



**InstronTek<sup>®</sup>**  
**Inc.**

innovators in instrumentation technology

# AggPlus™ System

Aggregate Gravity & Absorption Test  
*Coarse and Fine Aggregates*



## OPERATING MANUAL

[www.InstronTek.com](http://www.InstronTek.com)

# AggPlus™ System

**Coarse and Fine Aggregates**



**Instrotek®  
Inc.**

**Innovators In Instrumentation Technology**



**Determination of Percent Absorption and  
Specific Gravity of Coarse and Fine Aggregates  
Using the  
AggPlus™ System**

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Patent Pending



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**Introduction:**

The AggPlus™/CoreLok system is an innovative product designed to determine Apparent Specific Gravity and Percent Absorption of Aggregates. The apparent gravity and % absorption calculated by this method can then be used to determine bulk specific gravity and saturated surface dry (SSD) weight of the aggregate by employing the already determined relationships. This system is designed for use with fine and coarse aggregates.

**Important:** These procedures require that your water-weighing tank be a minimum of 18” width, 24” length, and 18” depth. Do not attempt to do this test with a smaller water-weighing tank. If needed, please call InstroTek for tank suppliers. The accuracy of your results and repeatability depend on having an appropriately sized tank.

**Procedure- Fine Aggregates****A. STEP 1 – Calibrate the Volumeter (small container) for Fine Aggregate**  
(Illustrations on pgs. 23-24)

***Important:*** Make certain the water temperature is  $77 \pm 2$  degrees Fahrenheit.

***Important:*** Be sure your fixture and volumeter are on a level surface. Use a level indicator to set up the fixture position.

***Note:*** Make certain you have all the necessary accessories. See attached picture for the required accessories.

***Important:*** To achieve the best repeatability, it is extremely important that the empty volumeter temperature remains at  $77 \pm 2$  degrees Fahrenheit. A simple way to keep the volumeter at the correct temperature is to fill a 5-gallon bucket with  $77 \pm 2$  degrees Fahrenheit water. Before each test, rinse the empty volumeter in this water and dry it with a towel. This will quickly stabilize the volumeter temperature and will allow you to start your testing. This step is particularly important on very cold or very hot days, when the volumeter temperature can change drastically by the use of tap water or by normal changes in ambient temperature in the lab.

- 1- Place the volumeter in the fixture and push it back until it makes contact with the stops. Fill the small spray bottle with isopropyl (rubbing) alcohol.

***Make sure the volumeter is pushed all the way back to the stops!***

- 2- Fill the volumeter with water to the level of the line indicated inside the volumeter. Approximately 0.375” (3/8”) from the top. It is important that you keep the water level at or below the line to avoid spills during lid placement.
- 3- Using the alcohol spray bottle, spray the surface of the water to remove bubbles.



- 4- Gently place the lid on the volumeter with the 1/8" hole facing the front. Close the clamps.

***When placing the lid on the bowl, make sure the 1/8-inch hole beside the lid post faces the front (see illustrations pg 23). Always locate lid this way.***

- 5- Using the syringe, slowly fill the volumeter through the large hole through the lid post (see illustration pg 21 & 23). Make sure the syringe tip is far enough in the volumeter to be below the water level. Gentle application in this step prevents formation of air bubbles inside the volumeter.
- 6- Fill the volumeter until you just see the water coming out the 1/8" hole on the surface of the lid.
- 7- Wipe the excess water from the top of the lid with a towel
- 8- Immediately place the entire fixture with the volumeter on the scale and obtain the weight
- 9- Record the weight in the top portion of the Aggregate Worksheet on "Fine Aggregate Only" row.
- 10- Repeat the above steps 2 more times and average the weights.
- 11- If the range between the 3 calibration weights is larger than 0.5 grams, then you are not performing the test correctly. Check to see if the fixture is level. Make certain the water injection with the syringe is done below the volumeter water surface and is applied gently. Check the water temperature. Check the volumeter temperature. Repeat the test until you have three weights that are within 0.5-gram range.
- 12- Record the average of the three weights.
- 13- The volumeter and the fixture are now calibrated and ready for testing. Re-calibrate the volumeter prior to changes in each aggregate source or a minimum of once per week.

## **B. STEP 2 – Test Fine Aggregate sample**

(Illustrations pgs. 25-28 Volumeter Procedure & pgs 35-37 CoreLok Procedure)

***Again, be sure your fixture and volumeter are level.***

- 1- Oven dry a sufficient quantity of aggregate to perform this test. A single test may require 2500 grams of sample. Split the sample into four portions. You will need two or three 500-gram samples for the test in the volumeter and one 1000-gram sample for vacuum test in the CoreLok.

***Note: Oven dry the sample for a minimum of 24 hours at 105 °C. You can make certain you have completely dried the sample to a constant weight by periodically weighing the sample.***

- 2- Cool the sample to  $77 \pm 2$  ° F. Use appropriate state or national standard procedure to split the sample.

***It is important that proper splitting technique be used for dividing the test samples.***

- 3- Submerge the volumeter (bowl and lid) into a  $77 \pm 2$  ° F rinse water to stabilize the temperature. Completely dry the AggPlus volumeter inside and out.

***Important: Steps 6 through 16 shall be completed within 2 minutes. Increased test time will affect the accurate determination of absorption during this process.***

- 4- Weigh a  $500 \pm 1$  gram of oven dry material and record in column A of the worksheet. Make certain the aggregates are at  $77 \pm 2$  degrees Fahrenheit. Do not test the aggregates if they are still hot.
- 5- Place the empty dry volumeter in the fixture and push the volumeter until it makes contact with the stops.

