

# Lapidary Level-1

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**Module Title: Slabbing gemstones**

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## LG #13

### LO #1- Prepare for work

#### Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Planning end result and Safety requirements
- planning and sequencing slabbing processes
- selecting Tools and equipment
- acquiring slabbing material
- Cleaning Equipment and work area.
- Checking and filling Coolant.
- Checking and maintaining blades.
- Loading Saws.
- Checking vices for firmness.
- Checking pump or coolant delivery system.

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- Plan end result and Safety requirements
- plan and sequence slabbing processes
- select tools and equipment
- acquire slabbing material
- Clean equipment and work area.
- Check and fill Coolant.
- Check and maintain blades.
- Load Saws.
- Check vices for firmness.
- Check pump or coolant delivery system..

**Information Sheet1-Planning end result and Safety requirements**

**1. Planning end result and Safety requirements**

**1.1 Planning end result**

The quality of cabochon or other gemstone product which is made from slabs depends on the quality of slabs. Therefore, before deciding to slab, the lapidary should consider various attributes.

Slabbing should be done by plan and program as per the needs of the end results. Here some of the end results are cabochons, beads, pendants, tiles, etc

Some basic characteristics of the perfect slab, such as pleasing color or pattern, may seem obvious, but other qualities such as thickness, imperfections, hardness and alignment are just as important to consider. Special handling techniques may also affect your decision to select a particular slab. Let this be a guide to help you select the best slabs for your cabochons.

**Size**

Slabs should generally be between 1/4” to 3/8” thick, depending on the size of the cabochon and other products to be created. Use thicker slabs for cabs larger than 30 mm x 40 mm or when a high dome is desired. Do not let a thick slab dictate an unnecessarily high



dome. Excess material can always be removed. On the other hand, a large cab can be very difficult to form and will not have much of a dome if the slab is too thin. Slabs should also be cut evenly, so the thickness is the same throughout. End cuts of a boulder and uneven slabs can be used only with considerable care and effort.

## Flaws

Slabs should be examined both wet and dry. Cracks in different materials can be revealed one way but not necessarily by the other. While a slab is drying, cracks will retain water and be most noticeable. If the slab has cracks or other imperfections, consider whether or not you should work around the flaws or discard the slab altogether. When working around a crack or bad spot, there may be a considerable loss of material, which can be difficult psychologically and sometimes financially. For instance, when working opal, the decision to cut off some of the stone with no play-of-color can be difficult, but the resulting cab will be much more attractive without the dead spots. Some imperfections can be filled with epoxy or other reinforcing materials before working, but this may detract from the look of the cabochon, especially if the epoxy takes a better polish than the mineral. Some materials, such as porous turquoise and lapis lazuli, are routinely treated in this manner. Malachite that has been filled with poorly matched material should definitely be avoided, as the cabochon will not be as attractive as it could be. Discard slabs with any pits or vugs that would adversely affect the look or the durability of the cabochon. Most cabling material looks best wet,

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since a wet slab most closely resembles the look of a polished cab. Any slab that dries out quickly, such as some jaspers, may be too porous to take a good polish and should be rejected. When translucency is a desired effect, such as with jade or williamsite, the edge of a dry slab should be held up to a strong light source to determine its suitability. Both sides of the slab should be examined for color patterns and flaws. Cutting into the slab while forming the cabochon will most likely change the color and pattern at least a little bit, as most slabs are not identical all the way through.

## Hardness

The hardness of the minerals or rock types in the slab will affect how the material needs to be worked. Such softer materials as serpentine, howlite and marble must be worked with a much lighter touch. An even texture in a mixed material slab will usually be easier to work with than an uneven texture. Constituent minerals that are softer than the surrounding minerals may undercut or cut faster than the harder components, which will make polishing difficult. Common materials with this problem include unakite, rhodonite, charoite, some jaspers and agates, included minerals such as rutilated or tourmalinated quartz. The included materials have the possibility of pitting when the grinding or polishing of the slab causes the inclusion to be pulled out of the matrix. Kyanite, which has prominent cleavage and a different Mohs hardness along different axes of the crystal, must be oriented properly to avoid splitting.

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## Alignment

Arrangement is also an important consideration when selecting material for phenomenal stones, such as labradorite, cat's eye, moonstone, asteriated stones and rainbow obsidian. If the rough has not been cut to access its special attributes, the cabochon cannot be a success. The difference of a few degrees will lead to off-center stars and cat's eyes or unrevealed layers of color.

