SAFETY STANDARDS MANUAL E

HYGIENE IN THE SOIL MECHANICS LABORATORY

AND

RESISTANCE OF MATERIALS OF

CIVIL ENGINEERING

LIMA PERU

2016

SAFETY AND HYGIENE STANDARDS IN THE LABORATORY

RECOMMENDATIONS FOR WORK IN THE LABORATORY

1. Have the devices, equipment and work material always clean.
2. Avoid cluttering your table space with unnecessary material.
3. The material to be processed uses what is necessary and what is left to keep it with your identification card.
4. Be careful when using the equipment. Remember that they are calibrated and very sensitive to movement.
5. The sieves are delicate, use them with great care.
6. When using the mortar, be careful with the powder for sifting No. 40.
7. Electric ovens are sensitive when placing materials. Open and close carefully and press the power button with dry hands.
8. Carefully read the instructions of each existing equipment in the Laboratory.
9. For practices outside the Laboratory, make an inventory of what you are withdrawing and what you will return when you return to it.
10. When placing on a hot plate gently install the flasks.
11. When using mercury, be very careful when it comes into contact with the skin, it is toxic.
12. When receiving the glass material, carefully check and see if it is cracked or broken. If the student breaks any material, he must replace the same one.
13. When using metal molds be careful not to hit your body.
14. When you activate the compaction hammer, be careful with the blows, it can hurt your hands.
15. When using the core extractor, be careful that the compaction mold centering can get stuck with your fingers.
16. When placing the tripod with the micrometer be careful not to drop the water.

17. When applying application speed on presses do so carefully.
18. When using the cutting cell, be careful, it is very heavy and you can have an accident.
19. When handling porous stones be careful they are brittle.
20. When handling micrometers they are sensitive to handle carefully.
21. When you activate the steel mass, be careful with your physical integrity.
22. Do not hesitate to ask the Professor or Technician about something that you have not understood.
23. Leave your table clean, tidy and hand in your washed materials at the end of practice.

LABORATORY SAFETY

1. Have PPE implements (Steel toe boots, Jebe or leather gloves, Jean pants, drill shirt, reflective orange vest, glasses, masks, hearing protector).
2. Be careful with sudden changes in temperature.
3. When washing clayey and/or silty materials, use rubber gloves.
4. When grinding the dry material, protect your eyes and nose from the existing dust.
5. When making a hole with the chisel in the field, protect your hands with leather gloves from the blows caused by the 2.5 lbs. steel camber.
6. When using steel molds and a manual hammer, use steel-tipped booties.
7. When moving the concrete specimen and beam, use the steel toe boots.
8. Take a prudent distance when the Hydraulic Press of 120 Tons.
9. In case of contact with the concrete mix, wash with plenty of water. The cement is alkaline (Ph>12) and can irritate the skin.
10. When carving clay and/or silty block specimens, use leather gloves to avoid cutting the body.
11. Check that the electrical connections are unplugged to avoid short circuit.
12. Wash your hands at the end of the practice very carefully.

13. Smoking is strictly prohibited in this area of the faculty.
14. Before leaving the laboratory, make sure that you have closed the water taps.

CENTRIFUGE FOR ASPHALT WASHING (ASTM D 2172)
INDICATIONS FOR USE
1. The centrifuge is uncovered, remove the inner lid of the bowl. 2. 1500 g is placed. of asphalt sample in the bowl. 3. A volume of Trichloroethylene is emptied to cover the mixture contained in the bowl. 4. We dissolve the trichlorethylene with test material. 5. A filter paper disc is placed over the edge of the bowl and the bowl is then covered with its lid. 6. Plug in (220V). 7. Start the centrifugation by turning slowly and gradually increasing the test speed of 3600 RPM until it stops flowing down the drain. The device is turned off, the solvent is added and the procedure indicated above is repeated until the solvent comes out of the cleaner drain. 8. The equipment is unplugged. 9. The filter paper disc is removed, avoiding losing adhered stone particles. 10. The sample is removed from the bowl onto a tray. 11. The equipment is left clean and installed.

INDICATIONS FOR USE OF ELECTRICAL SCALES
1. Plug in (220V) or battery. 2. Press the black button on the right back of the digital screen to turn on. 3. Weigh the container object (tray). 4. Press the (TARE) button to tare. 5. Weigh (coarse, fine aggregates, cement and water). 6. Press the (TARE) button to re-tare. 7. Turn off with the same black button. **NOTE**: Maximum Capacity = 120 Kg. (do not exceed).

