



# PACIFIC SOILS ENGINEERING & TESTING

## CONSULTING ENGINEERS AND GEOLOGISTS

HARMON INDUSTRIAL PARK  
PHONE: 646-6371

P. O. BOX 8453  
TAMUNING, GUAM 96911

September 8, 1982

Division of Fuel Cycle and Material Safety  
Office of Nuclear Material, Safety, and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Attention: Mr. James A. Jones  
Material Licensing Branch

Gentlemen:

This letter is to request that you approve a formal training program in radiation safety which we are proposing on Guam to assist in the training individuals in the use of nuclear moisture and density gauges.

In the past we have attempted to have an instructor from Troxler Electronic Laboratories, Inc., come to Guam to conduct a formal training course. However, the timing and costs for such a program on Guam have proved prohibitive to us.

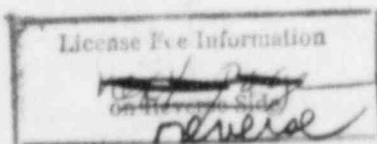
We propose to conduct a 2 day formal training program for the few individuals who would be interested in receiving such training. The course would cover the same topics and would be conducted in the same format as the Troxler course. Mr. M.K. Rao, who completed the Troxler course most recently in 1979 (see attached certificate), would conduct the course. His personal resume is enclosed.

An outline of the proposed course is also enclosed. The outline is taken from the Troxler course materials.

We anticipate that the number of individuals taking this course would be less than six. Formal attendance records would be taken, a written exam conducted, and letter certificates of satisfactory course completion would be issued.

We request your approval of this course as acceptable formal training in radiation safety. Due to the remoteness of Guam, this means seems to be the most practical method of conducting formal training. We appreciate your consideration.

Yours very truly,  
PACIFIC SOILS ENGINEERING & TESTING



COPIES SENT TO OFF. M. K. Rao  
PRESIDENT

Attachments

8507170071 850501  
REG5 LIC30  
56-19242-01 PDR

12551

RECEIVED BY LFMB	
Date..	9/21/82
Log.	Sept. 5 1982 dt
By..	B. S. ...
Orig. To.	...
Action Compl.	...

Applicant...	0819 #493L
Check No...	
Amount/ Fee Date...	Amendment
Type of Fee	10/12/82
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# TROXLER ELECTRONIC LABORATORIES, INC.

HEREBY CERTIFIES THAT

M. K. Rao

of

Pacific Soils Engineering & Testing

HAS SUCCESSFULLY COMPLETED THE TROXLER ELECTRONIC LABORATORIES, INC.  
TRAINING COURSE FOR THE USE OF NUCLEAR TESTING EQUIPMENT.

SUBJECTS INCLUDED IN THIS COURSE WERE AS FOLLOWS:

## Radiological Safety

- |  |   |
|--|---|
| 1. Principles and practices of radiation protection.                               | 5. Radioactivity measurement standardization and monitoring techniques and instruments. |
| 2. Leak testing procedures.  | 6. Accident and incident procedures.  |
| 3. Mathematics and calculations basic to the use and measurement of radioactivity. | 7. Procedures for nuclear gauge storage and transportation.                             |
| 4. Biological effects of radiation.  | 8. General safety precautions.  |

## Gauge Operation

- |                         |                      |
|-------------------------|----------------------|
| 1. Instrument theory    | 4. Field application |
| 2. Operating procedures | 5. Gauge calibration |
| 3. Maintenance          |                      |

Daniel R. Howe  
INSTRUCTOR

December 5 & 6, 1979  
DATE

William F. Troxler  
PRESIDENT

## RESUME

M. K. Rao

### EDUCATION:

M. S. Subsurface Geology, 1971  
University of Kansas  
Lawrence, Kansas

M. SC. Geology-Engineering Geology, 1968  
Osmania University  
Hyderabad, India

B. SC. Geology, Chemistry, Zoology, 1965  
Osmania University  
Hyderabad, India

### MEMBERSHIPS:

Geological Society of America  
National Water Well Association  
American Association for the Advancement of Science

### RESEARCH:

"Petrological Investigation of Medarametla Area." Study includes economic importance, origin of the rock types, and geological mapping of the area.  
Department of Geology  
Osmania University  
Hyderabad, India

"Scale Abrasion". Study includes determining the scale of abrasion for igneous, volcanic, metamorphic, and sedimentary rocks.  
Department of Geology  
University of Kansas  
Lawrence, Kansas

### EXPERIENCE:

1969-1971

Research Assistant-Department of Geology  
University of Kansas  
Lawrence, Kansas

DUTIES: Identification, classification of rock specimens in Sedimentology Museum.  
Separation and identification of microfossils from core samples for subsurface stratigraphic correlation for the purpose of oil exploration. Involved in soft rock research.

