Eddy Current Centralized Certification Program (ET-CCP)

Power Industry-Pressure Vessel Sector

1009588

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Technical Update, November 2004

EPRI Project Manager

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REPORT SUMMARY

Eddy Current examination is an invaluable Nondestructive (NDT) test method that is used extensively by utilities to investigate integrity of tubing found in balance-of-plant (BOP) heat exchangers. Data analysts performing the evaluation and interpretation of the results are normally certified as a Level II or Level III through written and hands-on practical examination. In order to be eligible for certification by examination, the candidate must fulfill certain educational and/or work related experience as stipulated in the following recommended practice documents:

i) American Society for Nondestructive Testing Recommended Practice SNT-TC-1A **and/or**

ii) American Society for Nondestructive Testing Standard for Qualification and Certification of Nondestructive Testing Personnel, ANSI/ASNT CP-189.

These documents are used to establish guidelines for the qualification and certification of NDT personnel whose specific jobs require sufficient knowledge of the technical principles involved in the applicable NDT method to witness, perform and evaluate the damage mechanism correctly.

The certification validity ceases immediately when the employee terminates their services with their employer. In order to be re-instated as a Level II or Level III, with a new employer, the candidate must once again take written and hands-on practical examination. These examinations may vary from one employer to the other.

The entire certification process, taking repeated examination, and performing multiple audits are becoming a cumbersome affair for the utilities, individuals and their employers. Most importantly, sustaining a similar pool of data analysis skills and quality across the power industry is now becoming a challenge.

To overcome this challenge, EPRI's nuclear utility members saw the need to standardize and minimize the certification requirements and multiple audits for eddy current examination of BOP tubular products. A three-year supplemental funding was approved to develop and make fully functional an Eddy Current Central Certification Program (ET-CCP). Inaugurated in January 2004, this program is moving forward with several milestones identified. One major task of this program is to gain acceptance and approval from the American Society for Nondestructive Testing (ASNT) to include EPRI's eddy current certification program under the ASNT Central Certification Program (ACCP).

Background

Material reliability has become a major concern to operating power plants due to aging components. Stringent efforts are being pursued daily by various industries and agencies to ensure safe and reliable operation of these components by performing periodic inspections. Plant life originally planned for 25 to 30 years is now being considered for up to 60 years extension. Continued licensing to operate nuclear power plants has imposed demands on proven technology and methodology to test critical components and provide pertinent information to take timely and corrective measures to allow safe operations. Although critical and mandatory inspections are

performed on primary side components, per code requirements due to safety and operability issues, secondary components play a vital role in the life cycle management of operating plants. Periodic inspection of heat exchanger and main condenser tubes for example are necessary to maintain and extend the operability of existing plants.

Secondary side heat exchangers and main condensers are typically exposed to harsh and untreated water conditions; therefore, the tubes are exposed to different types of damage mechanism. Evaluating and reporting the tubing integrity is afforded to the interpretation skills and experience of the data analyst. Because BOP heat exchanger tubing examinations are not mandated under the ASME code or NUREG Regulatory Guide requirements, most common eddy current inspection practices used in the industry vary from one component to another. This variation can promote differences in data analysis techniques and as a result incorrect flaw reporting may occur. In order to mitigate flaw reporting inconsistencies and maintain a similar pool of data analysis skills across the industry in the BOP arena, EPRI's eddy current central certification program (ET-CCP) was developed.

Objective

- To streamline and maintain a similar pool of data analysis skills and quality across the power industry for BOP tubular products.
- To provide a transportable NDE certification- no recertification by examination is required if the candidate switches employers but provides sufficient evidence of continuous work in the respective NDE discipline.
- To eliminate multiple audits performed by utilities for personnel certification
- To gain approval and acceptance by ASNT to incorporate EPRI's Eddy Current Central Certification Program into ASNT's-ACCP.
- To address the shortage of qualified data analysts in the industry (EPRI Nuclear Strategic Bridge Plan # 3).
- To address EPRI's Nuclear Strategic Bridge Plan # 4- "Service providers are risk intolerant, thereby reluctant to take on new technologies that can address strategic goals".

Approach

Component specific data sets from operating heat exchangers and main condensers will be the primary tool to challenge the experience and skills of the data analysts during data evaluation and interpretation. Data sets will consist of actual service induced flaws, which will be peer-reviewed and approved by industry experts before implementation in the hands-on practical portion of the examination. The knowledge of the Level II or Level III personnel in eddy current applications will be demonstrated though written examinations.

Results

Once accepted by ACCP program, EPRI's ET-CCP will be the first offered under the "Pressure Vessel Power Industry Sector" a Level II and Professional Level III certification in balance-of-plant heat exchanger tubing examination. This will be recognized as a national board certification.

EPRI Perspective

BOP heat exchangers play a vital role in the life cycle management of operating plants. Periodic inspection of these components is necessary to maintain and extend the operability of existing plants. Plant component/system engineers rely primarily on their in-house eddy current ISI staff or service vendors to provide the most accurate results to take preventative measures against tube leaks and unscheduled shutdowns. To maintain a similar pool of data analysis skills has become an industry issue with aging components. ET-CCP will address the component-specific tubular damage mechanisms. This program will check on the knowledge base of candidates through written examination. The practical examination will test the experience and skill of each analyst in interpreting specific types of damage mechanism. This performance oriented certification program will act as a tool to promote and achieve a common pool of data analysis skills across the power industry sector by utilizing realistic and well-characterized component data sets.

Cost savings through reduction of multiple audits performed by utilities, reduction in re-certification, maintaining similar data analysis skills, and addressing the NDE workforce shortage are realized through this certification program.

Keywords

Eddy Current Examination
Data Evaluation
Eddy Current Central Certification Program (ET-CCP)
ASNT Central Certification Program (ACCP)
Balance-of-plant Heat Exchangers

ABSTRACT

The issue of taking repeated examinations and performing multiple audits for certification is becoming a cumbersome affair for utility members, individuals and their employers in the NDE profession. Even more important is sustaining a similar pool of data analysis skills and quality of data evaluation across the power industry, which has now become a primary industry concern.

With qualified workforce attrition and dealing with data analyst from all over the world to meet the demands during domestic outage season, the industry is faced with a simple question: “Are the analyst’s qualified and experienced to perform the examination in a similar manner across the industry”?

To overcome this challenge, EPRI’s nuclear utility members saw the need to standardize the certification requirements and funded a three-year project to develop and make fully functional an Eddy Current Central Certification Program (ET-CCP). Inaugurated in January 2004, this program is moving forward with several milestones identified. One major task of this program is to gain acceptance and approval from ASNT to include the eddy current certification program under the ASNT – ACCP program and offer Professional Level III and Level II examinations.