INSTRUCTIONS FOR USE OF ELECTRIC OVEN
1. Open the door by pulling the handle to the side. 2. Place the samples or materials to dry. 3. Close the door by pulling the handle to the side. 4. Plug. 5. The ignition of the digital display graduated at 110 ºC is verified. 6. Allow 18 hours of drying overnight. 7. The next day turn off the electric oven. 8. Wait 15 minutes to remove the dried materials or samples. 9. Unplug. 10. Open and remove the material or sample. 11. To close.

INDICATIONS FOR USE OF ELECTRICAL SCALES

1. Plug transformer (220V) or battery.
2. Press black button bottom right.
3. Weigh the container object (tray).
4. Press the (TARE) button to tare.
5. Weigh (coarse, fine aggregates, cement and water).
6. Press the (TARE) button to re-tare.
7. Turn off with the same black button.

NOTE: Maximum Capacity = 30 Kg. (do not exceed).

INDICATIONS FOR USE OF ELECTRICAL SCALES

1. Plug transformer (220V) or battery.
2. Press black button bottom right.
3. Weigh the container object (tray).
4. Press the (TARE) button to tare.
5. Weigh (coarse, fine aggregates, cement and water).
6. Press the (TARE) button to re-tare.
7. Turn off with the same black button.

NOTE: Maximum capacity = 15 kg (do not exceed).

INDICATIONS FOR USE OF ELECTRICAL SCALES
1. Plug transformer (220V). 2. Press ON-ZERO-off button. 3. Weigh the container object (tray). 4. Press the (TARE) button to tare. 5. Weigh (coarse, fine aggregates, cement and water). 6. Press the (TARE) button to re-tare. 7. Turn off with the same black button. **NOTE**: Maximum capacity = 680 g. (do not exceed).

3 FT³ CONCRETE MIXER (ASTM C 31)
INDICATIONS FOR USE
1. Weigh the aggregates, cement, water + additive. 2. Moisten the hopper with drinking water. 3. Add 50% mixing water to the mixer. 4. Add all of the coarse aggregate (stone). 5. Add all of the fine aggregate (sand). 6. Add all the cement (check the time). 7. Plug with transformer (110V). 8. Press the black button on for mixing. 9. Add the remaining water, only what is necessary. 10. Three minutes of mixing. 11. Two minutes rest. 12. Two minute remix. 13. Press the red off button and unplug. 14. Pour fresh concrete into a moistened wheelbarrow. 15. After carrying out the fresh concrete tests, clean the hopper by evacuating the solids to a wheelbarrow.
NOTE: The student must have a PPE implement (steel toe boots, rubber gloves, Jean pants, apron, glasses, mask, hearing protector, helmet), during mixing remain 0.80 m. In case of contact with the mixture, wash with water. The cement is alkaline (pH>12), it can irritate the skin.

MECHANICAL AGITATOR – GRANULOMETRY (ASTM C 136)
INDICATIONS FOR USE
1. With the digital system, 1 min of shaking is programmed. 2. Set of 6 sieves + bottom and lid are placed on the support plate and adjust the locks. 3. Plug in (220V). 4. Press the green lit button for stirring. 5. Wait for it to turn off automatically. 6. The equipment is unplugged. 7. The sieve set is removed from the support plate. 8. Leave the cord in place for subsequent use. **NOTE:** Be careful while shaking, distance yourself 0.40 m. of the team.

HYDRAULIC PRESS – COMPRESSION (ASTM C 39)
INDICATIONS FOR USE
1. Plug in (220V). 2. Turn on with OFF-ON switch, (heating for 15 minutes). 3. Submit a cylindrical specimen with its lower base + neoprene pad. 4. Place upper base + neoprene pad. 5. Turn on digital display white button back. 6. Zero correction on digital screen with touch button. 7. In the hydraulic pump, activate the right lever from the bottom up (fast speed) of the piston. 8. On the hydraulic pump, move the left lever up (speed = 3.5 kg/cm² per second). 9. Start of the test (close protection grid). 10. Until obtaining the maximum reading on the digital display of the test, when the concrete specimen fails. 11. Deactivate both levers at the same time. 12. Turn off equipment, record digital reading and remove the failed specimen and prepare for the next test. **NOTE :**Have PPE, be careful when applying the load, move 1.00 m away. of the team. Maximum press capacity 120 Tn. Maximum working capacity of the press 60 Tn.

HYDRAULIC PRESS – BENDING - (ASTM C 78)
INDICATIONS FOR USE
1. Press adjust knob on right side. 2. Position the beam on the lower end rollers and upper center rollers. 3. Contact the beam and the press with leather straps. 4. Plug in (220V). 5. Turn on digital display white button back. 6. Zero correction on digital screen with touch button. 7. Apply the right hand lever load manually until failure of the concrete beam. 8. Take final reading on digital screen. 9. Release right side knob from the press. 10. Unplug equipment. 11. Remove failed concrete beam. 12. Leave clean equipment ready for the next group. **NOTE :**Have PPE, be careful during the application of the load manually. Maximum press capacity 5 Tn. Maximum working capacity of the press 4 Tn.

