Calpine – Houston, TX

Performance Demonstration Qualification Exam Protocol for UT Examiner Qualification

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1. PURPOSE

The Test Protocol for the PDQ Examiner Qualification (EQ) Program is presented to provide a description of the Performance Demonstration Examination Program for Advanced UT Examinations, for Automated UT (AUT), Phased Array UT (PAUT), and Time of Flight Diffraction (TOFD). The PDQ Test Protocol is intended to provide a brief overview for each Test Candidate regarding test administration and candidate preparation. The information contained in this procedure is subject to change, therefor, all candidates will receive an additional orientation by the PDQ Examiner prior to the start of each qualification exam.

2. PDQ Examinee Qualification (EQ) Testing Protocol

The following shall be presented to the PDQ Examination Administrator/ Examiner prior to beginning the PDQ Examination:

- Procedure for AUT, Phased Array, or TOFD, along with any supplemental manual UT, as applicable
- Scan Plan Plots or drawings
- These will be reviewed prior to the examination.

The following projected time schedule is provided for candidate reference. The actual practical examination times identified below can be affected as a result of candidate readiness. It is strongly recommended that candidate's become familiar with the PDQ Examination, specifically the data collection, reporting forms and examination procedure to increase efficiency.

- 8:00 – 8:30 Test Protocol Review and equipment set up
- 8:30 – 12:00 PDQ Examination
- 12:00 – 12:30 Lunch Break – In Room (optional)
- 1:00 – 5:00 PDQ Examination

Each Test Candidate will be given a unique test set consisting of PDQ specimens of Carbon Steel Material. Test Candidates shall work independently and are not allowed to discuss specimen or examination information during or after the demonstration. In general, there will be no single sample time limit established, however, if a sample requires sharing between 2 candidates, sample time limit provisions may be established.

Only one Test Candidate may leave the testing area at a time. A defined security plan will be established during testing (including lunch and bathroom breaks) to prevent test sample compromise.

All paperwork must be completed and turned into the PDQ Administrator by end of day. This includes all scrap paper. Time extensions will not be authorized. Candidates that fail to complete the examination in the allotted time will be considered unsuccessful.

3. Examinee Qualification Categories:

There are two (2) primary areas of PDQ Qualification:

1.	**Basic**	**Equipment Operability**
2.	**Advanced**	**Weld Inspection**

Notes:
-A successful completion of the Advanced PDQ Qualifications will automatically qualify the Test Candidate for the Basic.
-For the Advanced PDQ Examinations (Weld Inspection, the following will apply for data collection:

1. Non-Encoded
2. Encoded

The method of data collection shall be clearly outlined in the Test Candidate's UT Procedure and the Performance Demonstration Qualification Record, (PDQR). This qualification parameter will be documented on the PDQ Registry Form.

3. SPECIMEN PRESENTATION

Flaw location and "True" specimen identification shall be concealed to maintain a "blind test". Test specimens will be given a unique number identifier. The PDQ Test Specimens are divided into grading units. Each grading unit will be considered as either flawed or unflawed. There will only be one defect type in each grading unit. The number of flawed and/or unflawed grading units and specific grading unit length will not be made available to the candidates. There will be no disclosure of particular specimen results or candidate viewing of unmasked specimens during or after the performance demonstration.

4. THE PDQ TEST SET AND TEST SPECIMEN DESIGN

Each candidate will be supplied a list defining the test specimens that make up their test set. Each test set will be comprised a PDQ Test Set of 6 pipe samples, both small bore and large bore and one heavy wall plate.

The plate sample is 6" thick A516-70 Steel, with a 30 Degree bevel angle, single Vee, 16" of weld to be tested.