***Make sure the volumeter is pushed all the way back to the stops.***

- 6- Place approximately 500 ml (halfway full) of  $77 \pm 2$  ° F water in the volumeter.
- 7- Slowly and evenly pour the sample into the volumeter

***Caution: Make certain you don't lose any aggregate in the process of filling the volumeter. Use the provided pouring container to help in transferring the aggregate into the AggPlus volumeter. Use the provided brush to sweep the remaining fines into the volumeter. If you loose any aggregates in the process of filling the volumeter you will have to start the test over.***

- 8- Use the provided aluminum spatula and push it to the bottom of the volumeter against the inside circumference.
- 9- Slowly and gently drag the spatula to the center of the volumeter, removing the spatula after reaching the center.
- 10- Repeat this same procedure 7 more times so that the entire circumference is covered in 8 equal angles, i.e. every 45 degrees until the starting point is reached. If necessary use a squeeze bottle to rinse any sample residue off the spatula into the volumeter.
- 11- Fill the volumeter with water to the level of the line indicated inside the volumeter. Approximately 0.375" from the top. It is important that you keep the water level at or below the line to avoid spills during lid placement
- 12- Use the spray bottle filled with isopropyl alcohol and spray the top of the water to remove air bubbles.
- 13- Gently place the lid on the volumeter and lock the clamps

***When placing the lid on the volumeter, make sure the 1/8-inch hole beside the lid post faces the front. Do this each time you perform this test.***

- 14- Using the syringe, slowly fill the volumeter through the large center hole on top of the lid. Make sure the syringe tip is far enough in the volumeter to be below the water level. Gentle application in this step will prevent formation of air bubbles inside the volumeter (see pg 21 & 23).

- 15- Fill the volumeter until you just see water coming out the 1/8" hole on the surface of the lid.
- 16- Wipe the excess water from around the 1/8" hole with a towel.

***Note: Do not wipe water from the rim of the volumeter if it seeps between the lid and volumeter. Allow this water to remain on fixture.***

- 17- Immediately weigh the volumeter and the fixture. Record this weight in column B of the worksheet.
- 18- Repeat steps 4 to 17.
- 19- If the difference in weight of column B for the two samples tested is less than or equal to 1 gram, go to step 21.
- 20- Repeat step 4 to 17, if the column B weights for the first two tests, is larger than 1 gram.
- 21- Average the weights in column A and then average the weights in column B of the worksheet. Use the average values when using the AggSpec program.
- 22- Set the CoreLok unit to run on Program 1 (all settings of Program 1 are preset at the factory). Note: The CoreLok unit is setup at the factory to run this and other tests. Simply run program 1. For varying the settings use the Menu key and the Up or Down arrows.

***Important: For the following test you need a large water tank with the InstroTek cushioned weighing basket connected to a scale capable of reading to  $\pm 0.1$  gram. The temperature of the water should be maintained at  $77 \pm 2$  °F. The bath should be setup with an overflow system to correct for variations in weight resulting from changes in the water level.***

- 23- Place the three white filler plates into the CoreLok chamber. The plates fit in the chamber without touching the sealing bar assembly. Rotate them 90° if they touch or are above the sealing bar assembly.
- 24- Tear a small bag from the roll. Inspect the bag to make sure there are no holes, stress points or discontinuity in the side seals. Never use damaged bags.
- 25- Weigh the bag. Record the weight in column C.
- 26- Column D asks for rubber sheet weight. These are normally only used with coarse aggregates to prevent punctures. Enter '0' unless rubber sheets were used.

***Caution: Always handle the bag with extreme care to avoid creating weak points and punctures.***

- 27- Weigh 1000±1 grams of aggregate and record the weight in column E.
- 28- Place the sample in the small bag. Support the bottom of the bag on a smooth tabletop when pouring to protect against puncture and impact points.
- 29- Place the bag inside the CoreLok.
- 30- Grab the two sides of the bag and spread the sample flat by gentle shaking.

***Important: Do not use your hand to press down or spread the sample from outside the bag. Pressing down on the sample from outside the bag will cause the bag to puncture and will negatively impact your results.***

- 31- Place the open end of the bag over the seal bar and close the chamber door.
- 32- After the chamber door opens, gently remove the sample from the chamber.
- 33- Immediately submerge the sample in the water tank for water displacement analysis.

***Note: It is extremely important that you remove the sample from the CoreLok and immediately place it in the water bath. Leaving the bag in the CoreLok or on a bench top after sealing can cause air to slowly enter the bag and can result in low apparent gravity measurements.***

- 34- Cut one corner of the bag, approximately 1 to 2 inch from the side while the top of the bag is at least 2" down in the water. Make sure the bag is completely submerged before cutting. Introducing air into the bag will produce inaccurate results.
- 35- Open the cut portion of the bag with your fingers and hold open for 45 seconds. Allow the water to freely flow into the bag. Allow any small residual air bubbles to escape. Do not shake or push on the bag. This action can make the fines escape from the bag.
- 36- After water has filled in, cut the other corner of the bag approximately 1-2 inches. Squeeze any residual air bubbles out of the cut corners by running your fingers across the top of the bag.
- 37- Place the bag containing the aggregate on the weighing basket in the water to obtain the under water weight. You may fold the bag to place it on the basket. However, once on the basket under water, unfold the bag and allow water to freely flow into the bag. Keep the sample and bag under water at all times.

