Post Modification Testing and Special Instructions

Procedure Contains NMM REFLIB Forms: YES ☒ NO ☐

Effective Date	Procedure Owner: Title: Site:		Executive Sponsor: Title: Site:	
1/28/08		Oscar Limpias VP Engineering HQN		Oscar Limpias VP Engineering HQN

Exception Date*	Site	Site Procedure Champion	Title
	ANO	John N. Miller	Manager, System Engineering
N/A	BRP		
	GGNS	Douglas Jones	Manager, System Engineering
	IPEC	Steven Verrochi	Manager, System Engineering
	JAF	Aaric Mitchell	Manager, System Engineering
	PLP	Brad Berles	Manager, System Engineering
	PNPS	Scott McAllister	Manager, System Engineering
	RBS	Richard McAdams	Manager, System Engineering
	VY	James Callaghan	Manager, System Engineering
	W3	Bruce N. Proctor	Manager, System Engineering
N/A	NP		
	HQN	Karen Tom	Manager, Programs & Components

Site and NMM Procedures Canceled or Superseded By This Revision

Palisades: FP-E-MOD-09

Process Applicability Exclusion: All Sites: ☐

Specific Sites: ANO ☐ BRP ☐ GGNS ☐ IPEC ☐ JAF ☐ PLP ☐ PNPS ☐ RBS ☐ VY ☐ W3 ☐ NP ☐

Change Statement

Revision 1 is being issued to make the procedure applicable to Palisades. Palisades will continue to use site specific interface procedures until the corresponding Entergy interface procedure is adopted for use at Palisades.

*Requires justification for the exception

TABLE OF CONTENTS

1.0 PURPOSE

[1] This procedure establishes administrative controls and testing philosophy for: [P20297] [P20301]

(a) Functional testing performed to verify that objectives of configuration changes authorized by an Engineering Change (EC) are satisfied and or verify required performance of SSCs that may have been affected by the configuration change.

(b) Testing performed to provide new baseline data for development of acceptance criteria for Operability Surveillance or other periodic tests that have been impacted by a configuration change.

(c) Testing performed to troubleshoot and determine the root cause of system or component malfunctions experienced during plant operation so that effective corrective action can be defined.

(d) Testing to gather performance data, coordinate multiple post-maintenance tests or operate plant equipment outside the scope of approved operating procedures.

(e) Construction testing performed to verify proper installation of configuration changes authorized by an Engineering Change (EC).

(f) Testing performed following the implementation of a temporary alteration.

[2] Although it may be used for guidance, this procedure does not apply to site specific periodic testing that demonstrates Technical Specification required Operability at prescribed intervals (Surveillance, In-service Testing/In-service Inspections) or department level periodic tests.

[3] This procedure does not apply to reloads and/or fuel assembly changes; use ENN-NF-105 or ENS-NF-105, as applicable.

[4] This procedure ensures that the EC Test is evaluated for an Infrequently Performed Test or Evolution (IPTE) and performed in accordance with this procedure and/or site-specific procedures.

2.0 REFERENCES

[1] ANSI N18.7-1976, Administrative Controls and Quality Assurance for Nuclear Power Plants

[2] ANSI N45.2.8-1975, Supplementary Quality Assurance Requirements for Installation, Inspection and Testing of Mechanical Equipment and Systems for the Construction Phase of Nuclear Power Plants

[3] ANSI N45.2.9-1974, Requirements for the Collection, Storage and Maintenance of Quality Assurance Records for Nuclear Power Plants

[4] ANSI N45.2.11-1974, Quality Assurance Requirements for Nuclear Power Plants

[5] 10 CFR 50.65, Maintenance Rule

[6] Entergy Quality Assurance Program Manual (QAPM)

[7] INPO Good Practice Report 87-028, Post Maintenance Testing

[8] EPRI NP-7213, April 1991, Post Maintenance Testing: A Reference Guide

[9] INPO Good Practice MA-305, Post Maintenance Testing

[10] SOER 91-01 Conduct of Infrequently Performed Test or Evolution

[11] Infrequently Performed Tests (As defined by site specific procedures)

3.0 DEFINITIONS

[1] Construction Tests - Tests performed under the cognizance of the Responsible Field Engineer (RFE) during and following the construction phase of configuration change implementation. Usually of a static nature, these tests generally will demonstrate component level required function(s) and/or adequacy of installation and workmanship, such as calibrations, megger testing, hydrostatic testing, rotational checks, static valve tests, etc. These tests are typically performed prior to placing systems and equipment in specific configurations/alignments for more complex testing and prior to placing in service. [P20297] [P20524]

[2] Electronic Data Management System – The primary system used to provide records and current revision information to personnel, including indexing and imaging of Lifetime and Nonpermanent Quality Assurance records. [ANSI N45.2.9 Section 5.3.1]

[3] Engineering Change Assumption Test – Tests performed for confirmation of assumptions made in the development of the EC.

[4] Engineering Change Test (ECT) - A procedure or work instruction used to perform post modification functional testing. ECTs demonstrate that modified or affected systems, structures, or components will perform satisfactorily in service and satisfy design requirements. This does not include, construction tests, inspections and testing required solely for declaring SSCs operable.

[5] Functional Test - Tests performed under the cognizance of the Test Engineer following completion of construction phase testing. Generally, a Functional Test tests integrated system and component response, requires a specific system configuration and component alignments, demonstrate that the SSC affected by a configuration change will perform satisfactorily in service, and that the objectives of the configuration change

were met. In certain instances Construction Tests may be performed in the functional test phase where specific system or component alignments are required and could not practicably be obtained in the Construction Test Phase (such as dynamic valve motor operator testing, power factor testing of large motors, etc.). Operations Surveillance Tests may also be performed in the functional test phase, in whole or in part, to demonstrate successful implementation of a configuration change. [P20297]

[6] Indus Asset Suite (IAS) - The software product used by the Entergy fleet for Work Management, Engineering Change, Materials Purchasing and Contracts and for the creation of new controlled documents and revisions to controlled documents (controlled document information populates EDMS via an interface).

[7] Infrequently Performed Test or Evolution (IPTE) - Activities that are infrequently performed which have the potential to significantly degrade nuclear, radiological, or personnel safety and/or equipment/plant reliability. IPTE criteria will be defined by site- specific procedures.

[8] Intent Change: - For the purpose of this procedure, include the following:

(a) A change to an approved ECT beyond the scope of a non-intent change that results in a change to any one of the following:

(1) Changes to Objective statements, other than editorial corrections

(2) Changes to Acceptance Criteria

(3) Limiting Conditions for Operation not previously addressed

(4) Changes to steps previously identified as commitments

(5) Changes to QC Hold Points or Hold Point criteria

(6) Changes to controls established by Site Administrative Procedures

(7) Increased risk to personnel or equipment safety

(8) Operation of equipment or components:

1. Inconsistent with design limitations

2. In a previously unanalyzed mode or lineup

(9) Changes that affect the risk assessment

(10) Changes to an existing 50.59 evaluation or if a 50.59 evaluation is required to support the change.

[9] Lead Test Performer (LTP) - A person or group assigned by the Test Engineer to assist in the performance of an ECT or STI. The Lead Test Performer may perform the duties of the Test Engineer, in performing the test, as directed by the Test Engineer.

[10] Non-Intent Change – For the purpose of this procedure, include the following:

(a) Corrections involving obvious alphanumeric and grammatical errors (editorial errors), clarifications which do not alter the meaning (this could include the addition/deletion of steps/sections), and minor alterations to conform to wording or numbering in controlled design documents that were in existence at the time the affected procedure revision was issued such as:

(1) Misspelled words.

(2) Incorrect numbering of steps.

(3) Changing equipment identifiers (for example: changing B pump to A pump when the Procedure section obviously is written for the A pump).

(4) Minor word changes that add to ease in understanding but do not change the meaning.

(5) Minor changes to make the Procedure conform to the wording or numbering in existing controlled design documents such as Technical Specifications, P&IDs, or Vendor Manuals.

(6) Changes to Procedures to update organization position titles or Procedure cross-references.

(b) A Procedure change that implements a previously approved change to a design document (i.e., FSAR change, EC, etc.) may be a Non-Intent Change since a change to the design document has already been approved.

[11] Official or Original Approved Copy – The master copy of the test procedure verified by the Test Engineer as current and ready for use. At the discretion of the Test Engineer the procedure will be stamped “Official Copy” or “Official Work Copy”.

[12] On-Site Safety Review Committee (OSRC) – The onsite committee which independently reviews operational activities in order to provide additional assurance that the plant is operated and maintained to ensure nuclear safety. [P20297]

[13] Operations Tests - Tests performed under the cognizance of the Operations Department after completion of the Functional Test and turnover to Operations. These tests generally consist of Technical Specification and/or Technical Requirements Manual Surveillance tests required to demonstrate SSC operability, however, in

certain instances, it may be necessary or practical to perform construction or functional tests following turnover to operations.

[14] Post Modification Test Plan (PMTP) – A tool (either electronic or paper) used to summarize and track the required post modification testing. The PMTP lists tests for the scope of SSC listed on the associated RTSF by the phase in which the tests will be performed (i.e. Construction Tests, Functional Tests, EC Assumptions Test, Operations Tests, or Post Return to Service Tests). [P20297]

[15] Post Return to Service (PRTS) Tests - Tests performed after a system is returned to service. Generally these tests require prerequisite conditions (e.g. plant mode change) which can only be achieved after the system has been returned to service and/or declared operable with respect to a desired plant mode for the tests. These tests must be clearly delineated to allow Operations to return the SSC to service and/or make an operability declaration for the affected SSC prior to performing the test. Additional restrictions may be placed, requiring successful completion of the Post-RTS test prior to exceeding specified plant conditions (e.g. pressures, temperature, power level, run time, etc.). Usually these conditions will be identified and discussed in a 10CFR50.59 Evaluation for the EC or ECT. An EC Post Return to Service item is issued to track completion of PRST testing.

[16] Responsible Engineer (RE) – An individual assigned primary responsibility and cognizance for development of an EC.

[17] Responsible Field Engineer (RFE) - An individual who is the point of contact for implementation of an EC including construction testing.

[18] Return to Service Form (RTSF) - The instrument used to document completion of Installation, Construction and Functional Testing, and return to service to Operations. As part of the RTSF, the Test Engineer indicates in the IAS EC module that all required testing has been satisfactorily completed, and lists the associated ECTs, Work Order Tasks and procedure numbers for the testing.

[19] Special Test Instruction (STI) – A test that is of sufficient complexity to require specific, detailed procedural control and which cannot be performed using unaltered currently approved procedures. Special Test Instructions are not to be used for post modification testing.

[20] Technical Reviewer – The individual assigned responsibility to review the Test Procedure or test results to ensure technical accuracy, procedural compliance and test adequacy. Qualifications for filling the Technical Reviewer function are determined and maintained in accordance with site-specific personnel qualification requirements.

[21] Test Change Notice (TCN) – A written instruction used to effect a change to an Engineering Change Test (ECT) or Special Test Instruction (STI) after approval of the ECT or STI.

[22] Test Deficiencies – Unexpected conditions or events (measured, detected or observed deviation from expected results or acceptance criteria) encountered that preclude completion of a test step or merits further evaluation. Example of test deficiencies may include the following and should be documented on Attachment 9.10, Test Deficiency Log:

(a) Design Deficiency or Error

(b) Installation Deficiency or Error

(c) Test Procedure / Instruction Deficiency or Error

(d) Plant Condition Changes

(e) Equipment failures

[23] Test Engineer (TE) - A qualified individual from any organization, designated by the Testing Authority to perform the responsibilities of the Test Engineer. Qualifications for filling the Test Engineer function are determined and maintained in accordance with site-specific personnel qualification requirements.

[24] Testing Authority – That individual who owns the testing process. The System Engineering Manager is the Testing Authority.

[25] Work Order (WO) – A document (paper or electronic) used to control work and to authorize work.

4.0 RESPONSIBILITIES

[1] Test Engineer (TE) is responsible for:

(a) Reviewing and concurring with the Post Modification Test Plan (PMTP) that is developed by the RE.

(b) Developing the Engineering Change Test (ECT) referencing the PMTP.

(c) Developing Special Testing Instructions (STIs) for non-modification tests.

(d) Coordinating review and approval of ECTs and STIs as required.

(e) Generating test changes and routing for approval.

(f) Assuring the test is reviewed as an Infrequently Performed Test or Evolution (IPTE) as required.

(g) Performing or supporting pre-test briefings.

(h) Performing walk-downs in preparation for test development.

(i) Coordinating activities, materials, and personnel to support testing.

(j) Coordinating review and approval of testing documents as required.

(k) Reviewing Engineering Change Notices (ECNs) for effect on modification test requirements and adding or revising test instructions if applicable.

(l) Overseeing test performance.

(m) Documenting and evaluating test results and dispositioning any unsatisfactory results or test deficiencies.

(n) Ensuring all functional testing identified in the Post Modification Test Plan is complete prior to Return to Service.

