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**SANDIA NATIONAL LABORATORIES  
CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
TECHNICAL PROCEDURE (TP)**

**TP-237  
Revision 02**

**INSTALLATION AND VERIFICATION OF  
INSTRUMENTATION WIRING**

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Original signed by Ron S. Taylor 04/22/2004  
Author: Ron S. Taylor Date

Original signed by John W. Kelly 04/22/2004  
Technical Reviewer: John W. Kelly Date

Original signed by Leopoldo A. Buenviaje 04/22/2004  
Quality Assurance Reviewer: James F. Graff Date

Original signed by Ron S. Taylor 04/22/2004  
Approval: Ron S. Taylor Date

(Reviewer signatures above serve to document the review and resolution of comments)



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## REVISION HISTORY

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<b>Rev.</b>	<b>Effective Date</b>	<b>Change Summary</b>
00	8/7/95	Initial issue
01	1/31/97	Minor clarifications per YMP-96-D088 revision to clarify QA record designation requirements.
02	04/22/04	Modified per QAIP20-1, Revision 09, to address issues raised in CR2035, 3/9/04



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## **1.0 SCOPE**

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Sandia National Laboratories (SNL) is responsible for rock mechanics field experiments to monitor and characterize the Exploratory Studies Facility (ESF) in support of the Yucca Mountain Project (YMP). These experiments include installing and monitoring instrumentation that measures the long-term in situ stability of rock units penetrated by ESF excavations.

This Technical Procedure (TP) applies to all SNL YMP personnel and contractors who shall be trained and qualified to perform installation and verification of instrumentation wiring.

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## **2.0 OBJECTIVES AND PRIMARY TASKS**

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The objective of this technical procedure is to describe the process for verifying and documenting instrument installation and wiring.

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## **3.0 RESPONSIBILITIES**

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The Principal Investigator (PI) or PI designee is responsible for assuring and documenting that individuals assigned to install, verify and document data collection instrumentation wiring have read and are properly trained to this procedure before these individuals initiate work. The PI/PI designee is also responsible for verifying instrument and instrumentation performance in accordance with the requirements defined in TP-249, *Maintenance, Verification, and Reject Criteria of Instrumentation*.

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## **4.0 QUALIFICATION PREREQUISITES**

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The following prerequisites are required when using this TP:

- A current version of this TP is available for use.
- Measuring and Test Equipment (M&TE) used will have a current calibration.

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## **5.0 DEFINITIONS/ACRONYMS**

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ESF	Exploratory Studies Facility
M&TE	Measuring and Test Equipment
PI	Principal Investigator
QA	Quality Assurance
QAIP	Quality Assurance Implementing Procedure
SNL	Sandia National Laboratories
TCO	Test Coordination Office
TP	Technical Procedure
YMP	Yucca Mountain Project



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## 6.0 PROCESS

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Instrumentation wiring in the ESF may be installed by SNL field personnel and contractors involved in the YMP. The PI/PI designee is responsible to ensure that all wiring for a particular SNL experiment is documented adequately to facilitate maintenance and verified to ensure accurate association with data collected from the experiment. The following steps shall be performed for each SNL experiment:

1. Develop pre-fabrication wiring plans;
2. Develop wiring verification plan;
3. Perform functional test and document the results;
4. Develop as-built schematics, plans, tables and/or layouts of wiring installation.

### 6.1 Develop Pre-Fabrication Wiring Plans

Pre-fabrication specifications, plans or layouts of the wiring for each installation will be prepared, if applicable. This process may include reviewing the ESF materials inventory, M&TE inventory and product catalogs. Selected items will be reviewed by the PI/PI designee to assure the following:

- List of materials meet and are compatible with YMP ES&H requirements;
- Power requirements are communicated to ESF Test Coordination Office (TCO);
- Wiring material specifications are compatible with data transmission and power requirements for the instrumentation used;
- Installations are compatible with YMP integrated data system requirements (if appropriate); and
- Wiring plans and/or layouts are accurate and compatible.

A memo or purchase order authorizing fabrication shall be issued to the fabricator/supplier of service by the PI/PI designee. Approved fabrication layout plans are issued with the fabrication authorization. All modifications shall be documented and approved by the PI/PI designee.

### 6.2 Develop Wiring Verification Plan

A verification plan will be developed for each type of wiring installation. The verification plan will be reviewed by the PI/PI designee and approved prior to implementation. Identical installations do not require multiple verification plans. The verification plan should include:

- Review of all modifications to original drawings, if any;
- Continuity checks to ensure as-built layout accuracy;
- Verification of materials and their conformance with pre-fabricated plan specifications;
- Instrumentation identification, if any;



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- Instrumentation wiring and pinout configuration as supplied by manufacturer.

### 6.3 Perform Functional Test and Document the Results

Prior to **On-Line** use, a functional test of each installation will be implemented as directed by the PI/PI designee. If the installation passes the function test, proceed to Section 6.4. If the installation fails the functional test:

- Document results;
- Notify the PI/PI designee before proceeding.

