HANDS ON DEMONSTRATION & SURGICAL SKILLS MODELS

CMF Products Catalog

Expert models and skills development systems for demonstration and training
SAWBOONES CAN OFFER YOU:

- High quality workshop bones.
- Display models with or without the installation of your implants.
- Biomechanical test material for pre-testing and validation of your implants.
- Digital CAD files.
- Customized models upon request.

SAWBOONES MATERIALS GUIDE

**SOLID FOAM**

- Workshop bone.
- Rigid foam throughout.
- Most commonly used for external fixation.

**FOAM CORTICAL SHELL WITH CANCELLOUS**

- Workshop bone.
- Rigid foam cortical wall with inner cancellous material.
- Most commonly used for:
  - Total joint replacement
  - Internal fixation.

**SOLID WHITE PLASTIC**

- Demonstration bone.
- White plastic.
- Very durable.
- Most commonly used for:
  - Product display of external fixation implants.
  - Patient education.

**BIOMECHANICAL TEST MATERIAL**

- Composite blocks.
- Alternative test medium to cadaver bone.
- Most commonly used for:
  - When actual strength properties of real bone are required.
  - For testing, comparing and designing implants and other devices.

**SOLID CLEAR**

- Demonstration bone.
- Clear plastic.
- Very durable.
- Most commonly used for product display of implants.

*Can be converted to radiopaque option. Refer to page 14 for more information.*
RADIOGRAPHIC TRAINING SYSTEM
SAFE - SIMPLE - REPEATABLE

- 100% free of ionizing radiation
- Perfect for classroom training or solo
- Smooth operation; no springs or levers
- Laptop and custom software included

Mandible™ Max is created to train radiographic techniques with no concern for radiation exposure.
Direct supervision by a licensed dentist is not required.
Digital X-Ray system allows students to capture as many images as needed to complete a training exercise.
Instructor can access and review the complete history of progress.
Smooth, adjustable jaw mechanism - no springs or levers to bind or wear out.
Mandible™ Max is fully modular; any part can be repaired or replaced as needed, including skin and teeth.

#1573 includes: mannequin, digital collimator, sensors, alignment devices, laptop, software and case.

Order reference:
www.sawbones.com/mandible-max
or search for part number 1573
**SKULL**

#1344 — Skull without mandible. With vice attachment block. Solid foam.

#1344-16 — Skull without mandible. With vice attachment block. Solid white plastic.

#1344-46 — Skull without mandible. No vice attachment block. Solid foam.

**FULL SKULL**

#1345 — Full skull with mandible and vice attachment block. Solid foam.

#1345-4-1 — Full skull with mandible articulated with latex bands. No vice attachment block. Solid clear.

#1345-34 — Full skull with mandible. No vice attachment block. Solid white plastic.

#1345-35 — Full skull with mandible articulated with latex bands and vise attachment block. Solid foam with radiopaque option.

#1345-84 — Full skull with mandible articulated with latex bands. No vice attachment block. Solid foam.

#5114 — Full skull with articulating mandible and removable skull cap. Solid white plastic.
FULL SKULL WITH MUSCLES

#1345-25 — Full skull with mandible and facial muscles. With vice attachment block. Solid foam.

#1345-26-3 — Full skull with facial muscles and replaceable skin #1345-24. Includes mandible with limited range of motion, and vice attachment. Solid foam. May be purchased with custom fractures, please call or email for pricing.

SKULL WITH CRANIOTOMY

#1344-22 — Skull without mandible. Includes left lateral flap approximately 6 cm x 7 cm, cut at 90 degrees to the cranium. With a 1.5 mm cut to provide gap. With vice attachment. Solid foam.

#1344-29 — Skull without mandible. Includes left and right lateral craniotomies. With vice attachment. Solid foam.

PARTIAL SKULL

#1339-1 — Right posterolateral quarter section skull with vice attachment. Solid foam.

#1339-5-1 — Left lateral half skull with vice attachment block. 50 pcf density. Solid foam.

#1339-5-2 — Left lateral half skull with maxilla and vice attachment block. 50 pcf density. Solid foam.

#1339-10 — Right lateral half skull with maxilla. With vice attachment block. Solid foam.

#1339-10-1 — Left lateral half skull with maxilla. With vice attachment block. Solid foam.

#1339-12 — Left lateral half skull with maxilla. No vice attachment block. Solid white plastic.

#1339-12-1 — Right lateral half skull with maxilla. No vice attachment block. Solid white plastic.