(o) Ensuring the test procedure does not result in any SSC being operated outside the facility's licensing bases.

(p) Processing the Return to Service Form (RTSF) as described in EN-DC-118, "Engineering Change Closure".

[2] Lead Test Performer is responsible for:

(a) Assisting in the performance of an ECT or STI.

(b) Performing the duties of the Test Engineer as directed by the Test Engineer.

[3] Technical Reviewer is responsible for performing a thorough review of all information contained in the test document to ensure it is technically adequate, procedurally compliant, accurate and of a quality to warrant approval.

[4] Test Engineers' Supervisor is responsible for:

(a) Ensuring the ECT or STI is prepared in accordance with this test procedure.

(b) Ensuring that the PMTP adequately demonstrates proper installation and function of the modified System, Structure or Component (SSC) or any SSC(s) affected by the modification.

(c) Ensuring that the PMTP review and approval cycle has included all necessary parties.

(d) Reviewing and approving the test results for acceptability.

[5] Operations is responsible for:

(a) Reviewing and concurring with the PMTP as part of the EC review.

(b) Identifying Operations required testing to the RE during development of the PMTP.

(c) Ensuring required Operations tests are completed satisfactorily.

[6] Responsible Field Engineer (RFE) is responsible for the following activities: [P20524]

(a) Reviewing and concurring with PMTP.

(b) Identifying parts and materials required for construction test activities.

(c) Developing construction test requirements using site procedures.

(d) Recommending construction testing on the PMTP.

(e) Ensuring a pre-job brief is performed.

(f) Ensuring construction tests are performed with satisfactory results.

(g) Correcting installation deficiencies discovered during testing.

(h) Documenting and evaluating test results and dispositioning any unsatisfactory test results.

[7] Responsible Engineer (RE) is responsible for:

(a) Preparing the PMTP in accordance with Attachment 9.4, Post Modification Test Plan Form, with input from the RFE, the TE, and Operations as applicable.

(b) Identifying the testing, test results and acceptance criteria required for confirmation of assumptions made in the development of the EC and dispositioning any deviations from this criteria.

(c) Identifying the Acceptance Criteria for Post Modification Tests.

[8] Testing Authority is responsible for:

(a) Ensuring site compliance with this procedure.

(b) Designating the responsible Test Engineer and Technical Reviewer.

[9] Training Department is responsible for testing the Simulator for modifications in accordance with site procedures.

[10] Vice President, Engineering is responsible for maintaining and interpreting this procedure and ensuring the necessary documents are established and implemented to comply with this procedure.

5.0 DETAILS

5.1 PRECAUTIONS AND LIMITATIONS

The electronic forms and associated approvals are documented in the Indus Asset Suite (IAS). When IAS is unavailable, Attachments from this procedure should be used.

NOTE

Section 5.2 of this Procedure contains requirements for Post Modification Testing.

Section 5.3 of this Procedure contains requirements for testing not related to Plant Modifications or design changes (i.e. STIs).

Personnel using this Procedure are cautioned to use the appropriate section for their specific testing situation.

The Mechanical, Electrical and I&C Component Test Guides (Attachment 9.1, 9.2, and 9.3) can be used to assist in determining test requirements.

5.2 Post Modification Testing Requirements [ANSI N18.7] [ANSI N45.2.4] [ANSI N45.2.11]

[1] Due to the unique nature of each EC, detailed instructions to develop testing instructions/procedures are not provided here. However, the following general guidance is given in preparing tests (ref. Attachment 9.5). Considerations when specifying a test include:

(a) Tech Spec, Final Safety Analysis Report as Updated (FSAR) and other Licensing Bases Documents (LBD) requirements.

(b) Regulatory commitments.

(c) Industry codes and standards.

(d) Vendor recommendations, instructions, directions and manuals.

(e) Original Start-up Tests – these should be reviewed and portions re-run, if the test results may be altered by the EC.

(f) Failure Modes – this should be included as a matter of course in all testing. Consider testing not only under normal conditions, but also under loss of air, loss of power, expected extremes of temperatures, etc.

(g) Software control program requirements.

(h) System/Equipment operating history and problems.

(i) Experience with testing similar equipment.

(j) Requirements for Independent Verification.

(k) Assumption validation requirements specified in the EC by the Responsible Engineer.

(l) Operating Experience

(m) Testing should cover the entire operating range of the process as well as the supporting systems. If it is not possible to test over the entire operating range, determine what actions are to be taken to help ensure the equipment will perform satisfactorily when operated in the range not tested. [P16963]

[2] Post Modification Test Plan:

(a) The PMTP identifies the testing required (Construction, Functional, EC Assumptions, Operations, Post Return to Service). The PMTP documents all tests or series of tests that will be performed to comply with any code requirements for construction testing as well as those that will be performed to demonstrate component and system functionality after completion of the modification. This will include any existing surveillance tests, maintenance tests, or ECTs developed specifically for the modification. [P12572]

(b) The PMTP is documented on Attachment 9.4 and is prepared as part of the EC. [P20283] [P21421] [P21521] [P22306]

(c) When modification work potentially affects Tech Spec criteria or IST data such as pump vibration, flow, differential pressure (DP), stroke time, etc., the appropriate surveillance requirements should be specified as post- modification functional testing and performed to confirm acceptable post modification results.

(d) Post Modification Tests may take different formats, depending on the level and complexity of testing. If existing plant procedures or WO steps are recommended for post modification testing, then the RE lists the test information on the PMTP. Post modification tests that are not performed utilizing existing procedures or WO instructions require the development of an ECT that is listed on the PMTP.

[3] ECT Procedure Format

(a) New test procedures may be required when adequate site procedures or instructions do not already exist. These procedures may take the form of new test procedures or WO work instructions. Where WO work instructions are specified and are not bounded by existing approved plant procedures all review, approval, and revision requirements of this procedure apply.

(b) ECT procedure and Work Orders should include:

(1) Objectives - This section should contain available information about the reason, purpose and expectations for the test. Provide a thorough, concise description of what the test is intended to accomplish.

(2) References - This section should list sources of information reviewed during test preparation.

(3) Test Equipment - List equipment, instrumentation, M&TE and material required for the test.

(4) Precautions and Limitations - This section contains information that applies specifically to the test performance, including information required to alert the Test Engineer or other personnel to certain conditions. This may include guidance for abort criteria.

(5) Prerequisites - Activities performed before testing (steps in order, etc.) or initial conditions required for entry into the test.

(6) Instrumentation - This section contains calibration information for permanently installed instrumentation required for the test.

(7) Test Instructions –Detailed step-by-step instructions for performance of the test. Test instructions should refer to equipment ID number and noun name as found in the plant equipment database. Test instructions must be written to ensure objectives and Acceptance Criteria are met. Acceptance Criteria should be placed conspicuously within the test's instructions.

(8) Restoration - Necessary steps to properly restore the system or component after testing is finished.

(9) Test Data Sheets - Used to document test results. Each data sheet is to be titled and numbered uniquely. Data sheets will provide an initial/date sign-off space for each data entry or a signature and date block for each page of data. A data sheet may be used for independent verification sign-off of system/component alterations. Acceptance Criteria should be placed conspicuously within the body of the data sheets.

(10) M&TE Instrumentation - This section is used to document information (e.g., calibration due date, description) for M&TE used during the test. This information can take the form of a data sheet if desired.

(11) Summary Information: This Section summarizes the test and provides information that may be used to reconstruct the test's events and inform the appropriate departments of situations or conditions encountered during testing. It also provides a forum to discuss the overall test results. Test Summary information should include:

a. Description of overall test performance noting any unusual conditions or conditions to be aware of in future system operation. This includes information that should be "flagged" to Operations including throttle valve positions (number of turns open or closed) or special information learned during the testing that may require plant procedure revision.

b. Document and track Test deficiencies - When a test step cannot be completed or a problem occurs that suspends testing, the condition is to be documented, tracked, evaluated and resolved. The Test Deficiency Log, Attachment 9.10, should be utilized to document and track test deficiencies.

(c) ECT Number and Revision Assignment

(1) A typical ECT procedure number should take the following form:

ECT - [EC #] - TT Rev RRR
EC# - From EC number
TT- test number - e.g., 01
RRR- Test revision - e.g., 000

For example, the initial revision of an ECT associated with EC-2343 would be numbered as; ECT – 2343 – 01 Rev 000.

If an ECT procedure is not used and the test steps are included in the WO, then use the WO number as the ECT number.

[4] Testing Philosophy

(a) In general, the test for an EC should:

(1) Test the modification under all configurations, even those which may not "normally" be expected to occur. This includes testing all functions of the affected portion of the system (e.g. manual, automatic, engineered safeguards actuation, etc.).

(2) Test not only what has been added by the EC, but also what has been deleted. In other words, verify that things, which should have been removed, really have been.

(3) Test the EC thoroughly and at least one step beyond the interface to the equipment, which hasn't been modified.

(4) Avoid testing by simulation when equipment may be operated safely. (e.g., operate a relay versus installing jumpers across contacts).

(5) Consider the use of the Simulator and other methods to aid in developing and validating the test procedure/instruction.

(6) Be sequenced to perform the most basic tests first, then proceed to perform more complex component and system level functional and acceptance tests. The following sequence is recommended:

- Construction Test: Hydros, continuity checks, meggering, etc.
- Component Level (Prerequisite) Tests: Calibration, valve setup and stroking, loop, and scheme checks, etc.
- Logic verification checks.
- Functional Tests: Tests to prove the modified system or subsystem performs its design functions under operating conditions.
- Surveillances: Tests required by Tech Specs prior to declaring a modification operable.

[5] Test Instructions [P20524]

(a) At the applicable site's discretion, existing procedures may be used or revised to support testing.

(b) Existing procedures may be used as a basis for an ECT. The ECT may use the approved procedure in part or in whole to perform a portion of the test. In any case, ECTs must be reviewed and approved as new stand-alone procedures. Where a partial approved procedure is used, the Test Engineer should assure that the procedure is reviewed for consistency and the intent of the approved procedure is not changed.

(c) When modification work invalidates existing surveillance tests or creates additional surveillance requirements, new tests will be identified and performed to satisfy the plant surveillance program.

(d) When modification work potentially affects Tech Spec criteria or IST data such as pump vibration, flow, differential pressure (DP), stroke time, etc., the appropriate surveillance requirements should be specified as post- modification functional testing and performed to confirm acceptable post modification results. ECT steps used to satisfy Surveillance requirements are to be clearly identified.

(e) M&TE should be used to measure parameters and record data. Permanently installed instrumentation or MT&E may be used to take quantitative data if calibration has been verified or the uncertainty has been considered prior to performing associated testing.

(f) The Test Engineer ensures that the test procedure instructions will not create unplanned conditions which could significantly degrade plant margin of safety. Consult site specific procedures to determine review documentation requirements. These conditions include but are not limited to the following:

(1) Potential for draining the reactor vessel.

(2) Potential for inadvertent loss of Decay Heat Removal capability when Decay Heat Removal is required.

(3) Potential for loss of containment integrity when containment integrity is required.

(4) Changes to systems, equipment, or procedures related to the core reactivity, reactivity control, or reactor protection.

(5) Potential for loss of power which would affect the above listed areas.

(6) Unplanned safety system actuation.

(7) Performance of this test will not result in any SSC being operated outside the Facility's Licensing Bases.

(g) When preparing test instructions/procedures, the Test Engineer must determine if the test will require a pre-test briefing. Pre-test briefing requirements will be specified in the Prerequisites section of the Test Procedure. A briefing or series of briefings are required if the test is an Infrequently Performed Test or Evolution (IPTE) or if a potential exists for any of the following conditions: [P16431]

(1) To cause a Reactor Scram.

(2) To cause an undesired release to the atmosphere.

(3) Loss of a safety system.

(4) More than one person is required to perform actions in the test at the same time (other than the Test Engineer and Operations).

(5) Special communications are required (e.g. multiple communications systems).

(6) Communications may be impaired by location conditions (e.g., high noise area, distance to a communications device, etc.).

(7) The test procedure requires remote operator actions to be performed.

[6] Engineering Change Test (ECT) Review and Approval

(a) Attachment 9.7 contains ECT review requirements. Technical Review and Supervisor review are required for all ECTs.

(b) Risk impacts of all ECTs should be assessed and managed in accordance with 10 CFR 50.65(a)(4) in accordance with site-specific procedures.

(c) The Technical Review should be performed before the cross discipline review. A Supervisor may perform the Technical Review, provided that the preparer of the Test Procedure does not report directly to that Supervisor. A Supervisor may not perform the Technical Review and Supervisory approval for a single Test Procedure or test results.

(d) The Test Procedure Cover Sheet, Attachment 9.6, will be used to document ECT reviews and approvals.

(e) Upon approval of the ECT, the Test Engineer performs the following:

(1) Prominently identify the ECT package as the Official Copy. (Ensuring that the approved test is in the Work Control process satisfies this requirement.)

(2) An Official Copy will be used in the field to perform the test.