Component Size		Material		Weld Prep.	
Diameter	**Thickness**	**Type**	**Weld Length**	**Bevel Angle**	**Weld Type**
2.0"	0.218"	Carbon Steel	~ 7.5 inches	37.5 Deg.	Single Vee
3.0"	0.300"	Carbon Steel	~ 11.0 inches	37.5 Deg.	Single Vee
4.0"	0.337"	Carbon Steel	~ 14.1 inches	37.5 Deg.	Single Vee
6.0"	0.432"	Carbon Steel	~ 21.0 inches	37.5 Deg.	Single Vee
8.0"	0.500"	Carbon Steel	~ 27.0 inches	37.5 Deg.	Single Vee
10.0"	0.594"	Carbon Steel	~ 34.0 inches	37.5 Deg.	Single Vee
16.0"	0.844"	Carbon Steel	~ 52.0 inches	37.5 Deg.	Single Vee
24.0"	0.969"	Carbon Steel	~ 76.0 inches	37.5 Deg.	Single Vee

Potential Flaw Mechanism's

The following flaw types may be included in each test specimen. The number of flaws in each test specimen may vary for each test set. At least one Test Specimen may be unflawed along the entire length.

Planar Flaws-Surface Connected	Volumetric Flaws- Not Surface Connected
Lack of Penetration-LOP	Lack of Fusion-LOF
Inside Diameter Crack-IDC	Slag
Outside Diameter Crack-ODC	Porosity
Transverse Crack	Mid-Wall Crack-MWC

Haz Crack Haz crack

Definitions and descriptions of each flaw type are outlined in the Addendum to this PDQ Test Protocol.

A scan plan for each sample listed above shall be prepared in advance of the PDQ exam and calibration files loaded on the company equipment for the weld inspection.

5. TEST SAMPLE GEOMETRY

1. The Test Specimen may contain counterbore geometry
2. The Test Specimen may contain ID or OD mismatch
3. The Test Specimen weld crown reinforcement and weld root geometry will be in the "as-welded" condition and may be offset from sample centerline.

6. GRADING CRITERIA

Candidate performance will be evaluated in the following five categories:

A. **Detection** - The detection portion of the test is the top priority and all liner flaw over .250 must be identified. The Examinee must also detect **100% of these flaws in any give test set**. At least one pipe must be encoded to prove this capability. Sufficient data must be provided / saved in order for the PDQ Administrator to determine if the candidate actually detected the flaw.

B. **Flaw Length Sizing** - The flaw length shall be sized in accordance with the Test Candidate's UT Procedure. Successful performance for flaw length sizing is defined as the resultant flaw size as been equal to or greater than the actual flaw length size. Over sizing of the flaw length may result in false calls in the adjoining grading unit. The candidate must correctly length size approximately **100% of the detected flaws with .250 tolerance.**

C. **Flaw Positioning** - Reported flaws must also be positioned correctly with respect to the weld centerline (upstream/downstream). Evaluations will include the flaws approximate relationship to the weld centerline. Cross sectional plotting of flaw indications on the indication data sheets may be required in order to determine the location of the flaw. The candidate must correctly position approximately **100% of the detected flaws**, with **.500** tolerance.

D. **False Call** - A false call is defined as reporting a flaw within a non-flawed grading unit. Candidates will not know the location of unflawed grading units. The candidate must correctly evaluate the unflawed Grading Units and report **Zero False Calls** in order to be successful.

Unsatisfactory performance in any category will result in test failure.

7. TEST SPECIMEN RE-EXAMINATION

The candidate may re-look at any specimen during **"the day"** of the examination for those test specimens examined for that day, provided they are within the time limits of the test. Re-examination of test samples on subsequent days is not allowed.

8. PERFORMANCE DEMONSTRATION RE-EXAMINATION

Any unsuccessful candidate should wait 2 weeks and show evidence of at least 8 hours of added training on the appropriate Advanced UT System. Re-Examination will be administered

with the same rules and guidelines as the original test. After the second unsuccessful attempt the Test Candidate must wait 3 months and document Advanced UT field training experience (OJT) in which to take the Re-Test for the PDQ Examination.

9. TEST RESULTS

Test results will be provided ASAP / within 1 week after the PDQ examination. Test paperwork will be reviewed at the end of the session for completeness and legibility. All grading will be done post session and filed. The Test Results will be forwarded to Calpine only.

