SIMPSON
A Norican Technology

Operating Instructions

Sand Rammer

Model 42100

Accessories:	Model:
Tube Filler Accessory	42100A
Sand Rammer Base	42100C
Sand Rammer Pedestal	42100D
Stripping Post	PAB
Rowell Flowability Tester	42100E
Transverse Core Box Strength Accessory	42100F
Tensile Core Box Strength Accessory	42100G

Type:	Sand Rammer
Model:	42100
Part No.:	0042100 0042100-M
Serial Number:	

Name and address of manufacturer:

Simpson Technologies
2135 City Gate Lane Suite 500
Naperville, IL 60563

For other Simpson Technologies offices around the world and for our contact information please visit us on the internet at simpsongroup.com on the Contacts page.

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1 Introduction

Congratulations, you have just purchased an extremely reliable sand testing instrument that is backed by the professional technical support and years of proven sand technology experience of Simpson Technologies .

This laboratory equipment is constructed of quality materials and is the result of unsurpassed craftsmanship. The Sand Rammer should be operated only when it is in perfect condition, in accordance with its designed purpose and being aware of possible hazards. Observe the safety instructions in Section 2 and operating instructions in Section 5.

1.1 Application and Designated Use

The Sand Rammer, Model 42100, is intended exclusively for preparing test samples consisting of foundry sand. Usage of other materials may be possible upon consultation with the Technical Service department of Simpson Technologies.

Any other application outside the intended usage will be regarded as use not in accordance with its purpose, and, therefore, the manufacturer / supplier will not be held liable for any damage that might arise thereunder. The risk in this case will be exclusively that of the User.

1.2 Organizational Measures

The operating instructions should be readily available at the place of operation. In addition to the operating instructions, the general legal regulations or other mandatory rules for prevention of accidents and environmental protection should be made known and be observed!

The personnel instructed to use this apparatus, before beginning work, should have studied and fully understood these Operating Instructions, in particular the "Safety" chapter.

No modifications, extensions or changes of design of the device that would impact safety requirements should be put into effect without prior consent of the supplier! Spare parts must conform to the technical specifications defined by the manufacturer. This is always guaranteed when using original spares.

2 Safety

NOTICE

Before operating and/or performing maintenance or repair on Simpson Technologies designed and/or manufactured equipment, it is required that all personnel have read and understood the entire Operating Instructions manual. If any questions exist, you must contact your supervisor or Simpson Technologies before taking further action.

If properly operated and maintained, your Simpson Technologies supplied equipment can provide many years of dependable and safe operation. Please follow all recommended safety, operating, and maintenance instructions. Furthermore, the introduction of any non-Simpson Technologies manufactured and/or approved parts to the equipment may create a hazardous situation. Never alter the equipment without prior consultation with Simpson Technologies .

DO NOT use this machine for purposes other than that for which it was intended. Improper use could result in death or serious injury.

2.1 Safety Signs and Labels

Simpson Technologies has incorporated the ANSI Z535.6 / ISO 3864-1-2 safety symbol only label format on all of its laboratory equipment.

The harmonized ANSI Z535.6 format became an established safety label format since it not only fully meets the current ANSI Z535 standards, but also incorporates ISO 3864-2 symbols into the hazard severity panels and, thus, can be used for both the U.S. and international markets.

2.1.1 Safety Alert Symbols

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. OBEY all safety messages that follow this symbol to avoid possible injury or death.

DANGER! I*ndicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.*

The safety alert symbol used without a signal word to call attention to safety messages indicates a potentially hazardous situation which, if not avoided, could or may result in death or minor to serious injury.

NOTICE indicates information used to address practices not related to personal injuries but mayresult in property damage.

This symbol indicates information containing important instructions concerning the use of the machine or directions for further procedures. Ignoring this information can lead to malfunction of the machine.

2.1.2 Safety Symbol Labels

HAND CRUSH / FORCE FROM ABOVE
(STC #214058)

This label is located on the front of the base, in line with the ramming rod.

While performing a test or calibrating the Sand Rammer; the ramming weight free falls, striking the anvil every time the main cam completes one revolution while preparing a sand specimen. Also, when placing the anvil with the weight in the upper position for calibrating or housekeeping purposes, the weight and anvil will free fall if the auxiliary cam is not in the locked position, which may crush or cut body parts if Safety System Procedures are not followed. When performing any maintenance, the anvil and weight must rest on the frame; this will put the sand rammer into Zero Mechanical State (ZMS).

READ AND UNDERSTAND ALL SERVICE MANUAL INSTRUCTIONS
(STC #214042)

This label is located on frame right corner of the Sand Rammer.

Before operating and/or performing any maintenance or repair on Simpson Technologies designed and/or manufactured equipment, it is required that all personnel read and understand the entire Operating Instructions manual. If any questions exist, you must contact your supervisor or Simpson Technologies before taking further action. Follow Safety System Procedures before servicing.

2.2 Safety System Procedure

NOTICE

Whenever performing any type of maintenance or repair, whether in the form of cleaning, inspection, adjustment or mechanical maintenance, the equipment must be rendered into ***Zero Mechanical State (ZMS)****.*

Prior to any maintenance (routine or otherwise) or repair of equipment, a safety procedure should be established and maintained. This procedure should include training of personnel; identification and labelling of all equipment which is interlocked mechanically, through levers, gravity or otherwise; and a listing of the established procedures posted on each equipment.

Glossary:

Authorized Person(s) - Personnel who have been designated by his/her department to perform maintenance or service on a piece(s) of equipment, machinery or system, and are qualified to perform the work through proper training on Safety System Procedures for the equipment, machinery or system.

Zero Mechanical State - The mechanical potential energy of all portions of the equipment or machine is set so that the opening of pipes, tubes or hoses, and the actuation of any valve, lever or button, will not produce a movement which could cause injury.

3 Short Description & Specifications

3.1 Application

The Sand Rammer, Model 42100, is a device that compacts a standard AFS 2 in. x 2 in. or Metric 50 mm x 50 mm cylindrical sand specimen for compression, shear, splitting, deformation, and tensile tests. The unit can also be used to determine the compactability of standard molding sands.

A well-defined ramming energy is applied to transform the sand filling of the specimen tube into a test sample.

3.2 Description

The apparatus (Figure 1) features a frame (Item 1) and auxiliary cam (Item 2) and main cam (Item 4) of high strength cast iron. The rest of the pieces are of hardened steel and specially coated for rust-proof protection from the corrosive laboratory environment.

Figure 10 shows the sand rammer with its main components, together with its standard accessories and add-on units. Included with the rammer are a cylindrical shaped specimen tube (Figure 10, Item 8) of 52/55 HRc tempered steel, with its internal surface roughness honed to less than 6 RMS. The surface finish of the tube is essential to obtain consistent results and the hardness and rustproof features provide long life. A tube pedestal (Figure 10, Item 7), that supports and closes the bottom of the tube, is built in the same rugged way as the specimen tube (Figure 10, Item 8); and a stripping post with a rubber ring (Figure 10, Item 9) on its base protects the tube against impact damage.

