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YUCCA MOUNTAIN PROJECT

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Subject: DETERMINATION OF STRESS CORROSION CRACKING SUSCEPTIBILITY USING THE CONSTANT EXTENSION RATE TECHNIQUE.

Approved by: Willis L Williams — Technical Area Leader — 12/14/89 — Date

Approved by: David W. Short — YMP Quality Assurance Manager — 1/25/90 — Date

Approved by: [signature] — YMP Project Leader — 1/26/90 — Date

DETERMINATION OF STRESS CORROSION CRACKING SUSCEPTIBILITY USING THE CONSTANT EXTENSION RATE TECHNIQUE.

H.S.AHLUWALIA
Science and Engineering Associates
Livermore, California 94550.

J.C.Estill
Lawrence Livermore National Laboratory
Livermore, California 94551.

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1.0 INTRODUCTION

The LLNL-YMP Scientific Investigation Plan for Spent Fuel Waste Form Testing YMP WBS Element 1.2.2.3.1.1 [1] identifies an activity for oxidation tests on spent fuel and UO_2 by measuring the weight gained during the oxidation process in a low-temperature oven over long time periods. This activity will be performed at the Pacific Northwest Laboratories (PNL) of Battelle in Richland, WA. This activity plan describes performance details for this activity according to the guidelines prescribed in LLNL-YMP Quality Procedure 033-YMP-QP 3.0.

1.1 Activity Identity

The activity number assigned in the SIP (Spent Fuel Waste Form Testing) [1] for the oxidation tests on spent fuel and UO_2 using a low-temperature oven method is D-20-45.

1.2 Quality Assurance Level Assignment

Activity D-20-45 is assigned as QA Level I (see Appendix A).

1.3 Responsibilities

Key personnel responsible for performing the work in this activity are identified below:

Technical Area Leader:	Dr. Henry F. Shaw (LLNL)
Task Leader:	Dr. Ray B. Stout (LLNL)
Principal Investigator:	Dr. Robert E. Einziger (PNL)

Dr. Einziger will be supported by his colleagues, H. C. Buchanan (PNL), who has co-authored several papers on oxidation testing apparatus and the oxidation data measured [3-8] and Dr. W. J. Gray (PNL).

2.0 PURPOSE AND OBJECTIVES

Low-temperature experimental data on UO_2 spent fuel oxidation kinetics are necessary to develop performance assessment models that describe the behavior of the spent fuel in a

repository. The objective of these spent fuel experimental tests will be to evaluate the effects of variables such as moisture, temperature, burnup, and various other spent fuel characteristics on oxidation rate and phase formation, to evaluate and identify the various operative oxidation mechanisms, and to confirm results of an alternative short-term thermogravimetric testing method [4,5]. Results from these experimental tests will be used to develop a mechanistic model for the oxidation of UO_2 activity D-20-50.1, "Generate Models for Release of Radionuclides from the Spent Fuel Waste Form."

3.0 ACTIVITY DESCRIPTION

This low-temperature oven oxidation testing activity will be performed under the current LLNL-YMP QA Program Plan (QAPP) 033-YMP-R [2]. Some initial oxidation testing and scoping studies of spent fuel was conducted under the previous LLNL Nuclear Waste Management Program QAPP. This experience has been incorporated into this activity plan.

The sequence of steps in the activity and the connections with model development and leaching activities in the spent fuel task WBS 1.2.2.3.1.1 are illustrated in Figure 1.1 (pp 1.2) of the test plan entitled, "Test Plan for Thermogravimetric Analyses of BWR Spent Fuel Oxidation" document no. PNL-6745 [5]. Defining a set of precise decision points that identify completion of the activity is difficult because the activity for obtaining experimental data of oxidation kinetics and the activity for model development of oxidation kinetics are complementary, iterative and continuously coupled. However, at this stage in activity planning for low-temperature oven oxidation tests, decision points occur when:

i sufficient experimental data are provided to support or refute a proposed two stage mechanism of an initially rapid grain boundary oxidation process and then a slower grain volume oxidation process;

ii the proposed two stage mechanism is refuted, therefore, consideration needs to be given in possibly developing an alternative model for spent fuel oxidation kinetics with the available experimental data;

iii sufficient experimental data are provided to analytically represent, through a parallel model development activity, the temperature, moisture, and description parameters of spent fuel characteristics (burnup, grain size, fission gas content, etc) effects on spent fuel

oxidation kinetics over the expected range of environmental history conditions expected in a repository.