***Caution: Make certain the bags or the sample are not touching the bottom, the sides, or floating out of the water tank. If the bag contacts the sides it can negatively impact the results of this test.***

- 38- Allow the sample to stay in the water bath for ten (15) minutes.
- 39- Record the submerged weight and wait one minute. If after this time the weight increases by more than one-gram wait an additional five minutes. Record the weight and continue this process until the weight stops increasing.

***Note: In our experience fine aggregate samples should stabilize in less than 15 minutes. However, there might be some aggregates that require a longer soak time.***

- 40- Record the submerged weight in column F.
- 41- Open the AggSpec program.
- 42- Be sure that Fine Aggregate is selected.
- 43- Enter the weights from the Worksheet for sample A and B (average of two or three tests) into the program. The program will calculate the apparent density,

percent absorption, Bulk Specific Gravity (SSD) and Bulk Specific Gravity (Bsg). If you have used the rubber sheets for your test, make sure that the rubber Vc is entered correctly. You may export the data into an Excel spreadsheet template and print the data as well as other functions provided under the excel program. Simply click on “Export to Excel” and the AggSpec program will automatically pull the data into Excel.

- 44- If your absorption is zero, there might be two problems. First, the results (apparent gravity) of your vacuum test in the bag is low. There might have been a puncture in the bag. Repeat the test in the bag under vacuum with another 1000-gram sample. Second, you are possibly spending more than 2 minutes performing the tests in the volumeter or the temperatures during the test (of water, sample or volumeter) is changing drastically during the test. Increased test time during the volumeter test will cause the weights in column B to be higher than the actual values. Repeat this test with another 500-gram sample paying special attention to time and temperature (sample, water and volumeter).

## **Procedure – Coarse Aggregates**

### **C. STEP 1- Calibration of the Large Volumeter for Coarse Aggregate** (Illustrations pgs. 29-30)

***Important: Make certain the water temperature is  $77 \pm 2$  degrees Fahrenheit.***

***Caution: Be sure your volumeter is on a level surface. Use a level indicator to setup the volumeter position!***

***Note: Make certain you have all the necessary accessories. See picture for the required accessories.***

***Important: To achieve the best repeatability, it is extremely important that the empty volumeter temperature remains at  $77 \pm 2$  degrees Fahrenheit. A simple way to keep the volumeter at the correct temperature is to fill a 5-gallon bucket with  $77 \pm 2$  degrees Fahrenheit water. Before each test, rinse the empty volumeter in this water and dry it with a towel. This will quickly stabilize the volumeter temperature and will allow you to start your testing. This step is particularly important on very cold or very hot days, when the volumeter temperature can change drastically by the use of tap water or by normal changes in ambient temperature in the lab.***

- 1- Fill the large volumeter with water to the top of the volumeter.
- 2- Place the lid on the volumeter gently pressing it down so that water flows through the hole in the lid post. Be sure the lid is well seated by gently rotating the lid on top of the volumeter.
- 3- Make sure the small 1/8" hole on the lid is facing forward. Use the provided syringe and fill the container through the large hole in the post until water starts to flow through the small 1/8" hole.
- 4- Wipe the excess water from the volumeter with a towel. Place on a towel to wipe water from the bottom of the unit.
- 5- Place the volumeter filled with water on the scale and obtain the weight.
- 6- Record the weight in the top portion of the Aggregate Worksheet, on "Coarse Aggregate Only" row.
- 7- Repeat the above steps 2 more times and average the weights.
- 8- If the range in these weights is larger than 1.0 gram, then you are not performing the test correctly. Check to see if the volumeter is level. Check the water temperature. Check the volumeter temperature. Repeat the test until you have three weights that are within a 1-gram range.
- 9- Record the average weight on the worksheet.
- 10- The volumeter is now calibrated and ready for testing. Re-calibrate the volumeter prior to changes in each aggregate source or a minimum of once per week.

#### **D. STEP 2 - Testing Coarse Aggregate samples**

(Illustrations on pgs 31-33 Volumeter & pgs 35-37 Corelok procedure)

***Be sure your volumeter is on a level surface by checking with a level.***

- 1- Oven dry a sufficient quantity of aggregate to perform this test. A single test may require 5000 grams of sample. You will need two or three 1000 grams samples for tests in the volumeter and one 2000-gram sample for vacuum test in the CoreLok.

***Note: Oven dry the sample for a minimum of 24 hours at 105 °C. Make certain you have achieved constant weight.***

***Note: This test is designed for washed coarse aggregates. For coarse aggregates with high fine content or blended aggregates, small adjustments have to be made to the procedure. Contact InstroTek for more information on these procedures.***

- 2- Cool the sample to  $77 \pm 2$  ° F. Use appropriate state or national standards to split the sample into three individual 1000 gram and one 2000 gram samples.