(3) The original data and signatures shall be maintained in the Official Copy of the ECT.

[7] Changes to ECTs

(a) Following initial approval of an ECT, changes to the ECT “Official Copy” shall be performed by a Test Change Notice (TCN) or an ECT revision.

(b) ECT Revision:

(1) Revisions to ECTs may be required if changing the test procedure is impractical because of extensive rewrites, rewording, etc.

(2) A revision will be processed with all the reviews necessary of a new ECT.

(3) A new ECT cover sheet (title page) will be attached. The ECT cover sheet should indicate the new revision number.

(4) The first approved version of an ECT is revision 000. The subsequent revisions are 001, 002, 003, etc.

(5) The Test Engineer should evaluate the need for re-performing the test in its entirety.

(c) TCNs to ECTs

(1) After an ECT has been approved, changes may be made using a TCN, Attachment 9.8. The TCN is necessary to ensure that the changes necessary are adequately prepared, reviewed and inserted into the Test Procedure. The cover sheet will document required reviews and approvals. TCNs will be numbered sequentially beginning at 001.

(2) Changes should be indicated by use of revision bars and appropriate TCN number in the margin adjacent to the change.

(3) Each TCN includes a Cover Sheet and revised pages, if applicable. The Description of Change/TCN Posting Instruction Sections of the TCN Cover Sheet, Attachment 9.8, shall clearly indicate the pages/steps being revised (e.g., changed, added or deleted), a brief description of the changes and the reason for the changes.

(4) Test steps should not be signed more than once. If the change requires re-verification of previously performed steps, new pages containing these steps are to be included in the TCN.

(5) When sign offs or data have been recorded in a previous change or revision and are still valid, the Test Engineer should mark the latest revision or change steps/data sheets as "N/A" and note in the margin next to the "N/A", "See Rev #".

(6) TCNs that are determined to be Intent Changes require the following as a minimum:

a. Technical Reviewer

b. Operations Manager or designee

c. TE Supervisor

d. Additional reviews are determined by the Test Engineer, using Attachment 9.8.

(7) TCNs that are determined to be Non-intent Changes require as a minimum the Test Engineer’s and Supervisor’s signatures, and others as determined by the Test Engineer. These signatures should be obtained within 14 days.

(8) Changes to ECTs Acceptance Criteria that conflict with the EC would require an approved ECN as a basis for the TCN.

(9) The TCN may be used in the field once the required reviews and approvals are obtained.

(10) Upon approval of the TCN, the Test Engineer performs the following:

a. Prepares the TCN package.

b. At the discretion of the Test Engineer, prominently identify the TCN package as the Official Copy. This copy will be used in the field to perform the test.

c. File the TCN cover sheet(s) after the ECT cover sheet and insert the revised pages in the Official Copy.

d. The page revisions with the original data and signatures shall be maintained in the Official Copy of the ECT.

e. If, during the performance of the test, an event occurs that results in a change to the intent of the test, the Test Engineer should notify the Shift Manager or designee.

[8] Verification of Ready for Test

(a) The Test Engineer verifies RFE sign-off on the installation section of the RTSF in accordance with EN-DC-118, “Engineering Change Closure”.

[9] Test Preparations

(a) Expectations regarding the protocol associated with performing test briefs, establishing communication, use of temporary monitoring equipment, etc. are to be determined and controlled in accordance with site specific procedures and guidelines regarding equipment testing. Regardless of the test format, all testing will be performed per a WO and approved in accordance with EN-WM-102, Work Order Planning, Implementation, and Closeout”.

(b) Post Modification testing may be performed by Plant Maintenance personnel, construction craft, Engineering, or Operations. Frequently, one EC may require testing by more than one group. For example, a new control system has scheme/continuity checks done by craft, loop calibrations done by I&C, and functional tests by Systems Engineering or Operations. This testing will be delineated by the ECs Post Modification Test Plan (PMTP) and will require close coordination between the RFE and all test personnel to ensure smooth transition from construction to testing.

[10] Pre-test Brief

(a) The pre-test briefing, if required, must be adequate to ensure conduct of a safe test and to ensure positive control during the test evolution. Attachment 9.13 provides guidelines to ensure adequate pre-test briefing content. Pre-test

briefings or pre evolution briefings can also be held in accordance with site-specific procedures.

(b) Items that are to be included in the pre-test briefing (if applicable):

(1) Test objective(s).

(2) Initial conditions.

(3) Test Abort Criteria.

(4) Anticipated plant response.

(5) Risks, warnings, and cautions.

(6) Communications required.

(7) Roles and responsibilities during the test.

(8) Applicable Operating Experience.

(9) Safety (Radiological, Industrial, or Nuclear)

(10) Human Performance

(c) The Test Engineer will hold the pre-test briefing with the appropriate personnel. The extent of the pre-test briefing will depend on the complexity of the test. At a minimum the pre-test brief should include the Shift Manager (SM)/Shift Supervisor (SS) or Control Room Supervisor (CRS) or designee and someone from the Test Engineer's management as required.

(d) The pre-test briefing will be re-performed with appropriate personnel if:

(1) Test duration will carry over into subsequent shifts.

(2) Changes are performed to the test procedure affecting the brief.

(3) Resumption of a test after an unexpected plant response was encountered and testing was suspended.

(4) Where deemed appropriate prior to re-performing (re-test) test sections.

(5) When designated by the SM/SS or CRS.

[11] Conduct of the Test

(a) The Test Engineer or Lead Test Performer will be responsible for controlling the pace of the test and assuring that the required equipment and resources are in place and ready in advance of performing time critical and other key evolutions.

(b) Testing should proceed in an orderly and professional fashion. Should conditions arise where personnel or plant safety may be jeopardized, testing shall be delayed or halted until such conditions may be remedied.

(c) Test steps and sections shall be performed in the order and sequence specified in the Test Procedure unless the Test Procedure provides guidance to the contrary.

(d) The Test Engineer will assure that the required data is recorded as well as other necessary information (initial conditions, key events, restoration) so that the test may be reconstructed for the test summary and later review.

(e) The Test Engineer will assure that entries are documented into the official copy. The Test Engineer will assure that entries into the original approved copy are made using indelible ink, and are neat and legible.

(f) When test steps cannot be performed as written, the required changes are made to the test procedure, in accordance with this procedure, prior to proceeding.

(g) Test steps should <u>not</u> be signed more than once. Each time steps are re-performed, the Test Engineer should:

(1) Attach a copy of the required page(s), marked as required (e.g., Duplicate Page 1, Attachment 1, etc.).

(2) Provide a written justification for performance of the repeated steps in the Performance Summary Section of the test.

(3) Annotate those steps not needed to be re-performed on the added page(s).

(h) The Test Engineer shall ensure that the latest copy of ECT(s) is used during performance of the test

(i) Three-way (three-part) communication should be utilized at all times during the test.

[12] Test Log

(a) The Test Engineer maintains a Test Log, Attachment 9.9, to document the events of the test. The test log should include:

(1) Time, date, and attendees for the pre-test brief, if a briefing is held.

(2) Start and stop times of testing.

(3) Starting or stopping of major components under test.

(4) Unexpected plant responses.

(5) Transfer of responsibility (e.g. shift change) of Test Engineer, or other significant personnel involved with the test.

(6) TCNs.

(7) Test Deficiencies (unless recorded in a separate test deficiency log, Attachment 9.10).

(8) Record any CR's initiated during the test.

(9) Record any equipment issues.

(b) The Test Log may be used to document the verification of prerequisites, initial conditions, and test steps for performance of retest.

(1) Re-performance of individual test steps, groups, or sections shall be documented in the test log. Documentation should include the following information, as a minimum:

a. Reason for the test delay and why it is acceptable to continue.

b. Validation of the required test prerequisites and initial conditions.

c. Permission from the SM/SS or CRS to resume the test.

d. Test briefing, if necessary.

(2) Re-performance of the test steps will be documented on duplicate unsigned procedure pages from the latest revision of the Official Copy of the Test Procedure. Steps re-performed must be clearly annotated with a sequential re-test number (Example: re-test #4). Re-performance of test steps or sections out of sequence will require processing of a TCN, unless otherwise allowed by the ECT.

(3) Maintenance of the Test Log should not distract the Test Engineer from performing critical test steps or observing plant conditions where required. If necessary, the Test Engineer may record key events at convenient points.

[13] Test Deficiencies

(a) The Test Engineer will maintain a record of Test Deficiencies. Examples of test deficiencies to be recorded in the Test Deficiency Log, Attachment 9.10, include:

(1) Test step(s) for acceptance test cannot be completed due to a problem with the modification design or installation.

(2) Test step(s) cannot be completed due to a failure of existing plant equipment.

(3) Test step(s) cannot be completed due to procedural problem or procedure error.

(4) Failure to meet Acceptance Criteria.

(5) Unexpected plant response that merits further evaluation.

(6) Changing Plant Conditions that preclude test continuance.

(b) The deficiency along with those steps taken to clear the deficiency shall be documented in the Test Deficiency Log, Attachment 9.10) or in the Test Log, Attachment 9.9. The steps taken to clear the deficiency may include:

(1) Repair/rework of equipment or installation per approved work instructions.

(2) Change/revision to the EC (ECN).

(3) Initiating a TCN or ECT revision.

(c) Conditions adverse to quality shall be identified on a Condition Report in accordance with applicable site procedure(s).

(d) Clearing a test deficiency which had precluded completion of test step(s) should include documentation of one or more of the following:

(1) Re-performance of the applicable test step(s).

(2) A change (TCN) or revision to the ECT.

(e) The Test Engineer evaluates deficiencies for impact to the ECT. The Test Engineer shall consider the impact of the test deficiency on plant or personnel safety. The Test Engineer evaluates for the following:

(1) Impact on the validity of test steps or data.

(2) If testing may continue while the deficiency is being corrected.

(3) Test suspension and placing SSCs in a safe position.

(f) Initial Test Results Evaluation:

(1) The Test Engineer will evaluate the test results to verify that they are within the specified acceptance criteria and achieve the test objective. Failure to meet acceptance criteria/limits shall be appropriately documented, evaluated, and dispositioned as a test deficiency(s).

[14] Restoration:

(a) The Test Engineer will assure that SSCs are restored to their required alignments as soon as practical following testing or aborting the test or as required by Operations.

(b) Equipment alignment restorations may have been placed in the required alignment by other means (e.g. restoration of clearance or deviation) and manipulation may not be required to be performed as per the test procedure. Restoration steps may not be required if the equipment is to be left in this "as-found" condition or where directed by the SM/SS or CRS. These steps may be marked not applicable (N/A) as necessary and the reasons noted in the test log.

(c) It is recommended that M&TE used to verify acceptance criteria be returned for post test calibration as soon as practical after test completion.

[15] ECT Completion and Closeout

(a) After completing the ECT, the Test Engineer is responsible for notifying Operations and at his discretion preparing a thorough Performance Summary, Attachment 9.12. The Performance Summary should include :

(1) Attendees at the pre-test brief.

(2) Transfer of responsibility (e.g. shift change) of Test Engineer, or other significant personnel involved with the test.

(3) Brief description of any generated TCNs.

(4) Significant or noteworthy events occurring during performance of the test.

(5) Information discovered during testing that may affect plant operating characteristics.

(6) Re-performance of individual test steps, or sections should be documented in the Performance Summary including the reason for the re-performance.

(b) The Test Engineer assembles the ECT documentation and performs a final ECT results review.

(c) After the Test Engineer has completed the final ECT results review, the Test Engineer forwards the completed ECT to the Technical Reviewer.

(d) Submit ECT to the Responsible Engineer for review if required for confirmation of assumptions made in the development of the EC response.

(e) The Technical Reviewer reviews the ECT for completeness and technical accuracy, and ensures that the ECT acceptance criteria and objectives are met. Following satisfactory Technical Review, the ECT may be signed off as complete.

(f) After the close-out Technical Review has been completed, the Test Engineer's Supervisor reviews the ECT results to verify that testing has been properly completed and that the results are within the established acceptance range.

(g) If there are any discrepancies noted, the ECT must be returned to the Test Engineer for resolution.

(h) The Test Engineer assembles ECT summary information and submits a copy to Operations and other affected departments.

(i) Upon satisfactory completion of reviews, the Test Engineer ensures the completed ECT is submitted to Nuclear Plant Records per EN-AD-103.

(j) The Test Engineer writes a turn over statement, on the Return to Service Form (RTSF) (Attachment 9.1 to EN-DC-118, "Engineering Change Closure"), that briefly describes the test results and any conditions that may affect future system operation.

(k) The Test Engineer completes the EC milestone in IAS indicating all required tests are complete.

(l) As applicable, the Test Engineer forwards the RTSF to the Project Tracking System (PTS) Coordinator for further processing in accordance with EN-DC-118, "Engineering Change Closure".

[16] Satisfactory completion of Operations Testing and Post-Return to Service Testing is indicated by Operations completion of the associated PRTS item.

