SIMPSON
A Norican Technology

Operating Instructions

Methylene Blue Clay Tester

Model No. 42108

Type:	Methylene Blue Clay Tester
Model:	42108
Part No.:	0042108-ASM 0042108-M-ASM
Serial Number:	

Name and address of manufacturer:

Simpson Technologies
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Naperville, IL 60563

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1 Introduction

The Methylene Blue Clay test measures the amount of active bentonite present in foundry molding sands by determining the absorption exchange capacity of the bentonite. Absorption capacity depends on the clay's initial properties and on the thermal treatments they have undergone. An intense heating reduces the absorption capacity.

Once bentonite exceeds a certain temperature, which varies with each type of clay, the absorption exchange capacity is completely eliminated as is its ability to bond with molding sand. This material, dead clay, is not detected in the Methylene blue clay test.

Therefore, when the exchange capacity of fresh bentonite clay (measured as milliliters of Methylene blue solution per gram of clay) is determined, the amount of good live bentonite is determined by comparison.

The Methylene blue clay test will not determine the ratio of sodium to calcium bentonite within a sand system. Since this ratio may change in foundries using bentonite blends, it may be important to check and control. The wet tensile test would be the best method of controlling clay ratios.

Fire clay, kaolinites, has a very low absorption capacity and is not detected by the Methylene blue clay test.

Electric current: 110 volts, 50 or 60 Hz

Power: 100 W

Weight: 21 kg. (46 lbs.)

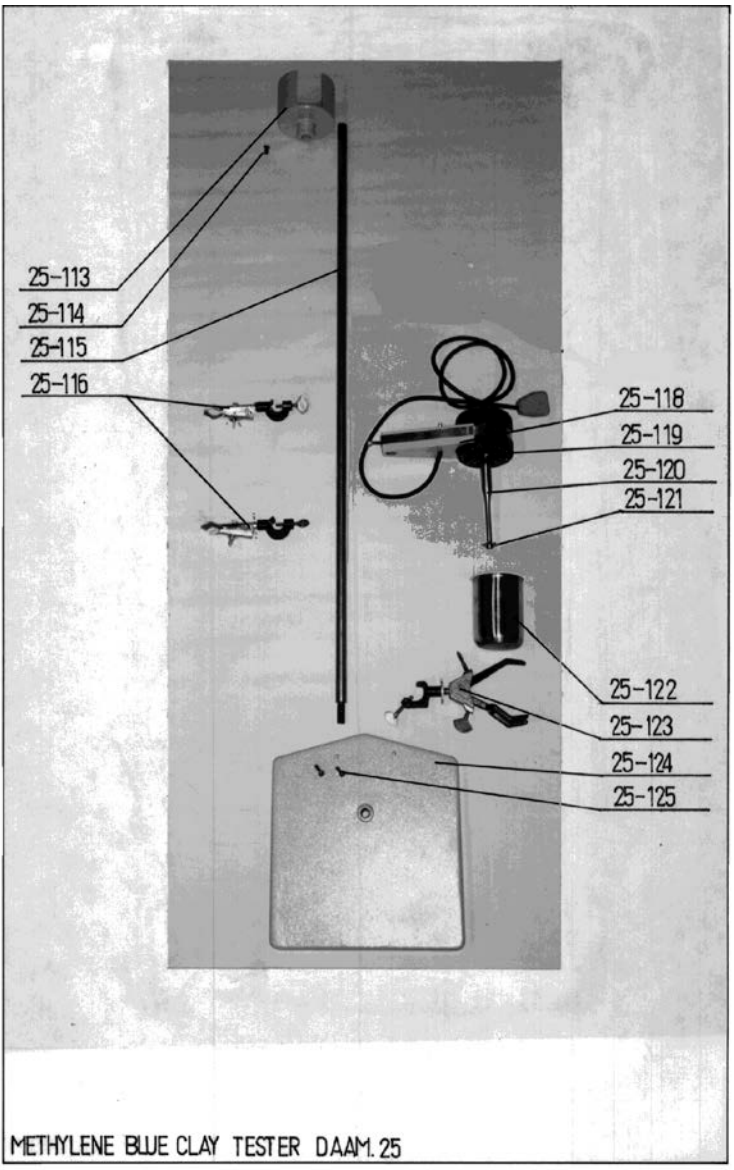
Dimensions: (millimeters): 250 x 300 x 750

