled the requirement for a general indoctrination into the quality program. Refer to Attachment 1, Quality Program Indoctrination for CCP Principals, for the required quality program indoctrination.

Each Program Principal is responsible for ensuring that his/her training records are maintained, current, and are available upon request.

5.1.1 The Program Sponsor:

- Designates whether or not the program is a CCP covered by this procedure.
- Ensures that program activities, including development, verification, validation, and control, conform to this procedure.
- Approves the original and each modification of the program and its documentation.
- Selects or approves the selection of the Technical Specialist, the Program Maintainer, and any Entity or A/E (as applicable) designees used to verify the program and prepare the related documentation.
- Assigns release (version) numbers to CCPs and computer program changes in accordance with Attachment 2, Controlled Computer Program Control Form Template.
- Submits documentation records, including computer codes and all required forms, to the Entity Document Management Department (DMD) where all documents will be stored in the Electronic Content Management System (ECMS).
- Approves the set of test problems/calculations to be used during program verification and validation.

5.1.2 Technical Specialist

The Technical Specialist, appointed by the Program Sponsor, is responsible for the technical integrity of the program.

The Technical Specialist:

- Proposes the set of test problems to be used during program verification and validation.
- Verifies the theoretical basis and the accuracy of results for the intended use of the program.
- Ensures adequacy and completeness of testing, verification, documentation, operational validation test problem(s), and incorporation of self-testing features, as appropriate.
- Defines and documents the program capabilities and limitations.

5.1.3 Program Maintainer/Documentation Preparer

The Program Maintainer/Documentation Preparer acts under the direction of the Program Sponsor and the Technical Specialist.

The Program Maintainer/Documentation Preparer:

- Makes changes to the program.
- Prepares program documentation.

5.1.4 Engineering Director

- Recommend to the Program Sponsor whether a program should be required to be verified and validated.
- Ensure that all CCPs have a Program Sponsor. If the Program Sponsor identified on Program Control Form is no longer in that role, a new Program Sponsor must be identified or the Engineering Director must archive/deactivate the CCP.
- Ensure that discipline personnel are made aware (via local Engineering Managers) of any limitations on the use of a particular CCP.



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- Issue a list or other Entity document containing a list of all CCPs approved for use in their respective offices within the Entity or A/E's offices. The document should include the following information:
 - Program name
 - Program ID
 - Version number
 - Operating system(s) approved for use (e.g., MS-DOS, Windows XP, Windows 7, Windows 10)
 - Computer(s) approved for use (e.g., Microsoft Windows compatible)
 - Remarks (as appropriate)

5.1.5 Engineering Manager (local)

- Designate the personnel associated with their office who should receive copies of CCP documentation and provide current distribution information to the Document Management Department (DMD).
- Ensure that discipline personnel receive appropriate guidance and training for the CCP. The training records should be stored in the ECMS.

5.1.6 Information & Communication Technology (ICT)

The ICT organization provides the following services:

- Maintenance of master and record copies of each software revision of the CCP controlled by the Entity or A/E (as applicable).
- Certification of the computer operating systems used by the Entity and under the direct control of ICT.
- Storage of the controlled versions' software for the CCP and control of distribution of software to the end users.
- Maintenance of a CCP Index and the list of those who have been sent or received a given CCP.
- Maintenance of a list of Program Principals and periodic (typically annual) verification that the individual listed in a particular role is still performing the tasks required by that position. If there is no active Program Sponsor, ICT shall notify Management of the discipline department that its CCP is not in compliance with this procedure and that a new Program Sponsor must be identified immediately or the program deactivated.

5.1.7 Entity Project Automation or BIM Manager

- Acts as the focal point for a project regarding the V&V of the CCP software and shall keep a list of CCP software used and in compliance with this procedure.
- Is the point of contact for all external project participants such as the A/E, ~~and~~ consultants and contractors and liaises with the Quality Assurance Manager to monitor compliance.

5.1.8 A/E or Consultant Automation representative

- Acts as the focal point for a project regarding the V&V of the CCP software and shall keep a list of CCP software used and in compliance with this procedure.