5.3 Requirements for Special Test Instructions (STIs) [ANSI N18.7] [ANSI N45.2.4] [ANSI N45.2.11]

[1] General Requirements

(a) Non-routine Tests conducted for reasons other than post-modification acceptance or functional verification are to be conducted in accordance with this procedure.

(b) Some examples of tests that fall outside of the modification process are as follows:

(1) Troubleshooting activities

(2) Data collection for performance monitoring purposes

(3) Retest for multiple, complex post-maintenance retest activities that warrant TE coordination and sequencing

(4) Operation of a system or component outside the scope of approved operating procedures

(5) Demonstration of proper system operation and performance after Temporary Alteration installation

[2] Test Procedure Format

(a) New test procedures may be required when adequate site procedures or instructions do not already exist. These procedures may take the form of new test procedures or WO work instructions. Where WO work instructions are specified and are not bounded by existing approved plant procedures, all review, approval, and revision requirements of this procedure apply.

(b) The STI test procedure should include the same items and format identified for the ECT in Section 5.2(3).

[3] Test Numbering

(a) A unique number shall be assigned to the test for proper identification and tracking. When formal, stand-alone Tests are written, the unique number shall be in accordance with the following format:

STI – NNNN Rev RRR
STI: Special Test Instruction
NNNN: Sequential Number Taken from IAS
RRR: Test Revision Number, beginning with 000.

For example, the initial revision of a STI associated with number 0233 taken from IAS would be numbered as; STI – 0233 – 0001 Rev 000.

[4] Testing Philosophy

(a) Due to the unique nature of each test, the items listed in Section 5.2[1] should be considered when preparing tests.

[5] Test Instructions

(a) For Test Instructions, see Section 5.2[5].

[6] Special Test Instructions Review and Approval Process

(a) Special Test Instructions must receive a proper review to ensure that the test is technically accurate and meets all applicable safety and quality requirements.

(b) Attachment 9.7 contains STI review requirements. Technical Review and Supervisor review are required for all STIs.

(c) All STIs require review per EN-LI-100, “Process Applicability Determination”. If a 50.59 evaluation was performed for the test, then OSRC review is required.

(d) The Technical Review should be performed before the cross discipline review. A Supervisor may perform the Technical Review, provided that the preparer of the Test Procedure does not report directly to that Supervisor. A Supervisor may not perform the Technical Review and Supervisory approval for a single Test Procedure or test results.

(e) The Test Procedure Cover Sheet (ref. Attachment 9.6) will document STI reviews and approvals.

(f) Upon approval of the STI, the Test Engineer performs the following:

(1) Prominently identify the STI package as the Official Copy.

(2) The Official Copy will be used in the field to perform the test.

(3) The original data and signatures shall be maintained in the Official Copy of the STI.

[7] Changes to STIs

(a) Following initial approval of a STI, changes to the STI “Official Copy” shall be performed by a Special Test Instruction Change Notice (STICN) or a STI revision.

(b) STI Revision:

(1) Revisions to STIs may be required if changing the test procedure is impractical because of extensive rewrites, rewording, etc.

(2) A revision will be processed with all the reviews necessary of a new STI.

(3) A new STI cover sheet (title page) will be attached. The STI cover sheet should indicate the revision number.

(4) The first approved version of a STI is revision 000. The subsequent revisions are 001, 002, 003, etc.

(c) STICNs

(1) The requirements and processing of STICNs are per Section 5.2[7](c). In addition, STICNs require review per EN-LI-100.

[8] Test Preparations

(a) Expectations regarding the protocol associated with performing test briefs, establishing communication, use of temporary monitoring equipment, etc., are to be determined and controlled in accordance with site specific procedures and guidelines regarding equipment testing. Regardless of the test format, all testing will be performed per a WO, approved in accordance with EN-WM-102, “Work Order Planning, Implementation, and Closeout”.

(b) Testing may be performed by Plant Maintenance personnel, Engineering, or Operations.

(c) Pre-test Brief

(1) Pretest briefing should be performed as identified in Section 5.2[10].

(d) Conduct of the Test

(1) Conduct of the test should be performed as identified in Section 5.2[11].

(e) Test Log

(1) The requirement for the Test Log should be performed as identified in Section 5.2[12].

(f) Test Deficiencies

(1) Test Deficiencies should be processed as identified in Section 5.2[13].

[9] Restoration:

(a) Restoration should be processed as identified in Section 5.2[14].

[10] STI Completion and Closeout

(a) After successful completion of the testing, the following actions are required.

(1) After completing the STI, the Test Engineer is responsible for notifying Operations and at his discretion preparing a thorough Performance Summary, Attachment 9.12. The Performance Summary should include information discovered during testing that may affect plant operating characteristics.

(2) The Test Engineer assembles the STI documentation and performs a final STI results review.

(3) After the Test Engineer has completed the final STI results review, the Test Engineer forwards the completed STI to the Technical Reviewer.

(4) The Technical Reviewer reviews the STI for completeness and technical accuracy, and ensures that the STI acceptance criteria and objectives are met.

(5) After the close-out Technical Review has been completed, the Test Engineer's Supervisor reviews the STI results to verify that testing has been properly completed and that the results are within the established acceptance range.

(6) If there are any discrepancies noted, the STI must be returned to the Test Engineer for resolution.

(7) Where review signoff steps are already a part of the test format additional review signoffs may be added if necessary.

(8) The Test Engineer assembles STI summary information and submits a copy to Operations and other affected departments.

(9) The Test Engineer submits the completed STI to Nuclear Plant Records per site procedures.

6.0 INTERFACES

[1] EN-DC-115, Engineering Change Development

[2] EN-DC-116, Engineering Change Installation

[3] EN-DC-118, Engineering Change Closure

[4] EN-LI-100, Process Applicability Determination

[5] EN-LI-101, 10CFR50.59 Review Process

[6] EN-WM-100, Work Request Generation, Screening, and Classification

[7] EN-WM-102, Work Order Planning, Implementation, and Closeout

7.0 RECORDS

[1] Post Modification Test Plan Form

[2] Completed ECT, including any associated TCNs

[3] Completed STI, including any associated TCNs

8.0 OBLIGATION AND REGULATORY COMMITMENT CROSS-REFERENCES

8.1 OBLIGATIONS AND COMMITMENTS IMPLEMENTED OVERALL

Step	Document	Commitment Number
[1]	N/A	None

8.2 SECTION SPECIFIC OBLIGATIONS AND COMMITMENTS

Step	Document	Document Section	Commitment Number
[1]	ANSI N18.7 (ALL)	5.2.7.2	None
[2]	ANSI N18.7 (ALL)	5.2.13.1	None
[3]	ANSI N18.7 (ALL)	All	None
[4]	ANSI N45.2.8 (ALL)	4.5	None
[5]	ANSI N45.2.11 (ALL)	4.5	None
[6]	QAPM (ALL)	A.1.d	None
[7]	QAPM (ALL)	A.3.f	None
[8]	QAPM (ALL)	B.8	None
[9]	QAPM (ALL	B.14a	None
[10]	NL-00-008-C04 (IP2)	All	None
[11]	COM-98-05938, Reply to NOV (IP3)	All	None
[12]	LER-93-23 (JAF)	All	None
[13]	10CFR50 (GGNS)	59 (C)1	None

Step	Document	Document Section	Commitment Number
[14]	10CFR50 (GGNS)	59 (d)1 S1 & S2	None
[15]	AECM (GGNS)	88/0041 87-35-01.III.4.S2	None
[16]	ANSI N18.7 (GGNS)	4.3.4(1)	None
[17]	ANSI N18.7 (GGNS)	4.3.4(2)	None
[18]	ANSI N18.7 (GGNS)	5.2.7.S2	None
[19]	ANSI N18.7 (GGNS / W3)	5.2.7.S5	None
[20]	ANSI N18.7 (GGNS)	5.2.13.1.S4(4)	None
[21]	ANSI N18.7 (GGNS)	5.2.17.S16	None
[22]	ANSI N18.7 (GGNS / W3)	5.2.19.3.S1	None
[23]	ANSI N18.7 (GGNS)	5.3.2.S2(3), S2(4), S2(5), S2(7), S2(8) & S2(9)	None
[24]	ANSI N18.7 (GGNS)	5.3.10.S1,S2, S3, S4, S5 & S6	None
[25]	ANSI N45.2.4 (W3)	5.2, 2.0	None
[26]	ANSI N45.2.5 (W3)	2.1, 2.3	None
[27]	ANSI N45.2.8 (W3)	2.0, 2.1, 2.3, 4.1, 5.2, 6.0	None
[28]	ANSI N45.2.8 (GGNS / W3)	4.5.S3/5.1.S11 & S12	None
[29]	ANSI N45.211 (GGNS)	2.2.S1	None
[30]	ANSI N45.211 (GGNS)	2.2.S2 (1), (2), (3), (4), (8), (9), (10), (11), (13) & (15)	None
[31]	ANSI N45.211 (GGNS)	4.5.S1/6.3.3.S9 thru S13	None
[32]	ANSI N45.211 (GGNS)	5.1.1, 5.1.2.S1, 5.1.3.S1 & S2, 5.1.4.S2 & S4, 5.2.2, 5.2.3, 5.2.4.S1 & S2, 7.1.S3(1) 7.1.S3(2), 8.S1 & 8.S2	None
[33]	GNRO (GGNS)	92/00102, page 1	None
[34]	QAPM (GGNS)	A.1.d	None
[35]	QAPM (GGNS)	A.3.f	None
[36]	QAPM (GGNS)	A.6.a, b, d	None
[37]	QAPM (GGNS)	B.8 a-g	None
[38]	QAPM (GGNS)	B.10.A	None
[39]	QAPM (GGNS)	B.14a	None
[40]	SOER (GGNS)	91-01	None
[41]	TS (GGNS)	5.1.1.S2	None
[42]	UFSAR (GGNS)	13.5.1.s1	None
[43]	LER-93-23 (JAF)		None
[44]	NL-00-008-C04 (IP3)		None

8.3 SITE SPECIFIC COMMITMENTS

Step	Site	Document	Commitment Number or Reference
[1]	ANO	0CAN070002	P16963
[2]	W3	SOER 87.01	P16431
[3]	W3	IR 91-03	P20283
[4]	W3	IR 91-03	P20297
[5]	W3	IR 90-15	P20301
[6]	W3	IR 92-18	P20524
[7]	W3	LER 94-001	P21421
[8]	W3	IR 93-35	P21521
[9]	W3	IR 92-18	P22306
[10]	W3	SCD 109	P12572

9.0 ATTACHMENTS

9.1 Mechanical Component Test Guide
9.2 Electrical Component Test Guide
9.3 I&C Component Test Guide
9.4 Post Modification Test Plan Form [ANSI N18.7] [P20524]
9.5 Test Procedure Preparation Guidelines.
9.6 Test Procedure Cover Sheet
9.7 Test Review And Approval Matrix
9.8 Test Change Notice
9.9 Test Log
9.10 Test Deficiency Log
9.11 Signature Identification Log
9.12 Performance Summary
9.13 Pre-test breifing guideline

ATTACHMENT 9.1 **MECHANICAL COMPONENT TEST GUIDE**

Sheet 1 of 10

(This guide can be used to assist in determining test requirements)

MECHANICAL	
COMPONENT	**TEST REQUIREMENTS**
Valve, Manual	M1- M7, M20, M21
Valve, Air Operated	M1 - M15, M17, M20, M21
Valve, Motor Operated	M1 - M17, M20, M21
Valve, Check	M4 - M7, M17 - M22, M24, M25, M26
Valve, Safety/Relief	M5, M7, M20, M21, M25, M26
Valve, Solenoid	M3, M4, M5, M7, M11, M12, M14, M20, M21
Pump	M27 - M34
Heat Exchanger	M35 - M39
Piping/Tubing Runs or Connections	M40
Tanks/Vessels/ Accumulators/Electrical Penetrations*	M40
Air Compressors	M41 - M47
Gas Dryers	M48 - M53
Air Handling Unit/Fan/Blower	M54 - M61
Filter/Strainer Demineralizer	M62, M63
Dampers	M3, M4, M7, M11 - M14
Diesel Generator**	M71 - M84
Cranes & Hoists	M64 - M70
Steam Traps	M85
Supports/Snubbers	M86

* Refer to Penetration in the Electrical Test Requirements Section for additional requirements.

** Refer to Diesel Generator in the Electrical Test Requirements Section for additional requirements.

NOTE: Some components affect or contain other components; in these cases the tests should cover all affected components. (e.g. Installation of a new MOV where there was not one before should result in the following tests: All associated with the MOV and electric motor, overload heaters, breakers, and fuses, the piping requirements (M40) for leak tightness, as well as the requirements for the new supports and/or snubbers, indicators and/or annunciators.

Attachment 9.1, Mechanical Component Test Guide **Sheet 2 of 10**

M1 Verify that the valve stem and handwheel have adequate clearance for travel, if applicable.

