



TERMS OF REFERENCE (TOR)

Procurement of Engineering Laboratory Equipment for
Mountain Province State University- Tadian Campus



1. Background

Mountain Province State University (MPSU) – Tadian Campus is strengthening its Civil Engineering program to enhance laboratory instruction, research capability, and compliance with CHED and AACUP accreditation standards. To support outcomes-based education and laboratory-based instruction, the University intends to procure engineering laboratory equipment including capacity-building training for Civil Engineering faculty members.

This procurement shall be conducted in accordance with RA 9184, RA 12009 and its IRR under Competitive Bidding for Goods.

2. Project Title

Improvement of Mountain Province State University’s Civil Engineering Laboratories- Tadian Campus

3. Approved Budget for the Contract (ABC)

PHP 15,000,000.00

(Inclusive of supply, delivery, installation, commissioning, training, warranty, and all applicable taxes)

Bids exceeding the ABC shall be automatically rejected.

4. Objectives

The procurement aims to:

- 1. Upgrade the Civil Engineering laboratory facilities.
- 2. Ensure proper utilization and maintenance of equipment.
- 3. Build technical competency of Civil Engineering faculty and students.
- 4. Support accreditation and CHED compliance requirements.

5. Scope of Supply and Services

The winning bidder shall provide:

5.1 Supply and Delivery

- Brand-new engineering laboratory equipment (see Annex A – Technical Specifications).
- Compliance with ASTM/AASHTO/ISO standards.
- Complete manuals and calibration certificates (if applicable).

5.2 Installation and Commissioning

- On-site installation.
- Testing and calibration.
- Demonstration of operational procedures.
- Electrical compatibility verification (230V single phase).





5.3 Faculty Training and Capacity Building

The Supplier shall conduct structured training for Civil Engineering faculty covering:

A. Training Coverage

- 1. Operation of each major laboratory equipment.
- 2. Calibration procedures and verification methods.
- 3. Preventive maintenance and troubleshooting.
- 4. Laboratory safety protocols.
- 5. Data interpretation and laboratory reporting.
- 6. Integration of equipment use into Civil Engineering laboratory courses.

B. Training Requirements

- Minimum of **3 full training days** (or equivalent 24 hours).
- Combination of lecture and hands-on demonstration.
- Conducted on-site at MPSU–Tadian Campus.
- Training materials (printed and digital copies).
- Issuance of Certificate of Completion to participants.

C. Trainers

- Must be qualified technical specialists or manufacturer-certified trainers.

6. Deliverables

The Supplier shall submit:

- 1. Complete equipment with accessories.
- 2. Installation and commissioning report.
- 3. Calibration certificates (where applicable).
- 4. Warranty certificates.
- 5. Training materials (manuals, slides, handouts).
- 6. Attendance sheet and training completion certificates.
- 7. Final turnover and acceptance documents.

7. Delivery Period

- Within **60 calendar days** from receipt of Notice to Proceed (NTP).
- Training must be completed within 15 days after full installation.

8. Inspection and Acceptance

Inspection shall be conducted by:

- BAC Inspection Committee
- End-User Representative (College of Engineering)
- Property and Supply Office





Acceptance shall be based on:

- Compliance with technical specifications
- Successful operational testing
- Completion of faculty training
- Submission of complete documentation

9. Qualification Requirements of the Bidder

The bidder must:

1. Be legally registered (SEC/DTI).
2. Have PhilGEPS Platinum Registration.
3. Have completed at least one similar contract within the last ten (10) years.
4. Provide after-sales technical support within the Philippines.
5. Submit proof of authorized distributorship or manufacturer authorization (if applicable).
6. Demonstrate capability to conduct technical training.

10. Warranty and After-Sales Support

- Minimum one (1) year warranty.
- Free replacement of defective parts during warranty.
- On-call technical support.
- Preventive maintenance visit at least once during warranty period.

11. Payment Terms

Payment shall be made upon:

- ✓ Complete delivery
- ✓ Installation and commissioning
- ✓ Completion of faculty training
- ✓ Final inspection and acceptance

Retention money shall apply in accordance with government accounting rules.

12. Liquidated Damages

Liquidated damages shall be imposed in case of delay in accordance with RA 9184, RA 12009 and its IRR, equivalent to at least 1/10 of 1% of the cost of the unperformed portion per day of delay.

13. Ownership

All equipment to be purchased under this contract shall be owned by the Commission on Higher Education (CHED). Said equipment shall be subject to formal turn-over to Mountain Province State University.