EPRI’s ET-CCP, once accepted and approved by ASNT- Certification Management Council (CMC), will be the first to offer the “Pressure-Vessel” Power Industry Sector Balance-of-Plant heat exchanger tubing examination for eddy current test personnel under the ACCP flagship. The primary focus will be on balance-of-plant heat exchanger tubing data. Component-specific data comprising of non-ferromagnetic, thin-walled high performance stainless steel such as 439 and SeaCure®, and Monel tubing material will be included for the hands-on practical examination.

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EPRI'S EDDY CURRENT CENTRAL CERTIFICATION PROGRAM (ET-CCP) TEAM

A task force was formed in January 2004 to advise and oversee all NDE Center BOP heat exchanger activities. Identified as the "BOP Heat Exchanger NDE Working Group", this team is comprised of "primary" and "secondary" members.

Primary Members

The primary members belong to the EPRI NDE Steering Committee. These are members who are responsible for identifying key industry issues and voting for project funding. Additionally, they are also involved in eddy current examination activities within their respective utility. Presently, the primary working group has representation from the following four nuclear utility members:

- Wolf Creek
- Exelon Nuclear
- Progress Energy
- Southern Company

Secondary Members

The secondary member representation is gained from eddy current industry experts. They consist of:

- Nuclear utility system/ISI engineers and QA/QC staff dealing with eddy current examination from:
  - PPL Susquehanna
  - Exelon Nuclear
  - Tennessee Valley Authority (TVA)
  - Constellation
  - Energy Northwest
  - Southern Company
- Eddy current service providers from:
  - Anatec International
  - Zetec Inc
  - AREVA (Framatome ANP)
  - MasterLee Engineering Services
- EPRI NDE Center BOP Heat Exchanger Group Staff

EPRI BOP HX NDE Working Group Responsibilities

The working group is responsible for initiating, upgrading and promoting the ET-CCP to the power industry. They will also oversee emerging industry issues and promote the need to obtain funding for further research, development and solution.

Recognition with ASNT

The American Society for Nondestructive Testing (ASNT) is already in the business to oversee NDE activities and certification, therefore, it was in the best interest to include EPRI's ET-CCP program under ASNT-ACCP flagship. Presently, there is no eddy current practical oriented examination under the ACCP program. ASNT only offers the Level III eddy current certification program comprising of the "Basic" and "Method" examination.

Under the ACCP program, a Level II and Professional Level III certification in eddy current methodology will be available.

ASNT-Certification Management Council (CMC) Responsibilities

ASNT Certification Management Council (CMC) will provide guidance and interact with EPRI's BOP HX NDE Working Group regarding certification standards, requirement and issues. Additionally, CMC panel will attempt to recognize and provide approval and seal of acceptance to include EPRI's ET-CCP program into ASNT-ACCP program. Issuance of certificates to successful candidates will be a joint effort between EPRI and ASNT.

Benefits of ET-CCP

The primary benefit of this program is to achieve similarity of eddy current data analysis skills across the power industry by utilizing realistic and well characterized component data sets. Additionally, cost reduction of preparing and developing individual site-specific performance demonstration tests (SSPD), reduction of multiple audits of certification programs, promotion of national and international acceptance of BOP HX NDE certification and deliver a standardized system for a central certification program to meet the requirements of ASNT-ACCP may be realized.

Guidelines

EPRI's ET-CCP program is written to meet the following guidelines:

- ANSI/ASNT CP-189-1991 edition
- SNT-TC-1A, August 1984 edition

ACCP Level II

Discussions are presently being pursued within ASNT-Certification Management Council (CMC) and EPRI Working Group regarding whether to include a separate certification status for

Data Acquisition. However, there will be a Level II certification program for Data Analysis. The data analysis portion for ACCP Level II certification will consist of the following components:

- General – Written Examination
- Specific- Written Examination
- Specific Hands-On Practical Examination

The Level II examination consisting of the General, Written, and Hands-On Practical sections will be developed by EPRI.

ACCP Professional Level III

The professional Level III examination will consists of the following components:

- Basic – Written Examination
- Method – Written Examination
- Procedure Preparation – Written Examination
- Specific- Written Examination
- Specific Hands-On Practical Examination

Basic Examination

Candidates who presently hold a valid ASNT Level III certificate in any NDE test method (not expired and in the 5 year time frame) will be exempt from taking the Basic exam offered in the Eddy Current Professional Level III ACCP examination.

Method Examination

The "Method" examination is presently under content review by authorized personnel. If the contents are found to be applicable towards balance-of-plant heat exchanger tubular inspection, then ASNT's method examination will be used. If not, new questions will be generated and included in the already existing ASNT "Method" examination.

Specific Hands-On Practical Examination

This examination will be the same for both Level II and Professional Level III candidates and will be prepared by EPRI.

EPRI will also prepare and develop the "Procedure Preparation", "Specific Hands-On Practical" and "Specific" test questions for the Professional Level III examination.

ET-CCP Program Focus

This program will strictly focus on balance-of-plant heat exchanger tubing material as listed below:

- All types of non-ferromagnetic tubing material
- High performance thin wall stainless steel tubing material such as SeaCure and 439 stainless steel

- Monel tubing material

Component Identification for Practical Examination

While still in discussion stage, some of the components identified for specific hands-on practical examination may include:

- Main Steam Condenser
- Residual Heat Removal Heat Exchanger
- Component Cooling Heat Exchanger
- Diesel Generators
- Turbine Lube Oil Coolers
- HPCI and LPCI Heat Exchanger
- Gland Steam Condensers
- Room Cooler Heat Exchanger
- Low/Intermediate and High Pressure Feedwater Heaters

Education, Training, Experience, and Qualification Requirements According to SNT-TC-1A for ACCP Professional Level III

Table 1 provides the requirements for certification examination for Professional Level III – ACCP status.