### 6.4 Develop As-Built Schematics, Plans, Tables and/or Layouts of Wiring Installation

As-built schematics, plans, tables, and/or layouts will be developed for completed installations. The PI/PI designee will sign and date the final draft of the completed installation as-built. This may consist of schematics, layouts of wiring and/or tables associating wiring junctions and components as illustrated by the example in Appendix A. These schematics, plans, tables and/or layouts may contain the following:

- Wiring Verification Plan (see Section 6.2);
- Installation location;
- Instrumentation identification, if any;
- Component configuration and labeling;
- Wiring specifications, i.e. wire type, AWG, number of pairs;
- Cable routing.

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## 7.0 RECORDS

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Records and record packages, including corrections and changes thereto, generated as a result of implementing this procedure shall be prepared and submitted as Quality Assurance (QA) records (QA:QA) in accordance with the requirements of AP-17.1Q.

QA records generated by this procedure include:

- PI/PI designee documentation that an individual has read this TP and can demonstrate proficiency in its use;
- Fabrication authorization memorandum, if any;
- Verification plan;
- Signed and dated as-built schematics, plans and/or layouts.



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## 8.0 REFERENCES

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1. AP-12.1Q, *Control of Measuring and Test Equipment and Calibration Standards*
2. AP-17.1Q, *Records Management*
3. AP-SIII.3Q, *Submittal and Incorporation of Data/Technical Information to the Technical Data Management System*
4. QAIP 20-1, *Technical Procedures*
5. TP-249, *Maintenance, Verification, and Rejection Criteria of Instrumentation*

The most current version of the reference procedures in place at the time of work performance shall apply.



## Example - Vibrating Wire Strain Gage Station As-Built Verification

STEEL SET # \_\_\_\_\_ STATION LOCATION: \_\_\_\_\_ JUNCTION BOX # \_\_\_\_\_

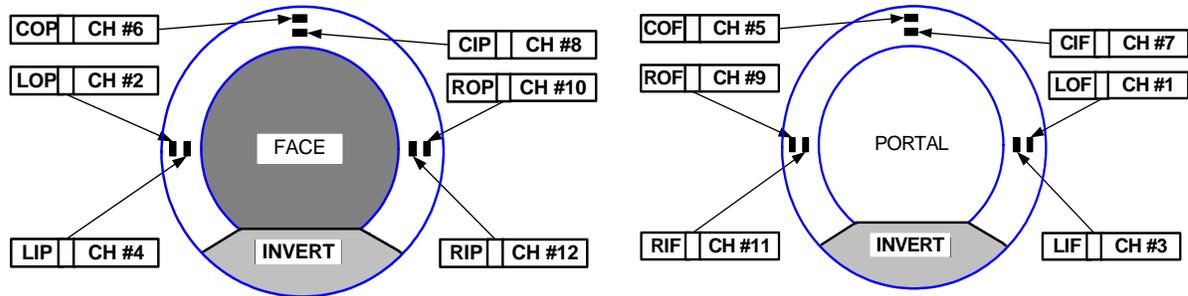
### 1. Verification of Vibrating Wire Strain Gage Location

M&TE ID: \_\_\_\_\_ M&TE Recall Date: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Print

Signature

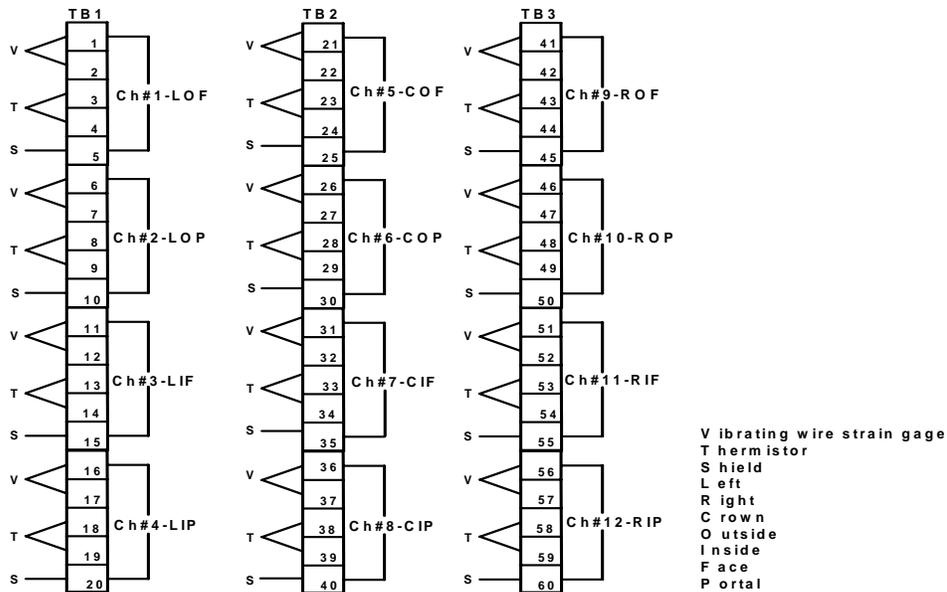


### 2. Verification of Channel Allocation for Junction Box

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Print

Signature



Comments: \_\_\_\_\_