***Important: Steps 4 through 10 should be completed within 2 minutes. Increased test time without the lid on the volumeter will affect the accurate determination of absorption during this process.***

- 3- Weigh  $1000 \pm 2$  grams of the oven dry material and record weight in column A of the worksheet.
- 4- Fill the volumeter halfway with  $77 \pm 2$  ° F water.
- 5- Slowly and evenly distribute the sample into the volumeter. Make sure the water completely covers the aggregate.
- 6- Using the aluminum spatula gently move the aggregate sample around to ensure that there is no trapped air between the particles.
- 7- Fill the volumeter with water to the top and spray with rubbing alcohol to remove air bubbles.
- 8- Place the lid on the volumeter and press gently so that water flows smoothly from the post and the sides. Continue to press until the lid is properly seated. Rotate the lid on top of the volumeter making sure good contact is achieved and the 1/8" hole is facing forward.
- 9- Using the syringe, slowly fill the volumeter through the large center hole on top of the lid. Make sure the syringe tip is far enough in the volumeter to be below the water level. Gentle application in this step will prevent formation of air bubbles inside the volumeter (**see pg 21 & 23**).
- 10- Wipe the excess water from the volumeter with a towel. Place the volumeter on a towel to dry the bottom. Do not tilt or spill any of the water in the volumeter.
- 11- Obtain the total weight of the volumeter, aggregate, and water and record in column B of the worksheet.
- 12- Repeat Steps 3 to 10.
- 13- If the difference in weight in column B for the two samples tested is less than or equal to 2 grams, go to step 13
- 14- Repeat steps 3 to 10, if the first two tests with the volumeter indicate weights that are more than 2 grams from each other.
- 15- Average the weights in column A and then average the weights in column B of the worksheet and use this average when entering numbers in AggSpec software.
- 16- Set unit to run on Program 1 (all settings of Program 1 are preset at the factory).  
Note: The CoreLok unit is setup at the factory to run this and other tests. Simply run program 1. For varying the settings use the Menu key and the Up or Down arrows.
- 17- Place the three white filler blocks into the CoreLok chamber. The plates fit in the chamber without touching the sealing bar assembly. If they appear too close to the seal bar or are above the seal bar, rotate them 90°.
- 18- Tear one large bag and one small off bag rolls. Inspect each bag for holes and tears.
- 19- Weigh the bags (one large and one small). Record the total weight in column C.
- 20- Weigh the two rubber sheets and record the weight in column D.
- 21- Weigh approximately  $2000 \pm 2$  grams of aggregate and record in column E.
- 22- Place the sample in the small bag. When filling, support the bottom of the bag on a tabletop to protect against puncture and impact points.

- 23- Place the large bag into the CoreLok chamber, then place one of the rubber sheets in the large bag. The rubber sheet should be flat, centered, and pushed all the way to the back of the large external bag.
- 24- Place the bag containing the sample into the large external bag centered on top of the rubber sheet.
- 25- Use your hand and spread and flatten the sample in the internal small bag. Be sure area taken up by the sample inside the small bag remains completely contained within the area of the rubber sheet.
- 26- Place the other rubber sheet on top of the small internal bag inside the large external bag.

**Note: The internal bag should be completely sandwiched between the two rubber sheets. The rubber sheets are cut to a size so as to not cover the opening of the small bag. If the rubber sheets cover the small bag opening this will restrict the airflow from the bag causing error in the readings.**

- 27- Place the open end of the large external bag over the seal bar and close the chamber door.
- 28- After the chamber door opens, gently remove the sample from the chamber
- 29- Immediately place the sample in the water, for water displacement analysis
- 30- Cut one corner of the bag, approximately 3 to 4 inch from the side. Make sure the bag is completely submerged before cutting. Introducing air into the bag will produce inaccurate results.
- 31- Open the cut portion of the large bag and the uncut small bag with your fingers and hold open for 25 seconds. Allow the water to freely flow into the bag. Allow any small residual air bubbles to escape from the bag.
- 32- After water has filled in, cut the other corner of the bag approximately 3-4 inches. Squeeze any residual air bubbles out of the cut corners by running your fingers across the top of the bag.
- 33- Place the bags containing the rubber sheets and the aggregate on the provided weighing basket under water. You may fold the bag to place it on the basket. However, once on the basket under water, unfold the bag and allow water to freely flow into the bag.

***Caution: Make certain the bag or the sample are not touching the bottom, the sides, or floating out of the water tank. If the bag contacts the sides it can negatively impact the results of this test***

- 34- Allow the sample to stay in the water bath for twenty (20) minutes.
- 35- Record the submerged weight and wait one minute. If after this time the weight increases by more than one-gram wait an additional five minutes. Record the weight and continue this process until the weight stabilizes.

***Note: In our experience most aggregates are fully saturated after 20 minutes. However, we have seen some aggregates with more than 8% absorption that require longer soak times.***



36- If your aggregate size is such that more than 2000 grams need to be tested, repeat steps 3-28. Average the results of the tests for the total aggregate amount required by ASTM C127 and AASHTO T-85.

*Note: AggPlus tests should only be done with 2000 g or less samples.*

- 37- Open the Gravity Suite program and select AggSpec.
- 38- Enter the average weight of the container with water only above the chart.
- 39- Enter sample identification. Tab over and select “coarse” aggregate.
- 40- Fill in columns 3 and 4 with the average weight (2 or 3 test) from column A and B of the worksheet.
- 41- In column 5 the combined weight of the rubber sheets is entered. The **first time** you try to enter this weight, a window will appear saying you must enter a value for “rubber sheet VC”. This value is the density of the rubber sheets and is written on the sheets (gm/cm<sup>3</sup>). Select OK. Click on ‘EDIT’ and then select ‘SETTINGS’. You now must enter a password- the password is **density**. In the next window, enter the numerical value from the rubber sheets and click OK. **Tab back to the rubber sheet weight column and enter the combined weight of the sheets.** The ‘Rubber Sheet VC’ will display above the chart and will not need to be re-entered for future tests unless the rubber sheets are replaced or damaged. As a precaution, record the rubber sheet density value in this manual in case it wears off the rubber sheets.
- 42- Continue by entering the weights from the worksheet and the sealed sample weight. The program will calculate the apparent density, percent absorption, Bulk Specific Gravity (SSD) and Bulk Specific Gravity (Bsg).
- 43- You may export the data into an Excel spreadsheet template and print the data as well as other functions provided under the excel program. Simply click on “Export to Excel” and the AggSpec program will automatically pull the data into Excel.
- 44- If your absorption is zero, there might be two problems. First, the results (apparent gravity) of your vacuum test in the bag is low. There might have been a puncture in the bag. Repeat the test in the bag under vacuum with another 1000-gram sample. Second, you are possibly spending more than 2 minutes performing the tests in the volumeter or the temperatures during the test (of water, sample or volumeter) is changing drastically during the test. Increased test time during the volumeter test will cause the weights in column B to be higher than the actual values. Repeat this test with another 500-gram sample paying special attention to time and temperature (sample, water and volumeter).