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ANNEX A. Technical Specifications

A. Structural Systems and Platform (PHP 3,600,00.00)

A1. Structural System 1

Shall be self-contained bench-top sized laboratory device for mechanically loading structural components and members up to and beyond point of failure with provision for measuring loads and deflections. The system shall consist of:

A1.1 Cast Assembly

Key Features

- Include a frame of sufficient strength to support structural models or members under 3700- lbs of stress with negligible distortion to itself.
- Shall have sufficient versatility in design to provide for a wide variety of structural tests on bridges, buildings and test specimens.
- Includes a workstation of 1.5-in welded steel tube frame with work surface and vertical steel mounting panel with silk-screened outlines and a dial indicator mounting bar.
- Minimum Dimensions shall be: Height(maximum): 36 in, Width: 38 in and depth: 30-in.

A1.2 Hydraulic Hand Pump

- Include necessary high-pressure hoses with quick couple fittings, capable of generating hydraulic pressures up to 2300 psi.
- Hydraulic pressure gauges shall be capable of measuring hydraulic pressure of up to 3000 psi full-scale.
- Power systems shall be entirely self-contained, requiring no external power source, electrical or otherwise.

A1.3 Hydraulic Ram

- Shall be a double-acting type with a 1-in stroke capable of applying up to 1000 lbs compression loading, 575 lbs tension loading, at a maximum hydraulic pressure of 2300 psi.

A1.4 Items Included

A1.4.1 Test Fixture Hardware Package includes

- Threaded rod adapter
- Three Clevis pin ¼-in x 7/8-in
- Three cotter hairpin
- Clevis, male thread
- Hex wrench 5/32-in, short arm
- Two Saddle Truss support





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- Load bar
- Beam truss load rod

A1.4.2 Bridge component Set 1 includes:

- Ten threaded beam
- Twenty-six beam 7-in
- Six beam 9.9-in
- Thirty button head screw, $\frac{1}{4}$ -20 x $\frac{3}{4}$ -in
- Ten button head screw, $\frac{1}{4}$ -20 x 1-in
- Forty SAE #10 Flat washer
- Eight cross braces

A1.4.3 Bridge component set 2A

- Four , 7-in beam
- Four, 9.9-in beam

Indicator package

- Strap nylon hook and hoop, black, 12-in
- Magnetic base
- Dial indicator base
- Two 1-in Square plug, polyethylene
- Precision dial indicator
- Two clamp, indicator swivel $\frac{3}{8}$ -in x $\frac{3}{8}$ -in
- Stainless steel rod, $\frac{3}{8}$ -in x 3-in
- Stainless steel rod, $\frac{3}{8}$ -in x 12-in
- Stainless steel rod, $\frac{3}{8}$ -in x 6-in

Learning outcomes

- Three functions of a structure and investigations of structures
- Structural elements
- Stability of structures

A2. Structural System 2

Shall include data acquisition system, bridge component set, beam component set and test fixture set

A2.1 Data Acquisition System

- Shall be capable of measuring the stress and strain imposed upon various types of specimens through the use of strain gauges and data acquisition and analysis software and shall consist of the following:
- Signal conditioner unit with analog channels
- Single active gauge
- DC dual power supply +/-12 VDC 0.16 amp
- USB cable
- Windows base data acquisition and analysis software with graphics controls , simultaneous display of up to eight signals, real time calculations/ display of results.





A2.2 Items Included

A2.2.1 Bridge component set 2B

- Four 7-in beams with pre-applied and wired strain gauges
- Four 9.9-in beams with pre-applied and wired strain gauges

A2.2.2 Beam Component Set 1

- Wood beam
- Foam beam

Learning outcomes

- Moments and equilibriums
- The use of moment equilibrium equations and importance
- Stress in relation to beam failures
- Bending moment occurring in beams
- Principle in moment of inertia in relation to a structural member.
- Forces in truss bridges
- Truss bridge analysis

A3. Structural System 3

This system shall include: Concrete beam Component set 1, Building Component set 1, Beam component set 2.

A3.1 Concrete Beam Component Set 1

This sets contains the components required to mix and form concrete beams.

- Two concrete mold base
- Four concrete mold side
- Four concrete mold end
- Fourteen concrete mold clamp
- Twenty-eight wing nut 10-24
- Twenty-eight SAE #10 flat washers
- Concrete mixing box
- 5-in x 11-in Brich trowel
- Beaker, 1000 ml
- Two support, concrete beam
- Load bar, concrete beam
- Concrete protector

A3.2 Building Component Set 1

This set shall contain the balance of the components required to build and test the building structure.