3.3 Specifications, Dimensions and Weights (Approximate)

Specifications	Sand Rammer (42100)
Length	7.5 in. (191 mm)
Width	9.5 in. (241 mm)
Height	22 in. (559 mm)
Weight	50 lbs. (22.7 kg)

3.4 Accessories

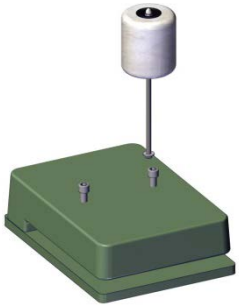
3.4.1 Tube Filler Accessory (Model 42100A)

This accessory is required with the Sand Rammer (Model 42100), Digital Pneumatic Sand Squeezer (Model 42160) and the Pneumatic Sand Squeezer (Model 42117) to determine the compactability of prepared molding sand.

Specifications	Tube Filler Accessory
Length	ca. 8.2” (210 mm)
Width	ca. 8.25” (210 mm)
Height	ca. 14” (356 mm)
Weight	ca. 2.6 lbs. (1.2 kg)

3.4.2 Sand Rammer Base (Model 42100C)

The Sand Rammer is mounted to this base to isolate the rammer from vibration variations to ensure consistent and accurate readings. The base is fitted with a Specimen Tube Swab (Part No. 0042100J) to clean and prepare the specimen tube before testing.



Specifications	Sand Rammer Base
Length	ca. 10” (254 mm)
Width	ca. 14” (356 mm)
Height	ca. 33.5” (89 mm)
Weight	ca. 112.5 lbs. (51.1 kg)

3.4.3 Sand Rammer Pedestal (Model 42100D)

The Sand Rammer Base, Model 42100C, and the Sand Rammer, Model 42100, mount to this column to eliminate vibrations that can affect the accuracy of the results and disturb other sensitive instruments on the same bench.

Specifications	Sand Rammer Pedestal
Diameter	ca. 10.5” (267 mm)
Height	ca. 33.5” (851 mm)
Weight	ca. 73 lbs. (33.2 kg)

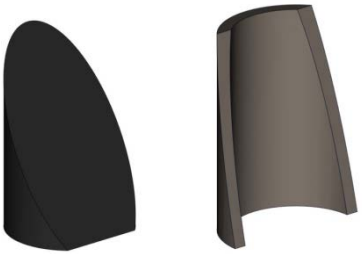
3.4.4 Stripping Post (Model PAB)

To strip the test specimen and to clean the precision test specimen tube. The replacement tube cleaning swabs is Part Number 592-820-141-1.

Specifications	Stripping Post
Length	5.5” (140 mm)
Width	5.5” (140 mm)
Height	7.95” (202 mm)
Weight	4.85 lbs. (2.2 kg)

3.4.5 Rowell Flowability Tester (Model 42100E/42100E-M)

The Rowell flowability tester is used to determine the flowability of a molding sand. Sands that do not have adequate flowability typically result in low density molds at the mold/metal interface in deep pockets and narrow sand cross sections.



Specifications	Rowell Flowability Tester
Length	ca. 2.5” (64 mm)
Width	ca. 2.5” (64 mm)
Height	ca. 2.5” (64 mm)
Weight	ca. 2.2 lbs. (1 kg)

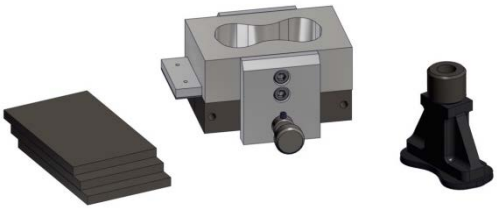
3.4.6 Transverse Core Box Strength Accessory (Model 42100F)

The Transverse Core Box Accessory is used with the Sand Rammer, Model 42100, to make sand specimens of 1 x 1 x 8 in. (22.36 x 22.36 x 175 mm), for the transverse strength tests of core sand mixtures.

Specifications	Transverse Core Box Strength Accessory
Length	ca. 8.25” (210 mm)
Width	ca. 4.5” (114 mm)
Height	ca. 4.5” (114 mm)
Weight	ca. 11.5 lbs. (5.2 kg)

3.4.7 Tensile Core Box Accessory (Model 42100G)

The Tensile Core Box Accessory is employed with the Sand Rammer, Model 42100, to make sand specimens of 1^2 in. (22.36^2 mm) cross section, for tensile strength tests of core sand mixtures.



Specifications	Tensile Core Box Accessory
Length	ca. 4” (102 mm)
Width	ca. 4” (102 mm)
Height	ca. 4” (102 mm)
Weight	ca. 4.4 lbs. (2 kg)

4 Unpacking and Installation

4.1 Unpacking

NOTICE *Your new Laboratory Equipment has been closely inspected before being shipped to your plant. However, damage can occur in route, so it is wise to inspect all equipment on arrival. Notify both the carrier and Simpson Technologies of any damage at once. Damage should be noted on the shipper's receipt before signing for receipt of the shipment.*

The Sand Rammer, Model 42100, is shipped in one piece and is intended to be used as received; no further assembly/disassembly is required. No lifting equipment is required for handling. The machine weighs approximately 50 lbs. (23 kg). Due to its bulky dimensions and tight-fitting shipping crate, it is recommended that two people remove the equipment from the crate. Whenever positioning or relocating this instrument, two people should be utilized. The approximate instrument dimensions are 18” (457 mm) x 12” (305 mm) x 12” (305 mm). Its shipping weight (in a crate) is 75 lbs. (34 kg).

ONLY authorized personnel may unload and install this equipment. Two people may be required to unpack this instrument due to the bulky dimensions and tight-fitting packing crate.

1. Remove any loose accessories/parts within from the shipping crate and place in a location away from any packaging material to assure that these items are not misplaced.
2. Carefully remove sand rammer from the packing crate and place on stable bench.
3. Once removed from the crate, proceed by taking off any protective wrap and unpackage the protective material from the included accessories.
4. The packaging remains the property of the Customer and may be used for returning the apparatus if some repair is required.

4.2 Components

Your new Sand Rammer is shipped with the following accessories and installation components. Please take a moment to identify that the following items were included:

- Sand Rammer
- Operating Instructions Manual
- Specimen Tube
- Tube Pedestal
- Stripping Post

If any of the above components or literature is missing, call your local Simpson Technologies office.

NOTICE *Do not store the device in the open and unprotected from atmospheric conditions. If this instruction is not followed, claims under guarantee will no longer be considered.*

4.3 Installation

The installation of the apparatus is the responsibility of the Client to include procuring and preparing the material required for this purpose.

In order to guarantee effective performance, the sand rammer should be situated close to the gas permeability tester and the universal strength testing machine. However, the vibrations produced by the sand rammer must not be transmitted to the other devices.

The sand rammer would likely be occupied by one operator at a time. It is used in a foundry sand laboratory with the measurement scales placed at eye level for the operator. It should also be placed in an ergonomically correct position so that the operator can easily handle the two cranks on each side of the unit.