10. THE TEST CANDIDATES ULTRASONIC EXAMINATION PROCEDURE

The Test Candidate shall bring to the PDQ examination a copy of the AUT, PAUT, and or TOFD procedure along with any supplemental manual UT procedures which will be used during the procedure qualification. The essential variables will be reviewed by the Test Administrator.

A detailed scan plan shall be prepared by the Test Candidate prior to the PDQ Examination and submitted to the Test Administrator at the beginning of the PDQ Examination. The scan plan shall be based upon the parameters outline in the test candidates AUT, TOFD, PAUT, or Manual UT Procedure.

This current exam measures the capability to do PAUT at the highest level. All indications >.250 in length should be analyzed, reported and sized using your very best PAUT skills. Data collection can be done by automated semi-automated or hand scanning.

11. EQUIPMENT REQUIREMENTS

The test candidate or candidate organizations are responsible for supplying **ALL** the equipment needed for each PDQ exam. **Sharing of equipment will not be allowed during the demonstration between NDE Service Providers**. Below is a recommended list of equipment and supplies that should be considered for use during the demonstration. Bring what you would to do PAUT in the field / site location and come 100% prepared.

Ultrasonic Instrument	Indication Plotting Devices
Ultrasonic Cables	Calculator
Ultrasonic Probes	Pens/Pencils
Basic / Calibration Blocks	Couplant
Specific / Special Calibration Reference Standards	Rags
	Encoders/Scanners

12. REQUIRED PAPERWORK

All PDQ Examination paperwork shall be completed and turn into the PDQ Administrator to maintain Test Specimen Security. No other paper or materials will be allowed at the testing station. The following demonstration paperwork will be required as a minimum;

Equipment Inventory

Ultrasonic instruments, search units, and other equipment essential to the examination system shall be inventoried and documented on the ***Performance Demonstration Qualification Record (PDQR)*** prior to the start of the qualification test. All non-inventoried equipment shall be stored in an area unrelated to the operation of the examination system. All subsequent inclusions of equipment for qualification purposes shall be documented on the sheet and verified by the PDQ

Administrator. An inventory sheet can be completed prior to the demonstration, but will be verified prior to the start of the demonstration. If the make model, frequency, size or shape cannot be readily determined the equipment certification should be on hand during the demonstration. (See attached Equipment Inventory and PDQR Forms)

Calibration Data Sheet

Calibration data record(s) as required by the Test Candidates UT Procedure shall be completed for each test specimen examined. The PDQ Administrator will review all calibration data sheets to ensure that they contain sufficient information to properly document the equipment was used during the demonstration and to document procedure compliance. The calibration data sheet will not be used as a pass-fail criterion, but shall be evaluated to determine correlation between successful and unsuccessful candidates.

Indication Data Sheet

For each sample, an indication data sheet shall be completed. The indication data sheet has been designed to properly identify indication start and stop positions (length), characterization, and flaw positioning, e.g., upstream or downstream. The candidate is responsible to ensure that all required data is legible and properly identifies the critical length and location (position upstream or downstream) and is clearly recorded on the PDQ Examination Report Form. See attached**.** (See attached Indication Data Sheet)

At the conclusion of the PDQ Examination, the Advanced UT System Data Storage Card/Device will be turned into the Test Administrator. The Test Administrator shall verify that no data is stored on the internal hard drive.

If a lap top computer is used during the examination for analysis, a computer scan search will be performed on the lap top hard drive to verify that no PDQ data was saved in any new files or a modified file during the dates of the Performance Demonstration.

13. SECURITY

Session Monitoring

The PDQ Examination will be monitored by the PDQ Test Administrator. Continuous testing area surveillance will be maintained to ensure test security. Entry into and out of the testing area will be restricted. The testing area will be monitored during lunch to allow candidates additional time for testing if they choose not to take a lunch break.