5.1.9 Project Quality Manager (Entity)

- The Entity's assigned Project Quality Manager or designee shall be responsible for monitoring and enforcing compliance to this procedure on a project.

5.2 Program Users

The User shall understand the program's methodology, operations, and limitations. The User is responsible for identifying errors and submitting a Controlled Computer Program Error Identification (CCPEI) Form if any errors are identified while using a CCP program.



6.0 PROCESS

6.1 Labeling a Controlled Computer Program (CCP)

A CCP may be developed or purchased and controlled by the Entity or A/E as described in this procedure. A CCP may be identified with a discipline code and number, e.g., ME101, or with a name and a discipline code and number, e.g., STAADpro–S001, etc.

6.2 Performing Calculations

Once the formal verification and validation process as outlined in this procedure has been performed, the CCP may be used in calculations without additional verification. However, validation at run-time must be performed. The validation test should be run in the local office computer environment prior to being deployed out into the wider office. Validation will also be required before every use of the CCP, see section 6.6.3.

6.3 Software Development (non-COTS)

For non-commercial-off-the-shelf software (non-COTS), new CCPs and major enhancements of existing CCPs shall comply with this section. The decision to create or enhance a CCP is based on factors such as the frequency of the need for project or staff personnel to perform specific types of analyses and the cost of achieving the CCP status versus the cost of individual detailed checking of each calculation using the associated software.

6.3.1 Software Needs Assessment

Performance objectives for new software are established at the direction of the Engineering Manager; the degree to which these objectives are achieved is reviewed with the Program Sponsor. If the Program Sponsor believes that the achieved performance will provide a cost benefit to the design process, the software may be approved for verification and validation.

The requirements that the CCP, or program enhancement, must meet are documented in the User's Guide and/or the Theoretical Manual. These requirements include, as appropriate, a definition of the software's response to anticipated classes of input data and, in general, provide the software's design basis.

6.3.2 Software Design

Software design shall include the generation of a software test plan, test procedures that include test cases, and a review of the software design to ensure that the software requirements are addressed. IEEE Standard 1012-2012, IEEE Standard for Software Verification and Validation, defines verification and validation processes for software.

6.4 Verification

Software shall be tested to verify that the program produces correct results for the test case(s). The program may be verified by comparing the results of the test case(s) with other benchmark solutions for the features and options tested over the range of the documented program applications. Good engineering judgment must be exercised when selecting benchmark solutions.

Examples of acceptable benchmark solutions are comparisons with:

- Hand calculations
- Comparable industry-recognized programs documented with revision and issue date
- Other Entity Computer Programs that provide comparable functionality
- Published and current experimental or operational data
- Applicable empirical data and information from technical literature

If a CCP imports data from another program, the correct transfer of the data shall be verified and documented in the Verification Report.

6.5 Validation

The program will be tested to validate that the software and hardware work together properly to produce acceptable results. This is done by the user immediately before the software is run on the computer to do the calculation or analysis.



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6.6 Documentation

6.6.1 General Requirements

The minimum documentation required for a CCP is a User's Guide, Theoretical Manual, and Verification Report. The validation test problem(s) and solution(s) shall be packaged together as part of the documentation. It may be placed in the User's Guide (recommended if a manual test) or in the Verification Report (recommended if an automatic test). These items may be combined into a single document or issued separately. Separate documents shall each have:

- A title page (see Attachment 2, Controlled Computer Program Control Form Template, for a typical example)
- A record of revisions control sheet (see Attachment 3, Controlled Computer Program Record of Revisions Template, for a typical example)

ISO/IEC/IEEE International Standard 24765-2010, Systems and Software Engineering— Vocabulary, is an industry standard that may be used when writing computer program documentation. However, the terms verification and validation shall be used as defined in this Procedure.

