



# INTERNATIONAL BOUNDARY & WATER COMMISSION

## NUCLEAR GAUGE MOISTURE CALIBRATION

Project: \_\_\_\_\_ Contract Number: \_\_\_\_\_

Contractor: \_\_\_\_\_ Date: \_\_\_\_\_

Laboratory: \_\_\_\_\_ Technician: \_\_\_\_\_

Gauge Manufacturer: \_\_\_\_\_ Model: \_\_\_\_\_ Serial Number: \_\_\_\_\_

Date of Gauge Measurement(s): \_\_\_\_\_ Date of Oven Drying Sample(s): \_\_\_\_\_

### SAMPLE INFORMATION

(GMC)

TEST #	LOCATION	LIFT/ELEV	TEST DEPTH (inch)	METHOD **	SOIL TYPE/ PROCTOR TEST ID#	WET DENSITY (pcf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)

\*\* Method A - Direct transmission      Method B - Backscatter

Gauge Moisture Content Reading (GMC) = \_\_\_\_\_

Oven Dried Moisture Content (ODMC) = \_\_\_\_\_

### Troxler Gauges:

$$K = \left( \frac{ODMC - GMC}{GMC + 100} \right) \times 1000 = \underline{\hspace{2cm}}$$

### Humboldt Gauges:

$$K = \left( \frac{ODMC - GMC}{GMC + 100} \right) = \underline{\hspace{2cm}}$$

Indicate which soils/proctors this moisture correction (K) applies to:

SOIL TYPE ID #	PROCTOR TEST ID # SOIL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	DENSITY REQUIRED (%)	MOISTURE REQUIRED (%)



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**INSTRUCTIONS**

Compaction testing involves only free water (e.g. that which can be driven off by low temperature oven drying) and the other types of nonfree hydrogen must not be involved. Nuclear gauges basically read hydrogen and cannot discriminate between free water hydrogen and other types of hydrogen. Therefore, it is obvious that a gauge operating on soils containing bound water, molecular hydrogen, water of hydration, adsorbed water or hydrocarbons, and hydrogenous materials will show a higher moisture content than is actually present in terms of free water as indicated by an oven dry test. The other type of interference comes from soils which contain elements or compounds which will capture or absorb slow neutrons before they can get to the detector tube and be counted. In this case the gauge will read a lower moisture content than is actually present in the form of free water.

Soils containing gypsum, lime, mica, clay, organics, and rare earth minerals as well as soils with high salt or iron oxide content require moisture corrections due to these interfering constituents.

When appropriate moisture correction is not made to the gauges being used, not only will errors exist in the percent moisture measured by the gauge, but erroneous dry densities will also be determined.

- All gauges must be calibrated using soil from this project.
- Prior calibrations from other projects are invalid.
- Use low temperature oven drying for all specimens.
- Do NOT use microwave oven drying.
- Warm up gauge per manufacturer's recommendations prior to taking any readings.
- Only test soil that is at or near optimum moisture content.

**Follow your gauge manufacturer's instructions for moisture calibration. If the method for your manufacturer varies from this form, provide a copy of the manufacturer's procedure to the inspector and COR.**

If  $ODMC - GMC > \pm 2$ , take at least four comparison samples within the soil being calibrated and use the averages of these tests to determine the correction factor (K). Multiple readings and multiple samples can also be taken to average any statistical errors.

If the K factor has a minus sign it means that the gauge moisture is greater than the ODMC moisture and a bound hydrogen condition exists in the soil. Conversely a plus sign means that the gauge moisture is less than that for the ODMC moisture and elements causing neutron capture exist in the soil.

**Attach copies of the field tests and laboratory tests performed to establish the moisture calibration.**



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Project: Make Believe Levee Work Contract Number: 191BWC99C9999  
Contractor: ABC Excavation & Construction Date: 03/16/2023  
Laboratory: Precision Testing Lab Technician: John Smith  
Gauge Manufacturer: Troxler Model: 3411 Serial Number: 30911

Date of Gauge Measurement(s): 03/13/2023 Date of Oven Drying Sample(s): 03/15/2023

**SAMPLE INFORMATION**

(GMC)

TEST #	LOCATION	LIFT/ELEV	TEST DEPTH (inch)	METHOD **	SOIL TYPE/ PROCTOR TEST ID#	WET DENSITY (pcf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
SG0316	Subgrade Sta 1600+50 4' to riverside	subgrade	4"	A	PSG025	146.1	4.1	140.3

\*\* Method A - Direct transmission Method B - Backscatter

Gauge Moisture Content Reading (GMC) = 4.1

Oven Dried Moisture Content (ODMC) = 4.2

**Troxler Gauges:**

$$K = \left( \frac{ODMC - GMC}{GMC + 100} \right) \times 1000 = \underline{0.96}$$

**Humboldt Gauges:**

$$K = \left( \frac{ODMC - GMC}{GMC + 100} \right) = \underline{0.00096}$$

Indicate which soils/proctors this moisture correction (K) applies to:

SOIL TYPE ID #	PROCTOR TEST ID # SOIL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	DENSITY REQUIRED (%)	MOISTURE REQUIRED (%)
PSG025	Poorly graded gravel w/silt & sand Proctors 0122, 0125, & 0128	140.0	5.8	95	+/- 2