- Two load beam
- Four load saddles





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- Building Load Rod
- Two hex nut 3/8 -16
- Six polyurethane flat disk spring
- Twelve Fender washer 3/8 x 1-1/4
- Six beam, 12.125-in
- Two beam, 12.125- in with strain gauge
- Eight cross braces
- Steel beam

A3.3 Beam Component Set 2

This set contains beams that are used in the bending, deflection and buckling test.

- Steel beam
- Aluminum beam
- Ten buckling member

B. Hydraulics Laboratory Equipment (PHP 4,400,000.00)

B1. Hydraulic Bench Service Unit

- Water operational temperature range Ambient to 55°C (131°F) Water flow rate 0–3.5 liters/minute
- Water volume-5 liters
- Digital thermometer Measuring range:- 200°C to 1372°C (-328°F to 2501°F)
- Accuracy: 0.015%
- Digital manometer Measuring range: +/- 103.42 kPa, Accuracy: 0.3%
- Hardwired thermal cut-out switch to prevent over the temperature of water
- Operating voltage: 24vDC power supply
- PSU voltage: 100VAC to 240 VAC, 50-60Hz

Features:

- Integrated pump
- Integrated flowmeter with needle valve
- Each service unit can be used as either a hot or cold water supply
- Quick connect couplings for easy connection to experiment modules, self- sealing on supply unit to minimize water loss
- Digital Manometer and Thermometer provided
- Bespoke system for experimental modules that reduces the risk of spillage
- Low voltage within the supply unit to protect users

B2. Manometer Inclined

- Screen printed scale for measuring water height in manometer tubes
- Tube structure acrylic





- Plain vertical tube and inclined tube: 6mm ID
- Stepped tube goes: 6mm ID to 14mm ID to 6mm ID
- Angle of inclination: 15° from vertical.

Experimental:

- To demonstrate the behavior of liquid at rest – a liquid with a free surface finds its own level
 - To show that the free surface of a liquid is horizontal and independent of cross section or inclination of the container
- Variation of pressure demonstration with varying flow rates against atmospheric pressure
- Effect of change in manometer inclination

B3. Manometer U-Tube

- Screen printed scale for measuring water height in manometer tubes
- Tube structure acrylic
- Plain vertical tube and inclined tube: 6mm ID
- Stepped tube goes: 6mm ID to 14mm ID to 6mm ID
- Angle of inclination: 15° from vertical

Experimental:

- To demonstrate the behavior of liquid at rest – a liquid with a free surface finds its own level
- To show that the free surface of a liquid is horizontal and independent of the cross- section of the container
- Comparison of pressure created with varying flow rates against atmospheric pressure for both ends of a straight pipe
- Differential pressure changes as flow rate changes across a straight pipe

B4. Tilting Flow Channel

- Channel size: 50 mm wide, 150 mm high and 2.0 m long
- Tilting adjustment, 2% to + 5%
- Side walls, clear acrylic with clear vertical scale
- Channel bed, stainless steel
- Flow measurement, water meter and a stop watch
- Power supply, 220V 1 Ph, 50 Hz

Typical Tests

- Open Channel flow
- Flow measurement
- Hydraulic jump
- Continuity and energy equations
- Discharge under sluice gate





B4.1 Item Includes:

- Stainless steel hook and point gauge
- V notch weir
- Rectangular notch weir
- Sharp crested weir
- Broad crested weir, round or sharp edge, each
- Crump weir
- Trapezoidal weir
- Bridge pier, round or square edge, each
- Culvert fittings
- Sluice gate, sliding type
- Radial gate and pinion drive
- Pitot tube with manometer
- Roughened bed, (gravel, sand or corrugated), each

C. Geotechnical Laboratory Equipment (PHP 7,000,000.00)

C1. Strain Direct Shear Testing Apparatus (2- speeds)

Application: This apparatus is used to test resisting shear strength of soil specimen.

Specification:

- Area of the soil sample:30cm² Lever ratio: 1:12 Vertical loading:
- 50,100,200,300,400(KPa)
- Max. horizontal loading: 1.2kN
- Shear rate: 0.02, 0.8, 2.4mm/min
- Handwheel speed: 0.1, 4, 12mm/min

C2. Digital Electric Strain Direct Shear Apparatus

Specification:

- Large LCD display Accepts specimens: 61.8x20mm
- Area of soil sample: 30cm² Lever ratio: 1:12
- Vertical Loading:50, 100,
- 200, 300, 400(Kpa)
- Max. horizontal loading:1.2KN
- Variable speed, 0.01 to 2.99mm/minute

C3. Electric Strain Unconfined Compression Tester

- Lift plate journey per revolution of the wheel: 0.2mm
- Max. stroke of the lift plate: 30mm
- Lifting speed: 1.8mm/min±1%
- Max. axial load: 0.6KN
- Diameter of the remolding cylinder: Φ39.1mm





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C4. Triplex Consolidation Apparatus (Middle Pressure)

Completed with:

Plate, upper beam, tension rod and meter rod made in stainless steel.

