097. 13 DPWH
08.16.2022

Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
CENTRAL OFFICE
Manila

AUG 12 2022

DEPARTMENT ORDER NO. 184
Series of 2022 dtd 8/16/2022

SUBJECT: Amendment to Department Order No. 53, Series of 2019 "Revised Guidelines for the Calibration of Testing Equipment of the DPWH Implementing Offices"

To ensure that the test results generated by the DPWH Construction Materials Testing Laboratories (CMTLs) are accurate and reliable, the guidelines for the calibration of testing equipment/apparatus is hereby amended.

As a general policy, the use of calibration, laboratory and field testing equipment/apparatus with no or expired calibration certificate shall be **strictly prohibited.**

All calibration, laboratory and field testing equipment/apparatus of the Bureau of Research and Standards (BRS), whichever is applicable and whenever possible, shall be calibrated by the Department of Science and Technology (DOST) – National Metrology Division (NMD), an ISO 17025-accredited third-party service provider, or by the original manufacturer of the equipment, to ensure that measurements made are traceable to national standards of measurements as specified by the International Committee of Weights and Measures.

The calibration, laboratory and field testing equipment/apparatus of DPWH Regional and Unified Project Management Offices (UPMOs) CMTLs shall be calibrated by the BRS. Meanwhile, the laboratory and field testing equipment/apparatus of DPWH District CMTLs shall be calibrated by their respective DPWH Regional CMTLs. Accordingly, DPWH Regional CMTLs who cannot provide calibration services for DPWH District CMTLs under their jurisdiction shall redirect the request for calibration to the BRS.

Calibration of DPWH UPMOs, Regional, and District CMTLs shall be undertaken as indicated in their submitted **Calibration Plan** (*Annex K*) or as prescribed by the original equipment manufacturer.

All DPWH District CMTLs shall submit the accomplished Calibration Plans to their respective Regional CMTLs. Subsequently, DPWH UPMOs and Regional CMTLs shall accomplish and submit to the BRS their respective Calibration Plan for the succeeding year by the end of November of current year.

Calibration activities shall be completed by the **end of the first quarter of the year**. The Implementing Office shall be responsible for issuing request for calibration of equipment/apparatus which were not calibrated during the said period due to valid circumstances (e.g. equipment under repair during the said period).

Only in cases wherein the DPWH cannot conduct the calibration of laboratory and field testing equipment/apparatus due to valid reasons or circumstances beyond its control may allow the DPWH UPMOs, Regional and District CMTLs to avail the calibration services of other government agencies, Philippine Accreditation Bureau (PAB)-accredited laboratories, or

DPWH-accredited Private Testing Laboratories within their respective regions. However, the calibration shall be witnessed by authorized representatives of the concerned DPWH calibrating entity.

Calibration of laboratory and field testing equipment shall be conducted periodically as specified under *Annex A* or based on manufacturer's operating instructions, or after occurrence of any mechanical or electrical shock that might have affected the equipment. The calibration procedure outlined in *Annex B* shall be strictly observed while the prescribed format of the Calibration/Verification Report *(Annexes C to I)* shall be adopted.

Equipment/apparatus that are not included in *Annex A* does not require calibration, however, verification of physical and mechanical condition, deformations and critical dimensions must be checked before every use and must be compliant with their respective standard reference and/or testing procedure (e.g. ASTM, AASHTO, etc.).

Only qualified personnel with adequate training and experience in calibration works shall be assigned to perform calibration. Likewise, to ensure the integrity of the calibration and for verification purposes, the calibrating entity shall furnish copies of calibration report/certificate of the equipment used for calibration (e.g. Load cells) to the CMTL being calibrated.

Those who seek to attain ISO/IEC 17025 certification may avail calibration services of an accredited third-party provider upon approval of the BRS to satisfy the requirements of such certification.

Compliance monitoring shall be conducted by the BRS to check if the provision under these guidelines are being followed. This may coincide with the spot-checking of Star-Rated DPWH CMTLs pursuant to the provisions of Department Order No. 126, series of 2016. Any subsequent non-compliance hereof may be considered as valid grounds for the downgrading or revocation of Star Rating.