## Special handling

Some mineral will require special handling techniques to be worked properly. These must be considered before deciding to work with that material. The use of oil for cutting slabs is common, but must be avoided for such porous materials as turquoise, variscite or chrysocolla, which can absorb the oil and permanently change color. Soaking the slab in water overnight before sawing may help keep the stone from absorbing too much oil. Working malachite and shell releases hazardous particle into the air even when a lot of water is used, so a ventilator and mask are necessary safety precautions. Excessive heat can adversely affect the color of some stones such as opal. Calcite and ulexite are also heat-sensitive. To protect them, these stones may need to be cold dopped, using epoxy rather than hot wax.

## Use

After the aesthetics of color, pattern, size and even the price of a slab

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have been established, and the cutting requirements, flaws and special handling needs of the selected material have been considered, there is one more aspect to think about before deciding on a slab: use. Will the cabochon be utilized as a practice piece, set in jewelry or wire wrapped or used for exhibition? Ask the dealer or collector how they have worked the material and what problems they have encountered and if they can offer any special advice. Consult a good reference book such as Gem Cutting by John Sinkankas, to learn about any special properties and polishing techniques that are recommended for unfamiliar materials. Making a beautiful cab can be easy or challenging, but success is much more likely when slabs are selected carefully to best meet your needs.

## 1.2 Safety requirements

### IMPORTANT! READ FIRST

For your own safety be sure to read, understand and follow all warnings, safety rules and instructions in this instruction manual before using this machine. Failure to do so can result in serious personal injury.

- **Avoid dangerous environments.** Do not use this machine near gasoline or other flammable liquids.

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- **Make sure machine is securely placed on a sturdy, level surface with ample working area and away from open electrical outlets.**
- **Check for damaged parts.** Before use of this machine, always check for any damaged parts to determine that it will operate properly and perform its intended function. Check for proper alignment of moving parts, binding of moving parts, breakage of parts, mounting, and any other conditions that may affect its operation. A part that is damaged must be properly replaced through the manufacturer of this machine to avoid risk of injury.
- **Know your power tool.** Read this instruction manual carefully. Learn the correct applications and limitations as well as specific warnings and hazards related to this machine.
- **Always wear proper apparel.** Do not wear any loose clothing, gloves, neckties or jewelry that can get caught in the machine's moving parts. Secure long hair with a rubber band or hair tie.
- **Always wear proper eye protection** to protect you from any debris that may fly out while sawing. We recommend wearing safety goggles or safety glasses with side shields. Everyday glasses are not safety glasses. If anyone is around the machine while it's in use, they must also wear safety glasses.
- **Keep work area well lit and clean.** Make sure your work area is not cluttered

- **Do not operate unattended.** Adult supervision is required at all times. Never leave the machine running unattended.
- **Do not operate this machine while under the influence of drugs, alcohol or any medication.**
- **Never run saw blades dry.** Saw blades are designed to be used with a lubricant, such as oil or water, and will be ruined immediately if used dry. Always make sure you are using adequate oil or water while sawing so that rock dust doesn't form. This dust contains chemicals that can be hazardous to your lungs if inhaled and is known to cause cancer, birth defects or other reproductive harm. To reduce your exposure to these chemicals, work in a well ventilated area and wear a face or dust mask if the sawing operation is dusty.
- **Never attempt to cut curves with the saw blade.** Saw blades are designed to cut straight lines only. Ignoring this warning may result in a damaged saw blade and possible injury.
- **Never cut more than one workpiece at a time.**
- **Some rocks contain poisonous elements.** Avoid sawing rocks that contain uranium, mercury, lead, arsenic, etc. Make sure you know the material you are sawing.
- **Allow your saw to cool.** By ignoring this warning, the 10" Slab saw can overheat and deform the saw housing.
- **Do not force the tool** or attachment to do a job it is not designed to do.

- **Saw blades continue to spin after turn off**, eventually slowing to a stop.
- **Avoid awkward operations and hand positions.** Make sure you have good balance while working on this machine. A sudden slip could cause your hand to move into the disc.
- **Always stay alert.** You must be focused while working on this machine. Stones can catch on the saw blade and eject out of the sawing area.

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<b>Self-Check -1</b>	<b>Written Test</b>
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## Direction 1: Short answer items

**Instruction1-** Read the following questions and give answers for each.

1. What are the lapidary products that can be produced from gemstone slabs?
2. What is the importance of planning end results before slabbing gemstones?
3. Mention at least 5 safety rules that should be applied while operating slab saw.

**Note: Satisfactory rating - 3 points**

**Unsatisfactory - below 3 points**

## Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

\_\_\_\_\_



## Information Sheet2-Planning and sequencing slabbing processes

### 2.1 Sequencing slabbing process

Slabbing involves a series of operations to be sequentially performed.