## Aggregate Worksheet

**(Fine Aggregate Only)** Weight of Volumeter and fixture filled with water.

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_ Avg. \_\_\_\_\_

**(Coarse Aggregates Only)** Weight of Volumeter filled with water.

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_ Avg. \_\_\_\_\_

Sample Number or Label	Trial Number	Aggregate Grade (Coarse or Fine)	A. Dry Sample A Weight (g)	B. Sample A Weight in Container Filled with Water (g)	C. Bag Weight (g)	D. Weight (2) of Two Rubber Sheets	E. Dry Sample B Weight (g)	F. Weight of Sealed Sample B Opened Under Water
	A1							
	A2							
	A3*							
	Avg							
	A1							
	A2							
	A3*							
	Avg							
	A1							
	A2							
	A3*							
	Avg							
	A1							
	A2							
	A3*							
	Avg							

\* Trial 3 is only necessary if the difference in weights in Column B for the first 2 trials is larger than 1 gram for fine aggregates and larger than 2 grams for coarse aggregates.



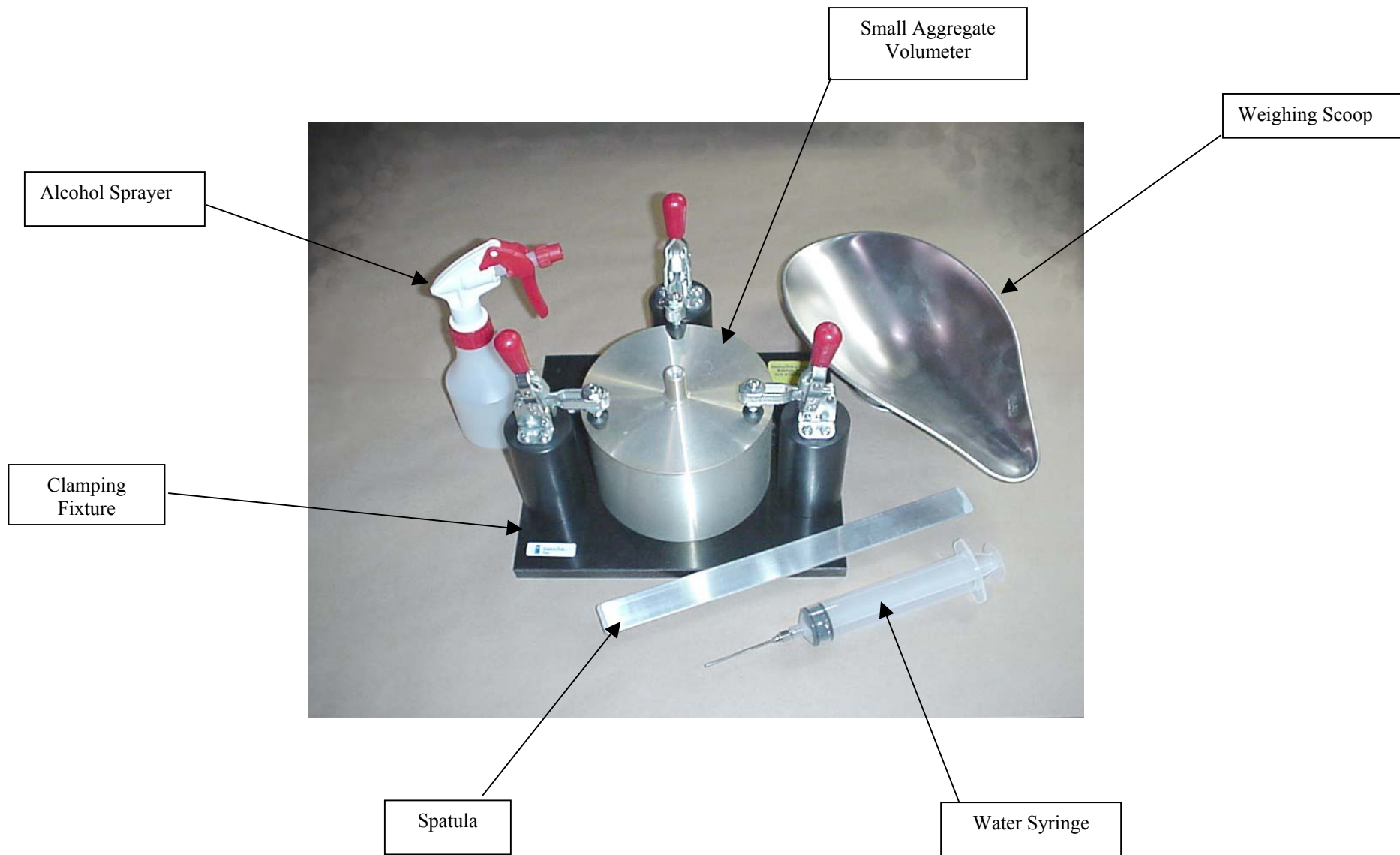
**Required Accessory: 18”X24”X18” water tank**