This Order supersedes Department Order No. 53, series of 2019 and shall take effect immediately.

MANUEL M. BONOAN
Secretary

14.1.4 RPF/EAA/MLC

ANNEX "A"

LIST OF EQUIPMENT FOR CALIBRATION

APPARATUS	MODE OF CALIBRATION	FREQUENCY	REFERENCE STANDARD
1. Universal Testing Machine (UTM)	Load Cell/Proving Ring	Yearly	ASTM E74/ ASTM E4
2. Compression Machine/Flexural Machine	Load Cell/Proving Ring	Yearly	ASTM E74/ ASTM E4
3. Pipe Tester	Load Cell/Proving Ring	Yearly	ASTM E74/ ASTM E4
4. California Bearing Ratio (CBR) Machine	Load Cell/Proving Ring	Yearly	ASTM E74/ ASTM E4
5. Marshall Stability Machine	Load Cell/Proving Ring	Yearly	ASTM E74/ ASTM E4
6. Point Load Tester	Load Cell/Proving Ring	Yearly	ASTM E74/ ASTM E4
7. Abrasion Machine (Charges/Steel Spheres)	Caliper & Digital Scale	Every 2 Years	ASTM C131/ ASTM C535
8. Laboratory Oven, Furnace and Other Temperature Measuring Devices	Thermometer	Yearly	ASTM E145
9. Weighing Scales and Balances	Standard Weights	Yearly	ASTM E617
10. Set of Sieves	Caliper & Calibration Glass Beads	Yearly	ASTM E11
11. Moisture Cabinet	Thermo-hygrometer	Yearly	ASTM E145/ ASTM D4230
12. Gyratory Compactor	Gyratory Compactor Calibration Equipment	Yearly	ASTM D6925
13. Ductility Apparatus/Machine	Ductility Machine Calibration Equipment	Yearly	ASTM D113
14. Viscometer	Standard Viscosity Fluids	Yearly	ASTM D445/ ASTM D446
15. Concrete Air Meter	Concrete Air Meter Brass Calibrator	Yearly	ASTM C231
16. Caliper	Standard Blocks	Yearly	ASME B89.1.14-2018
17. Speedy Moisture Tester	Speedy Moisture Tester Calibration Kit	Every 2 Years	ASTM D4944
18. Rebound Hammer	Anvil	As specified by the Manufacturer	ASTM C805
19. Load Transducers (Load Cell/Proving Ring)	Universal Calibrating Machine (UCM)	Yearly	ASTM E74/ ASTM E4
20. Calibration Standard Weights	Higher Class Standard Weights	Yearly	ASTM E617
21. Calibration Blocks	Calibration Verified Caliper	Yearly	ASME B89.1.14-2018
22. Universal Calibrating Machine (UCM)	Outsource	As specified by the Manufacturer	ASTM E74/ ASTM E4

CALIBRATION PROCEDURES FOR LABORATORY EQUIPMENT

1. PURPOSE

The purpose of this procedure is to provide a standard calibration procedure, frequency, schedule and requirements for calibration, performance verification, and maintenance of instruments and equipment.

2. SCOPE

This procedure applies to all equipment used in the materials testing laboratories of Bureau of Research and Standards (BRS), Unified Project Management Office (UPMO), Regional and District Engineering Offices.

3. DEFINITIONS

- **Calibration** – Adjustment or standardization of the accuracy of the measuring instrument/equipment, usually by comparison with a certified reference or standard.
- **Equipment** - Machines or tools used for testing construction materials incorporated in the implementation of DPWH infrastructure projects.
- **Frequency** – The schedule of calibration of testing equipment.

4. FREQUENCY

Refer to Annex A.

5. EQUIPMENT

As defined in the Standard Operating Procedures for calibration of equipment. The specific equipment are listed in Annex A.

