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HD2-KIT Guide_Handling

Last Updated: May 15, 2018

Before Beginning:

Required Equipment:

- **HD2-KIT**, including SONO M1 probe, HD2 Meter, protective carrying case, and accessories.

Overview:

- This guide is designed to help achieve the best accuracy possible for all your aggregate measurements by highlighting proper technique for material handling.

- To prevent the effects of an individual's "techniques" influencing moisture values, it is important to perform measurements using a standardized procedure in line with this document's guidelines.

- The HD2-Kit is delivered with 15 calibrations for various size and density sand, gravel, and crushed stone. All calibrations were prepared under laboratory, thus depending on site-specific conditions (fine fraction, cleanliness, and type of rock) measurement deviations of > 1% from any single calibrations are possible.

- For highest possible accuracy, it is recommended to perform a 2-point calibration with your local sand, gravel, or crushed stone. Please visit http://mesasystemsco.com for video instructions on this process.

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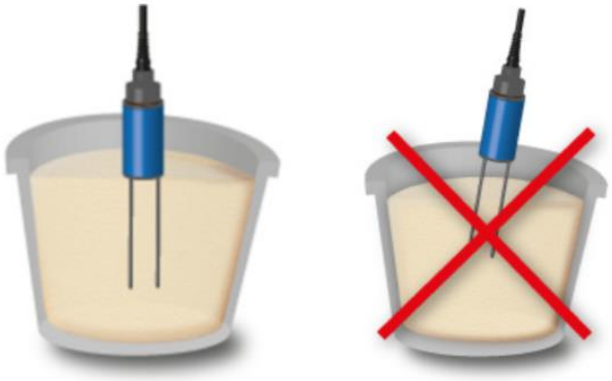
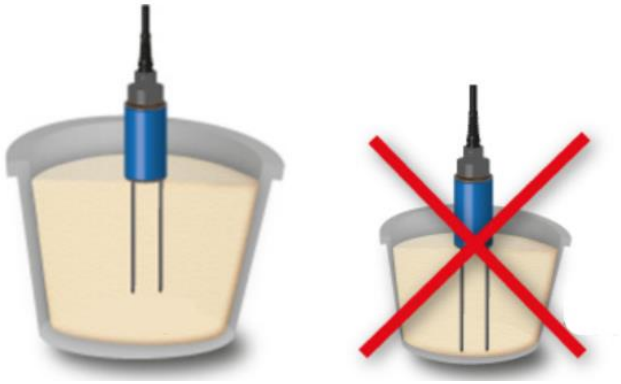
HD2-KIT Best Practices:

Part 1: Requirements for optimal accuracy

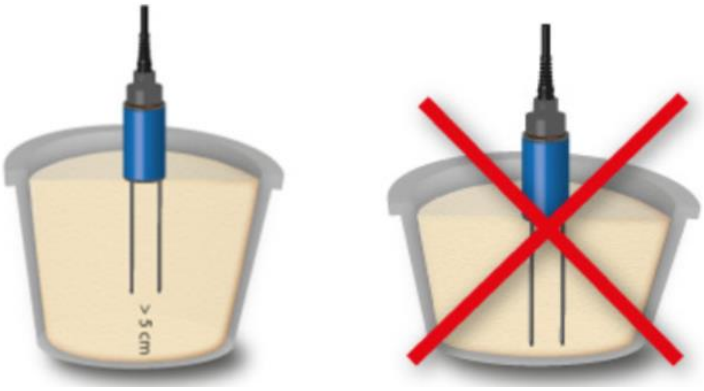
1) Ensure probe rods are covered **completely** by the material to be measured



2) Ensure bucket has a **volume of 2.5 gallons or more**, and is **non-metal**



3) Bucket should be as **cylindrical** as possible



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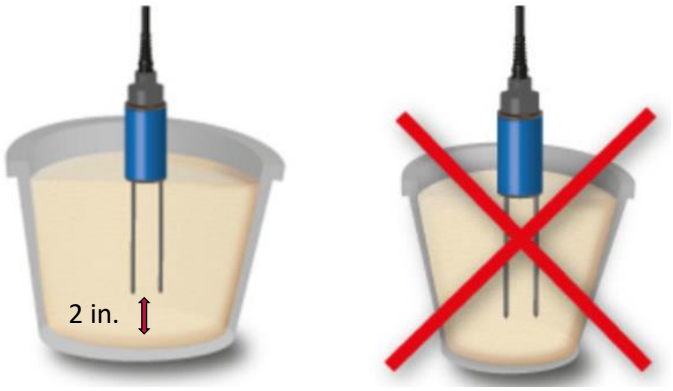
4) The **depth** of the bucket must exceed the rod length by a **minimum of 2 inches**