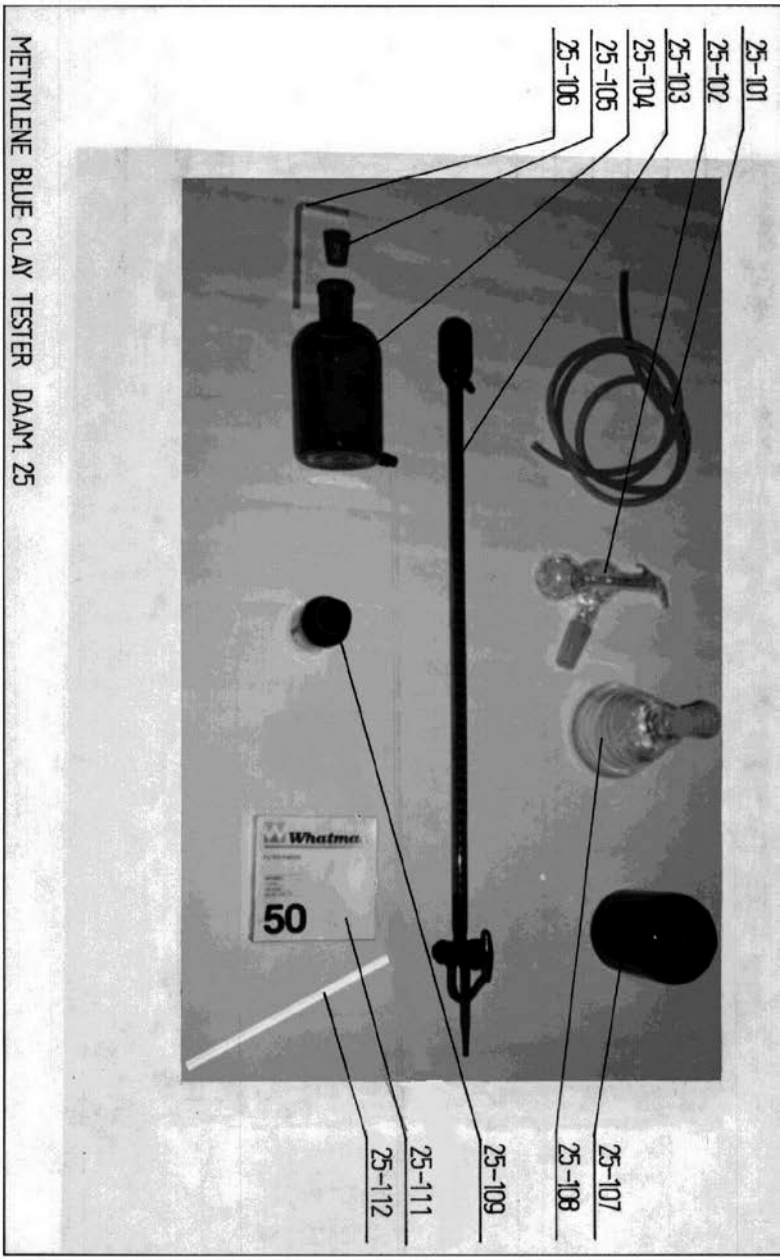
(Inches): 1 x 12 x 29.5

2 Parts

Part No.	Description
25-101	Rubber hose
25-102	Repeating pipettor head
25-103	Buret
25-104	Mariotte flask
25-105	Rubber plug
25-106	Venting glass tube
25-107	Overflow bottle
25-108	Repeating pipettor flasks
25-109	Methylene blue, 25 g bottle
25-111	Filter papers, box of 100 units
25-112	Glass rod
25-113	Mariotte flask support
25-114	Base fastening screw
25-115	Support column
25-116	Buret holding clamps (2)
25-118	Motor support
25-119	Electric motor
25-120	Agitator shaft
25-121	Agitator disc
25-122	Stainless steel beaker 250 ml
25-123	Beaker support

25-124	Base plate
25-125	Overflow bottle holding screws (2)

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METHYLENE BLUE CLAY TESTER DAAM. 25

3 Assembly Instructions

For more information on how to use and care for your Simpson Analytics equipment and accessories visit our Simpson Technologies channel on YouTube and search our library of videos. Subscribe to our channel to keep updated on new releases.