6. PROCEDURE

6.1. Operate the equipment in accordance with the relevant Operation Instructions.

6.2. Perform the equipment calibration according to the equipment specific Standard Operating Procedure.

6.3. Fill out form "Calibration/Verification Report" Sheet, see Annex C to I.

6.4. Attach "Calibration Sticker" to the equipment, see Annex I to K.

6.5. The performance verification of the equipment (only where necessary) shall be repeated prior to routine laboratory use.

6.6. When external calibrations are performed, service providers that demonstrate competence, measurement capability, and traceability shall be used. Calibration certificates from the providers shall contain the measurement results, including the measurement uncertainty and/or a statement of compliance

7. RE-CALIBRATION

7.1. If the calibration does not conform, repeat the procedure.
7.2. If the second calibration does not conform, clean and check the equipment according to the manufacturer's instructions. Then, repeat the procedure.

8. LIMITS

Calibration Instructions must be applied in accordance with the equipment specific Standard Operating Procedure. The general limit of accuracy and sensitivity will depend on the manufacturer's manual/instructions.

9. DOCUMENTATION

Document calibration results as per the attached "Calibration/Verification Report" Sheet, see Annex C - I. The Calibration records shall include:

- Name of the laboratory performing the calibration
- Identity of the item of equipment
- Name of manufacturer and model
- Serial/Property Number of the Instrument calibrated
- Laboratory Number of unique Identifier (Calibration Sticker)
- Capacity, Loading range and/or sensitivity
- Date of calibration
- Current location of the equipment
- Manufacturer's instructions or a reference to location
- Reference standard, certified reference material or reference material used for calibration
- Temperature at which the calibration was referenced, if applicable
- Copies of all reports, results of calibration, and/or certificates of calibration
- Maintenance plan and due date for the next calibration
- Identity of the individual performing calibration

ANNEX "C"

Date: _____

Lab. Report No.: _____

CALIBRATION / VERIFICATION REPORT
FOR UTM, COMPRESSION/FLEXURAL TESTING MACHINE

Name of Office: _____ Date of Calibration: _____
Office Address: _____ Valid Until: _____
Equipment/Apparatus: _____ Capacity: _____
Brand / Model: _____ Serial Number: _____

Applied Force		Reading of Loadcell (Div)			Average Reading of Loadcell		Error (%)
TONS	KN	Trial 1	Trial 2	Trial 3	Div	KN	

Remarks:

1. Calibration/verification was performed using Controls Digimax Plus, Model _____ (Serial No.: _____) and a Load Cell with _____KN capacity (Serial No.: _____) in accordance to **ASTM E74** *Standard Practices for Calibration and Verification for Force-Measuring Instruments* and **ASTM E4** *Standard Practices for Force Verification of Testing Machine. Load cell calibration valid until: _____.*
2. If the percentage error falls within the allowable error of ±1%, (insert recommendation).

CONDUCTED: **NAME** Designation **NAME** Designation	REVIEWED: **NAME** Designation
CHECKED: **NAME** Designation	ATTESTED: **NAME** Designation Office

ANNEX "D"

Date

Lab. Report No.: _____

CALIBRATION / VERIFICATION REPORT
FOR CBR/MARSHALL STABILITY MACHINE

Name of Client: _____ Date of Calibration: _____
Office Address: _____ Valid Until: _____
Equipment/Apparatus: _____ Capacity: _____
Brand / Model: _____ Serial/Property Number: _____

Machine Indicated	Reading of Loadcell (Div)				Calibration Factor		
Load, Div	Trial 1	Trial 2	Trial 3	Average	kN/Division	Lbs/Div	Average
							lbs/div
							Kg/Div

Remarks:

1. Calibration/verification was performed using Controls Digimax Plus, Model _____ (Serial No.: _____), and a Load Cell with _____KN capacity (Serial No.: _____) and calibration valid until _____, in accordance to **ASTM E74** *Standard Practices for Calibration and Verification for Force-Measuring Instruments*.