3.1 Technical Reviews

At this time, no technical reviews are planned for this activity. However, at least two meetings per year between PNL and LLNL personnel are planned to discuss and report the status and future plans for low-temperature oven oxidation tests and, at which time, the need for technical reviews will be re-examined. These meetings will be in addition to the anticipated formal reports and papers that will be written to document the results and to distribute spent fuel oxidation data amongst all the related activities in YMP and the scientific community for review and comment by peers. The timing of these meetings will be determined, in part, by the progress of the experimental work.

3.2 Hold Points

No hold points for directional changes in testing are currently identified. However, the need for establishing hold points will be considered during each meeting described in Section 3.1 of this activity plan.

3.3 Equipment

The experimental equipment required for this activity is identified and described in Section 2.0 of the test plan entitled, "Test Plan for Long-Term, Low-Temperature Oxidation of BWR Spent Fuel" document no. PNL-6427. This test plan is attached as Appendix B.

3.4 Materials

Initial oxidation tests have been conducted and are still continuing for PWR fuel samples (Series Test 1) and BWR fuel samples (Series Test 2) which are described in sections 1.2 and 2.0 of Appendix B. New samples of UO_2 spent fuel used in this activity are identified and described in the addendum to Test Plan for Long-Term, Low-Temperature Oxidation of High Burnup Spent Fuel. This addendum is attached as Appendix C. These samples are obtained from the Material Characterization Center (MCC) [9] which has been assigned the responsibility by DOE-HQ of providing QA Level I

specimens for spent fuel oxidation testing by YMP. Additional samples of different fuel types will be added to the test matrix as they become available. This will greatly increase the amount of data that can be acquired for use in oxidation modeling development activities and performance assessments.

3.5 Special Environmental Conditions

The test specimens are radioactive and the oxidation testing conditions require temperature and moisture control. The environmental testing conditions are described in Sections 2.1.3, 2.1.5, and 2.3 of Appendix B.

3.6 Special Training/Qualification Requirements

Training will be required for personnel performing work in this activity relative to the procedure for low-temperature oven oxidation tests, technical implementing procedures listed in Section 8.0 of this activity plan, and appropriate examination procedures discussed in Section 2.7 of Appendix B. Training will be accomplished through reading assignments and on-the-job supervision, as appropriate, to gain and demonstrate proficiency. Training documentation will be included in the Personnel Qualification Records at PNL.

3.7 Activity Closeout

At the completion of the low-temperature oven oxidation testing, any remaining QA records such as scientific notebooks and technical reports will be submitted to the LLNL-YMP Local Records Center.

4.0 PRECISION AND ACCURACY

The overall measurement error of the low-temperature oven oxidation testing is specified at less than 20% in Section 1.2 of Appendix B.

4.1 Calibration Requirements

All measurement instrumentation (i.e., balances, thermocouples, and data recorders) will be calibrated against National Institute of Standards and Technology (NIST) traceable reference standards. Calibration procedures and requirements are given in PNL

Technical Implementing Procedure (TIP) No. SFO-2-1. This section supersedes the fourth sentence in section 2.4.1 of Appendix B.