#### Steps of slabbing

- 1. SAFETY GLASSES MUST BE WORN WHEN USING THIS EQUIPMENT.**
2. . Roll the saw out into the center of the storage room. You need sufficient space around the saw so you can set up the rocks for cutting and to provide a work area while using the saw.
3. Before plugging in the saw, turn the saw blade by hand to make sure nothing is binding and there is sufficient oil. The oil should run down the blade after it has been manually rotated. Plug the motor into the wall outlet. Make sure the cord is not causing a tripping hazard
4. **Filling the Saw:** To determine the correct amount of light oil to add, simply pour the oil slowly onto the saw table while the saw is running. The correct fill level has been reached when a steady stream flies off the blade and hits the table in front of the blade. You can also see it leaving the blade guard and hitting the plastic cover.
5. **Clamping the rock/gem stone in the vise:**

- A.** It is important that the rock be clamped securely in the vise because if it should slip while the cut is in progress, the blade may be kinked. To clamp the rock, it is placed between the hardwood jaws. The jack screw on the right side on the vise is turned in or out until the jaws are approximately parallel when then bear on the rock. The hand wheel on the clamp screw is then tightened until the jaws firmly grip the rock. A final tightening is made with the jack screw, which will give the greatest clamping force on the rock. The rock must be clamped in place tight enough so that even a twist with the hand will not cause it to move in the jaws. Wood shims or wedges are used, if necessary, to hold the rock steady.
- B.** Sometimes it is found helpful to grind or saw a flat spot on the rock to ensure a firm grip.
- C.** An approach that can be used and one that will permit slabbing it completely from one end to the other, is to cast it in a block of plaster or concrete. This method is especially efficient where many small pieces are cast into one block and slabbed at one time.
- D.** Another approach that allows you to slab the rock completely is to glue it onto a block of wood and place the wood into the clamp.
- E.** If several parallel slabs are to be made, be sure to leave sufficient rock protruding from the jaws.

**F.** Once the rock is tightly gripped, it can be positioned for the first cut by moving the jaws across the carriage by means of the cross feed crank. The wing-nut on the front of the carriage locks the vice jaws in place and must be loosened before the cross feed is used, and then relocked again to hold the jaws in position while the cut is made.

**6. Use of the Cross Feed:** The cross feed screw can be used for setting the thickness of the slab that will be made. The cross feed screw will move the jaws 1/16” for every full turn of the cross feed crank. For example, to make a 1/4” thick slab, after the first trimming slice is made, the crank should be turned five (5) revolutions, counter clockwise. The first turn will advance the rock sufficiently to compensate for the stock removal of the blade in the first cut. The next four turns will move the jaws 1/4” to set the slab thickness. However, our experience has shown that the slab will be close to 5/16” thick. To eliminate the error caused by backlash in the cross feed, all cuts should be positioned by turning the screw counter-clockwise. If, by accident, you advance the rock more than you want, and find it necessary to back up, then back up well beyond the desired setting and make the final adjustment forward (at least one half turn) in the counter-clockwise direction.

<b>Self-Check -2</b>	<b>Written Test</b>
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### Direction 1: Short answer items-2points each

**Instruction1-** Read the following questions and gives answers for each.

1. List the basic characteristics of slabs
2. What is the importance of using hard wood jaws for clamping rough stones?
3. What is purpose of cross feed screw?
4. Explain the use of coolant

**Note: Satisfactory rating - 4 points**

**Unsatisfactory - below 3 points**

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

## Information Sheet-3

## Selecting tools and equipment

### 2. Tools and equipment

#### 2.1 Slab saw

Slab saws are used to cut gemstones/rocks into slices or slabs. The resulting slabs can be polished as display specimens or used to create cabochons or other products like tiles. There are different types of slab saws which are the same in operating principle but different in their size including the size of their blade that they use. The size of slabs range usually from 14" diameter to 36" diameter for large stones. Below this diameter size is termed as **trimming** saw. Generally the following tools and equipment are required for slabbing.

- **Blades** : diamond **lapidary blades**, for cutting precious and semi precious stones. Made with SMART CUT technology for lapidary precious and semi precious stones.