Table 1
Requirements for Professional Level III examination certification - ACCP

Applicant's Education	Minimum Number of Months Experience Required in NDT in an Assignment Comparable to That of Level II in the Applicable NDT Method(s)
1. Graduated from a minimum four-year college or university curriculum with a degree in engineering or science.	12
2. Completed with passing grades at least two years engineering or science study at a university, college, or technical	24
3. Neither of education items 1 or 2, above.	48

Education, Training, Experience, and Qualification Requirements According to SNT-TC-1A for ACCP Level II

Table 2 provides the requirements for certification examination for Level II – ACCP status

Table 2
Requirements for Level II examination certification - ACCP

Method	Level	Required Training (Hours)	Required Experience	
			Minimum Hours in Method	Total hours in NDT
ET	I	12	65	130
ET	II	40	600	1200

Initial Protocol Document, EPRI-ET-CCP-2004, Révision 1

EPRI's Eddy Current Central Certification Program Protocol Document was submitted to ASNT on 5/10/04 for review and comments by the Certification Management Council (CMC) members. The result of this document will be discussed during the next ASNT Fall Conference in November 2004. The unedited version of this protocol document is presented herewith as Attachment 1.

2
SUMMARY

EPRI's working group has identified several milestones that are being presently pursued by all working group members. This program per EPRI's commitment must be fully functional by December 31, 2006. Test questions and component data sets are being prepared and acquired for the respective examination. Successful launching of this program will promote a bank of similar data analysis skills that will benefit the end user towards better characterizing specific types of damage mechanism and hopefully address the NDE workforce issue, which presently has become major industry concern.

A

EPRI – Eddy Current Central Certification Program (ET-CCP) for ASNT-ACCP Pressure Vessel Power Industry Sector – Balance-of-Plant Heat Exchanger Tubing Examination

Document #	Revision	Date
EPRI-ET-CCP-2004	Rev.0	5/10/2004

EPRI – Eddy Current Central Certification Program (ET-CCP) for ASNT-ACCP Pressure Vessel Power Industry Sector – Balance-of-Plant Heat Exchanger Tubing Examination

1.0 Scope

This document establishes the standardized system for central certification of eddy current testing personnel developed to meet the requirements of ASNT-ACCP program. This program, undertaken by Electric Power Research Institute (EPRI) will focus on the pressure vessel power industry sector, balance-of-plant heat exchanger tubing examination using the electromagnetic test methods on non-ferromagnetic, high performance thin wall ferritic stainless steel and Monel tubing material.

2.0 Purpose

The purpose of this certification is to provide independent, transportable NDE certification for ACCP Level II and ACCP Professional Level III eddy current personnel by examination to promote national and international acceptance of NDT certification and reduce multiple audits of certification programs.

3.0 Documents

EPRI's Eddy Current Central Certification Program will be developed in accordance to guidelines mentioned in the following documents:

3.1 ASNT Standard Qualification and Certification of Nondestructive Testing Personnel, ANSI/ASNT CP-189-1991, Approved March 15,1991

3.2 American Society for Nondestructive Testing, Recommended Practice No. SNT-TC-1A, August 1984 Edition

3.3 ASNT Central Certification Program Description, CP-ACCP-1A, Rev. 9.19.02

4.0 Definitions

4.1 ***EPRI:*** Electric Power Research Institute: A non-profit organization who will develop and administer "Pressure Vessel Power Industry Sector" ACCP Level II and Professional ACCP Level III eddy current examinations pertaining to balance-of-plant heat exchanger tubing inspection, in accordance to ASNT-ACCP guidelines.

4.2 ***Eddy Current Central Certification Program (ET-CCP***): EPRI developed this program to address the pressure vessel power industry sector balance-of-plant heat exchanger tubing examination.

4.3 ***BOP HX NDE Working Group:*** Task force formed by EPRI to oversee EPRI's Balance-of-Plant Eddy Current Central Certification Program (ET-CCP). The working group consists of "Primary" and "Secondary" members.

4.4 ***"Primary" Working Group Members:*** Nuclear utility members who belong to the EPRI NDE Steering Committee.

4.5 ***"Secondary" Working Group Members:*** Nuclear utility system/ISI engineers, QA/QC personnel dealing with eddy current inspections, eddy current service providers and EPRI BOP HX group staff.

4.6 ***ASNT- NDT Level III:*** An individual, who, having passed ASNT administered Basic and Method(s) Examinations, holds a current, valid ASNT NDT Level III certificate in at least one method.

4.7 ***ACCP-Professional ET Level III:*** An individual, who, having passed ASNT administered Basic examination and having passed EPRI prepared and administered Method, Procedure Preparation, Practical and Specific examinations pertaining to power industry sector, balance-of-plant heat exchanger tubing examinations, holds a current, valid, ASNT-ACCP certification. (ASNT-ACCP certification requirement: Basic, Method, Procedure Preparation, and Practical Examinations only. EPRI's requirement will additionally include the Specific Examination).

4.8 ***ACCP-ET Level II:*** An individual, who, having passed EPRI prepared and administered General, Practical Hands-on and Specific Written examinations, holds a current, valid, ASNT-ACCP certification.

4.9 ***Certification Management Council (CMC):*** Formerly known as the Certification Management Board (CMB), this is a council within ASNT that is responsible for managing the ACCP.

4.10 ***Authorized Examination Center (AEC):*** A site with facilities and personnel, independent of the employer, approved by EPRI's BOP HX NDE Working Group Primary Members and ASNT Certification Management Council (CMC) to administer Eddy Current ACCP qualification examinations.

4.11 ***Authorized Qualifying Body (AQB):*** A competent organization, independent of the employer, approved by EPRI's BOP HX NDE Working Group Primary Members and ASNT Certification Management Council (CMC) to administer Eddy Current ACCP qualification examinations.

4.12 ***Certificate:*** Written testimony of qualification.

4.13 ***Employer:*** The corporate, private, or public entity that employs personnel for wages or salary.

4.14 ***Employer Authorization:*** The process whereby an employer's ACCP Professional Level III or ASNT NDT Level III reviews the certificates of ASNT central certification for the employer's NDT personnel, determines if further examination is required, and then, on behalf of the employer, authorizes personnel to perform NDT for that employer.

4.15 ***Endorsement:*** Written testimony of a particular qualification.

4.16 ***Guidance:*** Same as 4.24, *Supervision*.

4.17 ***Industrial Sector (IS):*** An industry, product-form or area of technology that possesses common characteristics with respect to NDT considerations.

4.18 ***Instruction:*** A description of the steps to be followed when performing an NDT technique; developed in conformance with a procedure.

4.19 ***Procedure:*** A written description that establishes minimum requirements for performing an NDT method on any object, written in accordance with established standards, codes, or specifications.

4.20 ***Qualification:*** Demonstration or possession of education, skills, training, knowledge, and experience required for personnel to properly perform NDT to a level as specified in this document.

4.21 ***Recertification Examination:*** An examination administered by EPRI/ CMC expressly for the purpose of recertification.