#1339-2 — Left lateral half skull with maxilla includes cancellous inner material and vice attachment block. Foam cortical shell.
OCCIPITAL

#1339-3 — Occipital section only. Solid foam.

#1339-8 — Occipital section only. Solid white plastic.

SKULL CAP

#1341 — Skull cap. Does not include brain matter. Solid foam.

#1341-1 — Skull cap, cranial flaps cut at 90 degrees and with 10 mm burr holes. Anterior flap with six burr holes, and posterolateral flap with two medial burr holes. Includes soft tissue brain matter. Solid foam.

#1341-10 — Skull cup, with left and right oval cranial flaps cut at 90 degrees, each with three 10 mm burr holes. Includes soft tissue brain matter. Solid foam.

#1341-16 — Skull cap, with right side cranial flap cut at 90 degrees and with three 10 mm burr holes. Includes soft tissue brain matter. Solid foam.

#1341-17 — Skull cap, includes 3.2 mm dura, two anterior partial depth osteotomies, and two posterior osteotomies. Solid foam.

#1341-20 — Skull cap, includes soft tissue brain matter. Solid foam.

#1341-21 — Skull cap, includes dura and soft tissue brain matter. Solid foam.

CRANIAL ACCESS MODEL

All of the cranial access models include the following replaceable components: silicone face skin #1485-185, half-skull #1339-28 in solid foam, and stand #1703-234.

#1925 — Standard model with right lateral approach. Also includes the following replaceable components: dura #1417-3 and right brain with ventricle cavity #1498-4.

#1925-3 — Right lateral approach with reinforced dura for suture applications. Also includes the following replaceable components: suturable dura #1417-3-1 and right brain with ventricle cavity.

#1925-4 — Right lateral approach with radiopaque properties for ventricle targeting applications. Also includes the following replaceable components: dura #1417-3, right brain with radiopaque ventricle cavity #1498-4-1, and half-skull with radiopaque cortex #1339-28-1.
**FRACTURED/PATHOLOGY**


#1339-18 — Partial skull. Right half. With two frontal teeth and one molar tooth missing. With knife ridge defect. With vice attachment block. Solid foam.

#1345-10 — Full skull with mandible. With LeFort I, II, and III fractures and transverse fracture on both sides of mandible between the first and second molar. Reattached with latex bands. Includes bone wafer #1521-6. Solid foam.

#1345-13 — Full skull with mandible. With zygomatic arch fracture, frontal arch fracture, LeFort I fracture and transverse fracture on mandible, one side only. Solid foam.

#1345-14 — Full skull with foam cortical shell mandible. With naso-ethmoid and LeFort II fractures on the left side, zygomatic arch fracture, sagittal fracture of the mandible. Solid foam.


#1345-18 — Full skull with nasal orbital and zygomatic fracture scored, solid mandible with angle fracture on left side and 2 scored on right side behind last molar and premolar. Holes between teeth. Solid foam.

#1345-18-1 — Full skull with skin. With nasal orbital and zygomatic fracture scored, solid mandible with angle fracture on left side and 2 scored on right side behind last molar and premolar. Holes between teeth. Solid foam.

#1345-20 — Full skull. Includes foam cortical shell mandible. Has facial nasal fracture, two orbital and zygomatic fractures, and mandible fracture bilaterally, sagittally split, and a genioplasty fracture of the chin. Solid foam.

#1345-28 — Full skull with mandible. With LeFort I fracture, bilateral zygomatic arch fracture, and transverse mandibular body fracture. Solid foam.

More fractures can be made upon request.
MANDIBLE

#1336-5 — Mandible with mucosa. Solid foam.

#1337 — Mandible with teeth indentations. Large. Solid foam.

#1337-1 — Mandible with teeth. Large. Solid foam.

#1337-3 — Mandible with teeth. Large. Foam cortical shell with cancellous.

#1337-9 — Mandible with teeth. Large. Solid white plastic.

#1337-22 — Mandible with teeth. Large. Solid clear.

#1338 — Mandible with teeth. Large. Can be used with maxilla holders #1348-2 & 11. Foam cortical shell with cancellous.

#1338-2 — Mandible with teeth. Can be used with maxilla holders #1348-2 & 11. Large. Solid foam.

#1345-30 — Mandible/Maxilla. Solid foam.

#5114-1 — Mandible with teeth. Medium. Solid white plastic.

MAXILLA

#1348 — Edentulous Maxilla. Large. Solid foam.