CONDUCTED: **NAME** Designation **NAME** Designation	REVIEWED: **NAME** Designation
CHECKED: **NAME** Designation	ATTESTED: **NAME** Designation Office

ANNEX "E"

Date: _____

Lab. Report No.: _____

CALIBRATION / VERIFICATION REPORT
FOR ABRASION SPHERES

Name of Client: _____ Date of Calibration: _____
Office Address: _____ Valid Until: _____
Equipment/Apparatus: _____ Serial/Property Number: _____
Brand Model: _____

Charges (No. of Spheres)	STEEL SPHERES					
	Diameter in Millimeter (mm)		Weight in Grams (g)			
	Actual	Standard (approx.)	Actual	Standard for ASTM C131-14		
#1		46.80		Grading	# of Spheres	Weight:
#2		46.80		A	12	5000±25 g
#3		46.80		B	11	4584±25 g
#4		46.80		C	8	3330±20 g
#5		46.80		D	6	2500±15 g
#6		46.80		Average mass of individual:		416 g
#7		46.80		Standard for ASTM C535-16		
#8		46.80		The charge shall consist of 12-steel spheres averaging approximately 47 mm (1-27/32 in.) in diameter, each having a mass between 390 and 445 g, and having a total mass of 5000±25 g.		
#9		46.80				
#10		46.80				
#11		46.80		**Note:** Steel spheres or ball bearings 46.0 mm (1-13/16 in.) and 47.6 mm (1-7/8 in.) in diameter, having a mass approximately 400 and 440 g. each, respectively, are readily available. Steel spheres or ball bearings 46.8 mm (1-27/32 in.) in diameter having a mass approximately 420 g. may also be obtainable.		
#12		46.80				
Ave. size in mm:		**Total Weight in Grams:**				

Remarks:

1. Calibration/verifaction was performed by using the standard procedure based on **ASTM C131** - *Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine* and **ASTM C535** - *Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.*

CONDUCTED: **NAME** Designation **NAME** Designation	REVIEWED: **NAME** Designation
CHECKED: **NAME** Designation	ATTESTED: **NAME** Designation Office

ANNEX "F"

Date:

Lab. Report No.: _____

CALIBRATION / VERIFICATION REPORT
FOR LABORATORY OVEN

Name of Client: _____ Date of Calibration: _____
Office Address: _____ Valid Until: _____
Equipment/Apparatus: _____ Capacity: _____
Brand / Model: _____ Serial/Property Number: _____

Oven Indicated Reading	Thermometer Reading	Temperature Error	Thermostat Reading	IMPORTANT:
°C	°C	°C	Correction (±)	If the thermometer reading is within ±5 °C of the thermostat reading, the calibration procedure is completed. If the thermometer reading differs from the thermostat reading by more than 5 °C, or if a more stringent calibration is desired, ASTM E145 is to be consulted.

Remarks:

1. Calibration/verification was performed with the use of _____ with serial number _____ and a capacity of __ °C in compliance with **ASTM E145** - *Standard Specification for Gravity-Convection and Forced-Ventilation Ovens.*

CONDUCTED: **NAME** Designation **NAME** Designation	REVIEWED: **NAME** Designation
CHECKED: **NAME** Designation	ATTESTED: **NAME** Designation Office

ANNEX "G"

Date

Lab. Report No.: _____

CALIBRATION / VERIFICATION REPORT
FOR LABORATORY SCALES/BALANCES

Name of Client: _____ Date of Calibration: _____
Office Address: _____ Valid Until: _____
Equipment/Apparatus: _____ Capacity: _____
Brand / Model: _____ Serial/Property Number: _____

Standard / Test Weights	Actual Reading	Error		Max. Allow.
Gram (g)	Gram (g)	Gram (g)	Percent	Tolerance, g

Remarks:
1. Calibration/verification was performed with the use of a set of _____ standard weights as per **ASTM E617 -** *Standard Specification for Laboratory Weights and Precision Mass Standards.*

CONDUCTED: **NAME** Designation **NAME** Designation	REVIEWED: **NAME** Designation
CHECKED: **NAME** Designation	ATTESTED: **NAME** Designation Office

ANNEX "H"

Date:

Lab. Report No.: _____

CALIBRATION / VERIFICATION REPORT
FOR CALIPER

Name of Client: _____ Date of Calibration: _____
Office Address: _____ Valid Until: _____
Equipment/Apparatus: _____ Capacity: _____
Brand / Model: _____ Serial/Property Number: _____

Standard Length (mm)	Measured Reading Length (mm)	Error		Max. Allow. Tolerance, mm
		Millimeter (mm)	Percent	

Remarks:
1. Calibration/verification was performed with the use of a set of Gauge Block as per **ASME B89.1.14-2018** Standard - Calipers.