4.22 ***Re-certification and Renewal:*** The process of extending one's certification after the initial period of validity, and maintaining certification for individual periods thereafter.

4.23 ***Specific Procedure:*** Same as 4.18, Instruction.

4.24 ***Supervision:*** The act of an ACCP Level II, ACCP Professional Level III in power industry sector eddy current testing pertaining to BOP heat exchanger tubing inspection, directing the application of eddy current inspections performed by other eddy current personnel, which includes the control of actions involved in the preparation and performance of the test.

5.0 Categories of Qualification

Categories of qualification are defined in terms of the skills and knowledge required in testing power industry sector, balance-of-plant heat exchanger tubular products.

5.1 Power Industry Sector ACCP Professional Level III: An individual, who, having passed ASNT administered Basic examination and having passed EPRI prepared and administered Power Industry Sector, BOP HX Tubing Examination in Method, Procedure Preparation, Practical and Specific examinations, holds a current, valid, ASNT-ACCP certification. *(ASNT-ACCP certification requirement: Basic, Method, Procedure Preparation, and Practical Examinations only. EPRI's requirement will additionally include the Specific Examination).*

Note: Candidates presently holding an ASNT Level III certification in any NDT test method(s) will be exempt from taking the Basic examination for ACCP Professional Level III examination.

An ACCP Professional Level III (BOP HX Power Industry Sector) shall have the skills and knowledge to establish techniques, to interpret codes, standards, and specifications, to designate the particular technique to be used, and to prepare or approve procedures and instructions. An ACCP Professional Level III shall also have general familiarity with other NDE methods, knowledge of materials, fabrication, and product technology in order to establish techniques and to assist in establishing acceptance criteria when none are otherwise available. An ACCP Professional Level III shall also be capable of conducting or directing the necessary training to prepare eddy current test personnel for EPRI /ACCP

administered Level II or Level III examinations. A certified ACCP Professional Level III is allowed to perform data analysis on BOP HX tubular products specifically for the power industry sector upon review and approval of certification by employer.

5.2 Power Industry Sector ACCP Level II: An ACCP Level II (BOP HX Power Industry Sector) shall have the skills and knowledge to set up and calibrate eddy current equipment, to conduct testes, and to interpret, evaluate, and document eddy current results in accordance with procedures approved by a power industry sector ACCP Professional Level III, ASNT NDT Level III and/or respective power plant eddy current Level III. An ACCP Level II shall be thoroughly familiar with the scope and limitations of the method to which certified and should be capable of directing work of trainees and Level I personnel. An ACCP Level II shall be able to organize and report eddy current data analysis results pertaining to balance-of-plant heat exchanger tubing. An ACCP Level II shall be capable of developing an instruction in conformance with a procedure. The employer shall review and approve certification of eddy current ACCP Level II personnel.

6.0 Program Administration

6.1 EPRI's BOP HX NDE Primary Working Group shall oversee administration and certification activities that include all procedures and examination involving the power industry sector's balance-of-plant heat exchanger tubing to demonstrate the qualification of an individual to perform tasks in eddy current examination, leading to ASNT-ACCP certification.

6.2 EPRI BOP HX NDE Working Group Responsibilities:

- 6.2.1 Initiate, maintain, upgrade and promote EPRI's eddy current central certification program (ET-CCP) to the power industry.
- 6.2.2 To generate all applicable ACCP Level II and ACCP Professional Level III, written and practical test questions pertaining to eddy current examination of power industry sector balance-of-plant heat exchanger tubing. (See section 9.0 for examination details)
- 6.2.3 To work closely with ASNT-CMC, to obtain acceptance and seal of approval to recognize EPRI's ET-CCP program for ASNT-ACCP certification.
- 6.2.4 To conduct peer review before the final release of all written and practical examinations for ACCP Level II and ACCP Professional Level III eddy current certification examination.

6.3 ASNT CMC Responsibilities:

6.3.1 To provide guidance and interact with EPRI BOP HX NDE Working Group to address ASNT-ACCP certification standards and requirements for power industry sector balance-of-plant heat exchanger tubing eddy current examination and certification.

6.3.2 To recognize and provide seal of approval for EPRI's ET-CCP program.

6.3.3 To recognize and issue to successful candidates, passing all written and practical examinations as set forth by EPRI's ET-CCP program and ASNT-CMC guidelines with EPRI/ASNT-ACCP certification.

6.4 Authorized Qualifying Bodies (AQBs)

6.4.1 EPRI may perform those functions of the ACCP primarily for power industry sector eddy current Level II and Professional Level III examinations only.

6.4.2 EPRI may authorize AECs with a mutual agreement from the CMC.

6.5 Authorized Examination Centers (AECs)

6.5.1 AECs when authorized by EPRI and the CMC, may be established at the same site as that of AQBs.

6.5.2 AECs may perform those functions of the ACCP for which they have been authorized by EPRI and the CMC.

7.0 Eligibility for Examination

7.1 Candidates shall have a combination of education, training, and experience in accordance to the requirements stipulated in ASNT's SNT-TC-1A, 1984 edition and ASNT CP-189, 1991 edition.

7.2 When applying for examinations, the candidate shall document the validity of the personal information provided including education, training, and experience needed to establish eligibility, as applicable.

7.3 Candidates with a current, valid ASNT NDE Level III certificate in any NDE test method will be exempt from the Basic Examination when they attempt the Eddy Current power sector ACCP Professional Level III examination. The candidate must take the remaining portions of the examination in ***Method, Procedure Preparation, Practical Examinations*** -ACCP requirements and ***Specific Examination*** (additional EPRI requirement).

8.0 Visual Acuity Testing

The candidate shall provide documented evidence of satisfactory vision in accordance with the following requirements before receiving ACCP certification or recertification:

8.1 ***Near-distance vision:*** The candidate shall have natural or corrected near-distance acuity in at least one eye capable of reading the Jaeger Number 1 test chart or equivalent at a distance of not less than 30 cm (12-inches). Near-distance vision examinations shall be administered by a physician, licensed nurse,

ophthalmologist or optometrist, or by personnel approved by the employer's Level III;

8.2 ***Color Vision:*** The candidate shall be able to differentiate among the colors used in the NDT method(s) for which certification by examination is sought. Color vision examinations shall be administered at each certification and recertification period by a physician, licensed nurse, ophthalmologist or optometrist, or by personnel approved by the employer's Level III;

8.3 ***Other Vision:*** The employer is responsible for determining when vision requirements in addition to near-distance vision and color vision are required. Other vision examinations shall be administered by a physician, licensed nurse, ophthalmologist or optometrist, or by personnel approved by the employer's Level III; and

8.4 ***Vision Documentation:*** Following initial certification, the documented near-distance, color vision, and other vision examinations as appropriate, shall be administered as required above, and records thereof retained by the employer.