**Note: Without an appropriately sized water tank, the chance of error in this test procedure will be increased significantly.**



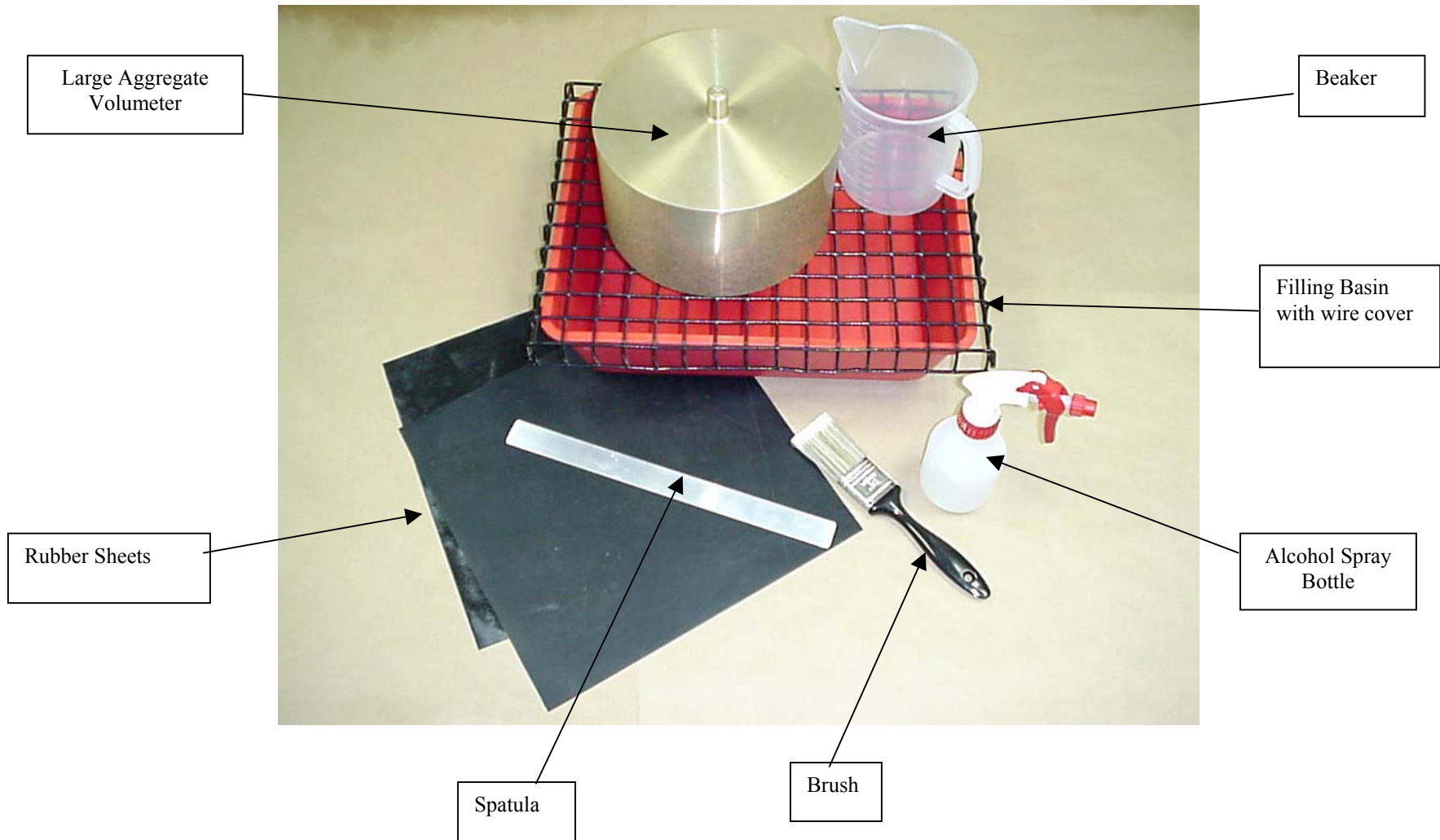


## Accessories: Fine Aggregate





## Accessories: Coarse Aggregate

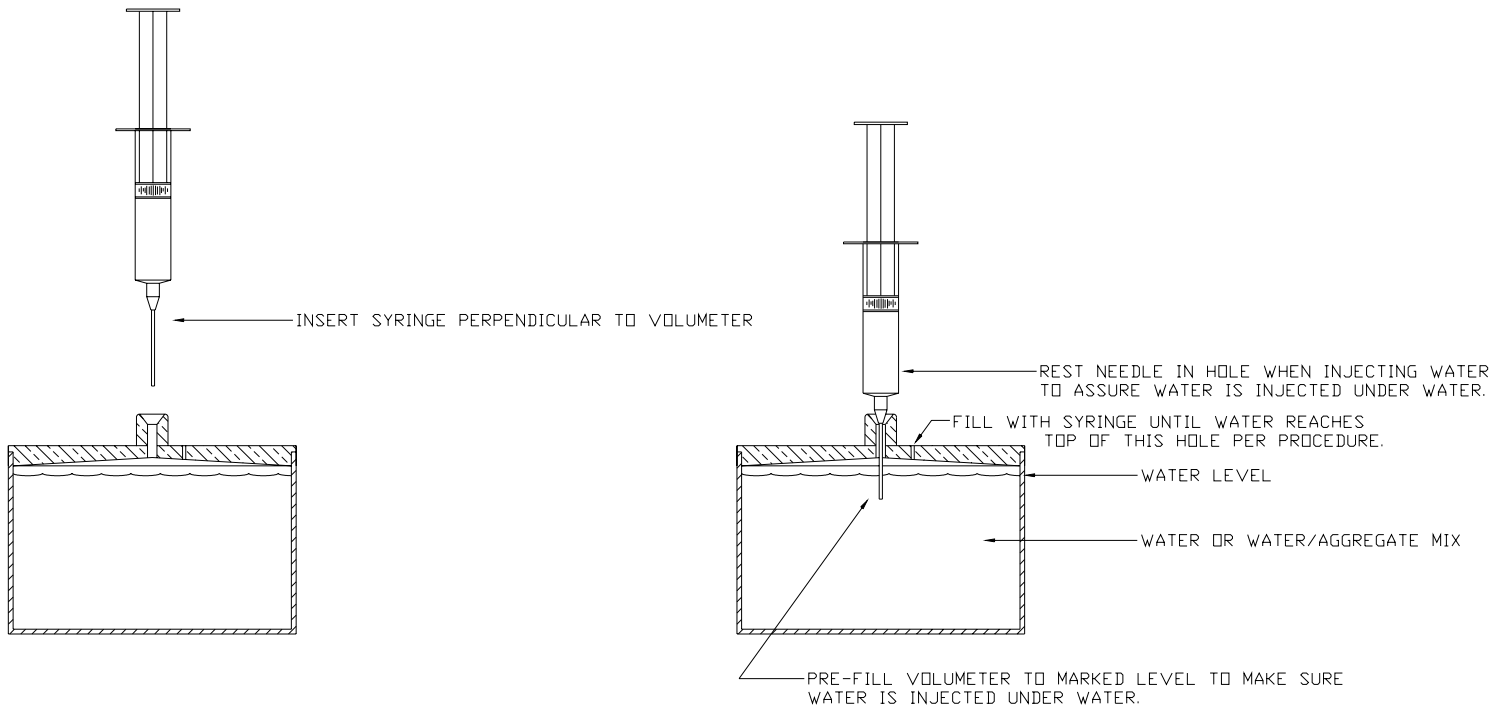






# VOLUMETER FILL PROCEDURE FOR INSTROTEK AGGPLUS SYSTEM

6/27/2001





## Volumeter Calibration Procedure: Fine Aggregate



Place the fixture on a level surface!

Fill water to the marked line in the volumeter



Close the clamps on the lid, be sure 1/8-inch hole faces toward the front.



Using the syringe, gently fill the container with water. Place the syringe tip under water level in the volumeter. Don't create air bubbles by injecting too quickly. Add water until water just comes out of small hole. Wipe extra water from around small hole.



Weigh the container and the fixture. Don't worry about seepage around lid at this point. Record the weight.

## Aggregate Testing Procedure: Fine Aggregate



Place the fixture on a level surface.

Place the container in the fixture and pour about 500 ml of water into the volumeter.

*Important: Complete the next 8 steps of this procedure in less than 2 minutes.*



Evenly distribute  $500 \pm 1$  grams of aggregate into the volumeter.