6.6.2 User's Guide

The User's Guide shall include the information necessary to allow users to operate the program effectively and shall:

- Describe program capabilities, assumptions, and limitations
- Outline interfaces with other programs and data files, input preparation, and output reports (including an example or description of the output format)
- Identify the computer(s), operating system(s), and associated programs necessary to operate the CCP and interpret output, as appropriate.

6.6.3 Theoretical Manual

The Theoretical Manual shall present the theoretical basis for the program. It shall contain:

- A detailed description of the mathematical model
- Assumptions that form the basis of the program
- Algorithms used to calculate program results
- References to standards and technical references used to develop the program

For programs that perform code checks (e.g., compare calculation results to established acceptance criteria such as national building codes, national manufacturers' codes, or other controlling codes and standards) or reformat/manipulate data in existing data bases, the Theoretical Manual shall present the logic and references to support the validity of the program operation.

6.6.4 Verification Report

The Verification Report shall provide evidence of program verification and describe the verification methods used to substantiate the program capabilities and applications. The Verification Report shall contain, when applicable:

- A listing of program capabilities (features and options) verified and the methods used to accomplish this
- Description of test samples, including boundary conditions, mathematical model(s), and key parameters
- List of test sample input data and reprint of program input and output, or reference to location where this is stored
- Results from comparison of solutions, citing references used
- Comparison of solutions, program validity evaluations, and deviation analyses. Deviation analyses shall consist of calculating deviations between compared solutions and evaluating their significance.
- Identification of the type of computer(s) (e.g., Microsoft Windows compatible) used in verification and approved for use with the CCP
- Identification of the computer operating system(s) (e.g., MS-DOS, Windows XP, Windows 7, Windows 10) used in verification and approved for use with the CCP.



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6.6.5 Document Review

Each CCP document shall receive an independent review for completeness and correctness by an individual, selected by the Program Sponsor, who has the qualifications to have originated the document. A Program Principal may review any portion of the document not prepared by that individual. The Technical Specialist may sign as the preparer or the reviewer, but not both.

6.6.6 Documentation Revisions

Whenever a CCP is revised, the documentation shall be reviewed for completeness and correctness and revised as necessary. As a minimum, when the program code is revised, the Verification Report shall be revised to indicate that the revised code has been verified. Revisions to CCP documentation shall be reviewed and approved in the same manner as the original issue. Documentation revisions shall be recorded using Attachment 3, Controlled Computer Program Record of Revisions Template.

6.6.7 Authenticating Signatures

The title pages for the User's Guide, Theoretical Manual, and Verification Report shall be signed by the preparer of the document, the reviewer, design verifier (as applicable), and the Technical Specialist and approved and signed by the Program Sponsor. Authenticating signatures shall be obtained for each documentation revision (not mandatory for COTS provided documentation).

6.6.8 Documentation Control

6.6.8.1 Controlled Computer Program Control Form

The Program Control Form (see Attachment 2 for example template) shall be used to document initial issue and program changes (versions/releases), associated revisions to CCP documentation, and changes of Program Principals. The form complements the User's Guide documentation.

6.6.8.2 Record Retention

The Program Sponsor shall store the verification and validation tests and documented evidence in the Entity ECMS. The Entity Document Management Department (DMD) is responsible for retention of these documents.

6.6.8.3 Proprietary Documents

The Program Sponsor is responsible for notifying the DMD of the location of Manuals and Verification Reports on the Program Control Form.

6.6.8.4 Distribution

Controlled copies of CCP software and associated documentation shall be obtained from the Entity DMD. Users are responsible for ensuring that only current, controlled copies of the documentation is used.

6.6.8.5 User Responsibilities

CCP users are responsible for the configuration of CCP documentation assigned to them, specifically:

- Ensuring only the most current documentation is used, including the latest revision of the Program control form
- All issued error notices are appropriately considered
- Delete or discard CCP-related materials and notify the DMD when no longer needed

6.7 **Program Control**

6.7.1 Production Version

Only the most current release of a CCP is normally maintained in production status. However, previous releases may be used, with recognition of applicable error notices, when deemed appropriate by the Program Sponsor. Previous releases not in use shall be archived and accessed only with authorization of the Program Sponsor.

