

Racing Surfaces Testing Laboratory

907 National Avenue
Lexington, KY 40502
207.570.9869



LABORATORY TEST METHOD FOR Water Holding Capacity Determination (ASTM D 2980-04, and D 7367-07)

Water Holding Capacity Determination Pre-Test Equipment Review

1. Replace and/or add distilled water to the bottom half of vacuum desiccator until approximately $\frac{1}{2}$ full. (Level of water should be higher than the sample once it is in place).
2. Make sure O-ring is correctly in place on top half of vacuum desiccator.
3. Empty the draining tray which holds the water drained from sample(s) tested.



4. Cut Whatman #541 filter papers to fit water holding capacity determination molds (WHCDM) with the 3 inch Fiskars cutter.
5. Clean the compaction hammer(s) which will be used for test with a paper towel. (Water can be used to clean compaction hammer but it must be thoroughly dried in order to prevent rust.)

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6. Make sure the 10 cm mark in permanent marker is clearly depicted on compaction hammer. If not, measure 10 cm from the bottom of the hammer handle and make a new mark.



Water Holding Protocol

1. Remove sample from synthetic oven (sample must be in oven **72** hours prior to testing). Sample must be dried material (0% moisture content).
2. Samples that are to be mixed using fibers and sand should be prepped individually for proper ratios.
3. Remove any large pieces of rubber or knots of fiber by sieving the sample with a #4 synthetic sieve and picking out the pieces that will not go through.
 - a. NOTE: Make sure it is a #4 sieve and it is for synthetics.



4. Once the sample is sieved, you must have at least 350g of material.

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5. Weigh empty, dry pan. Record this weight on the data sheet.
6. Place sample in pan.
7. Weigh the pan with the sample in it. Record this weight on the data sheet.
 - a. To add the correct amount sample and distilled water to achieve 4% moisture in the sample, please reference the table below.

Moisture content (%)	Sand to add (g)	Water to add (g)	End Sand + Wet Weight (g)
4	312	13	325



8. Securely cover pan (with sample and water inside) with plastic wrap so the moisture does not escape.



9. Get a clean, dry Water Holding Mold. Place a Whatman #541 filter paper filter paper on the bottom inside the mold.

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10. Record the Water Holding Mold identification number on the data sheet.
11. Place the empty Water Holding Mold with the Whatman #541 filter paper on the scale.
Record this weight on the data sheet. Do not remove from scale.
12. Tare the scale with Water Holding Mold and filter paper on it. Do not remove from scale.
13. Remove the plastic wrap from the pan and add 150g of the sample at 4% moisture content.
(WHM + Sample Weight #1)
14. Replace the plastic wrap and securely cover pan of sample at 4% moisture content so
moisture does not escape.

15. COMPACTION #1
 - a. Remove the Water Holding Mold from the scale and place on the stone in front of
the fireplace. Wipe any dirt off of the compaction hammer. Compact the sample in
the Water Holding Mold with 10 blows using the compaction hammer from a height
of 10 cm.

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- b. Make sure to place the compaction hammer in a new place before each blow so the sample is compacted evenly.
- c. Score the surface of the sample evenly to no greater than a depth of $\frac{1}{4}$ inch with the edge of any spoon. Put the spoon to the side.
- d. Place the top half of the Water Holding Capacity Determination Mold with filter and compacted sample on the scale. Remove the plastic wrap from the pan (with the sample at 4% moisture content) and add another 150g of the sample at 4% moisture content so the scale reads 300g.
- e. Securely cover pan (with sample and water inside) with plastic wrap so the moisture does not escape.

16. COMPACTION #2

- a. Remove the Water Holding Mold from the scale and place on the stone in front of the fireplace. Compact the sample in the Water Holding Mold with 10 blows using the compaction hammer from a height of 10 cm.
- b. Make sure to place the compaction hammer in a new place before each blow so the sample is compacted evenly.
- c. Score the surface of the sample evenly to no greater than a depth of $\frac{1}{4}$ inch with the edge of any spoon. Put the spoon to the side.

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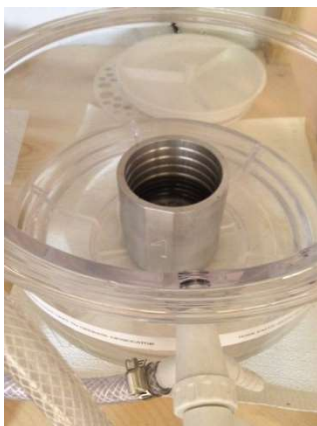
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17. Place the Water Holding Mold on the scale. Record this weight on the data sheet. (WHM + Sample Weight #2)
18. Identify height of sample in Water Holding Mold by counting down the centimeter marks on the inside of the Water Holding Mold starting at the top. The first line is 9 cm. If the surface of the sample is compacted between the lines then estimate. Record the sample height on the data sheet.