Purses, backpacks, or briefcases will not be allowed at the candidates testing stations. Additionally, no cellular telephones, personal pagers, or laptop computers (unless part of the examination and evaluation system) will be allowed in the testing area. Personal items shall be stored in a location specified by the PDQ Administrator and will be secured to prevent theft or loss during testing.

The Test Candidates Advanced UT Examination Equipment shall not be removed from the testing area. The Test Area will be locked to ensure test security as well as equipment security.

Test Candidate Expectations

The Test Candidate is expected to follow the test security rules as specified in this guideline. Candidates are not allowed to openly discuss information concerning the test samples or examination results. Any violations of the security rules may be cause for terminating the candidate's test and a failing grade to be posted. ***If the PDQ Examination is compromised, then the Test Candidate will NOT be allowed to take the PDQ Examination for a period of 5 years.***

The PDQ samples will be rotated and renumber.

Additional Security Rules

Additional security measures will be implemented as necessary to ensure the integrity of the testing program. Additional security will be covered in the orientation portion of the demonstration.

Dispute Resolution

A dispute resolution application form will be available to document unresolved issues and concerns with the qualification program.

14. FREQUENTLY ASKED QUESTIONS

1. How much weld length is in a typical test set?

   A. The approximate length of all welds to be examined will be determined by the PDQ Test Set. 100% of any given sample.

2. What is a grading unit?

   A. The total length of the weld is divided into sections called grading units. Grading units do not have to be of equal length and may not to be equally spaced. A single grading unit includes both sides of the weld. Grading units are considered unflawed or flawed. **Flawed grading units will contain only one flaw.**

3. What is the minimum size flaw that must be detected? (Any indication ≥ .250 in length)

   A. No fixed flaw size value has been established. Identifying flaw size tolerances is difficult because of the different potential flaw types presented. Flaws sizes are representative of those expected to be found during field applications. The PDQ Examination is designed to test a candidate's ability to perform Advanced Ultrasonic Examinations like Phased Array (PAUT), Time of Flight (TOFD), etc.

4. Do I have to bring an Ultrasonic Examination Procedure?

   A. Yes, The Ultrasonic Examination Procedure shall meet the minimum requirements for the appropriate UT process and with sufficient detail and flexibility for any certified tech to achieve the very best inspection results, per exam or code requirement specified. Calibration reports and equipment inventory records will be used to record the equipment used.

5. Are all of the test sets similar?

   A. Yes. All of the samples and test sets have been validated by the manufacture and the PDQ level III. The test sets do differ from sample to sample in the number and types of flaws that may be in any single sample. Each set is equally challenging and unique to the thicknesses, diameters and materials outline above.

6. What happens if I do not finish the test in the prescribed time?

   A. Candidates that fail to complete the examination in the allotted time will be considered unsuccessful. (some minor time allowance will be allowed) Future attempts will require a complete re-test.

7. Is there anything beneficial I can do prior to the start of testing?

   A. Yes. The Test Candidate shall become thoroughly familiar with the Test Protocol. In addition, Scan Plan plots, or computer simulation sketches or drawings **shall** be developed prior to the PDQ Examination and submitted at the beginning of the examination.

   B. Additionally, equipment inventory records shall be completed for the Phased Array system used. Calibration records may be completed and documented in advance.

   C. Training can be provided in advance by anyone. The exam is not the time to ask questions it is a time to prove performance capability.

8. Do I have to provide proof of identity?

   A. Yes. A driver's license with picture or an equivalent proof of identification is necessary.

9. Are calibration blocks supplied for the PDQ Examination?

   A. No. All reference and basic calibration blocks will be supplied by the Test Candidate.

10. Can I leave the facility during lunch?

    A. Yes, once testing has started the security requirements are put in place. Candidates are encouraged to bring lunch. Cell phone will remain with the exam proctor if you leave the exam location.