Prior to authorizing the use of an archived CCP or a previous version, the Program Sponsor shall determine whether outstanding errors are on record against the CCP. The Program Sponsor shall determine if and how such programs should be used.



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6.7.2 Program Change Control

Changes to a CCP shall be entered into production only after testing, verification, documentation of changes, and review and approval in accordance with this procedure. If the program is modified, verification shall be repeated to determine the effects on existing capabilities, and additional test cases shall be developed to substantiate new capabilities. The Program Sponsor shall document approval of program changes on the Program Control Form.

6.7.3 Host Computer Validation

To demonstrate program integrity, each CCP shall have a method for being validated on the host computer(s) at run-time by the end user. The preferred validation method is for the CCP to have an automated (i.e., built-in) test that automatically runs each time the CCP is started. This test should use known input and validate the results against known output. The test shall provide a means, such as a pass/fail response, for the user to determine whether or not the CCP has passed the validation test.

Runtime validation is not required for CCPs that require significantly long run times. Instead, a method shall be developed by the Engineering Director to ensure that validation is performed after a long period without use of the software. This operational validation is not a verification of the program; it is a process to validate that the CCP installation, software/hardware interaction, and operating system function as intended.

6.7.4 Operating System Verification

A CCP shall be verified for at least one of the operating systems within each operating system family that it will be running on. Examples of the operating families include:

- Any individual operating system not grouped below
- Any version of MS-DOS
- Windows 95, Windows 98
- Windows 2000, Windows NT, Windows XP
- Windows Vista
- Windows 7, Windows 2003 server, Windows 2008 server
- Windows 10, Windows 2012 server

A CCP verified for one operating system is valid for use on any other operating system within the same family (as listed above) even if each operating system is not individually mentioned on the Program Control Form.

The Program Sponsor shall forward the verification documentation (including the Program Control Form) to the DMD. Documentary evidence of test problem inputs and results shall be retained by the DMD.

6.7.5 Permanent CCP Classification

Once a program version has been declared to be a CCP and is released into production, it should retain CCP classification permanently. Termination of CCP status requires the approval of the Engineering Manager in the Entity. The Program Sponsor shall notify program users of the change in classification by issuing a revised Program Control Form. Subsequent versions of the program will need to comply with this procedure to maintain their status as a CCP.

6.8 Commercial-Off-the-Shelf (COTS) Computer Programs

COTS shall be procured in accordance with the Entity's software procurement policy.

The following requirements apply to COTS programs:

- For each COT program, a Program Control Form shall be completed and signed by the Program Sponsor and the Technical Specialist confirming that the program meets the requirements of this procedure.
- The Program Sponsor shall endeavor to obtain a full Verification Report from the program supplier. If a full verification report isn't available then a Verification Summary Report would be acceptable if it includes as a minimum:
 - A list of those features and options that are verified
 - A cross-reference that relates verified options and test sample identification number(s)
 - A brief description of the verification test problems
 - A summary of comparison results



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If the COTS program supplier does not provide a Verification Report that meets the requirements of this procedure, then the Program Sponsor must produce a Verification Report in accordance with the requirements of this procedure.

6.9 Error Identification and Notification

This procedure addresses errors in documentation, theory, program functions, and program coding. The identification and notification of errors and corrective actions resulting from malfunctions in computer hardware or systems software (i.e., the operating system and communications systems) is outside the scope of this procedure. Contracts with suppliers of COTS shall contain requirements that comply with this procedure.

6.9.1 Classification of Program Error Severity

Errors shall be classified as follows to indicate the degree of severity:

- Class One: Program errors that have no effect on the validity of results for engineering calculations.
- Class Two: Program errors that allow a program to execute but give numbers that are obviously meaningless or conspicuously detectable (e.g., absurd results).
- Class Three: Program errors that produce wrong results that could be interpreted as valid results.

When it is questionable whether an error should be classified as Class Two or Class Three, the error shall be classified by the Program Sponsor as Class Three.