Part 2: Material handling steps for optimal accuracy

1) Pour sample material into the bucket

2) Compact sample material by lifting the bucket and letting it fall vertically onto a solid base. Repeat this step 3-5 times or until there is no more compaction to see.

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3) Insert probe rods into the sample material completely
   - For Sand, press probe body until you feel counter pressure of the sand
   - For Gravel and Stone, jiggle the bucket while inserting the rods, as the probe is difficult to insert without movement.
   - Ensure the probe rods are in full contact with sample material

4) Take a reading with the HD2 meter by pushing the arrow button on your HD2 meter.

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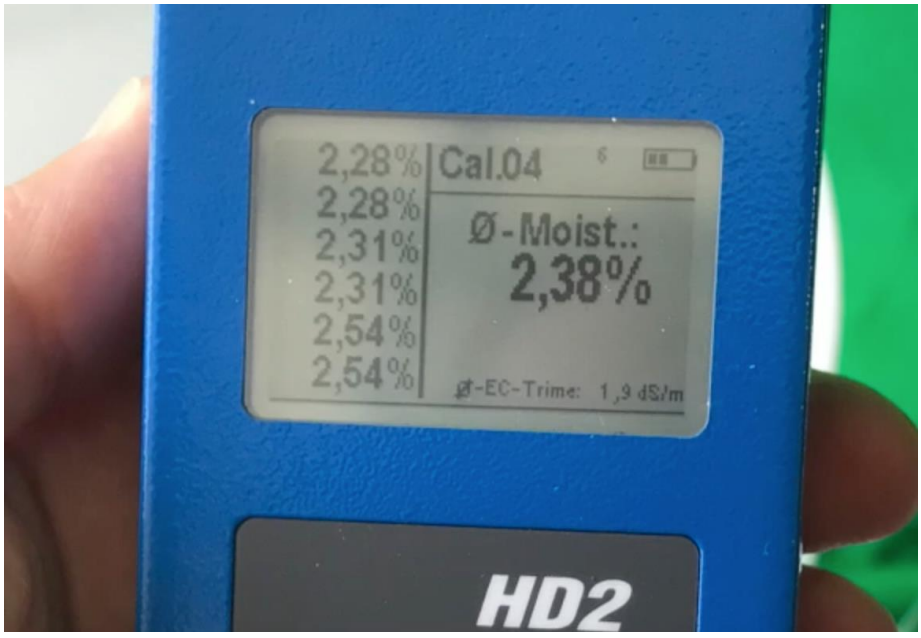
5) Remove the probe from sample material, and jiggle bucket to loosen up the material
    - For Gravel and Stone, it is recommended to transfer sample material into a separate bucket after three readings for a more accurate average

6) Repeat steps 2 to 5 until you have six measurements forming an average moisture value.



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Part 3: HD2-KIT calibration settings

1) Unless discussed upon ordering, the SONO-M1 probe will be shipped with the following factory calibrations:

Cal.	Name	Cal.	Name	Cal.	Name
1	Sand 94 lbs./ft³	6	Gravel 5/16" to 5/8"	11	Crushed Stone 7/16" to 5/8"
2	Sand 100 lbs./ft³	7	Gravel 5/8" to 1-1/4"	12	Crushed Stone 5/8" to 7/8"
3	Sand 106 lbs./ft³	8	Crushed Stone 1/16" to 3/16"	13	Crushed Stone 7/8" to 1-1/4"
4	Sand 112 lbs./ft³	9	Crushed Stone 3/16" to 5/16"	14	Mixed Crushed Stone 0" to 5/8"
5	Gravel 1/16" to 5/16"	10	Crushed Stone 5/16" to 7/16"	15	1/10tp

2) Depending on site specific condition, it may be necessary to calibrate the system with two different moisture values by performing a **2-point calibration.** Instruction videos for a 2-point calibration can be found at http://mesasystemsco.com