9.0 Qualification Examinations

9.1 ACCP Professional Level III

9.1.1 ***Basic Examination:*** This written examination consists of a minimum of 135 questions that assess the candidate's knowledge of:

9.1.1.1 Other NDT methods as required by ACCP Level II personnel;
9.1.1.2 Materials, fabrication, and product technology; and
9.1.1.3 Qualification and certification according to the ACCP, SNT-TC-1A, and ANSI/ASNT CP-189, 1991 and/or latest edition.
9.1.1.4 See section 5.1 "Note" for Basic examination exemption.

9.1.2 ***Method Examination:*** This written examination consists of a minimum of 135 questions that assess the candidate's knowledge and application of fundamentals, principles, and techniques pertaining to balance-of-plant heat exchanger tubing inspection. The Method Examination may include a portion that examines the candidate's ability to comprehend a specification and apply its requirements.

9.1.3 ***Procedure Preparation Examination:*** This written examination requires a candidate to demonstrate the ability to prepare a satisfactory test procedure in the applicable eddy current test method.

9.1.4 ***Practical Examination:*** All ACCP Professional Level III candidates shall be required to pass an ACCP Level II Hands-on Practical Examination in accordance with the requirements in 9.2.2 of this document. ACCP Professional Level III candidates with a valid ACCP Level II certificate are not required to be re-examined for those ACCP Level II Hand-on Practical Examinations in which current endorsements are held. This practical examination will be focused on power sector balance-of-plant heat exchanger tubing only.

9.1.5 ***Specific Written Examination:*** This written examination consists of a minimum of 135 questions relating to specifications, equipment, techniques, procedures, and methods employed, applicable to the power sector product(s). This examination is an additional requirement established by EPRI's requirements for ACCP Professional Level III certification.

9.2 ACCP Level II

9.2.1 ***General Examination:*** This written examination shall be developed by the EPRI Eddy Current Central Certification Program (ET-CCP) working group and shall consists of a minimum of 60 multiple choice questions that assess the candidate's knowledge of fundamentals and principles of eddy current examination as applicable to BOP Heat Exchangers.

9.2.2 ***Specific IS Practical Hands-on Examination:*** This examination assesses the candidate's ability to perform NDT in the eddy current test method pertaining to power industry sector balance-of-plant heat exchanger tubular products. This includes the capability to interpret and evaluate test results. EPRI's ET-CCP working group shall prepare specific raw tubing data banks from selected heat exchangers that may consist of service induced and/or fabricated flaws for data evaluation. Additionally, the working group shall prepare a written checklist in administering and grading the Level II practical examinations. The checklist, as a minimum, shall address the following items: proficiency in use of techniques and equipment/analysis software, proper adherence to procedure, test/analysis sequence, calibration, selection of materials/analysis parameters, satisfactory detection and location discontinuities, accuracy and completeness of data interpretations using the appropriate calibration curves, evaluations, and documentation of the final test results. (see table 6).

9.2.3 ***Specific Written Examination:*** This written examination consists of 40 questions and assesses a candidate's specific knowledge of practices and techniques unique to the power industry sector balance-of-plant heat exchangers, including applicable procedures, codes, standards, specifications, test equipment and materials.

9.3 ***Limited Certification Examination:*** This power sector, balance-of-plant eddy current central certification program (ET-CCP), developed and offered by EPRI shall be classified as limited certification examination applicable to balance-of-plant heat exchanger tubular product inspection only.

9.4 Qualification examinations shall conform to psychometric practices and approved CMC operating procedures.

9.5 Employers, customers or other bodies may require job specific examinations. Examinations for specialized NDT techniques or unique product forms are the responsibility of the employer and are outside the scope of this document.

9.6 ACCP certified individuals wishing to extend a method certification to another Industry Sector (IS) need not take the Basic Examination only. Since this document is limited certification for power industry-eddy current examination on balance-of-plant heat exchanger tubing, all other examinations in other NDE disciplines required by the IS or employer must be taken to obtain respective certification.

9.7 Grading

9.7.1 Qualification examinations for the purpose of initial certification and recertification shall be graded in accordance with approved EPRI and CMC operating procedures.

9.7.2 For each administered certification examination, each candidate shall achieve a grade of at least 70% and an average grade of 80% to be eligible for certification. All certification examinations shall have equal weight in determining the average grade.

9.7.3 The Level III Basic Examination, when passed first, remains valid, provided that the Method, Procedure Preparation, Practical and Specific Examination is passed within five years after passing the Basic Examination.

9.7.4 The Level III Basic Examination, once passed, need not be repeated thereafter, provided a current, valid ACCP Professional Level III certificate is maintained in accordance with the requirements of this document.

9.8 Reexamination

9.8.1 Candidates who fail to obtain a passing grade for any one or more examinations within the complete series required for ACCP certification need not reapply as a new candidate providing application for, and receipt of, reexamination occurs within 12 months of the failed examination.

9.8.2 A candidate for any reexamination shall apply for and take the examination in accordance with a procedure established by EPRI and CMC.

9.8.3 Candidates failing examination(s) for behavior not in accordance with the applicable code of ethics must have approval from the CMC Ethics Subcommittee and EPRI's Primary Working Group Panel in order to apply for any examination.

10.0 Examination Results

Candidates, having passed all required examinations for ACCP certification, shall be issued certification documents as described in 11.0, *Certification.*

11.0 Certification

11.1 Administration: Based on the results of the qualification examinations, a joint EPRI and ACCP certificate shall be issued in two forms; standard wall mounted and wallet-sized.

11.2 Wall-mounted certificates shall contain:

9.8.4 EPRI and ASNT name, logo, and embossed seal;
9.8.5 Name of individual certified;
9.8.6 Certification date;
9.8.7 Certification expiration date;
9.8.8 Endorsements for NDT method and level(s) of certification;
9.8.9 Endorsements for ISs;
9.8.10 Unique identification number; and
9.8.11 Signature of EPRI and ASNT official(s)

11.3 EPRI/ACCP certification attests to an individual having satisfied the requirements of this document, however, EPRI/ASNT does not give authority or license to that individual to perform NDT. The employers, should, through their own cognizant Level III or authorized designee, review the individual's qualification records for satisfactory completeness and retain copies thereof, prior to authorizing the individual to perform NDT. The employer shall be solely responsible for authorizing employees to perform NDT. If the individual is self-employed, then the individual shall assume all employer responsibilities described herein.