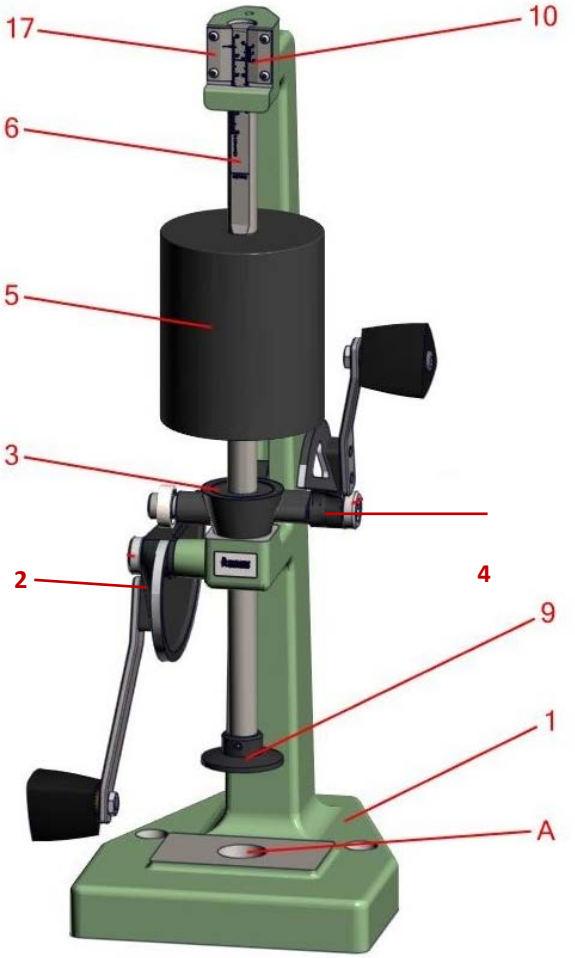


Figure 1: Sand Rammer Main Components

4.4 Set-Up

1. Standards require that the Sand Rammer, Model 42100, be anchored on a firm support. For that purpose, use the Sand Rammer Base, Model 42100C, that weighs approximately 110 lbs. (50 kg). In order to avoid transmission of the ramming vibrations to lab benches, use the Sand Rammer Floor Pedestal, Model 42100D.
2. The pedestal must be placed with its upper flange perfectly horizontal; any inclination will be transmitted to the base and the sand rammer, and the stem (Figure 1, Item 6) will not remain vertical. Shim as needed and bolt pedestal firmly to the floor.
3. Firmly bolt the sand rammer to the base by means of two M12 Allen head bolts which are supplied with the base. Be sure that both surfaces are perfectly clean.
4. The sand rammer and base assembly can now be placed on the rammer pedestal between the four Allen screws located on the outside edges of the Pedestal.
5. Lubricate the stem (Figure 1, Item 6) with light oil (SAE 10). Remove the excess oil with a clean, absorbent cloth. Leave the stem lightly oiled so that everything slides freely. The apparatus must be always kept as described.
6. Never turn the main cam (Figure 1, Item 4) without a molding sand mass in the specimen tube, lest the impact energy of the falling weight (Figure 1, Item 5) be absorbed by the frame (Figure 1, Item 1) and affect the alignment.
7. The equipment is ready for use.

This manual provides operating instructions for both the American Foundry Society (AFS) model and the Metric model sand rammer. The step-by-step instructions will always refer first to the AFS Standard Sand Testing references, followed by the Metric Standard Sand Testing references. To determine if your instrument is an AFS or Metric model, refer to the model number listed on the machine's nameplate. The AFS Sand Rammer is Part No. 0042100, and the Metric Sand Rammer is Part No. 0042100-M.

4.5 Rammer Scales

The Sand Rammer is designed with four scales. Two are affixed to the rammer frame and are referred to as the 2 in. (AFS standard) or 50 mm (Metric standard) Vernier scale, which is on the left side (Figure 1, Item 17) and the specimen height Vernier or right Vernier scale (Figure 1, Item 10). The other two are etched directly to the stem (Figure 1, Item 6) and are referred to as the compactability scale (left side) and specimen height scale (right side)

4.5.1 Scale Ranges

Metric Scale Ranges	42100-M
50 mm Vernier (left Vernier Item 17)	50 mm ±0.1 mm
Specimen height Vernier (right Vernier Item 10)	0 - 10 (graduated in 1 mm)
Compactability scale (left side stem)	20 - 70%
Specimen height scale (right side stem)	40 mm - 70 mm (graduated in 1 mm)

AFS Scale Ranges	42100
2-inch Vernier (left Vernier Item 17)	2 ±1/64"
Specimen height Vernier (right Vernier Item 10)	0 - 8 (graduated in 1/128")
Compactability scale (left side stem)	20 - 70%
Specimen height scale (right side stem)	1.5" - 3" (graduated in 1/16")

4.6 Airborne Noise Emission

Regarding airborne noise emission by the Sand Rammer, Model 42100, there is no motor or other noise emitted by this machinery other than the low, metallic hammering noise caused by the falling weight striking the anvil. Therefore, the equivalent continuous A-weighted sound pressure level at the workstation does not exceed 70db (A).

5 Operating 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.

5.1 Compactability Testing

1. The specimen tube (Figure 10, Item 8) must be clean and lightly lubricated every time a sand sample is made. Apply a small amount of parting liquid to the tube swab.
2. Insert the tube swab through the specimen tube (Figure 10, Item 8) several times in order to clean and properly lubricate the inner surface.

The specimen tube must be clean and lightly oiled every time a sand sample is made. A dirty or non-lubricated tube will absorb, by lateral friction, an important fraction of the compacting work delivered by the three strokes of the rammer. Therefore, the resultant sample will have a higher compactability, less strength and more permeability than the one correctly prepared.

3. Insert the Specimen Tube (Figure 10, Item 8) onto the pedestal (Figure 10, Item 7) and place the assembly under the Tube Filler Accessory Model 42100A (section 3.4.1). Riddle prepared molding sands through the screen located on top of the tube filler accessory until sand overflows the specimen tube assembly.
4. Using the strike off bar supplied with the tube filler accessory, gently remove excess sand from the specimen tube.

Sand should be struck off from the center of the tube to the right and then to the left.

5. Gently move the pedestal and specimen tube assembly to the pedestal support on the base of the sand rammer (Figure 1, Item A).
6. Gently rotate auxiliary cam (Figure 1, Item 2) to lower the stem (Figure 1, Item 6) and compacting foot (Figure 1, Item 9) into the prepared sand within the specimen tube. Using a slow rotation of the main cam (Figure 1, Item 4), drop the weight three times with three complete revolutions of the cam.

While rotating the main cam be aware of a potential pinch hazard between the top of the anvil and ramming weight of the sand rammer. When rotating the main cam, the falling weight may crush your fingers or hand. Always keep hands and fingers clear from this area when performing a test.

7. Using the 2-inch mark (or 50 mm metric standard mark) on the left Vernier scale (Figure 1, Item 17), read and record the corresponding compactability number from the compactability scale etched on the left side of the stem (Figure 1, Item 6)

5.2 Preparing a Standard Test Specimen

1. The specimen tube (Figure 10, Item 8) must be clean and lightly lubricated every time a sand sample is made. Apply a small amount of parting liquid to the tube swab.
2. Insert the tube swab through the specimen tube (Figure 10, Item 8) several times in order to clean and properly lubricate the inner surface.

The specimen tube must be clean and lightly oiled every time a sand sample is made. A dirty or non-lubricated tube will absorb, by lateral friction, an important fraction of the compacting work delivered by the three strokes of the rammer. Therefore, the resultant sample will have less strength and more permeability than the one correctly prepared.