Push the spatula all the way down on the edge of the volumeter and gently pull to the middle. Repeat this step eight times by changing the starting position of the spatula.



Fill the volumeter with water. The water level should be at or below the line drawn inside the volumeter. Approximately 0.375".



Spray the water surface with isopropyl (rubbing) alcohol to remove air bubbles.



Place the lid on top of the volumeter. Make sure the 1/8" hole is facing the front.



Use the three clamps to clamp the lid down. Be sure 1/8-inch hole faces toward the front.



Using the syringe, gently fill the container with water through the center hole. Make certain the syringe tip is below the water surface in the volumeter. Stop as soon as water starts to come through the 0.125" hole on the lid



Use a towel to wipe excess water from the 1/8" hole. *Do not wipe water from the rim of the container if it seeps between lid and volumeter. Allow this water to remain on fixture.*





Place the fixture and the container on scales. Measure and record the weight

## Volumeter Calibration Procedure: Coarse Aggregate

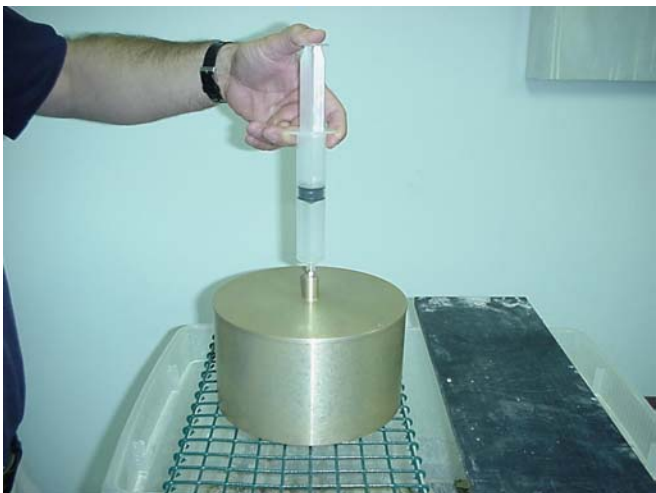


Place the fixture on a level surface!

Fill the volumeter with water all the way to the edge.