- **Slab Saws**: is lapidary equipment to slab bigger gem stones

- Trims saw: is lapidary equipment to trim and slab gemstones:



- Ruler : used to measure length, width and thickness of a slab
- Marker: for the purpose of outline
- Magnifying glass: to see the structure and pattern of the slab



illuminated-loupe



- Wrenches : used to loose and tighten machinery parts



- Spanners : used to loose and tighten machinery parts
- Twizers to pick and hold slabs
- Buckets to store rough and slab
- Brass guage used to measure length, width and thickness of a slab
- Clippers to cut the champers/sharp edges
- Shelves to store slabs

## 2.2 Types of slab saw blades

### 2.2.1 Notch-rim blades

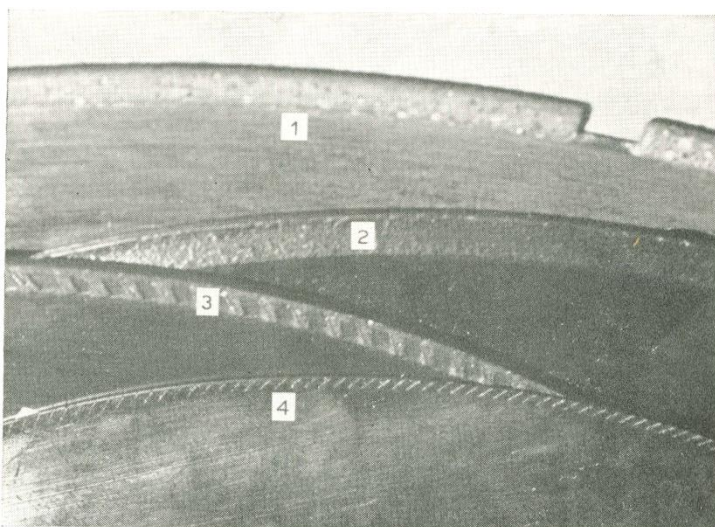
For common sawing, the mild steel blade is most popular. It comes in a large variety of sizes and thicknesses and can be obtained with a light, medium, or heavy charge of diamond. This kind is also the least expensive. The method of charging consists of slotting the entire



outside edge of the blade with evenly spaced notches about 1/8" in depth, the powder is introduced in each slot, and the rim of the blade is carefully rolled under pressure to close the metal over the diamond. The rolling action also expands the rim so that the saw is able to cut a groove somewhat thicker than the web and thus prevent binding. Because of the method of manufacture, these blades are known as "notch-rims."

### 2.2.2 Sintered-rim blades

In another process, diamond powder is mixed with metal powder and compressed into a thin hoop. This is then heat-treated, or "sintered," until the particles fuse together. The hoop is then soldered to a steel disk and forms what is called the "sintered-rim" saw. Both the notch-rim and sintered-rim blades are used extensively by amateurs, but the notch-rim is preferred because it is much less expensive and seems to do the job about as well as the other.





**Figure 1. A Series of Diamond Saws Showing Various Methods of Charging. 1. Heavy-duty segmented sintered-rim saw. 2. Ordinary sintered-rim saw. 3. Ordinary notch-rim saw. 4. Special thin bronze notch-rim saw.**

## **Coolants**

After checking of all parts of slab saw the availability of coolants must be confirmed. Coolants are used for lubricating purpose and washing of dust materials from the stone. The appropriate mixture of coolant is one unit of kerosene, one unit of motor oil and three unit of naphtha .

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<b>Self-Check -3</b>	<b>Written Test</b>
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### Direction 1: Short answer items

**Instruction1-** Read the following questions and give answers for each.

1. What is the difference between slab and trim saws?
2. List all the possible tools and equipment required in slabbing operation.
3. What will happen if the diameter of the rough stone to slabbed is greater than radius of saw blade?
4. What are the two types of saw blades?

**Note: Satisfactory rating - 3 points**

**Unsatisfactory - below 3 points**

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

## Information Sheet4-Checking and maintaining blades

### 4.1 Basic Operation rules of slabbing

- Ensure the blade is touching the oil reserve. The oil should cover no less than 1/8” of the blade.
- Ensure the rock is not too large for the saw. A grid provided at each saw will illustrate the maximum size a rock can be to use the saw safely.
- Ensure the rock is securely fixed in the vice. The rock should not shift when moderately pulled or pushed.
- Once the rock is securely fastened in the vice, manually spin the blade. The blade should not make contact with the rock.
- Water glass can be used to glue smaller or oddly shaped stones to wooden blocks. This will help ensure a firm vice grip on the rock. Talk to a workshop supervisor for more information.
- Always obtain the permission and approval of a workshop supervisor before turning the saw on. The workshop supervisor will double-check the setup.