3. Insert the pedestal into the specimen tube and place the assembly under the Tube Filler Accessory (Model 42100A).
4. Remove the screen from the top of the Tube Filler Accessory.
5. Weigh a sample of prepared molding sand to make a 2" x 2" AFS Standard or 50 mm x 50 mm Metric standard sand specimen. To do this, riddle the prepared molding sand through the Tube Filler Accessory screen into an empty container. Place an empty weighing pan on top of a balance and zero the balance. Transfer the riddled molding sand to the weighing pan to achieve a predetermined sand specimen weight.

Because of different sand densities, moisture contents and other compositional differences between foundries, the amount of sand required to make a standard sand specimen can vary from foundry to foundry and from day to day. The required sample weight will need to be evaluated periodically to ensure that the sample height is within tolerances as described in Step 9 & 10 of this procedure. If you do not know the sand weight required to make a standard sand specimen, then start with approximately 165 grams and follow the procedure "Determining Sample Weight Using the Vernier Scale" in Section 5.3 of this manual.

6. Pour the prepared sand sample through the top of the tube filler accessory with the screen removed and ensure that all of the sand enters the specimen tube assembly.
7. Gently move the pedestal and specimen tube assembly to the pedestal support on the base of the Sand Rammer (Figure 1, Item A).
8. Gently rotate auxiliary cam (Figure 1, Item 2) to lower the stem (Figure 1, Item 6) and compacting foot (Figure 1, Item 9) into the prepared sand within the specimen tube. Using a slow rotation of the main cam (Figure 1, Item 4) drop the weight three times with three complete revolutions of the cam.

While rotating the main cam be aware of a potential pinch hazard between the top of the anvil and ramming weight of the sand rammer. When rotating the main cam, the falling weight may crush your fingers or hand. Always keep hands and fingers clear from this area when performing a test.

9. After three rams, verify that the rammed specimen is within the 2" ± 1/64" AFS standard or 50 mm ± .5 mm Metric standard height tolerance using the AFS standard 2 inch or Metric standard 50 mm left Vernier (Figure 2 or 3, Item 17). If the 2-inch AFS or 50 mm Metric line on the stem (Figure 2 or 3, Item 6), at approximately 58 on the compactability scale, falls between the upper and lower lines on the 2-inch AFS or 50 mm Metric left Vernier scale (Figure 2 or 3, Item 17), then the sample is within specifications.
10. If after three rams the specimen measured is below tolerance, this procedure must be repeated, starting at 5.2 Step 2, using a slightly larger starting weight of molding sand; and if the specimen measures above tolerance, this procedure must be repeated using a slightly smaller starting weight of molding sand.

5.3 Determining Sample Weight Using the Vernier Scale

1. Weigh out 165 grams of prepared molding sand and make a standard sand specimen following the procedure "Preparing a Standard Sand Specimen" in Section 5.2 of this manual.
2. Using the specimen weight right Vernier (Figure 2 or 3, Item 10), determine the number of divisions between the 2-inch mark on the AFS scale (or the 50 mm mark on the Metric scale) on the stem (Figure 2 or 3, Item 6) and the "0" mark on the specimen weight right Vernier. Record this number. This can be a negative number.
3. Before raising the auxiliary cam (Figure 1, Item 2) and compacting foot (Figure 1, Item 9) from the specimen tube assembly, determine the actual specimen height using the specimen weight right Vernier to the nearest 1/128" (0.1 mm). This is done by lining up the two closest etched marks between the specimen weight right Vernier and the specimen weight scale etched on the right side of the stem. This procedure is shown on the following sketch. Record this number.
4. After determining these two numbers, then the following calculation can be used to determine the proper sample weight for the next test.

AFS Example:

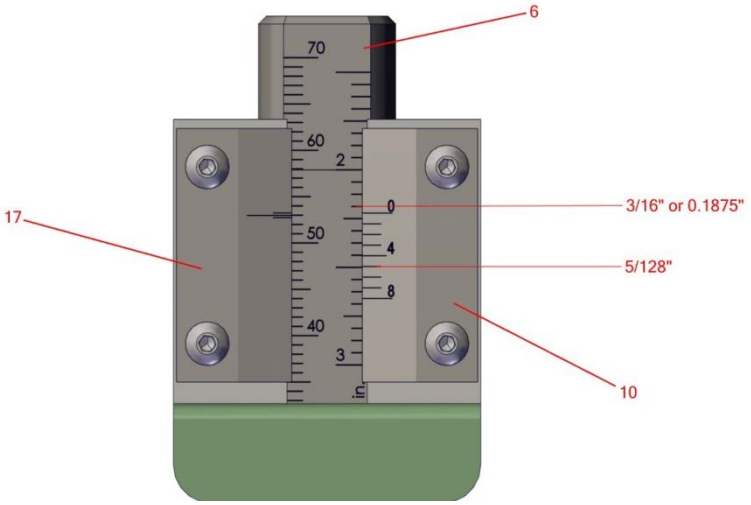


Figure 2: AFS Vernier

a) AFS Calculation:

CW = Calculated Weight for standard 2-inch specimen

SW = Starting Sand Sample Weight

SHN = Specimen Height to Nearest 1/128"

$$CW = \frac{SW \times 2}{SHN}$$

SW = 165 grams

SHN = 2" + 3/16" or .1875" (determined from Step 2) + 5/128" or .0390" (determined from Step 3) = 2.225"

$$CW = \frac{165 \text{ grams} \times 2}{2.225} = 148.2 \text{ grams}$$

CW = 148.2 grams - Based on this result a 148.2 gram sample should prepare a 2" specimen

Metric Example:

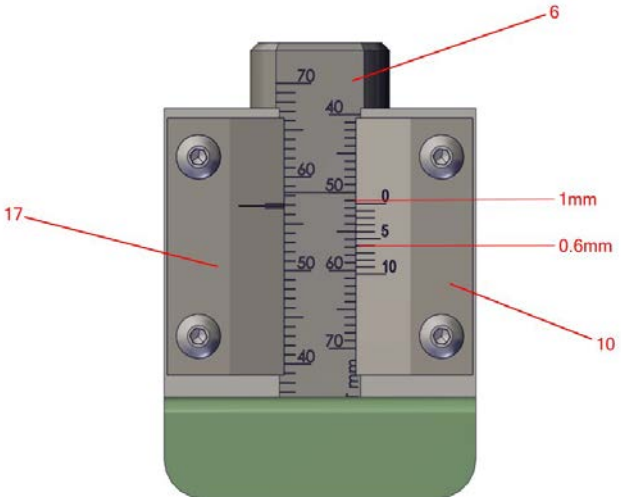


Figure 3: Metric Vernier

b) Metric Calculation:

CW = Calculated Weight for standard 50 mm specimen

SW = Starting Sand Sample Weight

SHN = Specimen Height to Nearest 0.1 mm

$$CW = \frac{SW \times 2}{SHN}$$

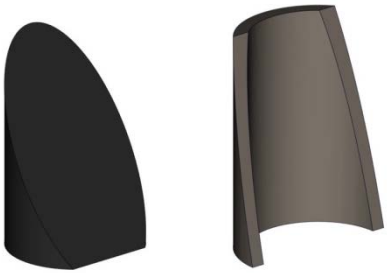
SW = 165 grams

SHN = 50 mm + 1 mm (determined from Step 2) + 6x 0.1 mm or 0.6 mm (determined from Step 3) = 51.6 mm

$$CW = \frac{165 \text{ grams} \times 50}{51.6} = 159.8 \text{ grams}$$

CW = 159.8 grams - Based on this result a 159.8 gram sample should prepare a 50 mm specimen

5.4 Rowell Flowability Tester



Part No. 42100E / 42100E-M

5.4.1 Description

The Rowell Flowability Tester is used to determine the flowability of molding sand. Sands that do not have adequate flowability typically result in low density molds at the mold/metal interface in deep pockets and narrow sand cross sections. This low density will result in several casting and molding defects including metal penetration, sand erosion, sand inclusions, broken molds and stickers.