3.1 Attach support column (25-115) to base plate (25-124).

A. Support column has following already attached:

a. Mariotte flask support (25-113)

b. Buret holding clamps (25-116) (2)

c. Beaker support (25-123)

d. Motor support (25-118) including electric motor (25-119), Agitator shaft (25-120) and agitator disc (25-115)

3.2 Align buret holding clamps (25-116) to left side of support column (25-115)

3.3 Attach buret (25-103) into buret holding clamps. Adjust height of buret and clamps so beaker (25-112) clears end of buret when placed under it.

NOTE: Attach buret holding clamps to buret at overflow reservoir and below 50 mL mark at bottom so mL calibration marks are not hidden by clamps.

3.4 Place 1000 mL mariotte flask (25-104) in holder (25-113) at top of support column. Holder may need to be re-oriented so cut out area is to the left of support column. Simply unscrew center screw in holder, rotate holder and re-tighten screw.

3.5 Push one end of rubber hose (25-101) on to hose connection on 1000 mL flask. Place 1000 mL flack into flask support.

3.6 Route rubber hose down to hose connection on buret. IMPORTANT: Leave enough slack in hose so no sharp bends are made. Cut hose at buret connection point and push hose from flask on to buret connection.

3.7 Push one end of remaining hose on to buret overflow connection at top of buret. Route hose down towards the base plate. Place overflow bottle (25-107) immediately behind support column. Place end of hose from overflow into bottle. Hose need only be inserted into bottle approximately 1".

3.8 Secure the two hoses to support column with supplied snap on clamps.

3.9 Align motor support (25-118) to right of support, column. Plug motor cord into 110 volt outlet.

3.10 Align beaker support (25-123) so motor agitator shaft (25-120) is between clamps. Beaker support should be aligned so clamps are at lower end area of agitator shaft.

3.11 Place beaker (25-122) in clamps and adjust clamp alignment so agitator shaft is in center of beaker. Correct adjustment is when bottom of beaker is about 1/8" away from agitator blade and clamps hold beaker at mid point. Agitator blade must not contact beaker in any manner.

3.12 After filling repeating pipettor flask (25-108) with sodium pyrophosphate solution (see AFS mold and core test handbook for formulation and preparation) place repeating pipettor head (25-102) into flask (25-108) and secure with spring clips.

4 Preparation of 2% Tetrasodium Pyrophosphate Solution

4.1 A 2% tetrasodium pyrophosphate solution is necessary to aid in the removal of bentonite from sand grains and the breakdown of any clusters of bentonite platelets. In order for methylene blue solution to properly react with all bentonite platelets they must be uncombined with sand and other platelets.

4.2 To prepare a 2% solution of tetrasodium pyrophosphate solution add either:

a. 33.5 grams of $Na_4\ P_2\ O_7 \cdot 10\ H_2O$ (hydrated tetrasodium pyrophosphate) to one liter of distilled water.

or

b. 20.0 grams of Na4 P2 O7 (anhydrous tetrasodium pyrophosphate) to one liter of distilled water.

NOTE: The Simpson/Gerosa Methylene Blue Clay Tester Kit No. 42108 does not include the above chemical.

4.3 Mix solution until crystals are totally dissolved.

4.4 Transfer mixed solution to the repeating pipettor flask (25-108) and place repeating pipettor head into flask.

5 Preparation of Methylene Blue Solution

5.1 **To prepare 1 liter of methylene blue solution, carefully weigh 3.74 grams of zinc free methylene blue crystals (methyltheonine chloride $C_{16}H_{18}N_3SCl \cdot 3H_2O$). Transfer methylene blue crystals into a 1000 milliliter or greater volumetric flask. Add 500 milliliters of distilled water to the volumetric flask. Stir with a magnetic stirrer for 30 minutes. If a magnetic stirrer is not available, then a manual or mechanical type device will work. Add another 500 milliliters of distilled water to the premixed solution within the volumetric flask. Stir the 1000 milliliter solution. Transfer the mixed solution into a dark brown glass container and allow to stand for twelve hours before use.**