Selectable models like high-pressure, mid-pressure and low- pressure. It is in the form of Bearing stainless steel plate

Specimen area: 30cm², 50cm² suitable for specimen

Φ61.8x20mm, Φ79.8x20mm

Specimen number: 3

Pressure range: 12.5- 1600KPa, 12.5-800Kpa

Load grade: 12.5, 25, 50, 100, 200, 300, 400, 800, 1600

Brass cells

C5. High Pressure type Triplex Consolidation Apparatus

Specifications:

- Specimen area: 30cm², 50cm² suitable for specimen
Φ61.8x20mm, Φ79.8x20mm
- Specimen number: 3
- Pressure range: 12.5- 1600KPa, 12.5-3200KPa
- Load grade: 12.5, 25,
- 50, 100, 200, 300,
- 400,800, 1600, 3200
- Brass cells

C6. Duodenary Direct Shear Pre-pressing Apparatus

- Area of soil sample: 30cm²
- Lever ratio: 1: 12
- Loading grade: 50, 100,200, 300, 400Kpa
- Quantity of soil sample per time: 36PCS

C7. 30KN Triaxial Testing machine (Main Frame & controller)

Technical parameters:

- Specimen size: Φ39.1×80mm
- Axial load: 30KN
- Lift speed range(mm/min): 0.003,0.006, 0.008, 0.012,0.020, 0.030, 0.040,0.050, 0.060, 0.070,0.080, 0.090,0.100, 0.200, 0.300, 0.400,0.500,0.600,0.700,0.800,0.900,1.000,3.000
- Max. Stroke: 50mm
- Max. confining pressure: 2.5Mpa
- Max. back pressure: 1Mpa
- Pore water pressure: 0- 2Mpa
- Volume change range: 0-50ml
- Min. division: 0.1ml
- Axial displacement range: 0-30mm
- Displacement rate: 0.001-1mm/min

C8. Improved permeameter (falling head) Application

Comprises:

- loading device (upper trans-pressure plate)
- adjusting hand-wheel for up and down distance
- permeameter cell including porous plate, filter paper, soil cutter
- base plate including permeating holes
- Measuring Board for the permeameter (6 lines)





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C9. Permeability testing machine (constant water head)

Application: It is used to determine the Penetration coefficient when the sand soil and the incoherence soil which has few broken stones to carry on the permeability test under constant head.

Specification:

- Inside diameter of the cylinder: Dia. 100mm
- Height of the cylinder: 400mm
- Three measuring pressure holes
- Distance between the measuring pressure pipe: 100mm

C10. Digital Liquid Plastic Limit United Device

Device Specification:

- Max. measuring range: 22mm
- Resolution: 0.1mm
- Nonlinear error:
- Superior than 2%
- Contact sensitivity: >10M
- Cone weight: 76g+/-0.1g
- Cone angle: 30°+/-2°
- Measuring Time: 5 Second

C11. Liquid Limit Devices: (Casagrande Method)

Standards: BS 1377:2, ENV 1997-2, ASTM D4318, AASHTO T89

Comprises:

- Consists of a removable brass cup, adjustable crank, mechanical blow counter, and base.
- MOTORIZED TYPE

C11.1 Plastic Limit Set

Standard: ASTM D4318 / AASHTO T90 / BS 1377:2 UNE 103-104 / UNI 10014 / NF P94-051

Packing information:

- Glass plate 1pc
- rod caliper 3mm dia
- mixing porcelain dish
- 1 pc flexible spatula,
- 1 pc aluminum moisture tins dia 55x35mm 6 pcs

Applications:

-the test device is performed to liquid limit test of soil lab or field use

C11.2 Shrinkage Limit Device

Standard: ASTM D427 - AASHTO T92 - UNI 10014-UNE 103-108 - NF P94- 060 - BS 1377:2

Complete with carrying case with the following:

- shrinkage dish 2pcs,
- crystallizing dish 1pc
- shrinkage prong plate, made from plexiglass material with three metal prongs 1pc
- evaporating dish 1pc,
- flexible spatula 1pc
- graduated cylinder 25ml capacity 1pc





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C12. CBR Tester

Specification:

- Max. load: 50KN capacity.
- Test speed: 1 mm/min (BS model) or 1.27 mm/min (ASTM/EN model)
- Size of the penetration rod: Dia. 50×100mm

C13. CBR Mould

ASTM/AASHTO, plated steel mould body with 6" (152.4 mm) dia. x 7" (177.8 mm) height. Supplied with complete with extension collar and perforated base plate.