The Rowell flowability is measured as relation between compacted hardness in two areas of a wedge-shaped specimen. At the narrow end of the wedge the sand is more difficult to compact and will show lower mold hardness compared to the wide end of the wedge.

The tester consists of a metallic wedge that is placed inside a standard specimen tube (Part No. 0042100H / 0042100H-M), and a curved metal support. Prepared molding sand is rammed into the wedge-shaped pocket with the Sand Rammer, Model 42100, and relative green hardness measurements at the extreme edges of the sample are taken using the Simpson Green Hardness Tester, Model 42142.

5.4.2 Equipment Required

- Rowell Flowability Tester
- Scale
- Sand Rammer, Model 42100
- Sand Rammer Base
- Green Hardness Tester - B Scale, Model 42142

5.4.3 Operation

1. Pass prepared molding sand through a no. 4 or no. 6 screen.
2. Place the clean wedge within the standard specimen tube/pedestal assembly and fill the specimen tube with the same amount of sand required to make a standard 2 in. x 2 in. AFS or 50 mm x 50 mm metric sand specimen.
3. Insert the specimen tube, wedge, sand, and pedestal assembly into the sand rammer. Gently lower the stem of the rammer into the specimen tube. Ram the molding sand within the specimen with three blows.
4. Using the stripping post, carefully remove the sand specimen and the metallic wedge from the specimen tube. Place the sand specimen on the curved plate supplied with the Rowell testing apparatus. The curved plate will support the sand specimen while determining the mold hardness.
5. With the sand specimen supported in the curved plate, using the Green Mold Hardness Tester-B scale, Model 42142, measure the green mold hardness at the narrow and wide ends of the specimen. (Figure 4). Position these points by aligning the edge of the mold hardness tester with the edges of the plane surface.

6. The Rowell flowability is expressed as the percentage of hardness at the narrow end of the mold, called the minor hardness, compared to the hardness at the wide end of the mold or the major hardness. As an example, if the minor hardness at the narrow end is 65 and the major hardness at the wide end is 90, with 65 being 72% of 90, the Rowell flowability is 72%.
7. For Rowell flowability on iron sands, flowability of 75% and upward is considered very good. Percentages below 65% are considered too low for iron sands.

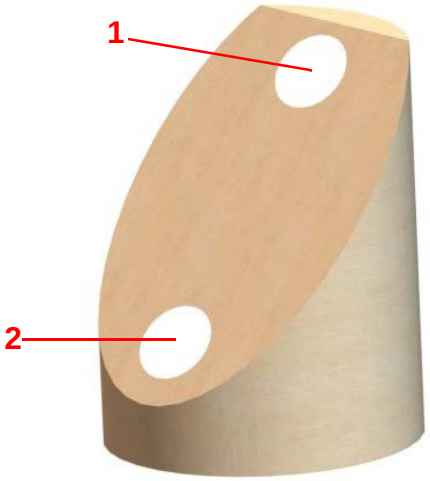


Figure 4: Mold Hardness Measurement Points - Lower Hardness (Point 1) and Higher Hardness (Point 2)

5.5 Transverse Core Box Strength Accessory

Part No. 0042100F-M / 0042100F

5.5.1 Description

The Transverse Core Box Accessory is used with the Sand Rammer, Model 42100, to make sand specimens of 1 x 1 x 8 in. (22.36 x 22.36 x 175 mm Metric, for the transverse strength tests of core sand mixtures.

It is supplied with three drying plates for baking or curing the sand specimens.

5.5.2 Equipment Required

- Transverse Core Box Strength Accessory
- Sand Rammer, Model 42100
- Sand Rammer Base
- Universal Sand Strength Machine, Model 42104

5.5.3 Operation of Core Box

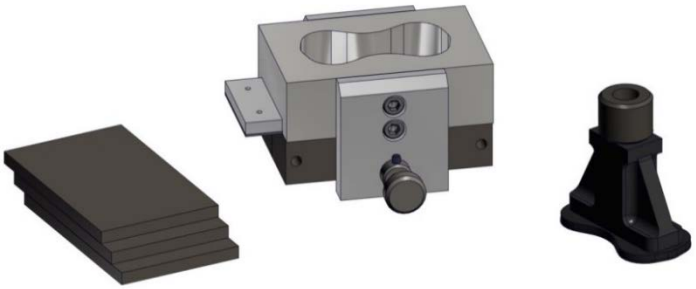
1. Remove the compacting foot (Figure 1, Item 9) from the Sand Rammer, Model 42100, by unscrewing it from the stem (Figure 1, Item 6).
2. In place of the compacting foot (Figure 1, Item 9), mount the long, rectangular head included in the accessory number 42100F on the main stem. Fasten it firmly by hand, keeping the long head crosswise to the sand rammer.
3. Mount the set with its base, core box, strike off and hopper. Spread sand evenly within the cavity of the hopper and core box. The amount of sand must be enough to fill the core box so the final height of the compacted sand will be at least equal to that of the core box, or a little higher. The strike off will be in the extracted position.
4. Gently place the rectangular compacting head over the sand and ram the sand with three strokes.
5. Strike off the excess sand with the strike off. Remove the hopper and the excess sand.
6. Place the resultant sand specimen in a drying oven.

5.5.4 Operation of Clamps

1. Attach the transverse clamps on the Electronic Universal Sand Strength Machine, Model 42104, by carefully aligning their guide pins into the respective holes on the movable and stationary clamp holders.
2. Place a baked sand specimen over the support pins of the transverse clamps.
3. Press the "Test Selection" key of the Electronic Universal Sand Strength Machine until the "Core Transverse" legend illuminates.
4. Press the "Start" key. The Electronic Universal Sand Strength Machine will apply a continuous load until the sand specimen fails. After specimen failure, the strength machine will automatically return to normal resting position. The digital display will show the transverse strength value.
5. Repeat the test five times and take the average.

NOTICE *For more information, see the manual for the Electronic Universal Sand Strength Machine, Model 42104.*

5.6 Tensile Core Box Accessory



Part No. 0042100G / 0042100G-M

5.6.1 Description

The Tensile Core Box Accessory is employed with the Sand Rammer, Model 42100, to make sand specimens of 12 in. AFS standard or 22.362 mm Metric standard cross sections for tensile strength tests of core sand mixtures.

It is supplied with three drying plates for baking or curing the sand specimens.

The Cold Tensile Strength Accessory clamps are mounted on the Electronic Universal Sand Strength Machine, Model 42104, for measurement of tensile strength of core mixtures, such as oil mixtures, hot box, and self-curing on coated sands. This is always a cold test.