#1348-2 — Maxilla with handle. Large. Can be used as permanent mandible holder for mandibles: #1336-1, #1338-2, #1338, #1338-5, #1338-6, #1338-7, #1338-8, #1338-11. Solid foam.

#1348-6 — Maxilla with mucosa. Large. Solid foam.
FRACTURED/PATHOLOGY

#1336 — Mandible with plateau deformity. Large. Solid foam.

#1336-1 — Mandible. Large. Edentulous pathology with transverse fracture of the horizontal region on the right lateral side. Can be used with maxilla holders #1348-2 & 11. Foam cortical shell with cancellous.

#1336-4 — Mandible. Endentulous with knife ridge. Foam cortical shell.

#1337-11 — Mandible with congenital malformation. Solid foam.

#1338-5 — Mandible. Large. Includes fracture between last two molars on right lateral side. Can be used with maxilla holders #1348-2 & 11. Foam cortical shell with cancellous and solid teeth.

#1338-6 — Mandible. Large. Includes fracture between the canine and premolars in front of the foramen on right lateral side. Can be used with maxilla holders #1348-2 & 11. Foam cortical shell with cancellous and solid teeth.

#1338-7 — Mandible. Large. Includes fracture through left side and mandibular angle and right side superior fragment fracture scored inferiorly. Can be used with maxilla holders #1348-2 & 11. Foam cortical shell with cancellous and solid teeth.

#1338-9 — Mandible. Partially edentulous. Solid foam.

#1338-10 — Mandible. Conductive. Includes 10-2 wire insert and latex compound with socket depression on right lateral side. Foam cortical shell.

#1338-11 — Mandible. Large. Includes sagittal fracture between anterior incisors. Can be used with maxilla holders #1348-2 & 11. Foam cortical shell with cancellous and solid teeth.

#1343 — Mandible with ridge deformity. Large. Solid foam.
SKULL

#1339-21 — Partial skull with maxilla region. Left lateral half. With vice attachment block. Solid foam.


#1344-18 — Skull without mandible. With vice attachment block. Solid foam.

#1345-23 — Skull with mandible. With vice attachment block. Solid foam.

MANDIBLE

#1337-21 — Mandible. Solid foam.

FRACTURED/PATHOLOGY

#1337-7 — Mandible with hemifacial microsomia of the right side. Solid foam.

SOLID RIGID POLYURETHANE FOAM

Solid rigid polyurethane foam is used as an alternative test medium for human cancellous bone. It does not replicate the structure of human bone, however, it does provide consistent properties in the range of human cancellous bone. This closed cell polyurethane foam is most commonly used for testing screw pullout, insertion and stripping torque.

The ASTM F-1839-08 “Standard Specification for Rigid Polyurethane Foam for Use as a Standard Material for Testing Orthopaedic Devices and Instruments” states “The uniformity and consistent properties of rigid polyurethane foam make it an ideal material for comparative testing of bone screws and other medical devices and instruments”.

<table>
<thead>
<tr>
<th>DENSITY (PCF)</th>
<th>DENSITY (g/cc)</th>
<th>VOLUME FRACTION</th>
<th>COMRESSIVE STRENGTH (MPa)</th>
<th>MODULUS (MPa)</th>
<th>TENSILE STRENGTH (MPa)</th>
<th>MODULUS (MPa)</th>
<th>SHEAR STRENGTH (MPa)</th>
<th>MODULUS (MPa)</th>
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<tbody>
<tr>
<td>ASTM D1622</td>
<td></td>
<td></td>
<td>ASTM D1621</td>
<td></td>
<td>ASTM D638</td>
<td></td>
<td>ASTM C273</td>
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<tr>
<td>5*</td>
<td>0.08</td>
<td>0.07</td>
<td>0.60</td>
<td>16</td>
<td>1.0</td>
<td>32</td>
<td>0.59</td>
<td>7.1</td>
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<tr>
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<td>38</td>
<td>1.3</td>
<td>56</td>
<td>1.2</td>
<td>13.7</td>
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<tr>
<td>10*</td>
<td>0.16</td>
<td>0.14</td>
<td>2.2</td>
<td>58</td>
<td>2.1</td>
<td>86</td>
<td>1.6</td>
<td>19</td>
</tr>
<tr>
<td>12*</td>
<td>0.19</td>
<td>0.16</td>
<td>3.2</td>
<td>81</td>
<td>2.5</td>
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<td>2.1</td>
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<td>15*</td>
<td>0.24</td>
<td>0.20</td>
<td>4.9</td>
<td>123</td>
<td>3.7</td>
<td>173</td>
<td>2.8</td>
<td>33</td>
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<tr>
<td>20*</td>
<td>0.32</td>
<td>0.27</td>
<td>8.4</td>
<td>210</td>
<td>5.6</td>
<td>284</td>
<td>4.3</td>
<td>49</td>
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<tr>
<td>25*</td>
<td>0.40</td>
<td>0.34</td>
<td>12.9</td>
<td>317</td>
<td>8.8</td>
<td>399</td>
<td>5.9</td>
<td>68</td>
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<tr>
<td>30*</td>
<td>0.48</td>
<td>0.41</td>
<td>18</td>
<td>445</td>
<td>12</td>
<td>592</td>
<td>7.6</td>
<td>87</td>
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<tr>
<td>35*</td>
<td>0.56</td>
<td>0.47</td>
<td>24.4</td>
<td>592</td>
<td>15.6</td>
<td>713</td>
<td>9.4</td>
<td>108</td>
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<tr>
<td>40*</td>
<td>0.64</td>
<td>0.54</td>
<td>31</td>
<td>759</td>
<td>19</td>
<td>1000</td>
<td>11</td>
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<tr>
<td>50*</td>
<td>0.80</td>
<td>0.68</td>
<td>48</td>
<td>1148</td>
<td>27</td>
<td>1469</td>
<td>16</td>
<td>178</td>
</tr>
</tbody>
</table>