M2 Verify that the valve packing is properly installed, does not interfere with operation of the stem, and is not blocked against the valve body. See Note 4.

M3 Operate equipment through one complete cycle of full travel and verify no binding. See Note 5.

M4 Verify proper operation of the local and remote position indications, if applicable.

M5 Verify packing gland, mechanical joints, or connection leakage is acceptable or non-existing during elevated pressure testing or at normal system operating temperature and pressure depending on the applicable piping code and/or site procedures.

M6 Obtain positive flow or pressure indication by cycling valve or allowing changes in flow or pressure across valve. Flow is permitted in the proper direction.

M7 Verify valve or damper seat leakage is acceptable or non-existing. If the equipment has specific leakage requirements then the equipment shall undergo a seat leakage test based upon the applicable code and/or site procedures.

M8 Verify that the valve strokes (open or close) from the fully closed position to the fully open position in the time specified by plant documents, including procedures, technical specification, technical requirements manual, design change documents, and the ASME In-service Test program.

M9 Verify that the stem mounted strain gauge sensor is free and operates properly as applicable.

M10 Verify that the control/limit switch prevents damage to the valve seat.

M11 If the valve or damper performs an automatic opening or closure function in response to specific signals or as a fail-safe operation, then these functions should be tested by inserting the actual signals or the appropriate simulated test signals to verify proper valve response.

M12 Ensure that the valve or damper operates on demand by exercising the valve from all control locations.

M13 For throttle/control valves or dampers, verify that valves or dampers operates per design requirements in both hand and auto modes (if possible) and perform a loop check/verification and flow rate and pressure check/verification.

M14 If the valve or damper provides an interlock or auto close/open function in the control circuit of another component, then the other component shall be demonstrated operable by performing an automatic function test of all the open/close functions/interlocks according to the actual signals or the appropriate simulated test signals.

M15 Verify that the torque switch or operator thrust is set per design or manufacturer specifications.

M16 Verify that the MOV starting and running voltage and current (opening and closing) are within operational limits.

M17 Perform valve diagnostic signature analysis test to establish a new baseline data for the valve.

Attachment 9.1, Mechanical Component Test Guide **Sheet 3 of 10**

M18 For normally open check valves, the exercise test should verify that the disk travels to the seat with reversal of flow. Confirmation of the flow should be by visual observation, by position indication, or by observing appropriate system dynamic indications.

M19 For normally closed check valves, the test should ensure that the disk moves away from the seat with flow being initiated through the valve. Confirmation of the opening should be by visual observation, position indication, or by real free flow observation through the valve as indicated by system dynamic indications.

M20 For valves that cannot be adequately tested, a disassembly and visual inspection are appropriate during the installation process.

M21 Verify that there are no unusual sounds during opening/closure of the valve.

M22 Verify valve seats against backflow. For non-return valves, use the manual override lever on the air-piston assembly.

M23 Deleted.

M24 Verify that there are no unusual sounds such as clatter, or whining during minimum flow checks.

M25 Verify the lift setpoint of a relief/safety valve/spring loaded check valve under controlled conditions such as a bench test stand, if possible:

- Use a dead weight tester or other suitable method.
- Use the proper medium for the test.
- Record the initial, as found setpoint data.
- Adjust valve and repeat test until the average of three successful tests show acceptable results that match the setpoint criteria.

NOTE: Certified manufacturer's test records are an acceptable substitute method.

M26 Verify that downstream pipe or process temperature instruments do not detect a significant temperature change as evidence of valve seat leakage. Acoustic instruments may also be used to detect leakage. Valve chattering is not acceptable, and valve may need to be reset or replaced if applicable.

M27 Verify that the pump rotation, speed, direction, and flow are according to vendor or design requirements.

M28 Verify that the pump suction and discharge temperature and pressure are according to vendor or plant requirements, and record on appropriate data sheet.

M29 Verify that the pump motor voltage and current at rated capacity meets vendor specifications.

M30 Verify that the pump performance curves are within the requirements stipulated by engineering requirements. Check the performance parameters at three different points (including the design point) on the pump curve.

M31 Verify that the pump and driver bearing temperatures do not exceed vendor or design requirements.

Attachment 9.1, Mechanical Component Test Guide **Sheet 4 of 10**

M32 Tighten or loosen packing gland and verify that seal leakage is within vendor or design requirements, if applicable.

M33 Verify that the pump and drivers vibration under normal operating conditions do not exceed specifications.

M34 Verify auto start/stop functions and operation of interlocks if applicable.

M35 Measure the flow rates of the primary and secondary fluids.

M36 Measure the inlet and discharge temperatures of both the primary and secondary fluids.

M37 Measure the pressure at the inlet and discharge of both the primary and secondary fluids.

M38 Calculate the heat transfer and pressure drop characteristics of the heat exchanger and compare to the design requirements.

M39 Pressurize the heat exchanger to its applicable test pressure and inspect for leaks. Provide overpressure protection for the heat exchanger and pressure test the remainder of the system in accordance with the applicable piping code and/or site procedures.

M40 Verify integrity of the pressure boundary. Pressurize to the applicable pressure and visually inspect for leaks. Test pressures and hold times are dictated by applicable piping code and/or site procedures.

M41 Start and allow the compressor to operate unloaded. Verify proper rotation, that abnormal noises, improper bearing lubrication, or excessive vibration are not present as determined by design or manufacturer's documentation.

M42 With compressor unloaded verify that the motor, voltage, current, RPM, temperature, and compressor temperature are in the correct range as determined by manufacturer's or design documentation.

M43 With compressor unloaded verify that air temperature, discharge pressure, cooling flow, oil level, and bearing temperature are within required manufacturers or design specifications, if applicable.

M44 Verify that the cooling water regulates properly on compressor startup and shutdown if applicable.

M45 With the compressor loaded, verify that the following parameters are according to specifications.

- Compressor discharge pressure and temperature.
- Compressor oil pressure and temperature.
- Compressor and driver bearing temperature.
- Motor current, voltage, and RPM at rated air compressor capacity.
- Interstate pressure.
- Compressor and driver vibration measurements.
- Airflow capacity, if practical. A manufacturer's certified factory test is an acceptable substitute test.

M46 Verify that the compressor functions correctly in all modes (auto, manual, and standby) and the operation of any interlocks, if applicable.

Attachment 9.1, Mechanical Component Test Guide **Sheet 5 of 10**

M47 Verify that the compressor cycles in accordance with manufacturer's specifications.

M48 Verify that the timer operates properly and that dryer cycles according to vendor and design requirements.

M49 Verify operation of the heater and record voltage and current, if applicable.

M50 Verify that the pressure differential across the dryer is within operating limits.

M51 Verify successful regeneration of the desiccant, if applicable.

M52 Verify that the correct purge flowrate through the tower is being regenerated.

M53 Verify that exit process gas dew point and flowrate is in accordance with specifications.

M54 Verify proper rotation and correct gas flow direction by jogging the driver.

M55 Verify no unusual noise exists when fan is operated.

M56 Verify proper rotating speed.

M57 Verify inlet and outlet pressure, temperature, and flowrate meet requirements, as applicable.

M58 Verify the motor capacity to handle load requirements.

M59 Verify that the motor voltage, RPM, temperature, and current meet requirements.

M60 Verify proper filter operation, as applicable.

M61 Perform a vibration test and verify vibration measurements, under normal operating conditions, do not exceed specifications.

M62 Verify that pressure differential across unit during operation is according to specifications.

M63 For dual element strainers, shift the strainer to verify shift mechanism operability and proper differential on both baskets.

M64 Operate the crane/hoist several times over the extent of its travel. (See note 1)

M65 Verify operation of controllers for intended movement for each of the crane/hoist directions and motions. (See note 1)

M66 Verify operation of all brakes. (See note 1)

M67 Verify operation of travel limit stops. (See note 1)

M68 Verify hook operation over its entire range. (See note 1)

M69 Verify load-related interlocks. (See note 2)

Attachment 9.1, Mechanical Component Test Guide **Sheet 6 of 10**

M70 Verify that travel speed of the hook/trolley moves as per design. (See note 2)

M71 Perform test to verify auto start function.

M72 Perform test to verify manual start function.

M73 Perform test to verify protective trips (overspeed, low lube oil pressure, high water temperature, etc.).

M74 Verify DG synchronization.

M75 Perform test to verify that DG starts within the required time at rated speed.

M76 Perform DG load test.

M77 Verify that air/electric starting system is functioning properly - air tank, air/electric motor, valves, batteries, etc. (See note 3)

M78 Verify that fuel oil system is functioning properly - fuel oil pumps (diesel and electric) strainers, fuel metering valves, injectors, etc. (See note 3)

M79 Verify that lube oil system is functioning properly - main piston and scavenging oil pumps, lube oil cooler, filter/strainer, controls etc. (See note 3)

M80 Verify that cooling water system is functioning properly - pump, radiator, expansion tank, electric water heater, controls etc. (See note 3)

M81 Verify that ventilation system is functioning properly - louvers, exhaust fans, filters, controls, etc. (See note 3)

M82 Start and load the diesel from remote and local control stations, and verify that the following parameters meet design and plant requirements as applicable:

- Lube oil level
- Lube oil temperature
- Lube oil pressure
- Coolant level
- Coolant temperature
- Fuel oil temperature
- Fuel oil level
- Cylinder temperatures
- Cylinder firing compression
- Exhaust temperature
- Turbocharger operation
- Alarms and warning system
- Indicating lights and monitoring instrumentation
- Governor operation
- Starts within the required time at rated speed
- Overspeed trip

M83 Verify engine RPM is correct.

M84 Verify that no unusual noise or vibration exists. Perform vibration tests.

M85 At normal system operating pressure and temperature, verify that the steam trap allows water to pass with little or no evidence of steam passage.

M86 Verify that all hangers and restraints are in position; spring hangers and snubbers are functional. Spring hangers are showing load and not bottomed out or pinned. All lock pins have been removed from hangers after hydrostatic test, and all temporary rigging has been removed. Verify that the hydraulic fluid in hydraulic snubbers is at the proper level and it does not leak and check for any other applicable surveillance requirements.

MECHANICAL TEST REQUIREMENT NOTES

1. This is an equipment operational test to confirm that the crane/hoist meets design and operational requirements for unloaded condition.

2. Subject the crane to a load test according to vendor or plant procedures to confirm the load rating (static and dynamic).

3. Refer to component matrix for additional tests, if required.

4. Generally it will not be practical to verify valve is packed by direct observation. Review of documentation is an acceptable verification method.

5. Provided a valve can be stroked automatically, manually stroking the valve its full stroke is not required if the stroking time is excessive and the valve is in a high radiation area. Valves should be stroked at least 10% of full stroke in each direction.

Attachment 9.1, Mechanical Component Test Guide **Sheet 8 of 10**

GENERAL MECHANICAL INSPECTIONS

The following inspections may be performed, as applicable:

Debris removed from vicinity of piping, motor; pump base, fans, drains, tanks, vessels, and the general vicinity of the equipment.

All auxiliary piping is connected including bearings, jacket and gland cooling, priming lines, vents, and drains.

All joints are properly made up:

- Flange joints complete with gaskets and bolts, which are tightened.
- Welded joints are completely welded.
- Disconnect joints are made up according to engineering and/or manufacturer's information.
- Unused openings, which do not serve as process connections, are closed according to engineering and/or manufacturer's requirements.

Coupling guards and other safety devices are installed where required.

Keys are tight and locked.

All components are properly identified.

All piping, tanks, vessels and ducts are heat traced/insulated/coated according to approved engineering documents.

Verify that tank and vessel internals are installed and any protective linings are applied and are undamaged.

Vessel interiors are free of all loose scale and debris.

Verify that Code Operating Certificate for pressure vessels is obtained.

Verify that all affected piping has been filled and vented prior to performance of testing.

Verify that all handhole and manway covers are made up complete with gaskets and bolts that are tightened.

Permanent and temporary strainers/filters are clean and in place. Gauges are installed to measure D/P across strainers, if necessary.

Verify that the system has been flushed and hydrostatic tested as required by the installation documentation or other approved engineering specifications.

Use flow diagrams/P&IDs to verify correct mechanical configuration of piping runs, equipment, and components.

Verify that sufficient thread engagement is visible on bolted fasteners.

Verify that the fan is securely mounted and that all bolts, fasteners, electrical connections are tight.

Attachment 9.1, Mechanical Component Test Guide **Sheet 9 of 10**

Verify that the fan blade angles (pitch of blades) are uniform.

For work that may have affected fan balancing, verify that the fan/wheel is balanced within plant requirements.

Duct filters have been inspected for proper installation including type and number, cleanliness, and proper closure of inspection access opening.

All flexible connections have been inspected for proper installation and connection integrity.

Alignment of fans driven by V-belts should be checked as follows prior to operation: (See note below)

- Remove belt guards. Verify correct belt(s) installed per vendor's instructions and/or design documents.
- Be sure sheaves are locked in position.
- Place straight edge or taut cord across faces of driving and driven sheaves to check alignment. The motor and fan shafts must be parallel, with V-belts at right angles to the shafts.
- To align properly, move motor on slide base. Be sure belts are tightened to correct tension, as per vendor's instructions.
- Multiple belt drives require the installation of matched belt sets.