6.9.2 Error Identification

The Program Sponsor is responsible for the overall direction of the CCP activities. CCP users have the responsibility to immediately notify the Program Sponsor and Engineering Director of each program error detected. The content of Attachment 4, Controlled Computer Program Error Identification (CCPIE) Form Template, is to be used to provide such notification. Personnel identifying errors shall provide sufficient information regarding the nature of the error to allow the Program Sponsor to effectively record and address the issue.

Program Sponsors shall immediately prepare Controlled Computer Program Error Notification (CCPEN) forms (see Attachment 5) for Class Two and Class Three errors and transmit the error notification forms to the DMD for distribution. The Program Sponsor shall obtain sufficient information from COTS Program suppliers or Entity Users to provide the required information on the error notification form. Preparation and distribution of Class One error notification forms shall be at the discretion of the Program Sponsor. The Program Sponsor shall determine whether to retain a program in operation or remove it from service when an error is reported. Error avoidance, if feasible, shall be described in the error notification form. When a Class Two or Class Three error is not readily avoidable, the program must be removed from service until the error is corrected.

6.9.3 Error Notification

6.9.3.1 Classification of Program Error Severity

Errors shall be classified as follows to indicate the degree of severity:

Class One: Program errors that have no effect on the validity of results for engineering calculations

Class Two: Program errors that allow a program to execute but give numbers that are obviously meaningless or conspicuously detectable (e.g., absurd results)

Class Three: Program errors that produce wrong results that could be interpreted as valid results

When it is questionable whether an error should be classified as Class Two or Class Three, the error shall be classified by the Program Sponsor as Class Three.

6.9.3.2 Error Analysis

Program Sponsors are responsible for analyzing errors in CCPs and categorizing these errors into one of the three error classes.

COTS Program Sponsors shall obtain sufficient information on program errors reported by the program supplier or Bechtel user to categorize these errors into one of the three error classes.



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6.9.3.3 Error Notification

Program Sponsors shall immediately prepare the CCPEN (Attachment 5) forms for Class Two and Class Three errors and transmit the error notification forms to the DMD for distribution. The Program Sponsor shall obtain sufficient information from COTS Program suppliers or Entity Users to provide the required information on the error notification form. Preparation and distribution of Class One error notification forms shall be at the discretion of the Program Sponsor.

The Program Sponsor shall determine whether to retain a program in operation or remove it from service when an error is reported. Error avoidance, if feasible, shall be described in the error notification form. When a Class Two or Class Three error is not readily avoidable, the program must be removed from service until the error is corrected.

6.9.3.4 Corrective Action

Error correction shall be noted on the Program Control Form and transmitted to Users via the DMD. Class One errors may be corrected at the discretion of the Program Sponsor.

If the Program Sponsor of a program containing readily avoidable Class Two or Class Three errors wishes to permit continued (long-term) use of the program without correction, instructions for error avoidance and remediation action shall be documented on the Computer Program Error Notification form and transmitted to Users via the DMD.

If a program containing an outstanding Class Two or Class Three error is to be removed from service without correcting the error, the sponsoring organization's Engineering Director concurrence shall be obtained on the Program Control Form.

6.9.3.5 User Responsibility

Users shall promptly acknowledge the receipt of CCPEN forms, and program corrections received via the Program Control Form. The User is responsible for notifying other users assisting him of all error notifications. Upon notification of an error, Users shall appropriately consider the effect of the reported program errors on calculations in process and on future calculations. If Users do not understand the reported error, they shall obtain necessary clarification of the error from the Program Principals (Program Sponsor, Technical Specialist, or Program Maintainer) as appropriate.

6.9.3.6 Engineering Manager Responsibilities

Upon receipt of the Computer Program Error Identification Notification (Attachment 5), the Engineering Manager shall ensure that the issue is analyzed and if the determination is to perform a detailed evaluation, the Engineering Manager will promptly notify the Engineering Director who in turn will notify the engineering managers in the Entities offices that may be using the same software.