5.6.2 Equipment Required

- Tensile Core Box Strength Accessory
- Sand Rammer, Model 42100
- Sand Rammer Base
- Universal Sand Strength Machine, Model 42104

5.6.3 Operation of Core Box

1. Remove the compacting foot (Figure 1, Item 9) from the Sand Rammer by unscrewing it from the stem (Figure 1, Item 6).
2. In place of the compacting foot, mount the shaped head on the main stem. Fasten it firmly by hand, keeping the head transversal to the Sand Rammer.
3. Mount the set with its base, core box, strike off and hopper. Spread sand evenly within the cavity of the hopper and core box. The amount of sand must be enough to fill the core box so the final height of the compacted sand will be at least equal to that of the core box, or a little higher. The strike off will be in the extracted position.
4. Gently place the shaped compacting head over the sand and ram the sand with three strokes.
5. Strike off the excess sand with the strike off. Remove the hopper and the excess sand.
6. Place the resultant sand specimen in a drying oven.

5.6.4 Operation of Clamps

1. Attach the clamps to the Electronic Universal Sand Strength Machine, Model 42104.
2. Place the baked sand specimen between the jaws of the clamps.
3. Press the "Test Selection" key of the Electronic Universal Sand Strength Machine until the "Core Tensile" legend illuminates.
4. Prior to the test, separate both clamps and slightly move the pulling pegs until they rest tightly on the sides of the sand specimen.
5. Press the "Start" key. The Electronic Universal Sand Strength Machine will start running, break the specimen, and return to its resting position. The digital display will show the tensile strength value.
6. Repeat the test five times and take the average.

NOTICE *For more information, see the manual for the Electronic Universal Sand Strength Machine, Model 42104.*

6 Maintenance and Calibration

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.

Despite its robust construction, the Sand Rammer, Model 42100, is a precise mechanical/electronic measurement device and needs appropriate care.

The Sand Rammer must be put into **Zero Mechanical State (ZMS).** Follow **Safety System Procedures** before servicing.

6.1 Maintenance

6.1.1 Daily Maintenance

- Clean the specimen tube after every usage. Prior to longer interruptions of operation, slightly rub it with acid-free oil (SAE 10).
- Remove and clean any loose sand/dirt from the outside of the Sand Rammer.
- Keep all the sliding, turning or supporting parts (contact surface between pedestal and frame) clean and lubricated. Remove any excess oil (SAE 10) with a clean, absorbent cloth.
- Check daily that the compacting foot (Figure 1, Item 9) is firmly screwed to the stem (Figure 1, Item 6).
- Keep the rammer and strength machine accessories clean and lightly oiled.

Do not use compressed air for cleaning.

6.1.2 Weekly Maintenance

- Regularly check the specimen tube (Figure 10, Item 8) for cleanliness, rust and/or pitting. It must be lightly lubricated every time it is used. A dry, rusted or pitted specimen tube will result in a loss of the compacting energy against the tube's inner surface due to friction. This will produce a sand specimen that is less compact and out of specifications.

6.1.3 Monthly Maintenance

- Specimen tubes in use should be checked against the standard (included in the Calibration Kit, Part No. 0042113-M/0042113) by comparing the compression strength and compactability tested in both tubes. If the difference is significant, the specimen tube must be replaced.

6.1.4 Semi-Annual Maintenance (every six months)

- Using a Master 2”x2” AFS Standard or 50 mm x 50 mm Metric Standard gauge, check the falling height of the weight (Figure 1, Item 5) by lifting it to the upper limit with the main cam (Figure 1, Item 2) and measuring the vertical gap between the weight (Figure 1, Item 5) and anvil (Figure 1, Item 3). In the Metric version, the gap is 50 mm +0.00 mm/-0.05 mm. In the AFS version, the run is 2 in +0.000 in./-0.002 in. If the vertical gap is smaller than the standard, the cam and its shafts are worn out and must be replaced. This is explained further in Section 6.2.3.

6.2 Calibration

To keep the Sand Rammer within standard specifications, the following controls should be made with the help of the Calibration Kit (Part No. 0042113-M/0042113). A complete calibration should be executed first after installation and at least once a year thereafter.

6.2.1 Leveling

Check the correct leveling of the supporting plate of the specimen tube in two opposite directions by means of the bubble level supplied in the calibration kit. If the installation was carried out properly, it is unlikely that the level has changed. If it is necessary to correct it, insert metallic shims between the Sand Rammer Base and the Pedestal.

6.2.2 Height of Sand Specimen

It is very important to verify that the Vernier scale is correctly aligned and within ± 2% allowed tolerances. In order to verify this, a 2" AFS or 50 mm Metric master steel cylinder is required as provided in the calibration kit.

1. Insert the pedestal (Figure 5, Item 7) into the pedestal support on the base of the rammer frame (Figure 1, Item A).
2. Place the 2" x 2" AFS or 50 mm x 50 mm master steel cylindrical standard (figure 5, Item B) [provided in the Calibration Kit] on the pedestal (Figure 5, Item 7).
3. Gently rotate the auxiliary cam (Figure 1, Item 2) to lower the stem (Figure 1, Item 6) and compacting foot (Figure 1, Item 9) onto the master steel specimen (Figure 5, Item B). Check that the compacting foot is in contact with the upper face of the master steel sample as shown below in Figure 5.

4. The zero on the specimen height right Vernier (Figure 2 or 3, Item 10) points to the 2” AFS or 50 mm Metric line on the specimen height scale. The 2” AFS or 50 mm Metric line should also align with the 2” AFS or 50 mm Metric tolerance mark on the 2” AFS or 50 mm Metric left Vernier (Figure 2 or 3, Item 17) as shown in Figure 6. If not, make sure the compacting foot (Figure 5, Item 9) is screwed all the way onto the stem and is tight. Do not adjust the Vernier scales (Figure 1, Items 17 and 10) as these are secured semi-permanently by the manufacturer. If all parameters including cleaning away any sand or debris does not solve the problem, contact Simpson at once for further technical support.

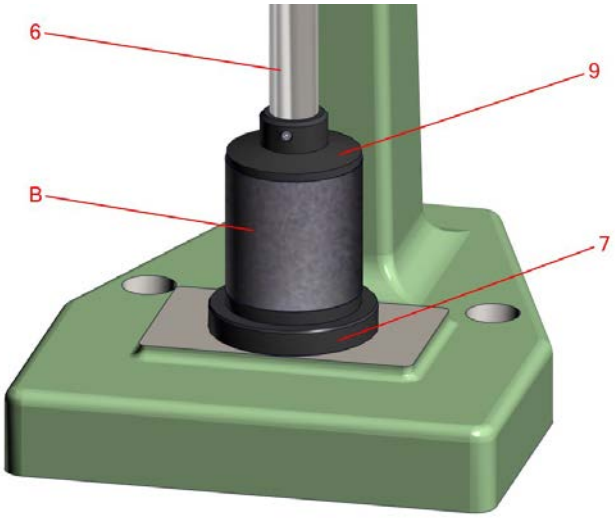


Figure 5: Showing master steel specimen (Item B) inserted between the compacting foot (Item 9) and the tube pedestal (Item 7) on the sand rammer.