12.0 Validity and Re-Certification

12.1 Certification shall be valid:
- 12.1.1 For a period not to exceed five years, at which point recertification is required in order to maintain certification; and
- 12.1.2 When an individual performs work in an IS, all examination(s) required for that work have been successfully completed and endorsement issued accordingly.

12.2 Certification shall be invalid if:
- 12.2.1 EPRI and CMC finds after reviewing evidence that the individual has violated the applicable code of ethics, and
- 12.2.2 Individual does not satisfy the annual near-distance vision examination requirement in 8.0. Failure to comply with this vision requirement may cause revocation of ACCP certification.

12.3 Employer authorization shall expire when employment is terminated.

12.4 Recertification

12.4.1 Recertification is required in order to:

12.4.1.1 extend certification after the specified period of validity; and

12.4.1.2 maintain certification after a significant interruption of continued satisfactory work activity in that NDT method or IS for which certification is held.

NOTE: A significant interruption of continued satisfactory work activity occurs when the period of interruption is:

a. greater than the sum of an individual's NDT experience at all levels of qualification in the method, or

b. less than the sum of an individual's NDT experience at all levels of qualification, but greater than 12 of the last 24 months, or

c. less than the sum of an individual's NDT experience at all levels of qualification, but greater than 36 of the last 60 months.

12.4.2 Re-Certification requires the candidate to:

12.4.2.1 submit documented evidence of continued service from employer and in accordance with this document;

12.4.2.2 submit a completed application in accordance with approved EPRI and CMC operating procedures;

12.4.2.3 provide evidence of satisfactory vision results in accordance with 8.0 of this document;

12.4.2.4 provide evidence of continued education or training activities related to BOP tubular inspection; and

12.4.2.5 satisfactorily complete applicable recertification examination(s), at least every other recertification period.

12.4.3 When a candidate for recertification cannot meet the requirements for recertification, that candidate shall be required to satisfy the requirements for initial certification.

13.0 Documentation

13.1 EPRI shall maintain and make available a web-based directory, a list of all certified individuals including the level of certification for power industry sector balance-of-plant eddy current qualified personnel. This directory will be password active and only accessible to the nuclear utility members.

13.2 The CMC shall maintain and publish, at least annually, a list of all certified individuals including the level of certification for power industry sector balance-of-plant eddy current qualified personnel.

13.3 A file shall be maintained at EPRI for each individual certified, for each applicant who has not obtained certification, and for each individual who has had certification revoked, suspended, or terminated containing:

13.3.1 completed application forms;

13.3.2 examination documents including, but not limited to, answer sheets, identification of specimens, and results of examinations;

13.3.3 re-certification documents including evidence of satisfactory vision results and continuous work activity; and

13.3.4 reasons for any withdrawal or suspension of certification and details of any other penalties.

13.4 All individual files shall be kept under suitable conditions and for duration in accordance with approved EPRI and CMC operating procedures.

Table 1: Overview of ACCP Professional Level III Certification Program –
Pressure Vessel Industry Sector
Balance-of-Plant Heat Exchanger Tubular Product Examination

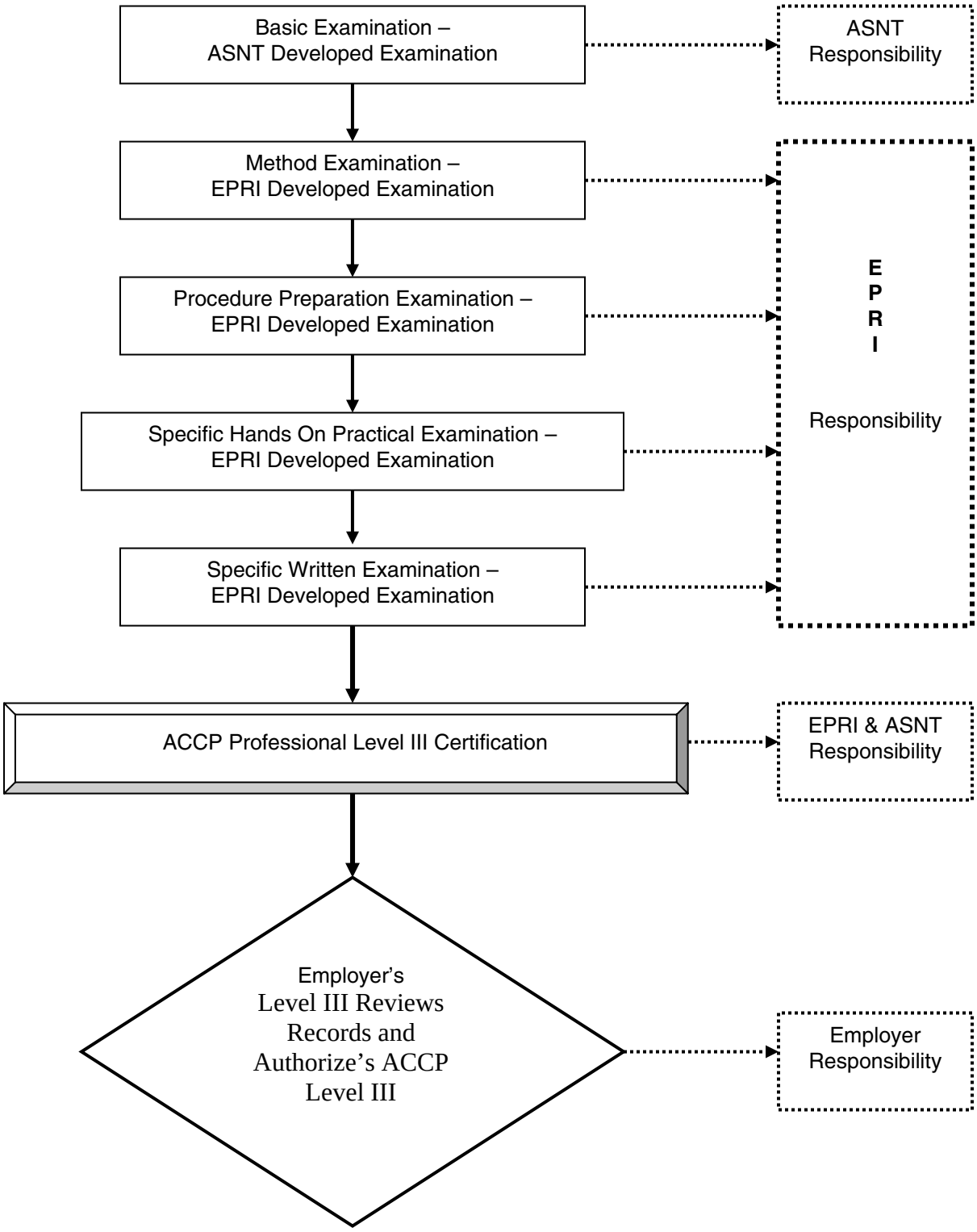

Table 2: Overview of ACCP Level II Certification Program –
Pressure Vessel Industry Sector
Balance-of-Plant Heat Exchanger Tubular Product Examination