1972-1973

Engineering Geologist  
Coastal Testing Labs  
Pasadena, Texas

DUTIES: Geological investigations for master planning purposes, logging and testing soil and rock samples for engineering properties, such as density, porosity, shear strength, etc.

1973-1976

Engineering Geologist  
Harding-Lawson Associates  
Houston, Texas  
Agana, Guam

DUTIES: Supervising field exploration programs and performing detailed geological investigations for various civil engineering projects. Much of the work involved extensive logging, assessments of geological conditions, seismicity and geological hazards evaluation. Conducted pile load tests and pile driving inspection in Guam and Texas. Managed soils lab for the firm.

1976-Present

Geologist  
Pacific Drilling, Inc.  
Tamuning, Guam

DUTIES: Monitoring water levels in deep water wells to obtain aquifer characteristics. Provided part time consultation for engineering and hydrological projects on Guam and the Trust Territory. Worked as a Project Geologist-Hydrologist on deep water well exploration projects on Guam.

1979-Present

Principal Engineering Geologist  
Pacific Soils Engineering & Testing  
Tamuning, Guam

DUTIES: Principal Engineering Geologist for geotechnical investigations and materials testing projects.

\* Outline of the Two-day Training Course for Nuclear Soil & Asphalt Gauge Operation

I. Characteristics of Radiation

- A. Origin of Radiation (cause)
  - 1. Structure of the Atom
  - 2. Unstable isotopes (Radioisotopes)
- B. Activity
  - 1. Curie
  - 2. Half Life
- C. Energy
  - 1. Relationship of energy and mass
  - 2. Electron volt
- D. Types of radiation
  - 1. Alpha
  - 2. Beta
  - 3. Gamma (and x-ray)
  - 4. Neutron

II. Effect of Radiation on matter external to the Radioisotope

- A. Ionization
  - 1. Ion Pairs
  - 2. Specific Ionization
- B. Interaction with matter (Gamma radiation)
  - 1. Photoelectric Absorption
  - 2. Compton effect

III. Detection and Measurement of Radiation

- A. Ionization chamber
- B. Geiger - Mueller detector
- C. Neutron detector
- D. Film badges
- E. Scintillation detector
- F. Radiation Units
  - 1. Roentgen
  - 2. Radiation absorbed dose (Rad)
- G. Biological Dose Units
  - 1. Relative biological Effectiveness (RBE)
  - 2. Roentgen equivalent man (Rem)

IV. Health Safety

- A. Internal radiation hazards
  - 1. Sealed source construction
  - 2. Leak test
- B. External radiation hazards
  - 1. Large dosage in single exposure
  - 2. Small dosages in continuous exposure
  - 3. Troxler gauge radiation profile



- C. Control of radiation dose
  - 1. Time
  - 2. Distance
  - 3. Shielding
  - 4. Example problems and homework assignment
- D. Radiation control procedures (Regulations)
  - 1. Maximum permissible levels of absorbed dose
    - (a) Max. Occupational dose
    - (b) Max. Public exposure
  - 2. Storage
  - 3. Transport
  - 4. Signing
  - 5. Emergency procedures

V. Troxler Gauge operation

- A. Gauge construction & basic operation
  - 1. Physical Design
  - 2. Standard Count
- B. Theory of Operation, Composition Effect and Zone of Measurement
  - 1. Backscatter density
  - 2. Air Gap density
  - 3. Direct transmission density
  - 4. Moisture
- C. Capabilities and Limitations
  - 1. Calibration
    - (a) Establishes gauge accuracy
    - (b) Troxler method
  - 2. Precision
    - (a) Radiation statistics
    - (b) Gauge statistics
  - 3. Field application
  - 4. Test correlation and analysis
  - 5. ASTM Nuclear Methods
- D. Maintenance and Care
- E. Trouble Shooting
- F. Service
- G. Wipe Testing Procedure

VI. Written Examination (closed book)

VII. Field Training

- A. Gauge Controls
- B. Site Preparation
- C. Test Determinations and Calculations
  - 1. Standard Count
  - 2. Test Count
  - 3. Count Ratio
  - 4. Calibration Tables
- D. Test Practice by Participants
- E. Sidewall effect on the Moisture & B. S. Density Measurements
  - 1. Demonstration
  - 2. Application of correction