### 4.2. Steps to maintain and adjust slab saw blades

The saw blade has to be checked for its wearing and misalignment. Wearing out of the blades can be inspected by direct inspection and by examining their performance. Whereas their misalignment can be sensed by abnormal sounds during operation and directly observing

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their bending effect. To correct this miss arrangements, maintenance should be done. To maintain them the following steps have to be used:

Follow these four steps to adjust the position of the saw arbor and saw blade so that the blade does not make contact with the saw table. This process may require trial and error.

1. Remove the saw table, then remove the brass bar. Loosen the two set screws located in the saw arbor using the Allen wrench. Once loosened, the saw arbor can slide side to side.
2. Replace the saw table and position the saw blade so that it is not in contact with the saw table. Your blade should spin freely.
3. Remove the saw table to tighten the two set screws using the Allen wrench, turning clockwise, and replace the brass bar.
4. Replace the saw table and manually rotate the saw blade, making sure the blade is not making contact with the saw table one last time before turning the slab saw on.

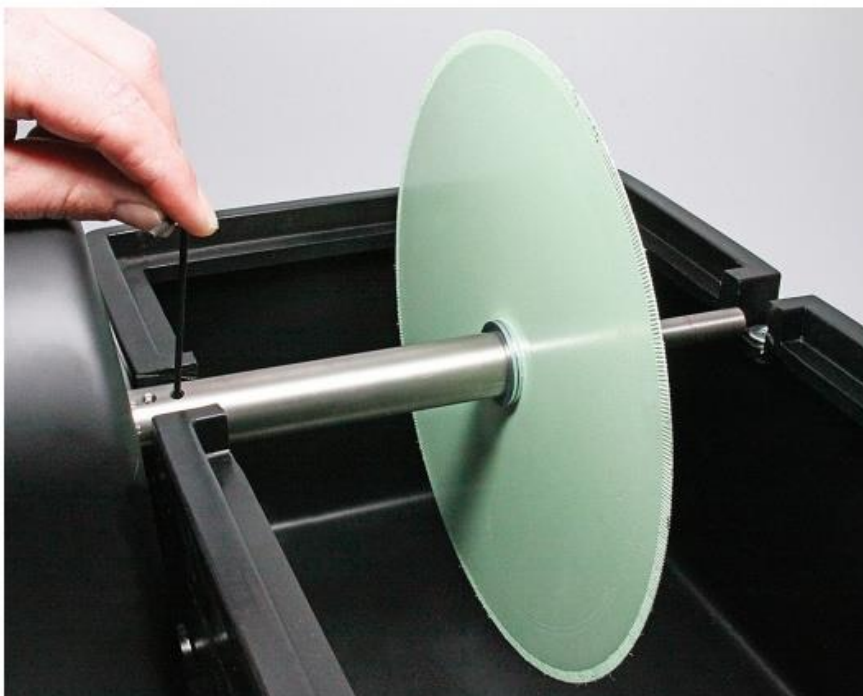


Figure –slab saw ready for blade adjustment

<b>Self-Check -4</b>	<b>Written Test</b>
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### Direction 1: Short answer items-2pts each

**Instruction1-** Read the following questions and give answers for each.

1. Mention the basic slabbing operation rules.
2. Write the 4 basic steps a lapidary should follow to adjust the position of the saw arbor and the saw blade so that the blade does not make contact with the saw table.
3. What will happen if blades are misaligned?
4. When you maintain the slab saw?
5. What do you do if your slab saw failed while you are slabbing?

**Note: Satisfactory rating - 5 points**

**Unsatisfactory - below 3 points**

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

<b>Information Sheet-5</b>	<b>Loading saws</b>
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### 3. Loading saws

#### Clamping the stone

Many rough gemstones, such as agate and jasper, occur in smooth, water-worn pebbles. Great care must be exercised in clamping stones of this shape to prevent slippage during cutting. Many blades are ruined by the shifting of a piece of rough in the clamp, causing binding of the blade, overheating, and sometimes bending or breaking of the rim. Of great value in clamping troublesome shapes are small chips and bits of soft wood which can be inserted around the stone to provide additional points of support. It is *always* worthwhile to take a little extra time and trouble at this stage. Once the stone is in place, test its firmness by twisting it with the hands in a deliberate attempt to move it; if it moves, it isn't fastened properly and should be readjusted.

When clamping the rough, try to visualize what you want to get out of it. If you desire a series of slabs, be sure to clamp the stone out far enough so that a number of cuts can be made before the stone has to be reshifted in the clamp. Inasmuch as it is quite difficult to line up the stone so that the next cut is parallel to the first, it is best to get as many cuts as you can in one clamping, as this will automatically insure slices of the same thickness. Extremely irregular, or long and

narrow specimens, often require a trimming cut in order to make them fit in the clamp. Each piece of rough has to be studied for a few minutes to determine the best way to saw it. The extra time spent in deliberation may mean the difference between a good yield of slabs or a poor one.