4.2 Conditions That May Adversely Affect Results

Progress and results may be adversely affected by understaffing and personnel changes during the course of an experiment in progress. Also, as discussed under model evaluation in section 2.F of the test plan entitled, "Test Plan for Series 2 Thermogravimetric Analyses of Spent Fuel Oxidation", HEDL-7556 [4], there exist uncertainties in the current understanding of low temperature UO_2 spent fuel oxidation kinetics which make these tests non-routine and developmental in nature. Thus, changes and updates in experimental procedures and directions should not come as future surprises, although none are currently anticipated. Uncertainties in mechanistic interpretations for oxidation kinetics have been discussed in the report entitled, "Technical Test Description of Activities to Determine the Potential for Spent Fuel Oxidation in a Tuff Repository", HEDL-7540 [3].

4.3 Sources of Uncertainty and Error to be Controlled and Measured.

Once the test specimens are provided, sources of experimental error are moisture measurements, temperature measurements, weight measurements, and elapsed time measurements. The temperature and weight measurements are the most critical for this test procedure. The temperature control limit of ± 3°C at temperatures up to 300°C and weight change limit of ± 0.01% are given as controllable measurements in the Section 2.3 of Appendix B.

5.0 IN-PROCESS DOCUMENTATION

Documentation to be generated during the conduct of this activity include: scientific notebooks; magnetic computer disks, and photographs. Scientific notebooks are controlled and maintained in accordance with PNL's Act Now Directive 89-1 entitled, "Use of Laboratory Record Books (MG 4.3, Research Records)." Records will be transferred to the PNL Records Center for storage and maintenance prior to turnover to LLNL-YMP on an annual basis.

5.1 Data Recording and Data Reduction

The data acquisition system and data reduction techniques are described in PNL TIP No. SFO-2-1.

5.2 Analysis

Section II.F of Reference 4 discusses existing references, phenomenological models, and correlation functions to obtain empirically fitted models. This approach will be augmented with the model development for the oxidation of UO_2 activity D-20-50.1 as described in the LLNL-YMP Scientific Investigation Plan for Spent Fuel Waste Form Testing YMP WBS Element 1.2.2.3.1.1 [1]. The experimental testing and the model development activities will be carried out in parallel with close and continuous technical interchanges to maintain consistent and contiguous data input quality and model prediction capability.

6.0 INTERFACES

Activity D-20-45 involves experimental tests for obtaining data on oxidation rates and the various oxidation states of UO_2. These data will be used in activity D-20-50.1 which is the activity for developing a mechanistic model of oxidation kinetics that can be extrapolated to the time domain for repository environmenal conditions. Activity D-20-45 is planned to be conducted in parallel with activity D-20-50.1. This will allow information to be "continuously" interchanged between the two activities. The Technical Area Leader for both of these activities is Dr. Henry F. Shaw, of LLNL. The Task Leader for both of these activities is Dr. Ray B. Stout, of LLNL. Thus, two levels of activity managers have direct technical information and budget control over the coordination between these activities.

Within the Spent Fuel Waste Form Testing YMP WBS Element 1.2.2.3.1.1, data and specimens at various oxidized states will be provided to activities for dissolution/leach testing. These activities are D-20-42, D-20-43, and D-20-53; and the Task Leader is Dr. Herman Leider, of LLNL. Other information, in terms of both experimental data and models developed, are provided to activities under the control of the LLNL-YMP Waste Package Performance Assessment WBS 1.2.2.5.1.

7.0 SCHEDULE

7.1 Duration

The duration of this activity is governed by the model development activity D-20-50.1 since this activity is planned to be an ongoing activity where data collected will be continuously provided to update and improve this model and provide input in future performance assessments. The duration of activity D-20-50.1 is approximately 7 years where the final model development will be provided into the final Licensing Application Design Performance Assessment.

The estimated test durations for the currently planned Series 3 oven oxidation testing are listed in Table 2.2 of Appendix C.

7.2 Staffing Requirements

Estimated staffing requirements are shown in Appendix D. Staffing requirements are based on the currently planned Series 3 oven oxidation tests described in Appendix C. As more fuel samples become available and are added to the test matrix, these estimates will be revised accordingly.