Note: May need to be re-verified if the motor or driver will be operated uncoupled as required by an additional test requirement.

Verify that the required lubrication for the component is performed in accordance with the manufacturer's instruction manual or an approved engineering document.

Note: In the event that the equipment is not yet lubricated, and the manufacturer's instructions provide a choice of acceptable lubricants, contact the appropriate site department to determine a lubricant that is acceptable for use on that site.

Document the type of lubricant and the quantity used.

All gear cases not lubricated at the factory are flushed and lubricated. Breather vents are clear.
Grease lubricated bearings are not over-lubricated and vent plug is removed as specified for run-in.

Note: See vendor's instruction for proper grease lubrication.

Oil lubricated bearings are cleaned, lubricated, and oil rings free to rotate.

Automatic lubrication system (including constant level oilers), if provided, is correctly filled, primed, and where possible, determined to be delivering oil to all parts.

Verify that crankcase sump, crosshead guides, and cylinders are thoroughly cleaned and lubricated as specified. In some applications, the vendor may specify flushing/cleaning with kerosene prior to operation.

After the run-in period, change oil as specified by vendor.

Verify couplings are lubricated per manufacturer's specifications.

Attachment 9.1, Mechanical Component Test Guide **Sheet 10 of 10**

With the driver coupled to the equipment and if possible, hand rotate the shafts of pumps, fans, and compressors at least one complete revolution in the normal direction of travel and verify that the equipment and turn freely without any rubbing or binding.

Verify that the pump and driver shafts are coupled and properly aligned.

Ensure proper valve line up to provide pump with adequate fluid supply to avoid pump cavitation.

Verify that the equipment is of the proper design (material, type, service, end connections, etc.) as specified by the design change.

Verify nameplate data as correct in accordance with design change specifications.

Verify that all bolting is in place and not visibly loose or broken and is torqued to specified values.

Verify that the equipment is completely assembled, securely mounted and connected properly in accordance with vendor or design change documents.

Verify proper orientation of the equipment.

Verify that there are no visible signs of improper equipment assembly.

Verify that the intake and discharge screens are clear.

Verify that dampers and linkages are in place and that threaded connections are properly locked.

Verify that all instrument test and access holes are covered.

Verify that the damper seal material is in good condition.

Verify proper installation of the "fusible link:" (protective device) for fire curtains.

Verify that safety/relief valve discharge piping is securely attached.

Verify that appropriate shielding is in place, to prevent safety/relief valve discharge from damaging equipment.

Verify that the valve is not gagged to prevent operation, ensure that gagging is not required in the existing mode of operation before removing the gag.

Verify correct installation/adjustment of vibration isolators.

ATTACHMENT 9.2 **ELECTRICAL COMPONENT TEST GUIDE**

Sheet 1 of 7

(This guide can be used to assist in determining test requirements)

ELECTRICAL	
COMPONENT	**TEST REQUIREMENTS**
Battery and Battery Charger	E9 - E14 and E16 - E19
Circuit Breaker	E18, E21 - E23
Contactor	E18, E20
Diesel Generator *	E18, E24, E25, E26
Fuse/Fuse Block	E18, E27
Electric Heater	E18, E28, E29
Heat Tracing Equipment	E18, E30, E31, E32
Inverter	E18, E33 - E36
Motor, Electric	E1 - E8, E18, E23
Motor Generator	E18, E37 - E43
Penetration**	E18, E44, E45, E46
Power Supply	E47 - E52
Relay/Meter	E18, E53
Switchgear	E18, E54 - E57
Switch, Electrical	E18, E58, E59, E60
Transformer	E18, E61 - E70
Emergency Lights	E18, E72 - E76
Indicating Lights	E18
Thermal Overload Heater	E18, E23, E71

* Refer to Diesel Generator in Mechanical Test Requirements for additional requirements as applicable.

** Refer to Electrical Penetration in Mechanical Test Requirements for additional requirements as applicable.

E1 Conduct a phase rotation test to verify that the correct phases have been connected to AC motors. For DC motors, verify that the polarity connections are correct.

E2 Check the physical rotation of the motor by manually rotating the shaft in the direction that the motor is expected to drive the equipment. Verify shaft is free from binding, noise and drag effects. Then, bump uncoupled and verify proper rotation. Energize the motor and operate it until bearing temperature stabilizes.

E3 Verify bearing temperature increase does not exceed manufacturer's tolerances or design documentation.

E4 Verify winding temperature does not exceed manufacturer's tolerances.

E5 Verify that the motor speed is within tolerance.

Attachment 9.2, Electrical Component Test Guide **Sheet 2 of 7**

E6 Verify start and run currents do not exceed full load on nameplate or other appropriate values as determined by engineering documentation.

E7 Verify bus voltage imbalance is within specifications.

E8 Perform vibration tests.

E9 Verify that the support or auxiliary systems related to the battery and the battery charger are functioning properly. Check fire detection systems, HVAC, etc.

E10 Verify individual cell voltage readings and battery terminal voltage. (Prior to installation and after charging is completed.

E11 Verify that continuity exists between the battery charger mounting and station ground, using a low voltage continuity test. In addition, verify that the resistance of any connection between the battery charger and the ground grid does not exceed 0.5 ohms.

E12 Perform intercell resistance checks on the battery.

E13 Verify that the resistance of the connection of the battery charger terminals to the cable(s) are within design or vendor specifications.

E14 Verify that the correct polarities have been connected to the battery charger by conducting a polarity test.

E15 Deleted

E16 Perform a battery capacity and service discharge test (Load Profile) according to plant procedures (see Surveillance Tests).

E17 Verify, through load testing, once charging has been completed, that:

- The battery charger will charge the batteries in the appropriate mode.
- Individual cell specific gravity is correct.
- Individual cell voltage is correct.
- Battery terminal voltage is correct.
- Required time for charging is correct.

E18 Verify that the alarm, interlock, control, and indication circuits associated with the component operate in accordance with vendor or design requirements.

E19 Perform the following tests by operating the battery charger with the batteries connected:

- Verify that DC voltage in float charge mode is correct.
- Verify that the charger output current is correct.
- Verify that DC voltage in equalizing charge mode is correct.
- Verify charging times for worst-case battery conditions meet design criteria.
- Verify that the charger re-activates after power is supplied.
- Verify automatic energization/deenergization of alternate AC supplies and subsequent charger operation under postulated scenarios, if applicable.

Attachment 9.2, Electrical Component Test Guide **Sheet 3 of 7**

E20 Verify that the contactor operates freely with no overheating, or other abnormalities occurring during the tests conducted with the load connected. Cycle the contactor several times and verify proper operation. (Verify contactor meets pickup/drop characteristics as specified, if applicable.)

E21 Perform breaker overload trip tests. Energize breaker to verify that trip currents and trip times conform to specifications.

E22 Verify that all protective relay settings are in accordance with specifications if applicable.

E23 Verify successful breaker or thermal overload heater operation with load connected if applicable. (Verify instantaneous/thermal breaker adjustments, if applicable, are set to specified settings.)

E24 With the diesel generator operating and supplying power to the bus, verify the following:
- Bearing temperature increase does not exceed specifications.
- Winding temperature does not exceed specification.
- Running direction is correct.
- Running current does not exceed full load on nameplate.
- Bus supply and generator terminal voltages are within nameplate values.
- Voltage imbalance does not exceed value specified.

E25 Perform sequencer load test and verify protective trips (e.g. undervoltage, overcurrent, etc.) if applicable.

E26 Verify DG autostart functions and verify synchronization, load speed control, and governor control.

E27 Energize each circuit that was installed or modified and verify correct voltage output and load acceptance for that circuit.

E28 Energize the heater and verify the following:
- Heater current and voltage are in accordance with specifications.
- Thermostat is functioning to regulate temperature within design requirements.
- Heater circuit does not trip or overheat.
- That the heater is maintaining the required temperature.
- High and low temperature alarms illuminate and extinguish as required.

E29 Verify that, when flow or heating medium is reduced for heaters with overcurrent protection except where fuses are installed, the heater trips at the required amperage.

E30 Energize the heat trace circuit, adjust the temperature, and perform a circuit wattage (voltage and current) test. Monitor heat trace circuit for two cycles during the given process to verify that the circuit (both redundant and primary) maintains the process fluids temperature or supplies wattage to heat trace circuits. (Some heat trace circuits do not maintain a temperature).

E31 Verify and/or calibrate over/under temperature control set points and alarm set points are per specifications.

E32 Perform circuit control card functional check per vendor manual.

E33 Perform central control unit calibration per vendor manual.

Attachment 9.2, Electrical Component Test Guide **Sheet 4 of 7**

E34 Conduct a phase check (AC side) and a polarity test (DC side) to verify that the correct terminals have been connected to the inverter.

E35 Verify that each current transformer (CT) and potential transformer (PT) is tested as follows:
- CTs should be given ratio checks, polarity check saturation tests, and winding resistance to ground checks per vendor or design instructions.
- Verify that each CT and PT is mounted correctly and with the correct polarities.
- Verify that the insulation tests have been performed on each PT.

E36 Energize the Inverter and verify that the following parameters meet vendor or design requirements:
- Output current and DC voltage are correct.
- Phase rotation is correct.
- DC voltage on the primary source of power is correct.
- Inverter output current under load is correct.
- DC voltage on alternate source feed is correct.
- Verify proper output voltage with input at minimum design limit.

E37 Performance tests/parameter checks are performed to verify design requirements and to obtain baseline operational data.

E38 Energize the motor to demonstrate that set starts on demand and reaches rated speed, then operate it until bearing temperature stabilizes. Verify temperatures are within specifications.

E39 Verify starting and running current and voltage is acceptable. Verify protective trips (undervoltage, overcurrent, etc.) as applicable.

E40 Verify auto synchronization circuit is functional.

E41 Inspect for proper lube level and leaks while equipment is running. Verify excess lubricant is relieved and properly discarded.

E42 Verify that the MG set will accept load and regulate within required specifications. Adjust controls as necessary per design or vendor documentation.

E43 Ensure that MG set does not exceed manufacturer's maximum allowable vibration.

E44 Verify that the Penetration has been connected to the proper phases or polarity by physically observing the connections and checking with a meter. Ensure no cross wiring has occurred.

E45 Perform a circuit functional test. Consult the penetration wiring and single line drawings for the type of equipment that is connected to the electrical penetration to determine the test required.

E46 Determine the instruments that should be loop checked and consult the appropriate plant documentation for recommended test. Verify that the loop/channel is in an acceptable state for the loop check to be performed.

E47 Energize the supply unloaded and verify correct output voltage per vendor or design requirements.

Attachment 9.2, Electrical Component Test Guide **Sheet 5 of 7**

E48 Load the supply to minimum and adjust the output voltage to the vendor's minimum and maximum specification. Verify that the output voltage is within vendor/design specification limits.

E49 Load the supply to 100% and adjust the input voltage to the minimum required for operation. Verify that the output voltage is within vendor or design requirements.

E50 Allow the supply to remain loaded with a median input voltage for a time period as recommended by the vendor manual. Verify that the output voltage is within the vendor or design limits.

E51 Verify that the cooling fan (if applicable) is operating satisfactorily.

E52 Operate the supply under normal operational loaded conditions and verify the outlet air and case temperature are within the vendor or design limits.

E53 Conduct test consisting of energizing the relay at rated voltage and verify the following:

- Contact wipe, pickup, dropout and resistance are adjusted according to the vendor or design documentation.
- No contact binding exists and, if the relay is a time delay type, the required time setting has been calibrated for the relay.
- All jumpers have been removed and any fuses installed.
- Energize the relay and cycle a minimum of three times by actuating at least one switch or relay contact of the coil circuit.
- The relay energizes and de-energizes to pick up or drop out, and all contacts function as expected.

E54 Energize the switchgear:

- Measure the voltages of the switchgear.
- Verify the phase sequence is correct.

E55 Verify that the Switchgear operates freely with no overheating, or other abnormalities occurring during the tests conducted with the load connected.

E56 Conduct the thermography scans at appropriate points to monitor heat generated at connections, excessive contact resistance, insulation breakdowns, inadvertent grounding of wiring or components, and excessive loads on the switchgear.

E57 Compare data against design criteria and similar load conditions. Evaluate any adverse trends.

E58 Verify that the normal switch position is according to the design documentation, using a continuity check. Place the switch in various possible configurations and verify that the correct contact actuates.

E59 Conduct testing which operates the switch and associated circuitry in all possible modes. Check to determine that the associated components function according to design requirements.

E60 Verify that all indication is correct, no burned out lights occur, and indication is not reversed.

E61 Verify that a Doble test is conducted on the lightning arresters and other high-voltage bushings.