CBR ACCESSORIES (ASTM Standard):

- Swell Plate
- Gauge Holder for Swell Measurements
- Dial gauge 10mm/0.01mm
- Slotted Surcharge Weight (2.27 kg)
- Annular Surcharge Weight (2.27 kg)
- Spacer disc

C14. Digital CBR Tester

Specification:

- Max. load: 50KN capacity.
- Test speed: 1 mm/min (BS model) or 1.27 mm/min (ASTM/EN model)
- Size of the penetration rod: Dia. 50×100mm Packing:
 - Main frame(mm): 390×500×870
 - Controller(mm): 330×350×300





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ANNEX B. Sample Pictures

1. Structural System 1



2. Structural System 2



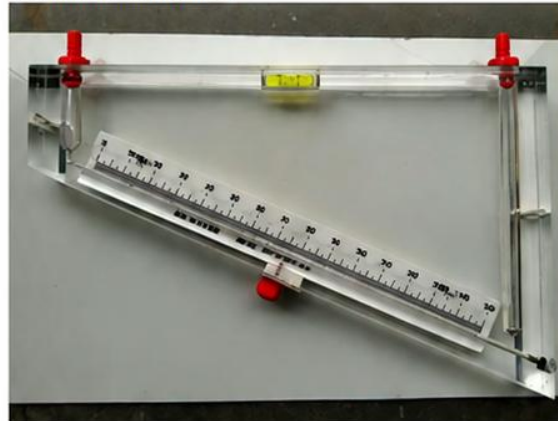
3. Structural system 3



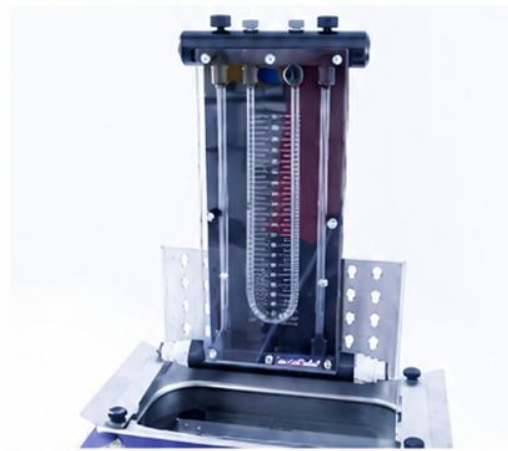
4. Hydraulic Bench Service Unit



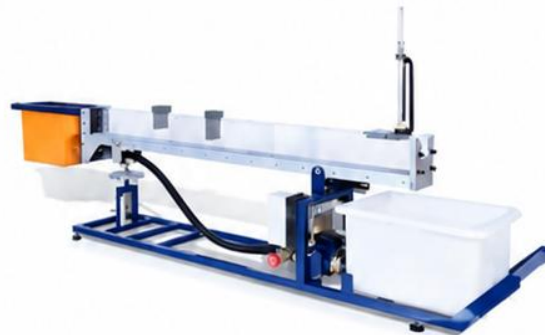
5. Manometer Inclined



6. Manometer U-tube



7. Tilting Flow Channel



8. Strain Direct Shear





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9. Digital electric strain direct shear



13. Doudenary Direct shear Pre-pressing apparatus



10. Electric strain unconfined compression tester



14. 30 kN Triaxial Testing Machine



11. Triplex consolidation apparatus



15. Improved permeameter (falling Head)



12. High pressure type triplex Consolidation apparatus



16. Permeability Testing Machine (constant head)





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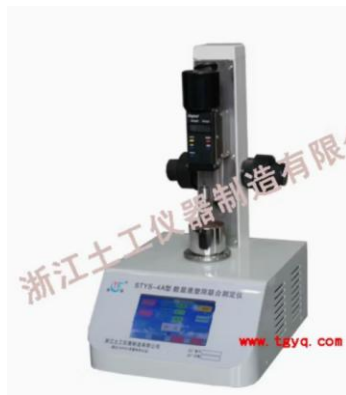
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17. Digital Liquid Plastic limit United



21. CBR Mould



18. Plastic limit set



22. Digital CBR tester



19. Shrinkage limit (Casagrande cup)



20. CBR Tester