5.2 **Methylene blue solution can be purchased premixed. Both the unmixed and premixed type solutions are appropriate for this test.**

5.3 **A calibration factor for the mixed methylene blue solution must be determined prior to use.**

5.4 **Solution strength is defined as the amount of methylene blue (measured in milliliters of uptake) needed to titrate 1 percent of a particular bentonite or blend of bentonites. This number is often referred to as the calibration factor or CF.**

5.5 **To calculate the CF of a mixed methylene blue solution a 6% bentonite standard is prepared.**

5.6 **To produce a 6% standard or equivalent mix, weigh out 0.30 grams bentonite as received from the clay supplier and 4.70 grams of new sand as received from the sand supplier.**

NOTE: This step must be performed with the Simpson/Gerosa digital balance 42118 or an equivalent balance capable of measuring to .01 grams

5.7 Transfer the weighed bentonite and sand to the 250 milliliter stainless steel beaker (25-122). Dry mix the material by tilting and gently rotating the beaker by hand.

5.8 Next add 5 grams of 220 mesh silicon carbide to the stainless steel beaker and dry mix the material by tilting and gently rotating the beaker by hand.

5.9 Add 50 milliliters of 2% sodium pyrophosphate from the repeating pipettor flask (25-108). Make sure that no clay or sand is adhering to the sides of the stainless steel beaker (25-122). Wash any adhering material from the sides of the beaker using additional sodium pyrophosphate.

5.10 Gently place the stainless steel beaker into the 250 milliliter beaker support supplied with the Simpson/Gerosa ultrasonic cleaning unit 42108A. Check that the water within the ultrasonic cleaner is at the recommended operating level (one inch from the top). Fill unit using warm tap water.

5.11 Turn on the ultrasonic cleaner (42108A) for seven minutes. This cleaning cycle will help to insure that all clay colonies are dispersed and that all clay is in solution.

5.12 **Fill buret (25-103) with methylene blue solution by rotating the valve located at the bottom of the buret until several drops of solution come over the overflow tip.**

5.13 **Remove the stainless steel beaker from the ultrasonic cleaner and position it directly under the filled buret (25-103). Add roughly 80 percent of the estimated methylene blue uptake requirement by turning the valve on the filled buret. In most cases, when determining the calibration factor, the estimated requirement is between 24 and 26 milliliters of methylene blue solution. After this addition is made transfer the stainless steel beaker to the beaker support (25-123) so that the agitator disc (25-121) is approximately 1/8" from the beaker bottom. Stir with electric motor agitator for 2 minutes.**

5.14 **After stirring, remove the stainless steel beaker from the beaker support and using a glass rod (25-112) gently stir the solution so that the rod occasionally rubs the bottom of the beaker. Remove the glass rod and make a methylene blue spot on a single piece of Whatman 50 hardened filter paper (25-111). If a light blue halo does not appear around the deep blue spot within a minute, then add one more milliliter of methylene blue solution and repeat the stirring process in step 5.13. Continue to add methylene blue solution at 1 milliliter increments until a halo which completely circles the dark blue spot appears. A complete halo is considered the end point.**

5.15 **Record the number of milliliters required to reach end point.**

5.16 To determine the calibration factor CF, divide the number of milliliters to reach end point by 6. This number is then used to determine the percent live bentonite in an unknown system sand. Loosely attach the CF number to the M.B. clay tester for reference. The CF number must be determined for every new bottle or batch of methylene blue solution.