8.0 TECHNICAL IMPLEMENTING PROCEDURES

Procedures for performing the tests are discussed in Section 2.7 of Appendix B. In addition, the following TIPs will also be used:

- PNL TIP No. SFO-2-1.

9.0 SPECIAL CASES (PROCUREMENT)

The experimental testing, data acquisition/storage and some preliminary data analyses are performed and managed by the Principal Investigator, Dr. Robert Einziger of Pacific Northwest Laboratories (PNL) in Richland, WA 99352 as described in Appendix B.

9.1 QA Requirements Specifications

Work to be performed under this activity plan will be in accordance with the latest revision of PNL-MA-70 QA Plan No. WTC-018, which is consistent with the requirements of LLNL-YMP QA Requirements Specification No. QARS-001C. This section supersedes the second sentence in section 2.9 of Appendix B.

9.2 Statement of Work

The description of the work to be performed by the Principal Investigator, Dr. Robert Einziger of PNL, is provided in Appendix B.

9.3 Subcontractor Interface Control

The technical contacts and interfaces between LLNL-YMP and PNL are described in the Special Client Requirements Section, Part B16.0 of the PNL-MA-70 QA Plan No. WTC-018. This section also describes the documents/reports (i.e., Technical Procedures, Reports and Test Plans) to be submitted by PNL to LLNL-YMP for review and approval. Informal memo and telephone exchanges will be documented in LLNL-YMP controlled scientific notebooks assigned to this activity.

9.4 Materials/Equipment Provided

At present, no materials and equipment are expected to be provided directly from LLNL-YMP to PNL for TGA oxidation testing under activity D-20-45. The UO_2 spent fuel specimens will be obtained from MCC [9] as previously discussed in Section 3.4 of this activity plan. All other testing equipment is currently available at PNL.

9.5 Deliverables

As described in Section 2.8 of Appendix B, periodic progress reports, formal reports, and journal papers will be provided as warranted. Currently, monthly progress reports, test plans, formal reports, and papers for journal publication are submitted by PNL to LLNL-YMP for review and approval.

10. REFERENCES

1. LLNL-YMP Scientific Investigation Plan for Spent Fuel Waste Form Testing - Rev. 1 (1989), Lawrence Livermore National Laboratory, Livermore, CA.

2. LLNL-YMP QA Program Plan (QAPP) 033-YMP-R (1989), Lawrence Livermore National Laboratory, Livermore, CA.

3. Einziger, R. E., (1985), Technical Test Description of Activities to Determine the Potential for Spent Fuel Oxidation in a Tuff Repository, HEDL-7540, Westinghouse Hanford Co., Richland, WA.

4. Einziger, R. E., (1986), Test Plan for Series 2 Thermogravimetric Analyses of Spent Fuel Oxidation, HEDL-7556, Westinghouse Hanford Co., Richland, WA.

5. Einziger, R. E., (1988), Test Plan for Thermogravimetric Analyses of BWR Spent Fuel Oxidation, PNL-6745, Pacific Northwest Laboratory, Richland, WA.

6. Einziger, R. E., and Woodley, R. E., (1985), Evaluation for the Potential for Spent Fuel Oxidation Under Tuff Repository Conditions, HEDL-7452, Westinghouse Hanford Co., Richland, WA.

7. Einziger, R. E., and Buchanan, H. C. (1988), Long-Term, Low-Temperature Oxidation of PWR Spent Fuel: Interim Transition Report, WHC-EP-0070, Westinghouse Hanford Co., Richland, WA.

8. Thomas, L. E., Einziger, R. E., and Woodley, R. E., (1989), Microstructural Examination of Oxidized PWR Fuel by Transmission Electron Microscopy, J. Nuclear Materials (in press).

9. MCC - Characterization Plan for MCC Approved Testing Materials - Draft Copy, (1989), Pacific Northwest Laboratory, Richland, WA.