Upon receipt of a Class Two or Class Three CCPEN form, the responsible Engineering Manager shall determine the potential impact of the error. This determination shall include the impact on active projects, inactive projects, closed projects (where appropriate), and other individuals or groups assigned to use the CCP by the Engineering Manager who may have used the CCP in project design.

6.9.3.7 Engineering Director Responsibilities

The Engineering Director will notify the engineering managers in the Entities offices and also notify other Entities that may be using the same software.

7.0 ATTACHMENTS

1. Quality Program Indoctrination for CCP Principals
2. EPM-KE0-TP-000033 - Program Control Form Template
3. EPM-KE0-TP-000034 - Record of Revisions Template
4. EPM-KE0-TP-000035 - Controlled Computer Program Error Identification (CCPEI) Form Template
5. EPM-KE0-TP-000036 - Controlled Computer Program Error Notification (CCPEN) Form Template



Attachment 1: Quality Program Indoctrination for CCP Principals

CCP Principals perform quality-affecting work that uses their computer program(s). To meet quality program requirements, CCP Principals must meet their responsibilities to the Entity as a whole.

Quality Assurance

Quality Assurance is a term associated with the concept based upon determining how to achieve adequate confidence that an item will perform satisfactorily in service.

A formal QA program is an organizational structure or system whose purpose is to attain and verify the desired level of quality. Such a program provides confidence to management that the quality requirement will be fulfilled. In simple terms, a QA program ensures that:

- Procedures are in place designed to meet program requirements
- All quality-affecting work is controlled in accordance with those procedures
- There is a systematic way to verify and document that the work meets the established quality standards

Audits and surveillances are performed to verify the implementation of the quality program and evaluate its effectiveness. Entity personnel conduct internal audits of Entity activities as well as external audits of suppliers and contractors. Surveillances generally do not involve verifying system effectiveness, but rather verifying implementation of specific procedures or an activity. CCP Principals are subject to audits and surveillances pertaining to the performance of their computer program-related duties and responsibilities.

Summary

CCP Principals satisfy QA program requirements by reading this appendix and performing their CCP-related duties in accordance with this procedure.



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Attachment 2: EPM-KE0-TP-000033 - Controlled Computer Program Control Form Template

Program No:		Revision Date:		Page 1		
ACTIVITY TYPE:		NARRATIVE DESCRIPTION OF ACTIVITIES (IF ABSTRACT IS BEING CHANGED USE SUBSEQUENT PAGE)				
INITIAL RELEASE SUBSEQUENT RELEASE TEST CASE(S) SUBMISSION DOCUMENTATION REVISION CONTROL FORM UPDATE PRINCIPAL CHANGE(S) DEACTIVATION						
PLATFORM, PROGRAM RELEASE, SPECIFIC APPROVED DOCUMENTATION, AND LANGUAGES		NEW DATA (ENTER 'SAME' IF NO CHANGE TO THE LINE ITEM)				
Computer: _____ Operating system: _____ Release: _____ Approved Documentation: _____ Programming languages: _____						
GENERAL PROGRAM INFORMATION		NEW DATA (ENTER 'SAME' IF NO CHANGE TO THE LINE ITEM)				
Title: _____ Acronym: _____ Standard: _____ Program Origin: _____ Discipline: _____ Sponsoring Dep.: _____ Sponsoring Off.: _____						
USAGE RESTRICTIONS:		NEW DATA (ENTER 'SAME' IF NO CHANGE TO THE LINE ITEM)				
_____		_____				
PRINCIPALS WITH ROLES						
Role	Name	New Name (Print)	Signature	Date	Organization	Location
Documentation Engineer	_____					
Documentation Reviewer	_____					
Maintainer	_____					
Technical Specialist	_____					
Sponsor	_____					



Verification and Validation of Computer Programs

Attachment 3: EPM-KE0-TP-000034 – Controlled Computer Program Record of Revisions Template

Revision Number	Date of Revision	Description

SAMPLE



Verification and Validation of Computer Programs

Attachment 4: EPM-KE0-TP-000035 – Controlled Computer Program Error Identification (CCPEI) Form Template