Notes:

- The lower of the two calibration points may not be at 0%
- The upper of the two calibration points may not be at the highest saturation point of the material
- The optimal solution for a 2-point calibration, is to find the two calibration points at 20% and 80% saturation of the aggregates
    - For example, for sand with a maximum moisture content of 10%, the calibrations points are ideally 2% and 8% moisture content
    - For example, for gravel with maximum moisture content of 5%, the calibration points are ideally 1% and 4% moisture content

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Part 4: Very dry aggregate users only

Notes: When working with very dry materials with measurement ranges lower 15% of the maximum moisture saturation, the measurement results are being distorted in a small amount in the lower range, Fig 2. This distortion is caused from a very low internal friction of the aggregates as the moisture tends to 0%, therefore causing the materials density to become a little higher. This small distortion can be corrected by using a simple empirical formula:

1) Subtract a correction value **"Maximum moisture content / 100 * 3"** from the measured value.
    a. Example: Measured moisture value in dry sand is 1.2% (this means 12% saturation at a maximum saturation value of 10% in sand):
        - 1.2% - **(Maximum moisture content / 100 * 3)**
        - 1.2% - (10% / 100 *3)
        - 1.2% - 0.3% = 0.9% (corrected moisture value in dry sand)

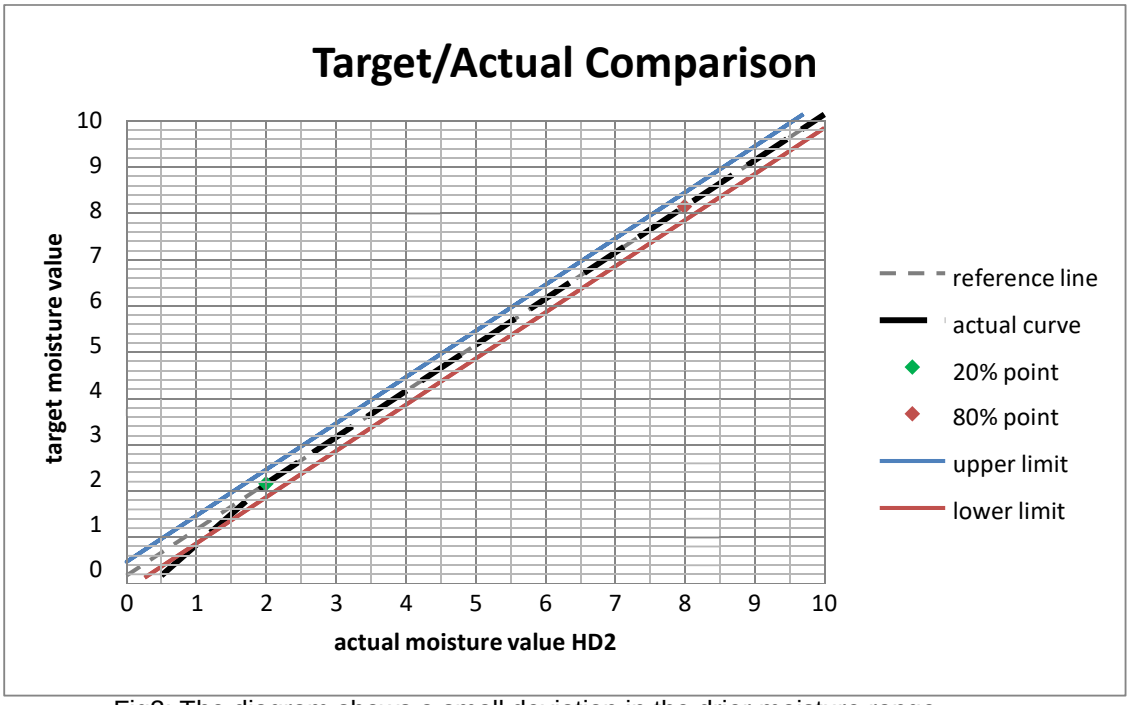

Fig2: The diagram shows a small deviation in the drier moisture range.

Please note: The absorbed water is also measured with the SONO-M1. Depending on aggregate type, adsorbed moisture can be greater than 0.5%. This should be taken into consideration when calculating the water/cement ratio, because the absorbed moisture is not relevant for the w/c-ratio.