Attachment 9.2, Electrical Component Test Guide **Sheet 6 of 7**

E62 Conduct a megger test, hi-pot test, and polarization index to verify correct insulation resistance characteristics.

E63 Verify that auxiliary support systems are operable such as pumps, oil coolers, fans, and fire protection system.

E64 Verify that the tap positions are correct to provide the voltage transformation required. Verify that the tap changer has been tested so that the winding ratio corresponds with vendor or design change documentation.

E65 Verify that an oil analysis is performed according to design or vendor requirements and that the dielectric strength, neutralization number, and color are within specified limits.

E66 Verify that a leak check is performed on the transformer by pressurizing it to at least 5 psi and that no appreciable leakage is detected, if applicable.

E67 Verify that a dew check is conducted on the nitrogen blanket in the transformer, if applicable.

E68 Not used

E69 Verify the following:

- Energize the transformer by closing the supply breaker. Load breakers should be open. Check transformer for abnormal noises, excessive vibration, arcing, gas emission, or other evidence of problems.
- Measure the bus voltage of the transformer. Verify acceptance criteria is specified from design documentation for the high and low side.
- Verify proper phase sequence exists.
- Verify that there are no abnormal operating characteristics (e.g., temperature and oil level changes) for a 24-hour period before loading the secondary of the transformer, if applicable.

E70 Repeat oil sample as required by manufacturer. Review laboratory results, and monitor for contamination, and particulate. Evaluate any adverse findings.

E71 Thermal Overload Heaters (TOLs) shall be trip tested (current vs. time) and verified to be functioning correctly in accordance with vendor or design specification.

E72 Verify that the "Push to Test" switch turns lights on.

E73 Verify lights are aimed in the proper direction.

E74 Demonstrate the candlepower output of the emergency light in accordance with vendor or Design Specification during an 8-hour discharge test.

E75 Perform blackout test. Turn off normal area lights (either by de-energizing or simulating loss of power) and verify that the emergency lights come on and adequate light exists to support operator access/egress and/or operator action.

E76 Load Test circuit from lighting distribution panel with normal load plus emergency light load and verify proper equipment function.

Attachment 9.2, Electrical Component Test Guide **Sheet 7 of 7**

GENERAL ELECTRICAL INSPECTIONS

Visually inspect to determine that the component is securely fastened to a support structure and verify seismic qualification acceptability.

Verify that all fasteners are in place and that connections to terminal blocks are tight.

Check wire routing to ensure that it is secure and that it does not bind when covers are closed or removed.

Verify that there is no corrosion on the component terminals and check for component cleanliness.

Verify that the surrounding area is free of loose equipment such as chain falls, tools and debris.

Perform point-to-point wiring verifications (continuity checks).

Verify that values of opens, shorts and grounds are acceptable. For components which require casing or cabinet ground, check to verify that continuity exists between the component and station ground, using a low voltage continuity test (resistance should not exceed 0.5 ohms).

Check the terminals connecting the component to cables against design electrical wiring or elementary drawings to verify that the connections match those documents.

Verify that the correct terminal types have been used in any installation work and that markers are in place on the cables connecting to the component.

Verify that the terminal lugs are torqued when required to values specified in the manufacturer's bulletins or design documents. Verify that all washers and other fasteners are in place on the terminal lug per the applicable drawings.

Perform meggering/dielectric/hi pot testing of cables, connections, equipment or splices to test the dielectric breakdown strength of electrical insulation and oils.

Verify that all jumpers have been removed. Also, verify that all fuses have been installed.

Verify that the correct voltage is present on all energized parts.

Energize each circuit that was installed or modified and verify correct voltage output and load acceptance for that circuit.

Energize the component unloaded if possible and verify proper operation per vendor or design requirements.

ATTACHMENT 9.3 **I&C COMPONENT TEST GUIDE**

Sheet 1 of 6

(This guide can be used to assist in determining test requirements)

INSTRUMENTATION & CONTROL	
COMPONENT	**TEST REQUIREMENTS**
Annunciator	I1, I2, I3, I16, I48
Bistable/Relay	I4, I5, I6, I7, I16, I21
Converter (E/P and I/P)	I13, I14, I15, I26
Control Switch	I16 - I21, I26
Gauge	I25, I26, I27
Indicator	I25, I26, I27, I28
Nuclear Instrumentation	I19, I29, I30, I 31, I33 - I37, I39, I46
Process Controller	I25, I26, I40, I41
Computing Module	I16, I25
Recorder	I19, I25, I28, I42 - I45
Radiation Monitor	I16, I19, I26, I27, I28, I46
RTD/Thermocouple	I25 - I28, I47
Transmitter	I21, I25, I26, I28, I46
Fire Detection	I19, I21, I22, I23, I24, I25, I30, I46
Computer, PC, PLC	I8 – I12
Software	I49

I1 Apply power and check voltage to the annunciator circuit. Verify that the system does not trip or overheat.

I2 Momentarily toggle, jumper, or lift (as appropriate) the field input and verify the output changes state relative to actual condition (e.g. windows flash, horns sound, etc.). Then verify that the alarm can be acknowledged, if applicable.

I3 Restore or change the input condition by toggle, jumper, or lifted lead (as appropriate) to verify that the output again changes state. Then verify that the alarm can be cleared, if applicable.

I4 Verify that components/cards are properly programmed.

I5 Energize the loop and verify that the bistable/relay is in the correct state for the operational condition. Verify that applied voltage is correct.

I6 Verify that relay energizes and de-energizes to pick up or drop out, and all contact interlocks operate as designed.

I7 Verify that no contact binding exists and, if the relay is a time delay type, the required time setting is verified for the relay.

Attachment 9.3, I&C Component Test Guide **Sheet 2 of 6**

I8 If the computer I/O is a process termination cabinet, compare the point that has been maintained with another existing channel reading the same process variable. If the channel does not exist, verify that the process is correct by alternate means. Verify that the reading is reasonable. If the component is one that has a tolerance determined by channel checks or surveillance tests, verify that the channel is within that tolerance.

I9 Verify that any other device performs its intended function as an I/O device. Ensure that it can display its normal parameters in the correct configuration.

I10 Verify that I/O equipment, such as link system, disk drives, Versitech, CRT, operate correctly by using the applicable tester.

I11 Verify that security I/O, if applicable, operates correctly by suing the appropriate test records.

I12 Verify that the computer I/O devices operate correctly by loading and running the appropriate diagnostics.

I13 Energize the loop and verify that the air pressure and loop voltages are within limits.

I14 Input the appropriate current or voltage and verify that the output response in pressure is acceptable according to design requirements.

I15 Perform a channel/loop check, to verify that the E/P or I/P is driving the end device properly.

I16 Check, using a low-voltage continuity test, that wires are terminated to the correct point, compare to the design documentation.

I17 Verify that the normal switch position is according to the design documentation, using a continuity check. Place the control switch in all possible configurations and verify that the correct contact actuates.

I18 Using the plant drawings, procedures, and other manuals as necessary, operate the switch and associated circuitry in all possible modes. Check to determine that the associated components function according to the design document requirements.

I19 Verify that all interfaces, such as alarms, plant computer input, and other status output, occur as required.

I20 Verify that all indication is correct, no burned out lights, and indication has not been reversed.

I21 Perform channel calibration and channel functional tests, as required. Verify actuation and reset point for alarms, control settings, actuation, and indication.

I22 Perform channel checks and supervisory circuit checks on all detector channels that reside in the Fire Protection panel.

I23 Perform a functional test on the relay or zone-indicating unit. Using a detector test kit, apply an activating source to the detector and verify that the detector functions properly. Verify actuation of alarms locally and in the master supervisory panel. Clear the alarm at the master panel.

Attachment 9.3, I&C Component Test Guide **Sheet 3 of 6**

I24 Verify that when smoke, light, or temperature device is actuated, the appropriate automatic function occurs, i.e., dampers close, fans trip, etc.

I25 Perform a device calibration. This may be a bench or in place calibration.

I26 Verify that all fluid pressure boundaries are not leaking and can hold pressure, if applicable.

I27 Verify gauge reading is consistent with other indication checks.

I28 Energize the loop and check the indicated value against a known input obtained from redundant channels or simulated signals. Verify that the indicated value is within tolerance.

I29 Perform appropriate checks of power supply, meter, instrument drawer, and indicator per the vendor manual.

I30 Perform detector calibrations (including power supply setting) per vendor technical manual and establish initial setting.

I31 Perform channel calibration for the affected NI channel, including channel checks, channel calibration, channel functional checks.

I32 deleted

I33 If applicable, perform and incore detector channel calibration.

I34 Verify actuation settings from channel calibrations.

I35 During reactor startup, verify proper operation by comparison with redundant channel at each indication point.

I36 If applicable, perform incore/excore calibrations per station procedures.

I37 If applicable, perform high power primary to secondary calorimetrics to verify reactor power against turbine power and reconcile per station procedures.

I38 deleted

I39 Perform an incore detector drive test.

I40 Perform an operations check by energizing the loop and checking the indicated output value against a known output obtained from redundant channels or operational knowledge. Verify that the indicated value is within tolerance.

1) Verify that all indicators operate per design requirements.
2) Verify that all control stations function per design requirements.
3) Verify that all blocks, permissives, interlocks, protective devices function properly.
4) Verify that inputs to computer monitoring pads operate properly.
5) Verify that all instrument switches and relays function as required.

Attachment 9.3, I&C Component Test Guide **Sheet 4 of 6**

I41 A channel functional test (channel/loop check) is the qualitative assessment of channel (or loop) behavior during operation by observation. This determination shall include, when possible, comparison of the channel indication and/or status with other indications and/or status derived from independent instrument channels measuring the same parameter.

1) Energize the loop and allow the loop to stabilize. Check the controller output value against a known output obtained from operating knowledge. Verify that the value is within tolerance and operationally check the loop, when plant conditions permit, to verify that the controller is operating correctly throughout its range.

2) Verify proper operation of loop components.

I42 Verify that a correct trace is indicated/recorded versus input.

I43 Verify that multi-point print heads are synchronized to the proper input.

I44 Verify that recorder printout quality is adequate to be reproduced or photographed.

I45 Verify proper chart speed and take up.

I46 Verify automatic function, including: alarms, indications, interlocks, automatic actuations, setpoints and resets.

I47 Verify RTD resistance at two known temperatures using a precision bridge instrument. Verify accurate reading to actual process temperature.

I48 Push test button for 30 seconds and verify that system does not trip or overheat.

I49 For digital changes, test requirements are summarized on the Software Requirements Matrix (SRM) developed per ENN-DC-162. Digital hardware and other hardware system test requirements are identified in modification/EC.

Attachment 9.3, I&C Component Test Guide **Sheet 5 of 6**

GENERAL INSTRUMENT AND CONTROL INSPECTIONS

Verify that the Component has been installed in the correct location per appropriate design drawings and related components are correctly attached.

Verify that the Component is installed securely with all required brackets and linkages. All supports are in conformance with engineering and vendor instructions.

Verify that all probes are fully inserted into the process being monitored.

Verify that all fasteners, covers, terminal blocks, connectors, couplings and feedback mechanisms are in place and that connections to terminal blocks are tight.

Verify that the installed component has the correct nameplate data. Ensure that component serial number corresponds to as designed documentation.

Verify that the mechanical components have all of the required linkages securely connected.

Verify that the correct type of tubing joint compound is used.

Verify that the installed component has the correct scale graduations.

Verify that all indicating lamps and lamp caps are properly installed. Replace all burned out lamps and broken caps.

Verify, before energizing instrument loops, that the power, control, and signal circuits containing fuses are checked for proper fuse type and rating. Fuse holders should be checked for dirt, corrosion, looseness, and missing parts.

Verify proper equipment grounding and that a separate plant instrument ground bus is used, if required.

Verify proper version of software/firmware is installed.

Verify that the power supply is compatible with all circuit/channel components.

Verify sensing, signal, and sample line cleanliness; clean to remove dirt and debris by blowing with air or flushing with fluid compatible with the system are required.

Verify that all tubing/capillary has no kinks, dimples, or sags and that it is securely supported.

Verify that all disturbed connections are tight, and bring the line to operating pressure:

- Exercise care to protect instruments during leak checks.
- Identify loop isolation boundaries and isolate as needed.
- Verify that equalizers are open on D/P instruments.
- Record attained test pressure when required.

Verify that existing parts in use are not worn excessively. If any worn parts are found that could affect the equipment qualification, ensure that the proper disposition of those parts is performed; e.g., part does not complete its qualified life and fails early, necessitating new analysis of qualified life for the part.

Attachment 9.3, I&C Component Test Guide **Sheet 6 of 6**

Inspect disturbed splices, seals, or torque components to ensure that environmental qualification requirements are maintained.

Verify that any lubricants, gaskets, or other expendable material are of the type specified in the equipment qualification program.

Verify that fuses have been replaced in the supply circuit and that power to the device has been restored, consistent with plant tagging procedures.

Verify that appropriate maintenance inspections, electrical checks, and calibrations have been satisfactorily completed.