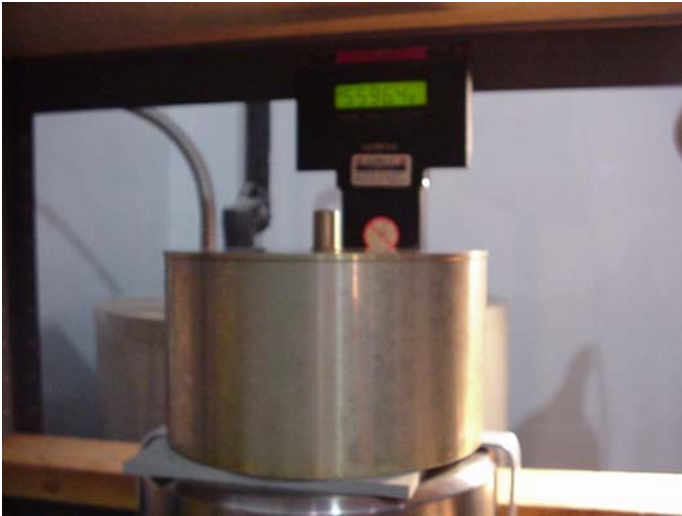
Place the lid on the volumeter and gently push down. Water should come slowly out of the post and sides of the lid. Rotate the lid on the volumeter to ensure good contact.



Position volumeter with the small hole to the front. Fill the volumeter with the syringe until water just comes out of the small hole. Insert needle completely to avoid introducing bubbles.



Dry the container removing all excess water.



Weigh the volumeter.

## Aggregate Testing Procedure: Coarse Aggregate



Place the fixture on a level surface.

Fill the volumeter approximately halfway with water.

*Important: Complete the next 6 steps of this procedure in less than 2 minutes.*



Evenly distribute  $1000 \pm 2$  grams of aggregate into the volumeter.



Gently move the aggregate around to remove any trapped air pockets.



Spray surface of water with alcohol to get rid of any foam or air bubbles on surface.



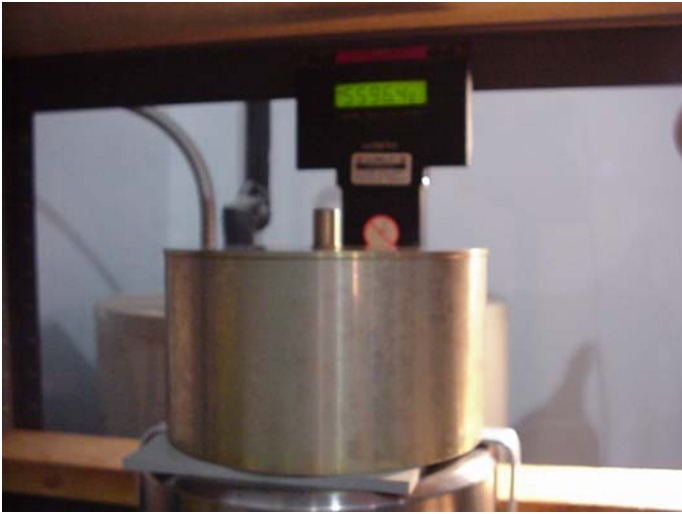
Fill the volumeter completely to the top with water and place the lid on making sure it is seated properly. Rotate the lid on the volumeter to ensure good contact.



Position volumeter with the small hole to the front. Fill the volumeter with the syringe until water just comes out of the small hole. Insert needle completely to avoid introducing bubbles.



Dry the volumeter with a towel.



Weigh the volumeter, aggregate, and water. Record the weight.



## Aggregate Apparent Gravity Determination: Coarse and Fine Aggregate

**Note: You DO NOT need the rubber sheets or the external large bag for FINE aggregate tests. Simply use a single small bag to perform this test. You may need the rubber sheets and the external bag if the fine aggregate contains sharp objects such as glass.**



Place the rubber sheet (for coarse aggregates) into the large external bag. Be sure it is centered and pushed all the way to the back of the external bag.



Place the sample (2000 grams for coarse aggregate, 1000 grams for fine aggregate test) into a small bag and place it into the large external bag.

Using your hand for coarse aggregate and by shaking the small bag for fine aggregate, be sure the aggregate is spread out as flat as possible and covers an area inside the area of the rubber sheet.



**Note: You DO NOT need the rubber sheets or the external large bag for FINE aggregate tests. Simply use a single small bag to perform this test. You may need the rubber sheets and the external bag if the fine aggregate contains sharp objects such as glass.**



Place the other rubber sheet on top and to the back of the small internal bag. Make sure the two protection sheets completely sandwich the small internal bag and sample. Also it is important that the rubber sheets don't restrict the opening of the small bag.



Seal the large external bag with the small bag and protection sheets inside. Be sure only the large bag is exposed to the heat-sealing strip.

**Note: You DO NOT need the rubber sheets or the external large bag for FINE aggregate tests. Simply use a single small bag to perform this test. You may need the rubber sheets and the external bag if the fine aggregate contains sharp objects such as glass.**



The rubber sheets should completely cover the aggregate.

Immediately transfer the sample to the water tank and submerge in water



Cut one side approximately 3-4 inches. Spread both bags open and hold for 45 seconds, allowing the water to get in. When the water has filled the bag and the aggregate falls to the bottom cut the other side approximately 3-4 inches. For fine aggregate cut 1.5 to 2" on each side

**Do this step with bag submerged in water!** (picture for illustration only)

Leave the cut bag under water for (20 minutes for coarse aggregate and 10 minutes for fine aggregate) to stabilize. Follow the procedures given in this manual for recording this weight. Use the AggSpec program to calculate absorption and gravities of the test sample.



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