

Georgia Department of Transportation
Office of Materials and Research

Standard Operating Procedure (SOP) 13
Nuclear Moisture and Density Testing

I. General

The [Office of Materials and Research](#) is responsible for the Nuclear Compaction Testing Program within the Georgia Department of Transportation. The Quality Assurance Branch has authority to perform and is accountable for administrative functions such as accounting for gauges per district, improving testing procedures, maintaining gauges, calibrating gauges, maintaining prevalent radiation safety, and providing material for and assisting in operator training. The District Testing Management Operations Supervisor or Independent Assurance Area Supervisor is accountable for daily gauge assignment, gauge care, safety proficiency and testing proficiency within his/her area in accordance with established procedures.

II. Quality Assurance Branch

This branch performs administrative functions necessary to maintain a continually effective and safe testing program.

A. Maintenance of the Program

A gauge inventory and location list shall be kept current showing the Testing Management or Independent Assurance Supervisor who is accountable for each gauge. This list is useful in gauge distribution, leak test performance, inventory checks, inspection by the licensing agency, etc.

Calibration charts for each mode of each gauge is re-established annually by the Quality Assurance Branch using the calibration blocks acquired for this purpose. This promotes between gauge synchronization to help standardize test results.

Tools for training and guidance are revised when the need arises. Each time gauges are recalibrated the "Nuclear Gauge Handling Guide" and the "Guide for Accidents and Theft" are checked and updated if needed and replaced in calibration booklet for frequent review by the operator.

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Gauge repairs are performed by the Quality Assurance Branch as expediently as practical to insure that gauge “downtime” is minimal. In the event the Quality Assurance Branch repair personnel find it necessary, a gauge may be returned to the manufacturer. Anytime a gauge must be shipped or transported out of state, the Radiation Safety Officer must be consulted for authorization and for the current shipping procedures.

Survey meters are useful in monitoring the radiation level around gauges. The Quality Assurance Branch insures that the Testing Management Operations Supervisors are familiar with survey meter operation and that they are aware of typical levels of radiation around a gauge so occasional area or gauge monitors may be made. This is helpful in the selection of adequate storage points and increases awareness of the condition of individual gauges. Knowing typical radiation levels is also helpful in troubleshooting an accident where a nuclear gauge is involved.

Testing procedures are in GDT 59 of the “Sampling Testing and Inspection Manual”, and from time to time, revised by the Quality Assurance Branch to reflect improved techniques. Improvements in techniques are generally developed through a joint effort of Quality Assurance Branch personnel and the various operators and supervisors. Ideas for ways to improve are generally formed and exchanged during workshops, seminars, training sessions, and field visitations. Those ideas are checked out and refined until procedural improvements are made.

Gauge to gauge tracking is a useful approach to checking the ability of various gauges to compare with one another. It is also useful for identifying specific gauges that may need calibrating or repairing and to isolate operators that may need additional training. Quality Assurance Branch personnel evaluate and report comparison results as they accumulate. This affords operators and supervisors an opportunity to evaluate testing quality for various materials and operators.

B. Safety

The National Radiation Commission (NRC) working through the Department of Natural Resources controls the involvement of radioactive materials in Georgia. The Department of Natural Resources Radiological Health Unit issues a license to each user. The [Office of Materials and Research](#) holds one of these licenses. This license outlines the authorization and limitations that apply to the Surface Moisture and Density Gauges. It also names a Radiation Safety Officer who coordinates the fulfillment of the requirements. Leak tests are performed every February and August on each gauge to insure that it remains safe to use. The wipe kits and instructions may be forwarded from the Quality Assurance Branch to the Testing Management Operations Supervisor and Independent Assurance Area Supervisors. The Supervisors or other qualified personnel perform the wipes and return them to the Radiation Safety Officer. The collection of wipes is scanned with a survey meter and forwarded to the appropriate facility for testing.

After leak test results are received, they are reviewed to determine if any source has excessive removable contamination. In the event one does, it is removed from service, the Department of Natural Resources is informed, and the appropriate action taken.

For incident notification, the Radiation Safety Officer periodically updates the “Radiological Emergency Assistance Telephone Directory”. In the event of adversities, such as an accident or theft involving a gauge,

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the operator will notify one of the personnel listed on the "Guide for Accidents and Theft". This person will give appropriate temporary instructions and will notify the Radiation Safety Officer. (In the event the Radiation Safety Officer is inaccessible, the Quality Assurance Branch Chief or the Testing Management Branch Chief will be notified). If the incident is of a nature that requires such, the Radiation Safety Officer, the Quality Assurance Branch Chief or the Testing Management Branch Chief will notify the Radiological Emergency Assistance Personnel. In any event, the operator shall be advised as soon as practical what further action should be taken.

Where an incident is serious enough, the operator isolates an area of 15 feet (4.6 m) radius before he/she notifies anyone, but makes notification as soon as practical. Examples of this degree of seriousness are when the gauge housing is broken or deranged, the gauge is inoperative, or any evidence that causes the operator to suspect the source may be ruptured. Where the incident is of a nature such that the Radiological Emergency Assistance people are notified, the appropriate report is prepared by the Radiation Safety Officer.

Initial training of operators must be in classes and in accordance with material developed for this purpose. Workshops and seminars are useful for allowing previously trained operators to have input into improving procedures; therefore, they are held from time to time. The Quality Assurance Branch, Testing Management Branch or Independent Assurance Branch may initiate such meetings.

As an important part of our Radiation Safety Program in the event of a pregnancy, the employee shall be solely responsible for immediately notifying the District Testing Management Operations Supervisor or the Assistant. The employee will be given duties that will not require the lifting [30 - 40 lbs (13.6 - 18.1 kg)] or the use of a Surface Moisture and Density Gauge or other radioactive sources for the remaining term of the pregnancy. Upon notification of a pregnancy The Testing Management Operations Supervisor shall have the employee complete and sign a letter of Declaration of Pregnancy. The original copy of the Declaration of Pregnancy shall be submitted to the State Radiation Safety Officer.

A safety conscious environment is an effective approach to maintaining prevalent safety in use, transporting and storage of nuclear gauges. This is accomplished by continual use of tools that maintain the use of nuclear gauges. The "Guide of Accidents and Thefts," the "Nuclear Gauge Handling Guide" and the "Instructor's Training Manual for Surface Moisture and Density Gauges" are such tools.

III. Testing Management and Independent Assurance Branches

The inter-district workload is frequently reviewed by the Testing Management Branch Chief and by the Independent Assurance Area Supervisor, and when necessary gauges are temporarily shifted between districts and Testing Personnel; however, when a gauge is shifted, the Quality Assurance Branch is notified immediately so gauge location records can be properly maintained.

Daily gauge activity and functioning is accounted for by the Testing Management or Independent Assurance Supervisor, whichever is applicable. The Supervisor is accountable for maintaining operator proficiency and care for gauges within his area. He assures that each operator is adequately trained and is proficient in safe transporting, storage, use and related testing techniques. This training should be conducted in classes, workshops, or seminars, but verification of proficiency is through continual observance of the operator functions and gauge condition. In addition, each technician will successfully complete an one day school conducted by the

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manufacture of nuclear gauges concerning radiation theory safety and correct gauge use. In addition, each technician shall participate in an in-house Refresher Training Class to be conducted by District Testing Management Operation Supervisors. Each technician shall receive this training annually and a record of the training will be maintained by the RSO in Forest Park.

Georgene M. Geary, P.E.
State Materials and Research Engineer

Glenn W. Durrence, P.E.
Director of Construction