<b>Self-Check -5</b>	<b>Written Test</b>
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### Direction 1: Short answer items

**Instruction1-** Read the following questions and give answers for each.

1. What are the important concerns that should be thought while clamping the gem material rough?
2. List the stones with a smooth water –pebbles resulting clamping difficult?
3. What is the cause of overheating and damages saw blades?

**Note: Satisfactory rating - 3 points**

**Unsatisfactory - below 3 points**

### Answer Sheet

Score = _____
Rating: _____

<b>Information Sheet-6</b>	<b>Checking pump or coolant delivery system</b>
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## The coolant and tank

All saws for stone need a liquid bath through which the blade must run. Considerable heat is generated by the impact of diamond particles against hard stone; this heat, as well as the stone dust produced by the abrasive action, must be carried off. Furthermore, friction is considerable, and the cooling liquid serves as a lubricant. The liquids used are popularly known as "coolants" and consist of either oil-kerosene mixes, water, or water to which has been added a quantity of soluble oil. The first mixture is generally best and is prepared easily by mixing about one part of ordinary motor oil with about five parts of kerosene. Other light oils, such as transformer oil, flushing oil, etc., have been used also. Water solutions of soluble oil are employed extensively in machine shops for all manner of cutting operations but have rather limited use in lapidary work. Certain minerals tend to absorb the oil from such solutions causing the remaining fluid to be primarily plain water.

- Water alone may be used successfully for very soft stones, such as limestone, granite, serpentine, and also those which are extremely porous. It is good practice, when sawing, to have a

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bucket or pan of soapy water at hand in which the slabs can be immersed as soon as they come off the saw. Prompt washing off will prevent oil from penetrating deeply into porous stones and will leave all of them far easier to handle in subsequent operations.

- The fine particles of rock dust form a heavy sludge on the bottom of the coolant tank. In time this sludge must be removed to prevent it from being drawn up through the saw cut and reducing the efficiency of the blade. If the oil-kerosene mixture is used, the oil may be salvaged by pouring the thin sludge into a large container and putting it to one side to settle. This process takes a long time, especially if the amount of kerosene is small in proportion to the oil. The oil is not harmed in any way by being used in the saw, and so there is no reason why it shouldn't be salvaged if it can be.
- People with tender skins are sometimes sensitive to kerosene, and it is best' for them to use a very light flushing oil without the addition of kerosene.
- In general, oil coolants seem to provide better cutting with most minerals; they also have the advantage of preventing rust on the equipment. Conversely, water-soluble oil mixtures, or water alone, are likely to rust steel and iron but are far less messy to use. For the amateur who uses his saw but rarely, it is often a good compromise to use soluble oil and then promptly drain it off after use and wipe off the saw parts thoroughly to prevent rust.
- In most slabbing saws, the tank serves not only to hold the coolant but also to support the saw assembly and carriage. In such cases

the tank is usually made of stout galvanized iron sheet welded together at the joints. In other types, the tank is merely a liner made of thin sheet metal resting in a wooden box, which, in turn, supports all of the machinery. It is highly important that this supporting box, or tank, as the case may be, be as rigid as possible, because it supports both the carriage and the saw blade and keeps them in alignment.

- Whether homemade or purchased, every saw should rest squarely and firmly on its supports. Placing cushions of felt or sponge rubber under the corners will do much to reduce noise and vibration. Most manufacturers sell stands for their slabbing saws, but these are not absolutely necessary, and satisfactory substitutes can be made from two-by-four lumber.
- For effective delivery of any type coolant to contact of stone and blade the pumping system has to be normal. That is, it should be periodically checked and maintained if there is any sign of abnormality.

**Self-Check -6****Written Test****Direction 1: Short answer items**

**Instruction1-** Read the following questions and give answers for each.

1. What are the various functions of coolant
2. List the coolants used in saw machinery
3. Describe the proportions of a coolant mix.