CONDUCTED: **NAME** Designation **NAME** Designation	REVIEWED: **NAME** Designation
CHECKED: **NAME** Designation	ATTESTED: **NAME** Designation Office

ANNEX "I"

Date: _____

Lab. Report No.: _____

CALIBRATION REPORT

Name of Office: _____ Calibration Date: _____
Office Address: _____ Calibration Due: _____
Equipment/Apparatus: _____ Capacity: _____
Brand / Model: _____ Serial Number: _____

Reference:

Secondary Force Standard
Serial No.:
NIST No.:
Calibrated Date:
Calibration Due:

Temperature Standard
Serial No.:
Made:
Calibration Date:
Calibration Due:

The above identified instrument was used by Morehouse Instrument Company, Inc. in calibrating the unit below.The unit above has a traceable to the SI through a National Metrology Institute (NMI) such as the United States National Institute of Standards & Technology (NIST). The details are available on the issued Calibration Certificate No. _____.

Specifications of the Universal Calibrating Machine (UCM):

Proving Ring
Brand:
Model:
Capacity:
Serial No.:

Indicator
Brand:
Model:
Serial No.:

UCM CALIBRATION FACTOR (lbf/div):

Calibration Date:
Calibration Due:

The interpretation of the Morehouse's issued calibration certificate can be found on the issued Calibration Certificate No. _____.

APPLIED FORCE		READING OF LOADCELL (DIV)			AVERAGE READING OF LOADCELL	LOAD PER DIVISION	ACTUAL READING	ERROR (%)	ABOVE ±1%?
KN	DIVISION	TRIAL 1 (0°)	TRIAL 2 (60°)	TRIAL 3 (300°)	DIV	KN/DIV	KN		Recommend
				Factor (KN/div.):					

Remarks:
1. Calibration/verification was in accordance with **ASTM E74 Standard Practices for Calibration and Verification for Force-Measuring Instruments.**
2. The calibration was performed using Digimax Plus Digital Display (Brand: Controls; Model: _____) with Serial No.: _____.
3. Based on the calibration results, the percentage errors fall within the testing machine tolerable error of +/- 1%.
4. The load cell is recommended for use to calibrate UTM, compression/flexural machine, CBR machine and other force-measuring instruments

CONDUCTED: _____ (Position) _____ (Position)	REVIEWED: _____ (Position)
CHECKED: _____ (Position)	ATTESTED: _____ (Position)

ANNEX "J"

DPWH-QMSP-42-08- Rev00

DPWH CALIBRATED

LAB REPORT NO.: _____

NAME OF EQUIPMENT: _____

S.N./P.N.: _____

CALIBRATION DATE: _____

VALID UNTIL: _____

CALIBRATED BY: [NAME/SIGNATURE]
[OFFICE]

SIZE: **40 X 75 mm**

ANNEX "K"

OFFICE LETTERHEAD

Summary Report of Calibrated Equipment and Calibration Plan
Date of Submission

Item No.	Laboratory Equipment	Year Acquired	Model/ Manufacturer	Serial Number	Previous Calibration		Next Calibration		Remarks/ Condition
					Date of last Calibration	Conducted by	Scheduled Date	Assigned Personnel	
1.	XXXXX	2000	XXXXX	000000	01/20/2020	Juan Dela Cruz/BRS	01/20/2021	Juan Dela Cruz/BRS	Operational

Important: Request for calibration shall be submitted at least three (3) months before the expiration date.

PREPARED:

NAME
Designation

CHECKED:

NAME
Designation

APPROVED:

NAME
Designation