CONTROLLED COMPUTER PROGRAM ERROR IDENTIFICATION
Program Title:
Program Sponsor Name: Engineering Manager Name:
Program Number:
Release/Version No.:
Project:
Location:
Operating System on Which Program Was Run:
Date Error Identified:
Error Description:
User Name: Date:

SAMPLE



Verification and Validation of Computer Programs

Attachment 5: EPM-KE0-TP-000036 – Controlled Computer Program Error Notification (CCPEN) Form Template

Program Error Number Assignment and Dates (filled out by CSL)		
1. To:	Distribution	4. Date DMD Received:
2. Source Error No.:		5. Date DMD Transmitted:
3. DMD Error No.:		
Program Identification		
6. Program Number	7. Release/Version No.	
8. Program Title/Name/Acronym:		
Program Error Information		
9. Error Severity: ☐ CLASS 1 (MINOR) ☐ CLASS 2 ☐ CLASS 3 (MAJOR)		
10. Computer System(s) on Which Program Error is Applicable:		
System 1:		
System 2:		
System 3:		
System 4:		
11. Date Error Received by Program Sponsor:		
12. Date Error Confirmed by Program Sponsor:		
13. Affected Period This Error Existed: From: To:		
14. Error Description:		
15. Error Evaluation/Impact Description:		
16. Recommendation (Error Avoidance and/or Remedial Action):		
17. Correction Notice/Final Disposition:		
18. Technical Specialist Signature:	19. Program Sponsor Signature:	20. Date:
21. FOR YOUR ACTION:		
(1) Consider the effect of this computer error notice on any past, in-process and future calculations.		
(2) Retain this error notice in your program documentation copy until the error has been corrected.		
Printed Name _____		Employee # _____
Signature _____		Date _____



**Attachment 6 : Instructions for Completing Controlled Computer Program
Error Notification Form**

Completed by the DMD
1. Show distribution on attached sheets. The Program Sponsor advises the DMD who should be listed. The DMD composes the list based on the sponsor's request.
2. If provided, enter COTS Supplier Error No. Leave blank for other developed software.
3. Enter a sequential error notice number.
4. Date CCPEN received by the DMD from the Program Sponsor.
5. Date CCPEN of transmittal, to Distribution (#1), by the DMD.
Completed by Program Sponsor and Technical Specialist
Note: Only one error per Class Two and Class Three CCPENS; Class One CCPENS can be combined.
6. Enter the CCP number (Examples: STAADpro – S001).
7. Identify all known release(s) / version number(s) that have this error (Examples: N9-57, 2.0).
8. Identify the program Title, Name, or its acronym. (Examples: STAADpro , Structural Design and Analysis)
9. Check one of the boxes for the class of the error. Error classifications are in accordance with this procedure (see Computer Program Error Notification above).
10. Indicate the operating system(s) on which the program error is applicable. (Examples: Windows 2003, Windows 7). Note this information should match the program's Program Control Form.
11. Give the date the error was initially discovered or suspected.
12. Give the date the error was confirmed by Program Sponsor, Technical Specialist, or designee.
13. Give the <u>time period</u> the error existed. If the error still exists, enter PRESENT in lieu of the final date.
Note: Items 14, 15, and 16 may be written on additional sheets.
14. Provide a concise description of the error.
15. Describe how the error may have affected program results on a generic basis.
16. Describe: (a) how the error may be avoided when operating the program, and (b) what corrective action should be initiated for existing calculations.
17. Identify what corrective action is being taken to correct the error, i.e., program revision, deactivation, etc., and other information which may assist the user.
18. Program Technical Specialist's Signature.
19. Program Sponsor's Signature.
20. Date of Program Sponsor's signature.
Completed by CCPEN Recipient
21. Within fifteen calendar days of receiving a CCPEN, send acknowledgement to the DMD that the error notification was received. Acknowledgements may be completed electronically in lieu of signing and returning the notification form to the DMD. No acknowledgment is required for Class One errors.