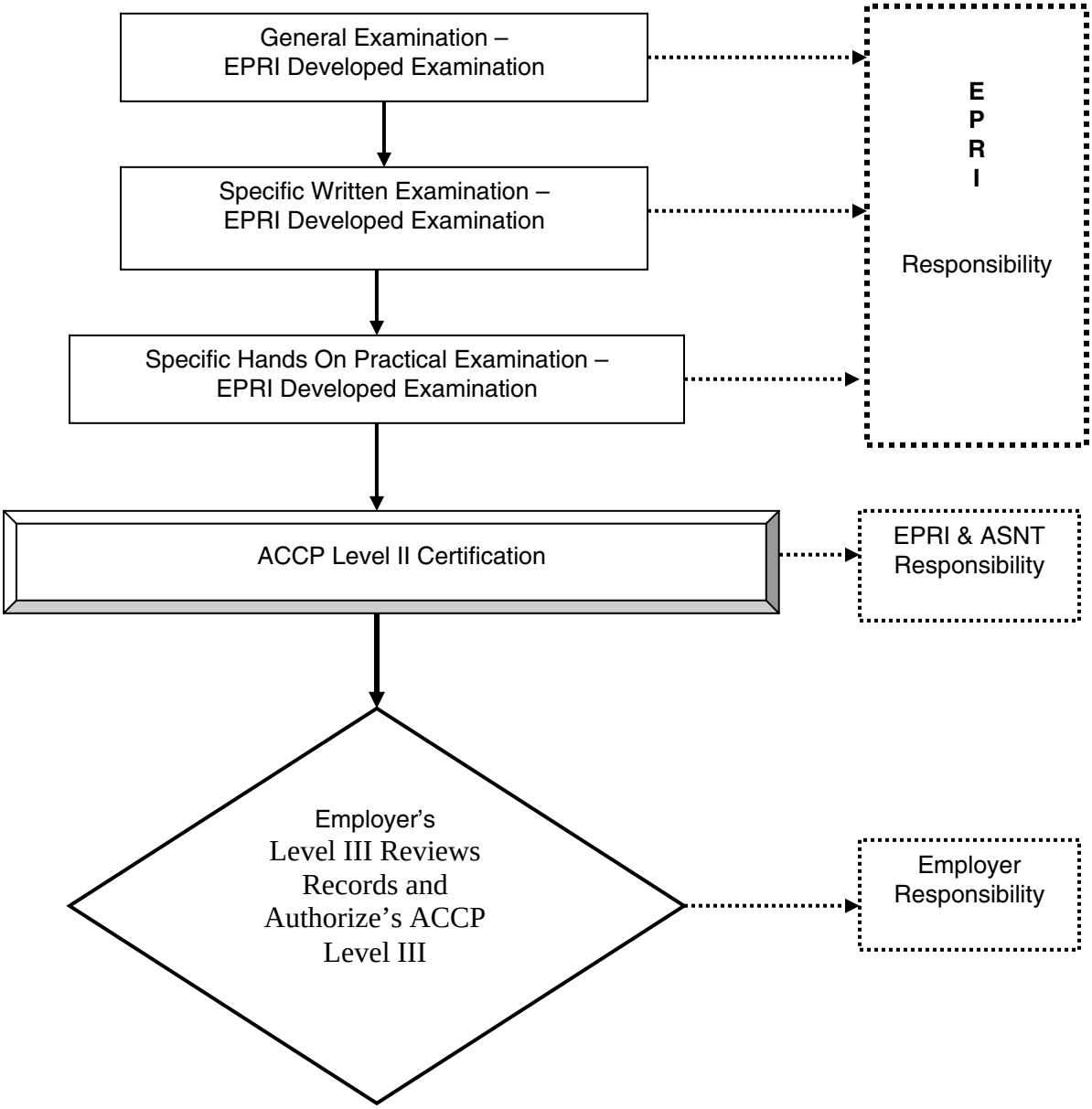

Table 3: Education, Training, and Experience Qualification Requirements for Level II ANSI/ASNT CP-189

Level I and Level II

Method	Level	Required Training (Hours)	Required Experience	
			Minimum Hours in Method	Total hours in NDT
ET	I	12	65	130
ET	II	40	600	1200

ET = Electromagnetic Testing

Notes

1. Experience shall be based on the actual hours worked in the specific method.
2. A person may be qualified directly to Level II with no time as a certified Level I, providing the required training and experience consists of the sum of the hours required for Level I and level II.
3. The required minimum experience shall be documented by method and by hour with supervisor or Level III approval.
4. While fulfilling total NDT experience requirements, experience may be gained in more than one (1) method. Minimum experience hours must be met for each method.

Table 4: Education, Training, and Experience Qualification Requirements for ANSI/ASNT CP-189 Professional Level III

Applicant's Education	Minimum Number of Months Experience Required in NDT in an Assignment Comparable to That of Level II in the Applicable NDT Method(s)
1. Graduated from a minimum four-year college or university curriculum with a degree in engineering or science.	12
2. Completed with passing grades at least two years engineering or science study at a university, college, or technical school.	24
3. Neither of education items 1 or 2, above.	48

NOTES

1. Credit for experience may be gained simultaneously in two or more NDT methods. For each NDT method in which certification is sought, an applicant shall have spent at least 25% of each month of experience claimed, in an assessment comparable to that of a Level II in the applicable NDT methods(s).
2. Comparable experience shall include at least four functions; calibrating, performing, evaluating and reporting NDT at least 25% of the time in two or more methods. The remainder of the claimed experience (no more than 50%) shall be spent in NDT-related activities. If only one NDT method is applied for, then direct performance of that NDT method shall have been 50% of the required time and the remainder shall have been NDT-related.
3. NDT related activities are:
   a. Preparing for NDT;
   b. Consulting on NDT;
   c. Developing NDT reports;
   d. Reviewing NDT reports or data;
   e. Writing NDT procedures, instructions, specifications, or standards;
   f. Supervising NDT activities;
   g. Post-NDT cleanup;
   h. Communicating NDT instructions;
   i. Surveying or monitoring NDT activities;
   j. Training NDT subjects; and/or
   k. Maintaining NDT records.