19. Place the Water Holding Mold into the bottom half of vacuum desiccator (the clear spherical container half-filled with distilled water) next to the flow bench. The vacuum desiccator should be about half full of distilled water. Make sure the level of the distilled water in the desiccator is above the level of the sample in the Water Holding Mold. If the level of the distilled water in the vacuum desiccator is lower than the level of the sample in the Water Holding Mold, add distilled water by pouring it in with a beaker.



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20. Pour distilled water into the top of the Water Holding Mold until there is 2cm of water on top of the sample by pouring from a beaker.
21. Place the lid of vacuum desiccator on the bottom half of the desiccator checking to see that it seals.
22. Snap the clips that are around the base of the top of the desiccator down. Turn the white valve to the left in order to get the necessary suction.



23. Turn on the vacuum pump by pushing the white switch on the wall behind the table (FYI...switch is not directly behind motor). Check to make sure the vacuum gauge on top of desiccator is reading in the negatives.
24. Start the stop watch. Allow the sample to saturate for 12 minutes
25. Stop the stopwatch after allotted saturation time (12 minutes). Turn off the vacuum, turn the white valve in the front to the right and listen for the “whoosh” and unsnap the clips around the top. Remove the lid and set aside.

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26. Remove the sample and start the stopwatch again (after setting back to zero after the 12 minute saturation). Do not spill any water that may be on top of the sample. Wipe off any water on the outside of water holding capacity determination mold.
27. Place the stopwatch next to the base of water holding capacity determination mold to which the water holding capacity determination mold will correspond. Place the top half of Water Holding Mold removed from vacuum desiccator onto draining tray.
28. Cover the Water Holding Capacity Determination Mold with plastic wrap, secured with rubber band, and poke a hole in the top with the bendy wire. Make sure to not break the surface of the sample.



29. Replace the lid on the vacuum desiccator.
30. After the stopwatch reads between 2 hours and 2 hours & 10 minutes, remove the rubber band and plastic wrap.
31. Remove the Water Holding Capacity Determination Mold from the draining tray. Weigh the Water Holding Capacity Determination Mold with the sample. Record this weight as "Sample Mass" (weight of WHCDM & Sample after Draining).
32. Remove the sample from the Water Holding Capacity Determination Mold by scooping it out with a spoon and place it in the oven for reuse. (Be sure to write the date when the

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sample was put back in oven on the index card affiliated with the particular sample after testing. If testing is complete put the sample back in oven and complete the index card affiliated with sample accordingly so the sample can be used for other testing ordered or bagged after it dries if no other testing is necessary).

33. Discard Whatman #541 filter paper. If any disintegration of filter paper occurs, write a note (date, sample ID, what was noticed, and initials of tester in the notes per round section).
34. Wash and dry the Water Holding Capacity Determination Mold. Place back on draining tray.
35. Wash sieve #4 (if used), making sure to remove any pieces stuck in it.
36. Wash any pans and spoons used.
37. Bag the pieces of rubber and fiber removed at the beginning and label them as “Large Rubber and Fiber Pieces.” Document date bagged, sample ID, description of material removed, weight, and who bagged sample. Enter on SL-WO (if applicable).

If the vacuum pump begins to spew water out the top and sounds gurgly then turn it off and follow these directions:

1. Unscrew the release valve (which is on the front of the pump labeled “release valve”) with a wrench and place a container under the valve to catch the liquid that comes out.

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2. Replace the release valve cap and run the pump for 2 minutes or until all of the water in the tubing is gone.
3. Repeat step 1.
4. Replace the release valve cap and use pliers to take out one of the yellow plugs labeled "oil."



5. Add oil.
6. Make sure the pump sounds normal and is not spewing oily water.

Revision No.	Date	Revision By	Description
1.0	summer 2013	Molly Segee	Created and issued procedure
1.1	fall 2013	Hannah Rubin	Updated Procedure
1.2	Feb/Jan 2014	Roberta Leavitt	Edited everything
1.3	24-2-14	Michaëlle Lachance	Edited everything again
1.4	11-4-14	Hannah Rubin	Added pictures
1.5	05-02-14	Hannah Rubin	Added pictures
1.6	15-Jan 2015	Karen Introne	Modified to reflect new desiccators
1.7	30-Jun 2015	Karen Introne	Added new pictures to reflect draining tray
1.8	26-Feb-19	H. Adams	Updated address and phone number
1.9	05-Jul-23	M. Rockefeller	Updated address