6 Determining the Methylene Blue Clay in System Sand

6.1 **Obtain a 50 to 100 gram representative sample from the sand system. Dry the sample in a moisture teller or drying oven. After drying, carefully weigh 5.0 grams on a Simpson/Gerosa digital balance (42118) or equivalent. Care must be taken not to include any core butts, metallic particles or other tramp material. Place the 5.0 gram sample in the 250 milliliter stainless steel beaker (25-122).**

6.2 **Add 50 milliliters of 2 percent tetrasodium pyrophosphate from the repeating pipettor (25-108).**

6.3 **Install the stainless steel beaker into the Simpson/Gerosa ultrasonic cleaner (42108A) and turn on the cleaner for 7 minutes.**

6.4 **Remove the stainless steel beaker from the ultrasonic cleaner and place directly under the buret (25-103) filled with methylene blue solution. Add 80 percent of the estimated methylene blue solution required to reach end point. This number is determined by estimating the percent clay within the 5.0 gram sample. In other words, the percent live bentonite in the sand system. Multiply the estimated live bentonite by the CF number and multiply the product by .8. This calculation will determine the initial amount of methylene blue solution that must be added to the stainless steel beaker (25-122).**

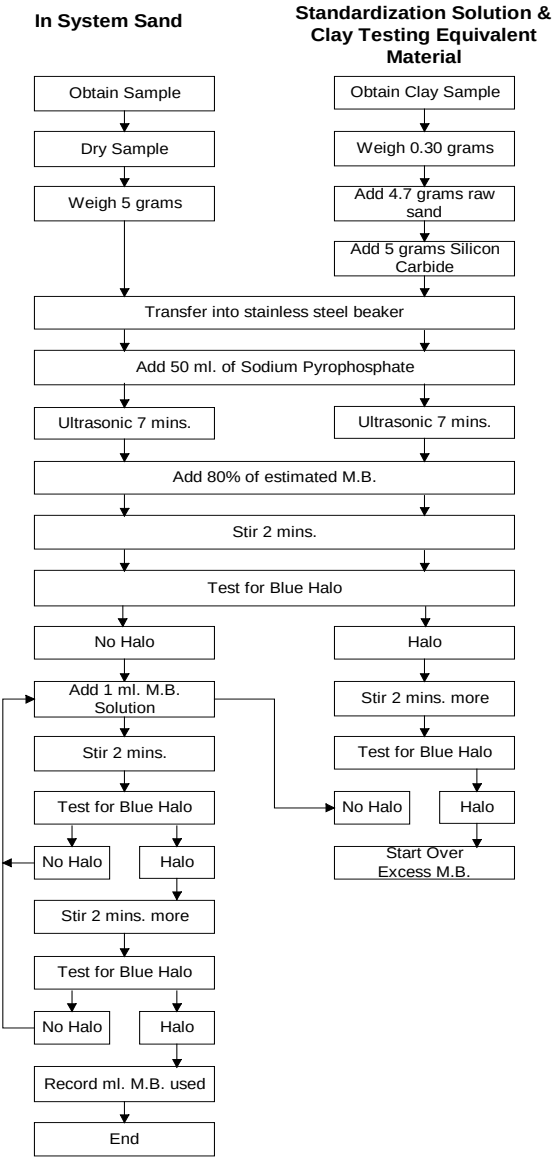
6.5 **After adding the estimated milliliters of methylene blue solution install the stainless steel beaker in the beaker support (25-123). Turn on the electric motor (25-119) and stir the solution for 2 minutes.**

6.6 Remove the stainless steel beaker from the beaker support, allowing time for the solution to drain from the agitator shaft and disc (25-120 and 25-121). Prepare a sheet of Whatman 50 hardened filter paper. Gently stir the methylene blue/system sand solution with the glass rod (25-112) occasionally striking the bottom of the beaker with the rod. Using the glass rod, a single drop of solution is placed on the filter paper. If no light blue halo appears around the dark blue spot after approximately one minute, then return the beaker to the buret and add one more milliliter of methylene blue solution. Follow the directions in steps 5 and 6 until a light blue halo forms completely around the deep blue spot on the filter paper. The end point is then checked by giving the solution another 2 minutes of stirring and transferring a drop to the filter paper to be sure that the halo persists. Record the number of milliliters of methylene blue solution that was added to reach end point.

NOTE: If more than five one milliliter additions are made to the sample, then the entire process must be repeated.

6.7 To determine the percent live bentonite in the system sand divide the milliliters of methylene blue solution added to reach end point by the calibration factor (CF).

Methylene Blue Clay Determination



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