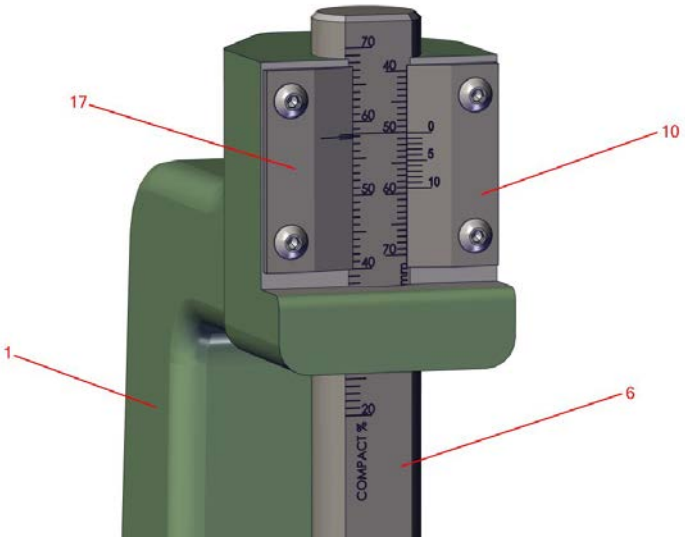


Figure 6: Showing perfect alignment of Vernier scale of a metric sand rammer with a 50 mm metric master specimen.

6.2.3 Falling Height

Lift the weight (Figure 1, Item 5) with the main cam (Figure 1, Item 4) just before reaching the point where it falls down. The space between the weight and the anvil must tightly contain the 2" AFS or 50 mm Metric master steel specimen +0.00 mm/-0.05 mm (+0.000 in/-0.002 in) as shown in Figure 7.

At times the falling height will be less than the standard. This shows a wearing condition and the worn-out parts should be replaced: main cam (Figure 10, Item 4) and corresponding bushing (Figure 10, Item 12)

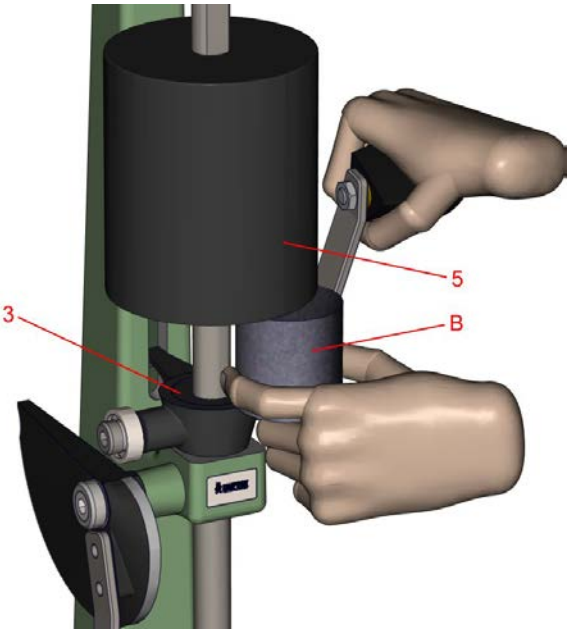


Figure 7: Showing insertion of master steel cylindrical standard specimen (Item B) between the weight (Item 5) and anvil (Item 3).

While rotating the main cam be aware of a potential pinch hazard between the top of the anvil and ramming weight of the sand rammer. When rotating the main cam, the falling weight may crush your fingers or hand. Always keep hands and fingers clear from this area when performing a test.

6.2.4 Available Energy

Available energy or ramming force is measured by averaging the deformation suffered by standardized cylindrical rings subjected to one ram each.

1. Insert the proving ring anvil (Figure 8, Item C, provided in the Calibration Kit) into the pedestal support on the base of the rammer frame (Figure 1, Item 1).
2. On the raised portion of the proving ring anvil (Figure 8, Item C), place a cylindrical proving ring (Figure 8, Item D) so that its round face is centered on the top of the proving ring anvil. Hold the ring steady with your right hand.
3. With the left hand, slowly rotate the auxiliary cam (Figure 1, Item 2) to lower the stem (Figure 1, Item 6) and compacting foot (Figure 1, Item 9) onto the proving ring (Figure 8, Item D). Check that the proving ring is centered on the compacting foot (Figure 8, Item 9) and on the proving ring anvil (Figure 8, Item C) as shown in Figure 8.
4. Ensure that both hands are cleared from the sand rammer and turn the main cam (Figure 1, Item 4) one rotation so that the proving ring (Figure 8, Item D) is compacted one time.
5. Raise the compacting foot by rotating the auxiliary cam (Figure 1, Item 2).
6. Remove the proving ring and measure the smallest diameter of the test proving ring with a linear caliper as shown in Figure 9.

7. Compare this measured value to that specified on the calibration certificate that came with the proving rings. This deformation is typically specified in each cylindrical rings box. If the average measurement falls within the calibration certification range of ±0.10 mm, the rammer's impact energy is within specifications. Otherwise, the assembly of base, pedestal and sand rammer must be inspected.

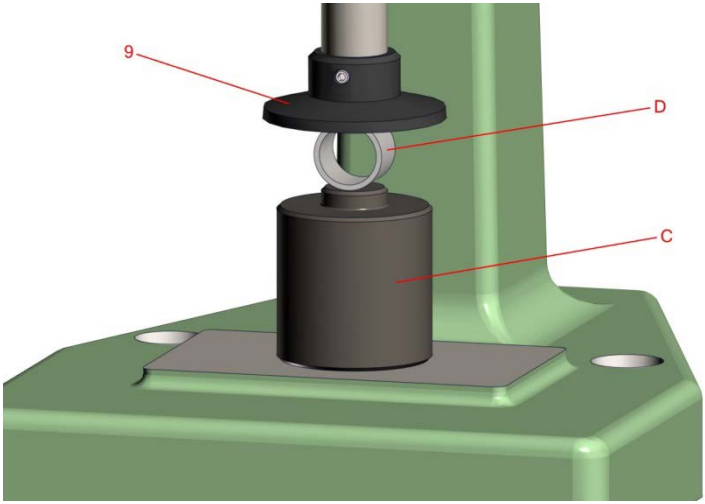


Figure 8: Showing proper alignment of the proving ring (Item D) between the compacting foot (Item 9) and the proving ring anvil (Item C).

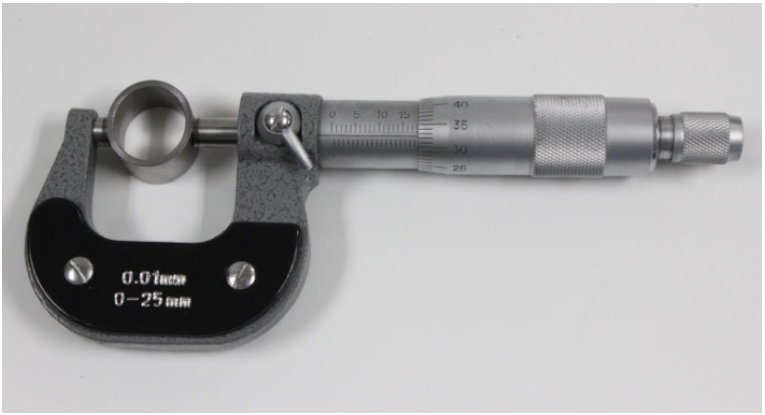


Figure 9: Showing measurement of deformation of proving ring.

6.2.5 Specimen Tube

It is very important to keep the inner surface in good, standardized dimensions and condition. The control sequence is as follows:

1. With the specimen tube in use perform a sand test, complete with shear and compression strength, permeability and compactability measurements.
2. Repeat immediately, in order to keep the humidity condition, the same tests with the same molding mass, but this time use the standard specimen tube (provided in the Calibration Kit).
3. The obtained values should be similar. If the differences are significant, replace the specimen tube in use.