**Note: Satisfactory rating - 3 points**

**Unsatisfactory - below 3 points**

**Answer Sheet**

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

<b>Operation Sheet-1</b>	<b>Prepare for work</b>
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Procedures of preparing work for slabbing gem material

1. Plan end result and Safety requirements
2. sequence slabbing processes
3. select Tools and equipment
4. acquire gem material
5. Clean Equipment and work area.
6. Check and fill Coolant.
7. Check and maintain blades.
8. Load Saws.
9. Check vices for firmness.
10. Checking pump or coolant delivery system

**LG Code: MIN LAP1M04LO2-LG-14**

**TTLM Code: MIN LAP1MTTLM0421v1**

**LG #14**

**LO #2- slab gem material**

### Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- keeping on Sawing till the cut is through
- Stopping slab saw
- Removing stone from saw
- Immersing slab in cleaner

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- Keep on sawing till the cut is through
- Stop saw if needed
- Removing stone from saw
- Immerse slab in cleaner

### Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 20.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the [self-checks 1, 2, and 3 in pages5,7,9 respectively](#)
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further

instructions or go back to Learning Activity #1.

7. Submit your accomplished Self-check. This will form part of your training portfolio.

## Information Sheet 1- keeping on sawing till the cut is through

### 1. Slabbing

What we call **slabbing**, in lapidary, is really a grinding process. The process of dividing/slicing stones into pieces or removing the excess material from the rough stone is called slabbing. A slabbing machine is used for this step and lapidary must wear protective equipment during this stage, including goggles, and masks. Slabbing is performed by using the following general procedures.

- ✓ Detect the part of the stone to be sliced;
- ✓ Draw a sawing line;
- ✓ Double-check the water level and firmness of the vises of the slabbing machine;
- ✓ Saw carefully along the line that you have marked out.

The blades are generally thin round disks with an abrasive grit such as silicon carbide, emery, or diamond embedded into the rim.

The detailed steps to be followed while slabbing /sawing gemstones are indicated as below:

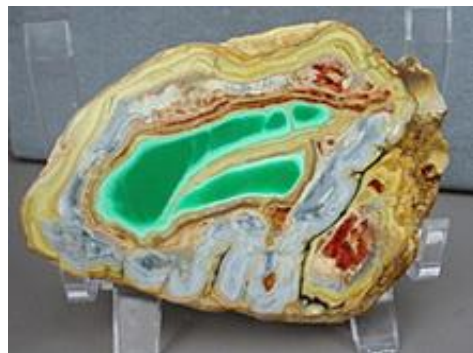
- A.** Now that the coolant oil has been added and the rock is firmly gripped in the vise jaws and positioned for the first cut, you are ready to start slabbing.
- B.** The vise and carriage are slid forward until the rock is almost touching the blade.

- C. The brass half nuts are engaged (due to equipment wear a short brass wire is placed between the half nuts).
- D. Check that the saw blade guard will clear the stone and vice while cutting.
- E. Put the Plexiglas hood in place.
- F. Turn on the machine
- G. The cut will start shortly, and you can watch the progress through the transparent hood. Listen to the machine, is it turning smoothly? If not notify a target Officer. You should hear the “ching” of the rock being cut.
- H. Once started, the cut should progress smoothly until completed. The carriage will advance at approximately 10” per hour. Stay in the room with the saw and listen for any sound of problems with the saw or cut.
- I. If the cut is started on a steeply sloping surface of a hard-to-saw material, the blade may be deflected sideways slightly and start a crooked cut. If this is suspected, the cut should be restarted after the blade has cut a slight notch. Restarting is very seldom necessary with this saw.

**Note:** trimming is the process of slicing/sawing to remove unnecessary parts from the stone. The difference between trimming and slabbing is on the size of the sawing machine and the gemstone which may be usually sliced. That is, small slicing saws are termed as **trim** saws. The gemstone saws with saw blade diameters of 14 inch and below are usually known as trimming saws. Trimming is the process of removing usually small parts of gemstone beyond the outline of the project/product.during slabbing or trimming the be sure that the blade must be traight.



Tourmaline slabe



*nodular variscite*

<b>Self-Check -1</b>	<b>Written Test</b>
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**Direction 1: Short answer items**

**Instruction1-** Read the following questions and give answers for each.

1. What is slabbing?
2. Mention the general procedures to be followed while slabbing the gem material.
3. What is the basis for classification of gem saws as slab and trim?

**Note: Satisfactory rating - 3 points**

**Unsatisfactory - below 3 points**

**Answer Sheet**

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Short Answer Questions**



<b>Information sheet-2</b>	<b>Stopping the saw and removing the slab</b>
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## 2.1 Manually or automatically stopping the slab saw

As the blade reaches the end of the cut, the product will drop on the bed of the slab and you can detect this by sound or directly observing slab through transparent window.

Upon completion of the cut, the machine should be manually or automatically (which is adjusted before) stopped to make ready the machine for the next operation i.e material removal. The stopping operation can be performed manually using on/off switch.