*Foam meets ASTM F1839-08.

Our foam is available in a range of sizes and densities, from 0.08 to 0.80 grams per cubic centimeter (5 to 50 pounds per cubic foot).

BLOCK SIZE:
13 cm x 18 cm x 4 cm
#1522-23 — 5 PCF
#1522-536 — 8 PCF
#1522-01 — 10 PCF
#1522-48 — 12 PCF
#1522-02 — 15 PCF
#1522-03 — 20 PCF
#1522-660 — 25 PCF
#1522-04 — 30 PCF
#1522-1349 — 35 PCF
#1522-05 — 40 PCF
#1522-27 — 50 PCF
BIOMECHANICAL TEST MATERIALS

CELLULAR RIGID POLYURETHANE FOAM

This closed cell polyurethane foam has a cell size that is closer to human cancellous bone and is most commonly used for testing subsidence, press-fit devices and cement augmentation.

<table>
<thead>
<tr>
<th>DENSITY (PCF)</th>
<th>CELL Size (mm)</th>
<th>COMPRESSIVE Strength (MPa)</th>
<th>COMPRESSIVE Modulus (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5</td>
<td>0.5-2.5</td>
<td>1.4</td>
<td>12.4</td>
</tr>
<tr>
<td>10</td>
<td>0.5-2.0</td>
<td>2.3</td>
<td>23.0</td>
</tr>
<tr>
<td>12.5</td>
<td>0.5-1.5</td>
<td>3.9</td>
<td>47.5</td>
</tr>
<tr>
<td>15</td>
<td>0.5-1.0</td>
<td>4.1</td>
<td>68.4</td>
</tr>
<tr>
<td>20*</td>
<td>0.5-1.0</td>
<td>5.4</td>
<td>137.0</td>
</tr>
</tbody>
</table>

*Contains e-glass fibers.

OPEN CELL RIGID FOAM

This open cell foam is a composite made of urethanes, epoxies and structural fillers. It is most commonly used in specific applications that require an open-cell structure, cement augmentation and dynamic loading.

<table>
<thead>
<tr>
<th>DENSITY (PCF)</th>
<th>Volume Fraction</th>
<th>COMPRESSIVE Strength (MPa)</th>
<th>COMPRESSIVE Modulus (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5</td>
<td>0.09</td>
<td>0.11</td>
<td>6.2</td>
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<tr>
<td>7.5</td>
<td>0.12</td>
<td>0.28</td>
<td>18.6</td>
</tr>
<tr>
<td>15</td>
<td>0.24</td>
<td>0.67</td>
<td>53.0</td>
</tr>
<tr>
<td>20</td>
<td>0.32</td>
<td>1.3</td>
<td>105</td>
</tr>
<tr>
<td>30</td>
<td>0.48</td>
<td>3.2</td>
<td>270.0</td>
</tr>
</tbody>
</table>

*Contains e-glass fibers.
SOLID RIGID POLYURETHANE FOAM SHEETS

This closed cell polyurethane foam is most commonly used for testing screw pullout, insertion and stripping torque.