DIRECT CUTTING EQUIPMENT - (ASTM D 3080)
INDICATIONS FOR USE
1. Carve unaltered sample in a 6 x 6 x 2 cm mold. 2. Raise the shear box movable ring to 0.64 mm. 3. Place the metal grid, porous stone and filter paper in the lower part of the cutting box. 4. Install the unaltered sample in a cutting box divided into two halves. 5. On the sample, place filter paper, porous stone and charge transfer plate. 6. Place the shear box in the shear cell. 7. Introduce the dead load framework. 8. Place dead weight (0.5, 1.0 and 2.0 kg/cm^2). 9. Install horizontal and vertical indicators. 10. Add distilled water to saturate the sample. 11. After 18 h. saturation apply normal load. 12. Record the primary consolidation of the sample. 13. Plug in (220V). 14. With controlled speed data recording up to E-% of 15% or failure of the undisturbed sample. 15. Turn off and unplug 220 V. 16. Remove failed sample and install another sample for dead load of 1.0 and 2.0 with the same procedure. 17. Leave clean equipment ready for the next group.

CONSOLIDATION - (ASTM D 2435)

INDICATIONS FOR USE

1. Carve sample in ring h=2.10 cm. and D=6.35 cm.
2. Install in the consolidation cell: porous stone, filter paper, ring + sample and fixing ring.
3. Put on top p. filter e.g. porous and plate loaded.
4. Place load frame and make load contact “O”.
5. In the loading frame, place an expansion control weight, and a micrometer with approx., 0.001”.
6. Fill the consolidation cell with distilled water.
7. Let the sample saturate for 18 hours.
8. Beginning of the test with effective load cycle: 0.10; 0.25; 0.50; 1.00 and 2.00 kg/cm^2.
9. Record timing data and micrometer readings.
10. Time: 0.1; 0.5; 1.0; 2.0; 4.0; 8.0; 15.0; 30.0; 60.0; 120.0 and 1440 minutes; each effective charging cycle.
11. Equal Discharge Cycle 1.0; 0.5; 0.25 and 0.10 kg/cm^2.
12. After this, the sample is removed from the cell, leaving the equipment clean, be very careful with porous stones, they are very fragile.

    NOTE: Take care that no person moves the loading frame of the consolidometer during the course of the consolidation test.

UNCONFINED COMPRESSION - (ASTM D 2166)
INDICATIONS FOR USE
1. Obtain a cylindrical specimen of undisturbed soil with a diameter = 5.60 cm. and height = 11.20 cm. 2. Measure data: lower, middle and upper diameters, height and weight of the undisturbed soil sample. 3. Present the specimen in a digital press with a base disc on top of the soil sample. 4. Plug in (220V). 5. Make zero contact with the load cell by reading digital display. 6. Install vertical deformation indicator clock. 7. Manually apply a speed of 1% E-%/min to the press. 8. Record charge data on digital display for every 0.5 E-% until failure of the soil specimen. 9. Unplug (220V). 10. Remove test specimen and measure angle of failure. **NOTE:** Have PPE, be careful during the application of the load manually. Maximum press capacity 1 Tn.

CALIFORNIA BEARING RATIO (CBR) - (ASTM D 1883)

INDICATIONS FOR USE

1. Drain the compaction molds in saturation.
2. Weigh molds + samples (56, 25 and 10 strokes/layer).
3. Present the compaction mold centering it with the plunger piston of the press.
4. Add circular and slotted discs of 5 lbs. each to the top of the mold + compacted sample.
5. Plug in (220V).
6. Make zero contact with the load cell by reading the digital display.
7. Install penetration indicator clock in inches.
8. Apply a speed of 0.050 in/min to the press, manually.
9. Write down load data in pounds on the digital screen in 0.025”; 0.050”; 0.075”; 0.100”; 0.200”; 0.300”; 0.400" and 0.500" penetration in inches.
10. Unload and remove the mold + compact soil.
11. Repeat the same procedure for 25 and 10 blows.

NOTE: Have PPE, be careful during the application of the load manually.

Maximum press capacity 2.3 Tn.

PHOTO Nº 1: EQUIPMENT WITH ITS INDICATIONS FOR USE

PHOTO Nº 2: INDICATIONS FOR USE

ASPHALT WASHING CENTRIFUGAL

PHOTO Nº 3: INDICATIONS FOR USE ELECTRIC SCALE OF 120 KG

PHOTO Nº 4: INDICATIONS FOR USE OF ELECTRIC OVEN