7 Apparatus Layout

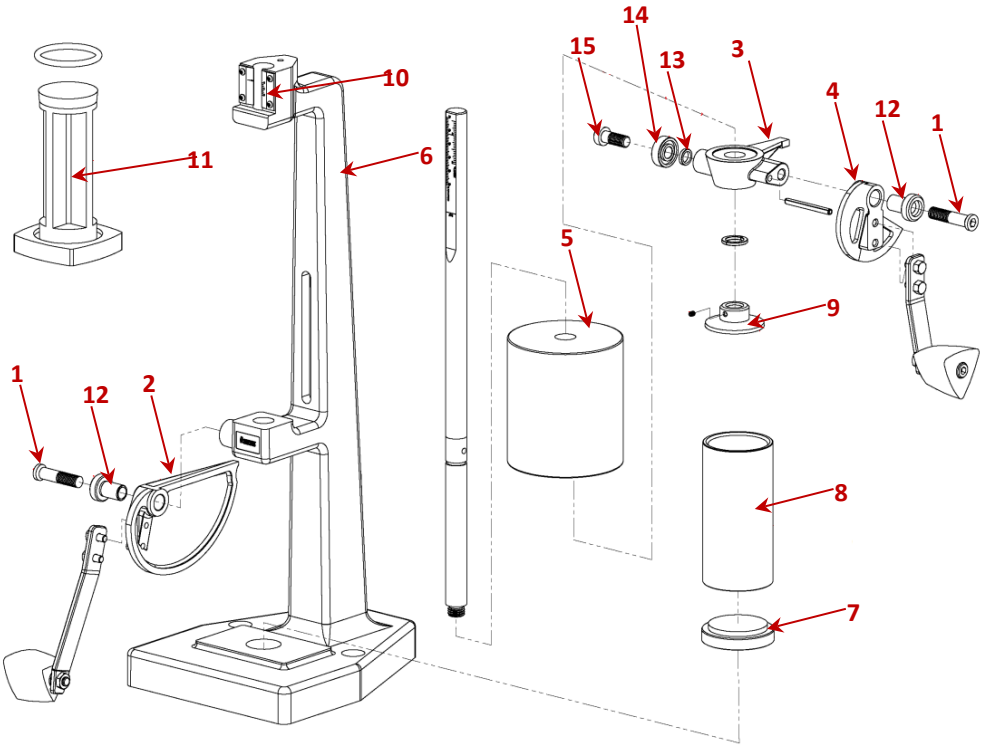


Figure 10: Isometric Explosion

7.1 Parts List - AFS

Parts List

Sand Rammer

Item No.	Qty.	Description	Part No.
1	2	Cam Bolt	0045618
2	1	Auxiliary Cam	208504
3	1	Anvil	45604
4	1	Main Cam	0045603A
5	1	Weight	-
6	1	Stem	-
7	1	Pedestal	0045629
8	1	Specimen Tube	0045628A
9	1	Foot	0045610A
10	1	Right Vernier Scale	-
11	1	Striping Post Assembly	0045622A
12	2	Cam Bushing	0045605
13	1	Spacer	0045611
14	1	Cam Bearing	0045617
15	1	Anvil Bolt	0045619
16	2	Socket Set Screw	0045626

Parts List – Metric

Parts List

Sand Rammer – Metric

Item No.	Qty.	Description	Part No.
1	2	Cam Bolt	0045618
2	1	Auxiliary Cam	208504
3	1	Anvil	45604
4	1	Main Cam	0045603M
5	1	Weight	-
6	1	Stem	-
7	1	Pedestal	0045630
8	1	Specimen Tube	0045628M
9	1	Foot	0045610M
10	1	Right Vernier Scale	-
11	1	Striping Post Assembly	0045622M
12	2	Cam Bushing	0045605
13	1	Spacer	0045611
14	1	Cam Bearing	0045617
15	1	Anvil Bolt	0045619
16	2	Socket Set Screw	0045626

8 Parts List / Ordering Parts / Returns

8.1 Spare Parts List

Simpson maintains a large inventory of common spare parts for all current Simpson Analytics products. The following table provides part numbers for common spare parts for this device. Contact Simpson Technologies with the part number and description when ordering.

Part No.	Description
0045628A	Specimen Tube - AFS
0045628M	Specimen Tube - Metric
0045629	Pedestal - AFS
0045630	Pedestal - Metric
0045622A	Stripping Post Assembly - AFS
0045622M	Stripping Post Assembly - Metric

8.2 Ordering Replacement / Spare Parts

The source of replacement parts for your Simpson Analytics equipment is just as important as the make of the equipment you purchase. ALWAYS order parts for your Simpson Analytics equipment directly from Simpson Technologies. To find the Simpson office closest to you please visit us on the internet at www.simpsongroup.com on the „Contact Us“ page.

Parts may be ordered from the sales department via e-mail at parts@simpsongroup.com: When contacting our sales department to obtain a quotation on replacement parts or service please always include the equipment serial number, the description of the part and the part number. Your Simpson Technologies sales team representative will provide you with a quote on the items with current price and delivery times. When ordering, please always refer to the quote number on your order.

To arrange for calibration support or repair assistance please contact our customer service department at service@simpsongroup.com.

8.3 Returned Goods Policy

Simpson Technologies strives to provide their customers with maximum follow-up support and, in order to offer the most practical flexibility, the following conditions apply to returned goods. Adherence to these procedures will ensure the most prompt and efficient service.

RETURNS WILL BE CONSIDERED IN THE FOLLOWING SITUATIONS:

- Products ordered in error by customer (subject to a restocking charge).
- Incorrect or defective products shipped to customer.
- The return of existing products for factory repair or upgrade.
- Products ordered correctly but which are unwanted or unsuitable (subject to a restocking charge).
- A Safety Data Sheet (SDS) must accompany material that is sent to Simpson Technologies for testing purposes. Simpson Technologies will NOT authorize the return of hazardous materials.

RETURN PROCEDURE:

- **The customer must obtain a Return Material Authorization Number (RMA#) from Simpson Technologies prior to returning the goods.**
- To obtain an RMA#, the customer should contact the Customer Service department by phone, , e-mail to service@simpsongroup.com. The material being returned must be identified and the reason for its return clearly specified. Once approved for return, Simpson Technologies will issue the customer an RMA form to be included with the shipment and with instructions on where and how to ship the goods.
- All returned goods are to be shipped with transportation charges PREPAID, unless otherwise agreed when the RMA# is assigned. If it has been predetermined that return goods are to be shipped COLLECT, Simpson Technologies will specify the desired routing.
- All returned shipments will be subject to inspection upon arrival at Simpson Technologies.
- Material returned without an RMA# may be refused and returned at customer's expense.

9 Decommissioning

Before doing any work, review the Safety Procedures in Section 2. Failure to follow safety procedures could result in serious injury.

Use qualified personnel and follow safety procedures, applicable local policies and regulations in decommissioning the Sand Rammer and peripheral equipment.

WASTE DISPOSAL

The machinery and controls consist of:

- Iron
- Aluminum
- Copper
- Plastic

Dispose of the parts in accordance with the applicable regulations.

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