<table>
<thead>
<tr>
<th>SHEET SIZE:</th>
<th>SHEET SIZE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 cm x 18 cm x 1 mm</td>
<td>13 cm x 18 cm x 1.5 mm</td>
</tr>
<tr>
<td>#1522-50 — 20 PCF</td>
<td>#1522-28 — 50 PCF</td>
</tr>
<tr>
<td>#1522-102 — 30 PCF</td>
<td></td>
</tr>
<tr>
<td>#1522-103 — 40 PCF</td>
<td></td>
</tr>
</tbody>
</table>

SHEET SIZE:
13 cm x 18 cm x 2 mm
#1522-19 — 10 PCF
#1522-15 — 15 PCF
#1522-18 — 20 PCF
#1522-20 — 30 PCF
#1522-16 — 40 PCF
#1522-24 — 50 PCF

SHEET SIZE:
13 cm x 18 cm x 3 mm
#1522-13 — 15 PCF
#1522-14 — 20 PCF
#1522-06 — 30 PCF
#1522-07 — 40 PCF
#1522-08 — 50 PCF

COMPOSITE SHEETS

This epoxy is filled with short glass fibers and is used to simulate cortical bone for structural testing of fixation devices and total joint replacements.

<table>
<thead>
<tr>
<th>SHEET SIZE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 cm x 18 cm x</td>
</tr>
<tr>
<td>#1522-50 — 1 mm</td>
</tr>
<tr>
<td>#1522-102 — 2 mm</td>
</tr>
<tr>
<td>#1522-103 — 3 mm</td>
</tr>
<tr>
<td>#1522-15 — 4 mm</td>
</tr>
<tr>
<td>#1522-18 — 6 mm</td>
</tr>
<tr>
<td>#1522-20 — 8 mm</td>
</tr>
<tr>
<td>#1522-24 — 10 mm</td>
</tr>
</tbody>
</table>

EPOXY SHEET TOLERANCES:

<table>
<thead>
<tr>
<th>Density</th>
<th>+/-10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length and Width</td>
<td>+/-2mm</td>
</tr>
<tr>
<td>Thickness</td>
<td>+/-0.3mm</td>
</tr>
</tbody>
</table>

1mm and 2mm are +/-0.2mm (3401-07, 3401-01)
CUSTOM LAMINATED FOAM BLOCKS

Laminated test blocks are manufactured to your specifications using any combination of solid rigid polyurethane foam, cellular rigid polyurethane foam, open cell rigid foam and short fiber filled epoxy sheets.

Blocks are laminated with sheet(s) of solid rigid polyurethane foam or short fiber filled epoxy selected to simulate unicortical or bicortical bone. Standard laminated test blocks are 12 cm x 17 cm with a thickness based on your specified combination of block and sheet sizes. All blocks and sheets are laminated together with 0.64g/cc (40PCF) solid rigid polyurethane foam.

Please see the property tables to make your selection of materials that will best simulate a bone model for your biomechanical test or product demonstration.

CUSTOM MACHINED FOAM

We have a full CNC machining center available to create your custom rigid foam part that may be used in biomechanical tests or product demonstration. We have solid rigid polyurethane foam available in sizes up to 61 cm x 61 cm x 10 cm thick.

To request a quote please email a dimensioned drawing, sketch or 3D CAD model to:

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Fax: +46 40 650 70 01
RADIOPAQUE IMAGING

Standard Sawbones models produce a realistic and user friendly image in x-ray or fluoroscopy environments.

For an even higher contrast in detail, most Sawbones models can be made with the radiopaque option. Solid foam models include the enhanced radiopaque visualization properties on the outer surface only. Foam cortical shell models provide this radiopaque imaging enhancement on the inner and outer surfaces.

DIGITAL ANATOMY / CAD FILES

Usage:
- CNC machining.
- Finite element modeling.
- Product information guides.
- CAD software applications.

File formats:
- IGES
- Stl
- Parasolid
- Step
- Sldprt

Most of our bones can be scanned. Please contact us for further information and availability.

*Example pictures showing foam cortical shell with cancellous material.
SAWBOUNES CUSTOMER COMMITMENT AND PRODUCT GUARANTEE

At Sawbones, we are committed to providing the highest level of service and product quality. If you are less than completely satisfied with the performance of our products for any reason, we will gladly honor a full refund or replacement.

Contact us anytime with suggestions on how we can improve our products or service.

ORDERING INFORMATION

Please provide the part number, description, and quantity for each item requested.

Indicate precise shipping instructions, if different than the billing address, and purchase order number when applicable.

Credit cards and bank transfers accepted. Please call customer service.

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