Table 5: Minimum Number of Test Questions for ACCP Level II for

Power Sector BOP Eddy Current Tubular Examination

ACCP Level II Examinations	Number of Test Questions	Testing Hours
General	60	2 hours
Specific Written Examination	40	2 hours
Specific Hands On Practical Examination	* See Notes	4 hours

NOTES: *

1. EPRI's ET-CCP working group shall prepare specific raw tubing data banks from selected heat exchangers that may consist of service induced and/or fabricated flaws for data evaluation.
2. Three different component-specific data sets will be attempted.
3. Each data set will have no more than three different damage mechanisms per component.
4. Each data set will consists of i) practice data sets and ii) examination data sets.
5. Multiple data sets per component for examination and re-examination will be maintained.
6. The working group shall prepare a written checklist in administering and grading the Level II practical examinations. The checklist, as a minimum, shall address the following items: (see Table 6)
    a. Proficiency in use of techniques;
    b. Proficiency in use of equipment/analysis software;
    c. Proper adherence to procedure, test/analysis sequence, and calibration;
    d. Selection of materials/analysis parameters;
    e. Satisfactory detection and location of discontinuities;
    f. Accuracy and completeness of data interpretations using the appropriate calibration curves, evaluations; and
    g. Documentation of the final test results.

Table 6: EPRI and ACCP Level II and Professional Level III Power Industry Sector Eddy Current Hands-On Practical Examination Checklist

Section A: Candidate Information

Date of Examination: _____Place of Examination:_____

Candidate's Name: _____

Company Affiliation: _____

Certification Level Seeking For: *(check appropriate box)*

☐ ACCP Level II ☐ ACCP Professional Level III

Attempt: *(check appropriate box)*

☐ First attempt ☐ Second attempt ☐ Third attempt ☐ Recertification

Section B: Practical Examination Checklist

Analysis Done on (check appropriate box) ☐ PC Platform ☐ UNIX Platform

Data Analysis Software Used: _____Version:_____

Component	Material	Tube Dimensions
		OD x wall
		OD x wall
		OD x wall
		OD x wall

		Pass	Fail
a.	Calibration curve/s generation	☐	☐
b.	Proficiency in use of all differential and absolute channels	☐	☐
c.	Proficiency in using phase analysis	☐	☐
d.	Proficiency in using amplitude analysis	☐	☐
e.	Mixer channel generation	☐	☐
f.	Proficiency in use of analysis software	☐	☐
g.	Proper adherence to procedure	☐	☐
h.	Proper adherence to analysis sequence	☐	☐
i.	Proper selection of analysis parameters	☐	☐
j.	Satisfactory detection and location of flaws	☐	☐
k.	Satisfactory interpretation of non-relevant flaws	☐	☐
l.	Accuracy and completeness of data interpretations using appropriate calibration curves, frequency/s and channel/s	☐	☐
m.	Documentation of the final test results	☐	☐

Comments:_____

_____

_____ _____ _____

Signature of Authorized Personnel Full Name and Title Date

Table 7: Minimum Number of Test Questions for ACCP Professional Level III for Power Sector BOP Eddy Current Tubular Examination

ACCP Professional Level III Examinations	Number of Test Questions	Testing Hours
Basic Examination *	135 see notes *	4 hours
Method Examination	135	4 hours
Specific Hands-On Practical Examination **	See notes **	4 hours
Procedure Preparation Examination ***	See notes ***	4 hours
Specific Written Examination ****	135 see notes ****	4 hours

Notes:

Basic Examination *

1. Candidates presently holding an ASNT Level III certification in any NDT test methods need not take the Basic examination for ACCP Professional Level III in the eddy current test method.
2. Candidates who wish to directly attempt the ACCP Professional Level III power sector eddy current examination without holding a current valid ASNT Level III certification will be required to take the ASNT Basic examination portion only.

Specific Hands-On Practical Examination ** *(same as ACCP Level II Specific Hands-On Practical Examination)*

3. EPRI's ET-CCP working group shall prepare specific raw tubing data banks from selected heat exchangers that may consist of service induced and/or fabricated flaws for data evaluation.
4. Three different component-specific data sets will be attempted.
5. Each data set will have no more than three different damage mechanisms per component.
6. Each data set will consists of i) practice data sets and ii) examination data sets.
7. Multiple data sets per component for examination and re-examination will be maintained.
8. The working group shall prepare a written checklist in administering and grading the Level II practical examinations. The checklist, as a minimum, shall address the following items: (see Table 6)
    a. Proficiency in use of techniques;
    b. Proficiency in use of equipment/analysis software;
    c. Proper adherence to procedure, test/analysis sequence, and calibration;
    d. Selection of materials/analysis parameters;
    e. Satisfactory detection and location of discontinuities;
    f. Accuracy and completeness of data interpretations using the appropriate calibration curves, evaluations; and
    g. Documentation of the final test results.

Notes: ***(cont'd)***

Procedure Preparation Examination ***

9. Candidates will be given the task to prepare specific data acquisition and data analysis procedures. Data acquisition procedure will include as a minimum;
    a. Proficiency of the ACCP Professional Level III to identify the frequency/s, selection of channel/s, calibration standard/s, probe/s, gain settings, probe pull speed, etc., to acquire quality data that is repeatable for data analysis.

    Data Analysis Procedure will include as a minimum:

    b. Proficiency of the ACCP Professional Level III to identify the specific channel/s, calibration curve/s, phase angle and voltage setting for evaluating specific types of damage mechanism, including mixer channel selection. Full description of the analysis set-ups will be required.

Specific Written Examination ****

10. This examination assesses a candidate's specific knowledge of practices and techniques unique to the power industry sector balance-of-plant heat exchanger tubing, including applicable procedures, codes, standards, specifications, test equipment, site specifications/requirements and materials.

About EPRI

EPRI creates science and technology solutions for the global energy and energy services industry. U.S. electric utilities established the Electric Power Research Institute in 1973 as a nonprofit research consortium for the benefit of utility members, their customers, and society. Now known simply as EPRI, the company provides a wide range of innovative products and services to more than 1000 energy-related organizations in 40 countries. EPRI's multidisciplinary team of scientists and engineers draws on a worldwide network of technical and business expertise to help solve today's toughest energy and environmental problems.

EPRI. Electrify the World

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