11. APPENDICES

11.1 Appendix A - QA Level Assignment Sheets for Low-Temperature Oven Oxidation Tests.

11.2 Appendix B - Test Plan for Long-Term, Low-Temperature Oxidation of BWR Spent Fuel, PNL-6427 by Robert E. Einziger, December 1988.

11.3 Appendix C - Addendum to Test Plan for Long-Term, Low-Temperature Oxidation of High Burnup Spent Fuel by Robert E. Einziger, August 4, 1989.

11.4 Appendix D - Estimated Staffing Requirements for Series 3 Oven Oxidation Tests.

Appendix A - QA Level Assignment Sheets for Low-Temperature Oven Oxidation Tests

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SUMMARY SHEET

QALA Record: _____ Rev. No.: _____

Planning Reference: _____

Item/Activity	QA Level	Justification
D-20-45	I	~~II.H~~ II.C.2 HFS 8/22/89

Upper Tier QALA Record:

WBS	Description	QA Level
1.2.2.3.1.1	Oven oxidation tests, spent fuel and UO_2	I

Approvals:

LLNL YMP		DOE PROJECT OFFICE	
Task Leader: Roy B. Stout	Date: May 15, 1989	DD:	Date:
Technical Area Leader:	Date: 5/15/89	PQM:	Date:
QA Manager: R. E. Spence	Date: 5/15/89		
YMP Leader: Fobi J Harris	Date: 5/15/89		

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QA LEVEL ASSIGNMENT & GRADING APPROVAL SHEET

Upper Tier
QALA Record No. _____ Rev: _____ Dated: _____

Lower Tier

WBS No. 1.2.2.3.1.1 Activity No. D-20-45

S.I.P. Identification: WASTE FORM - SPENT FUEL

Activity Description: OVEN OXIDATION TESTS, SPENT FUEL AND UO_2

Quality Assurance Level: I QALA Meeting Date: 4/26/89

Additional Comments:

Meeting Attendees:

R. SCHWARTZ
L. JARDINE
H. LEIDER
R. STOUT
H. SHAW

SIGNATURES INDICATE APPROVAL OF LEVEL OF QUALITY ASSURANCE & GRADED SELECTION OF APPLICABLE REQUIREMENTS

Technical Area Leader	5/8/89 Date	YMP QA Manager	5/8/89 Date
YMP Project Leader	5/10/89 Date		

AFTER PROJ LEADER APPROVAL, RETURN TO QA MGR W/COPY TO TASK LEADER

DOE (YMP) Proj Office	Date	DOE Proj Office QA Mgr	Date

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DECISION CRITERIA RECORD

Upper Tier
QALA Record No. _____ Rev: _____ Dated: _____

Lower Tier

WBS No. 1.2.2.3.1.1 Activity No. D-20-45

S.I.P. Identification: WASTE FORM - SPENT FUEL

Activity Description: OVEN OXIDATION TESTS, SPENT FUEL AND UO_2

Decision Criteria	Applicability
I	NO HARDWARE (ENGINEERED ITEMS)
II.A	INDETERMINATE
II.B	NO SOFTWARE DESIGN
II.C.1	INDETERMINATE
II.C.2	APPLICABLE
II.D.1	APPLICABLE
II.E	NOT APPLICABLE - NO HISTORICAL REPORTS
II.F	NOT APPLICABLE - NO ENVIRONMENTAL/SOCIOECONOMIC STUDIES
II.G.1	APPLICABLE
II.H	NOT APPLICABLE

Additional Considerations:

Quality Assurance Level: I

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GRADED QA CONTROL SPECIFICATION RECORD