Verify that the correct nameplate data, including serial number, is on the component and matches controls on locations such as control board.

ATTACHMENT 9.4 **POST MODIFICATION TEST PLAN FORM (TYPICAL)**

Sheet 1 of 1

EC #		**Rev**	**Title**	**Page of**
		Test Requirement(s)		Acceptance Criteria
Item #	☐ Construction ☐ Functional ☐ EC Assumption ☐ Operations ☐ Post Return to Service			
Item #	☐ Construction ☐ Functional ☐ EC Assumption ☐ Operations ☐ Post Return to Service			
Item #	☐ Construction ☐ Functional ☐ EC Assumption ☐ Operations ☐ Post Return to Service			
Item #	☐ Construction ☐ Functional ☐ EC Assumption ☐ Operations ☐ Post Return to Service			
Item #	☐ Construction ☐ Functional ☐ EC Assumption ☐ Operations ☐ Post Return to Service			
Item #	☐ Construction ☐ Functional ☐ EC Assumption ☐ Operations ☐ Post Return to Service			
Item #	☐ Construction ☐ Functional ☐ EC Assumption ☐ Operations ☐ Post Return to Service			

Prepared By: ______________ / ______ Responsible Engineer / Date

Reviewed By: ______________ / ______ Operations / Date

Reviewed By: ______________ / ______ Responsible Field Engineer / Date

Reviewed By: ______________ / ____ / ______ Other Reviewer / Dept / Date

Reviewed By: ______________ / ______ Test Engineer / Date

Approved By: ______________ / ______ Test Engineer Supervisor / Date

ATTACHMENT 9.5 **TEST PROCEDURE PREPARATION GUIDELINES**

Sheet 1 of 3

1. Prerequisite lineups, conditions and configurations have been determined for the systems/components affected by the test (being tested or supporting the test) and these have been incorporated into the test.

2. Test verifies equipment negative testing where applicable (e.g. lights verified to extinguish when required, lockouts prevent actuation when required, annunciators/indicators clear when required, equipment is not running with controls in the off or stop position, etc.).

3. All normal functions and configurations of the system/components, which need to be proven, have been included in the test.

4. All abnormal and emergency functions and configurations of the system/ components, which need to be proven, have been included in the test.

5. All systems/components added or modified by the modification have been included in the test.

6. Deleted system component functions are verified to be deleted by test where possible.

7. All components, which have been de-terminated, disconnected, relocated, blanked, etc., to support the test have been included in this test, either by testing following restoration or independent verification of restoration.

8. Testing is being performed at least one step beyond the interface to equipment which hasn't been modified (where possible).

9. All testing is being performed by operating systems/equipment when possible (i.e. simulation, jumpering, etc. is minimized).

10. All testing is being performed using normal power, water, air, hydraulics, etc. when possible (i.e. use of temporary power, water, air, etc. is minimized).

11. Technical Specification, SAR and other License Basis Document requirements, which are proven by, or bear on the performance of the test, have been appropriately incorporated into the test.

12. Regulatory commitments, which are satisfied by, or bear on the performance of the test, have been appropriately incorporated into the test.

13 Applicable Industry Codes and Standards have been reviewed and incorporated into the test.

14. Applicable vendor manuals, correspondence and/or recommendations have been reviewed and appropriately incorporated into the test.

Attachment 9.5, Test Procedure Preparation Guidelines **Sheet 2 of 3**

15. If applicable, previous testing and system/component operating history have been reviewed and appropriately incorporated into the test.

17. Applicable operating procedures and other plant procedures have been reviewed. The test references or incorporates applicable sections of these procedures to perform normal system/component operation. Equipment or system limits or precautions have been incorporated where applicable.

18. Adequate precautions have been included in the test to ensure that more than one train of safety-related systems/components are not made inoperable at the same time.

19. Instructions for discharge/disposal of fluids have been included in the test. Steps have been included to obtain necessary discharge permits. Material Safety Data Sheets have been reviewed and appropriate cautionary steps have been included if hazardous fluids are involved.

20. Personnel safety precautions have been included as appropriate.

21. Ensure that the testing demonstrates the following:

    - The critical characteristics of the EC are clearly demonstrated and proven.
    - Systems or components, which the EC interfaces with or has potentially, affected, have been restored to proper operation.
    - The full channel or loop is tested.

22. Ensure that proper operation of equipment interlocks have been verified, including verification of trip set points.

23. Equipment testing should allow for a reasonable run-in period in order to detect premature failures that may occur during operation.

24. Contingency actions needed or required to mitigate the consequences of equipment / component malfunctions (i.e., such as leaks).

25. Required test support personnel availability (resources may need to be allocated and coordinated).

26. Test equipment availability, some may need to be purchased.

27. Scheduling of testing activities (12 week rolling schedule or outage).

28. Equipment should be tested over its full range of operation and in the worst case or highest demand configuration.

Attachment 9.5, Test Procedure Preparation Guidelines **Sheet 3 of 3**

29. Steps that install and remove intrusive test equipment should be independently verified.

30. Ensure that equipment to be manipulated is labeled in the field and clearly identified in the test.

31. Tests should be written to verify alarms, when possible, preferably by system operation or by simulated condition from output of alarm sensors.

32. A Walk down has been completed to verify that the test can be performed as written.

33 Protective Tagging requirements have been specified, if applicable.

ATTACHMENT 9.6 **TEST PROCEDURE COVER SHEET**

Sheet 1 of 1

TEST COVER SHEET

TEST TYPE: ☐ **ECT Procedure** ☐ **STI Procedure** **Page 1 of**

TEST #: _____ **REV. #:** _____ **Quality Class:** ☐ **QR** ☐ **NQR**

TEST TITLE: _____

_____

REVIEW (Print/Sign/Date)

Test Engineer (TE): _____ /_____

Technical Reviewer: _____ /_____

CROSS-DISCIPLINE REVIEW

Operations Department: _____ /_____ _____ : _____ /_____
Organization

_____ : _____ /_____ _____ : _____ /_____
Organization Organization

_____ : _____ /_____ _____ : _____ /_____
Organization

ADDITIONAL STI (ONLY) PROCEDURE REQUIREMENTS

EN-LI-100 Review: ☐ Attached ☐ Other

10CFR50.59 Evaluation: ☐ Not Required ☐ Attached ☐ Other

OSRC Approval ☐ Not Required Mtg No._____ Date:_____ Chairman:_____

APPROVAL (Print/Sign/Date)

TE Supervisor: _____ /_____

TEST COMPLETION REVIEW / ACCEPTANCE

Summary of Test Results: _____

_____

_____

Test Engineer (TE): _____ /_____

TE Supervisor: _____ /_____

ATTACHMENT 9.7 **TEST REVIEW AND APPROVAL MATRIX**

SHEET 1 OF 1

Use this Table with care. Ensure that the most stringent requirements are met. For example, if a Test affects only Non-Quality Related, Major Rotating Equipment, then the review and approval process must contain all reviews that apply to these two situations. As Required "A/R" as determined by Site programs.

TESTING CONTAINS OR AFFECTS	PREPARER	TECHNICAL REVIEW	TEST ENGINEER SUPERVISOR REVIEW	QA REVIEW	OPERATIONS REVIEW	MAINTENANCE REVIEW	HEALTH PHYSICS REVIEW	CHEMISTRY REVIEW	REACTOR ENGINEERING REVIEW	ON SITE REVIEW COMMITTEE	INDUSTRIAL SAFETY
QUALITY RELATED SYSTEMS OR COMPONENTS	X	X	X	A/R	X					A/R	A/R
MAJOR ROTATING EQUIPMENT	X	X	X		X						A/R
TRIP SENSITIVE OR TRIP CRITICAL SYSTEMS OR COMPONENTS	X	X	X	A/R	X					A/R	A/R
POTENTIALLY AFFECTS PLANT CHEMISTRY	X	X	X		X			X			A/R
POTENTIALLY AFFECTS NUCLEAR FUEL, SPENT OR ACTIVE, OR POTENTIALLY AFFECTS REACTIVITY, CORE GEOMETRY, REACTOR POWER OR NUCLEAR INSTRUMENTATION	X	X	X	A/R	X				X	A/R	A/R
REQUIRES A SPECIFIC RWP OR POTENTIALLY AFFECTS DOSE RATES	X	X	X		X		X				A/R
10CFR50.59 EVALUATION	X	X	X		X					X	A/R
MAINTENANCE SUPPORT	X	X	X			X					A/R
OPERATIONS SUPPORT	X	X	X		X						A/R
CHEMISTRY SUPPORT	X	X	X					X			A/R
HEALTH PHYSICS SUPPORT	X	X	X				X				A/R
NON-QUALITY RELATED COMPONENTS OR SYSTEMS ONLY	X	X	X		X						A/R

ATTACHMENT 9.8 TEST CHANGE NOTICE

SHEET 1 OF 1

TEST CHANGE NOTICE

TEST TYPE: ☐ **ECT** ☐ **STI** **Page 1 of**

TEST #: _____ **Change Notice No.:** **Quality Class:** ☐ **QR** ☐ **NQR**

TEST TITLE: _____

_____

Type of Change: ☐ Intent ☐ Non Intent

Description of Change(s):_____

TCN POSTING INSTRUCTION

List Page(s) being Replaced (N/A, if not applicable): _____

List Page(s) being Added (N/A, if not applicable): _____

List Page(s) being Deleted (N/A, if not applicable): _____

REVIEW (Print/Sign/Date)

Test Engineer: _____/_____

Technical Reviewer: _____/_____ or ☐ Non Intent Change

(Signature not required for Non-intent Changes, mark N/A and check box)

STI Original EN-LI-100, process Applicability Determination: ☐ Not Impacted; ☐ Impacted and Revised

OSRC Approval:☐ Not Required Mtg No.__ Date:_____ Chairman:_____

Operations Department:_____/_____ _____: _____/_____

Organization

_____: _____/_____ _____: _____/_____

Organization Organization

_____: _____/_____ _____: _____/_____

Organization Organization

On Site Risk Assessment Group:_____

APPROVAL (Print/Sign/Date)

TE Supervisor: _____/_____

ATTACHMENT 9.9 **TEST LOG**

SHEET 1 OF 1

Test Number: ECT/STI:____ Page_____of_____

Date	Entry	Initials

ATTACHMENT 9.10 **TEST DEFICIENCY LOG**

SHEET 1 OF 1

Test Number: ECT/STI:_____ Page__of_____

DEFICIENCY NUMBER	DEFICIENCY DESCRIPTION	DATE/TIME

ATTACHMENT 9.11 **SIGNATURE IDENTIFICATION LOG**

SHEET 1 OF 1

TEST NUMBER: ECT/STI:_____ **PAGE____OF_____**

Name	Title	Signature	Initials

ATTACHMENT 9.12 **PERFORMANCE SUMMARY**

SHEET 1 OF 1

Test Number: ECT/STI:____ Page______of_____

Date	Entry	Initials

ATTACHMENT 9.13 PRE-TEST BRIEFING GUIDELINES

Applicable site-specific briefing procedures may also be used. The following list is provided to assist the Test Engineer prepare/conduct a pre-test briefing. It is not a requirement to follow this attachment. There is no significance to the order presented.

1. Safety – re-emphasize this to all personnel involved, include specifics such as working with live loads (voltage measurements), high temperature equipment and ambient conditions, use of proper safety equipment, etc.

2. Reason for the Test – ensure this is clearly explained because understanding “why” helps achieve a successful test.

3. Operator Activities – need to describe what needs to be done. The Operations shift superintendent determines whom or which watch station is most appropriate.

4. Plant Conditions – think how any plant conditions could affect the test, and discuss these.

5. Proximity Issues – are any trip sensitive components in the area of the test that test personnel need to avoid contacting.

6. Lessons Learned – from industry and in-house events, applicable to the test.

7. Expected Plant Response – there should be no step in the test for which you do not know what to expect. Any step that causes significant changes to flows, pressure, power, etc. should be pointed out, and expected results reviewed.

8. Communications – almost all tests require remote communications such as radio or telephone. Agree to the appropriate methods during the briefing. Include also where the Test Engineer will be located, during the test. Three-way communication is to be used at all times for verbal communication.

9. Data Gathering – describe what data is going to be collected, how it is the data going to be collected, and who is going to collect the data. Include what you have done to obtain redundancy (which could save repeating steps) and which data is critical for success and which data is “nice to know”.

10. Pausing to Think – stress the importance of having a questioning attitude. STAR (Stop Think Act Review) concept is to be used.

11. Review Responsibilities – who is in charge of the testing, who is responsible for equipment manipulations (e. g. Operations personnel will stroke the valve, etc.).

12. Abort Criteria – if there is a need to abort or suspend the test, determine ahead of time the best step or section in the procedure to do so. Abort parameters should be discussed during the pre-job brief.

13. Reactor Safety – re-emphasize this because we cannot afford any mistakes in the area.

14. Potential challenges and critical evolutions that may be encountered during testing.

15. Plans for System Restoration after testing.