Definitions:

Planar Flaws-Surface Connected

Lack of Penetration-LOP	A planar flaw at the ID root area due to insufficient weld penetration.
Inside Diameter Crack-IDC	A planar flaw at the ID surface of the plate or pipe component which may be either a single vee or a double vee welded joint.
Outside Diameter Crack-ODC	A planar flaw at the OD surface of the plate or pipe component which may be either a single vee or a double vee welded joint.
Transverse Crack	A planar flaw at the ID surface which is transverse to the length of the of the plate or pipe weld of a single vee or a double vee welded joint.

Volumetric Flaws- Not Surface Connected

Lack of Fusion-LOF	An area of non-fusion located between the weld beads along the weld joint preparation bevel
Slag	A non-metallic inclusion which is generally round in shape and lies in the area of the mid volume of the weld. This flaw is only characteristic of the carbon steel test samples
Porosity	A group of rounded gas pores which lie in the area of the mid area of the weld volume
Mid Wall Crack-MDC	A planar flaw at the mid-wall volume in a 1-inch thick double vee welded joint of the plate weld sample

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ULTRASONIC EXAMINATION PERFORMANCE DEMONSTRATION QUALIFICATION RECORD

Record Number: _____

PERFORMANCE DEMONSTRATION QUALIFICATION RECORD (PDQR-PQ)	
Test Candidate Name:	
Current Level Of Certification:	
Employer:	

Ultrasonic Examination Procedure(s)				
UT Procedure No.	**Rev.**		**Rev. Date:**	
Procedure Title:				
UT Procedure No.	**Rev.**		**Rev. Date:**	
Procedure Title:				

UT Examination Equipment							
Semi-Automated:		Encoded:		Automated:	N/A	Manual:	
UT Instrument Manufacturer:				Model:			
Collection Software Revision / Version:				Analysis Software Revision / Version:			

Qualification Test Specimens						
Components:	Pipe specimens'		Vessel specimens'		Plate:	
Material Type:	Carbon Steel		Stainless Steel:		Other:	
Diameter Range of Test Specimens':			Minimum:		Maximum:	
Thickness Range of Test Specimens':			Minimum:		Maximum:	
Access	Double Side:		Single Side:		Enhanced Single Side	

Data Collection / Data Analysis	
Description of Primary Data Collection:	
Description of Supplemental Data Collection:	
Description of Primary Data Analysis:	
Description of Supplemental Data Analysis:	

Hard Drive Directory	
All Data Stored on Compact Flash Drive	
System Security verification performed by:	Date:

ULTRASONIC EQUIPMENT INVENTORY LIST

Candidate's Name:		**Session ID:**
Company:		
Procedure No:	**Rev. No.:**	**Title:**

ULTRASONIC TRANSDUCER						ULTRASONIC UNIT			
Probe Unit #	Mfg. / MODEL	FREQ.	Pitch	ANGLE(s) Used	S/N	MANUFACTURER	MODEL	Softwar e	Pulsers Element

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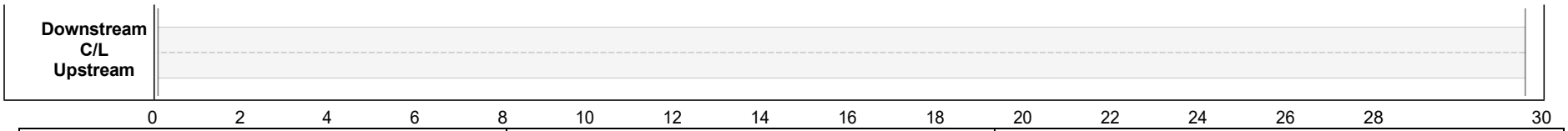
QUALIFICATION EXAMINATION REPORT

	Name:		**Date:**		**Company**
	Mat. Thickness:		**Mat. Dia.:**		**Mat. Type:**

Sample ID: _____

Indication No. #					**Flaw location from zero**		**Flaw length**		**Notes**
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									



US DS **1**	US DS **2**	US DS **3**
US DS **4**	US DS **5**	US DS **6**
US DS **7**	US DS **8**	US DS **9**

For Grading Purposes Only:

Detection	Length Sizing	Positioning:	False Calls