Upper Tier
QALA Record No. _____ Rev: _____ Dated: _____

Lower Tier

WBS No. 1.2.2.3.1.1 Activity No. D-20-45

S.I.P. Identification: WASTE FORM - SPENT FUEL

Activity Description: OVEN OXIDATION TESTS, SPENT FUEL AND UO_2

LLNL QUALITY ASSURANCE PROGRAM PLAN (QAPP) STRUCTURE

APPLICABLE (YES/NO)		DESCRIPTION	JUSTIFICATION OR CONTROL PROCEDURE(S)
YES		Section I - ORGANIZATION	033-YMP-QP 1.0
YES		Section II - QA PROGRAM	033-YMP-QP 2.series
YES		Section III - SCIENTIFIC INVESTIGATION & DESIGN CONTROL	
YES		1.0 Scientific Investigation Control	
	YES	1.1 Preparation of Plans	
	YES	1.2 Assignment of QA Levels	
	YES	1.3 Review & Approval Process	
	YES	1.4 Scientific Investigation Data Interpretation and Analysis	
	YES	1.5 Use of Computer Programs	
	YES	1.6 The Use of Scientific Notebooks Versus the Use of Technical Implementing Procedures	
	YES	1.7 Change Control	
	YES	1.8 Interface Control	
	YES	1.9 Verification of Scientific Investigations	
	YES	1.10 Surveillance of Scientific Investigations and Experiments	
	YES	1.11 Reports, Conclusions and Recommendations	
	YES	1.12 Close-Out Verification	
NO		2.0 Design Control - NO ENGINEERED ITEMS INVOLVED	
	NO	2.1 General	
	NO	2.2 Design Input	
	NO	2.3 Design Analysis	
	NO	2.4 Design Verification	
	NO	2.5 Design Change Control	
	NO	2.6 Design Interface Control	
	NO	2.7 Design Output Requirements	
	NO	2.8 Design Documents as QA Records	
NO		3.0 Software Quality Assurance and Control - NO SOFTWARE DESIGNS	
	NO	3.1 Computer Software Documentationand Contrc:	
	NO	3.2 Documentation of Comouter Software	
	NO	3.3 Software Configuration Management	
YES		4.0 Peer Reviews	
YES		5.0 Technical Reviews	

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GRADED QA CONTROL SPECIFICATION RECORD (CONTINUED)

APPLICABLE (YES/NO)		DESCRIPTION	JUSTIFICATION OR CONTROL PROCEDURE(S)
YES		**Section IV** - PROCUREMENT DOCUMENT CONTROL	
		1.0 Requirements	
	YES	1.1 Measures to Assure Adequate Quality	
YES		2.0 Additional Requirements for Level I Activities	
	YES	2.1 Content of Procurement Documents	
	YES	2.2 Procurement Document Review	
	YES	2.3 Procurement Document Changes	
	YES	2.4 Distribution of Procurement Documents	
YES		**Section V** - INSTRUCTIONS, PROCEDURES, PLANS, AND DRAWINGS	033-YMP-QP 5.0
YES		**Section VI** - DOCUMENT CONTROL	033-VMP-QP 5.0
YES		**Section VII** - CONTROL OF PURCHASED ITEMS AND SERVICES	
YES		1.0 General Requirements	
	YES	1.1 Procurement Planning	
	YES	1.2 Source Evaluation and Selection	
	YES	1.3 Bid Evaluation	
	YES	1.4 Supplier Performance Evaluation	
	YES	1.5 Control of Documents Generated by Suppliers	
	YES	1.6 Acceptance of Item or Service	
	YES	1.7 Acceptance of Services Only	
	YES	1.8 Control of Supplier Nonconformances	
YES		2.0 Commercial-Grade Items	
	YES	2.1 Alternatives	
YES		**Section VIII** - IDENTIFICATION AND CONTROL OF ITEMS, SAMPLES AND DATA	
NO		Part A - Identification and Control of Items - NO ENGINEERED ITEMS INVOLVED	
	NO	1.0 Identification	
	NO	1.1 General	
	NO	2.0 Control	
YES		Part B - Identification and Control of Samples	
	YES	1.0 Identification	
	YES	1.1 General	
YES		Part C - Identification and Control of Data	
	YES	1.0 Identification	
	YES	1.1 General	
NO		**Section IX** - CONTROL OF PROCESSES - NO SPECIAL PROCESSES	
NO		1.0 General Requirements	
NO		2.0 Process Control	
	NO	2.1 Method	
	NO	2.2 Identification of Special Processes	
	NO	2.3 Qualification of Special Process Procedures	
	NO	2.4 Qualification of Personnel Performing Special Processes	
	NO	2.5 Special Process Equipment	
	NO	2.6 Special Process Records	

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GRADED QA CONTROL SPECIFICATION RECORD (CONTINUED)

APPLICABLE (YES/NO)		DESCRIPTION	JUSTIFICATION OR CONTROL PROCEDURE(S)
NO		**Section X - INSPECTION**	NO ENGINEERED ITEMS INVOLVED
NO		1.0 General Requirements	
NO		2.0 Personnel	
	NO	2.1 Reporting Independence of Personnel	
	NO	2.2 Qualification	
NO		3.0 Inspection Hold Points	
NO		4.0 Inspection Planning	
	NO	4.1 Sampling	
NO		5.0 In-Process Inspection	
	NO	5.1 Combined Inspection and Monitoring	
	NO	5.2 Controls	
NO		6.0 Final Inspection	
	NO	6.1 Inspection Requirements	
	NO	6.2 Acceptance	
	NO	6.3 Modifications, Repairs or Replacements	
NO		7.0 In-Service Inspection	
	NO	7.1 Methods	
NO		8.0 Qualifications Requirements	
NO		9.0 Records	
	NO	9.1 Inspection Records	
	NO	9.2 Personnel Qualification Records	
NO		**Section XI - TEST CONTROL**	NO ENGINEERED ITEMS INVOLVED
NO		1.0 General Discussion	
NO		2.0 Test Requirements	
NO		3.0 Test Procedures	
	NO	3.1 Test Instructions, Procedures and Drawings	
	NO	3.2 Test Prerequisites	
	NO	3.3 Review of Procedures	
	NO	3.4 Potential Sources of Error	
	NO	3.5 Alternatives	
NO		4.0 Test Results	
NO		5.0 Records	
YES		**Section XII - CONTROL OF MEASURING AND TEST EQUIPMENT**	
YES		1.0 General	
	YES	1.1 Maintaining Accuracy of Equipment	
	YES	1.2 Scope of Control Program	
	YES	1.3 Description of Responsibilities	
YES		2.0 Purpose of Equipment	
	YES	2.1 Selection	
	YES	2.2 Calibration	
	YES	2.3 Control	
	YES	2.4 Commercial Devices	
	YES	2.5 Handling and Storage	
	YES	2.6 Records	

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GRADED QA CONTROL SPECIFICATION RECORD (CONTINUED)

APPLICABLE (YES/NO)		DESCRIPTION	JUSTIFICATION OR CONTROL PROCEDURE(S)
~~YES~~		**Section XIII** - HANDLING, SHIPPING AND STORAGE	
YES		1.0 General	
	YES	1.1 Special Equipment and Protective Environments	
	YES	1.2 Specific Procedures	
	YES	1.3 Inspection and Testing of Special Tools	
	YES	1.4 Operators of Special Equipment	
	YES	1.5 Marking and Labeling	
NO		**Section XIV** - INSPECTION, TEST AND OPERATION STATUS	NO ENGINEERED ITEMS INVOLVED
NO		1.0 Indication of Status	
NO		2.0 Methods of Indicating Status	
NO		3.0 Application and Removal of Status Indicators	
YES		**Section XV** - CONTROL OF NONCONFORMING ITEMS	**033-YMP-QP 15.0**
YES		**Section XVI** - CORRECTIVE ACTION	**033-YMP-QP 16.00**
YES		**Section XVII** - QUALITY ASSURANCE RECORDS	**033-YMP-QP 17.00**
YES		**Section XVIII** - AUDITS	**033-YMP-QP 18.00**

Supplemental Controls Required:

NONE

Justification:

Remarks:

NONE