## 2.2 Removing the slab from saw

Upon completion of the cut, the slab should be safely removed from the machine and immersed in a cleaning agent.

Before removing the slab, it is advisable to go through the following procedures:

- Be sure that the machine has been shut down and its moving parts are at static state
- Prepare a collecting container with cleaning agent
- Safely open the splash hood
- Use safety clothing to prevent damages from sharp edged slabs and blade edges
- Carefully pickup the slab and immerse into the prepared container.

As the blade reaches the end of the cut, it is important to avoid letting too much pressure drive the stone past the blade. Furthermore, when the slab finally breaks off, it has a nasty habit of leaving behind a sharp projection which can seriously gouge or dish the blade. Consequently many experts stop the saw just short of completing the cut and break the slab off with their fingers. This is not quite so necessary when using a mechanical-feed saw as it is with a weight-feed saw, but it is a good idea in either case.

After removing the slab and other broken out pieces of stones, the next new slabbing process should be gone by repositioning the clamped rough relative to the saw blade and the process may continue as per needs of the production.

After completion of the production, the machine and the work area should be properly cleaned and stored as per standard workshop procedures.

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<b>Self-Check -2</b>	<b>Written Test</b>
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**Direction 1: Short answer items**

**Instruction1-** Read the following questions and give answers for each.

1. Write the procedures that a lapidary should use while removing a slab.
2. What is the cause of blade gouging or dishing?
3. What is the advantage of inspecting the slabbing process?

**Note: Satisfactory rating - 3 points**

**Unsatisfactory - below 3 points**

**Answer Sheet**

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Information Sheet-3****Immersing slab in cleaner****2. Immersing slab in cleaner****Cleaning off sawed pieces**

All slabs and chunks of rough sawed with an oil-base coolant should be promptly cleaned off to prevent the oil from penetrating into the pores and crevices. In certain gemstones, such as agate, serpentine, and rhodonite, oil penetrates so deeply that it may even be necessary to soak the pieces in a detergent solution brought up to and maintained at a simmer. As each piece comes from the saw, wipe off the excess oil with a rag and plunge immediately into a bucket or pan of detergent solution. The detergent solution must be ISO certified for the safety of a lapidary and its product. The other purpose of cleaning slabs is to make them easy and neat for further outlining and processing.

**Self-Check -4****Written Test****Direction 1: Short answer items**

**Instruction1-** Read the following questions and give answers for each.

1. What is the main reason of cleaning gem amterial slabs.
2. Mention the detergents which are commonly used for cleaning slabs.
3. Which materials are used to put or collect slabs for cleaning?

**Note: Satisfactory rating - 3 points**

**Unsatisfactory - below 3 points**

**Answer Sheet**

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

<b>Operation Sheet-1</b>	<b>Slabbing gem material</b>
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**steps for slabbing gem material**

**Step 1 :** Plan end result /project

**Step 2 :**Use safety requirements

**Step 3 :** Arrange sequenc of slabing processes

**Step 4 :** select tools and equipment

**Step 5 :** acquire gem material

**Step 6 :** Clean equipment and work area.

**Step 7 :** Check and fill Coolant.

**Step 8 :** Check and maintain blades.

**Step 9 :** Load Saws/clamp the stone.

**Step10 :** Check vices for firmness.

**Step 11 :** Check pump or coolant delivery system.

**Step12:** close the splashhood to protect the spread of coolnts

**Step 13 :**turn on the machine and slab the material/stone

<b>LAP Test 1</b>	<b>Practical Demonstration</b>
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Name: \_\_\_\_\_ Date: \_\_\_\_\_

Time started: \_\_\_\_\_ Time finished: \_\_\_\_\_

**Instructions:** Use all necessary tools, equipment and materials that you require to perform the following tasks within **2 hours**

**Task 1:** Slab gem material with a thickness of **10mm**

## LG #15

### LO #3- clean up material

#### Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Clearing, mopping, and cleaning equipment and Work area
- disposing Waste
- trading procedures

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- Clear, mop, and clean equipment and Work area
- dispose Waste
- trade procedures

#### Learning Instructions:

8. Read the specific objectives of this Learning Guide.
9. Follow the instructions described in number 3 to 20.
10. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
11. Accomplish the **self-checks 1, 2, and 3 in pages 5,7, and 9 respectively**
12. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
13. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
14. Submit your accomplished Self-check. This will form part of your training portfolio



## Information Sheet 1- Clearing, mopping, and cleaning equipment and Work area

### 1. Clearing, mopping, and cleaning equipment and Work area

After completing slabbing work, the work area and the equipment should be properly cleaned and made ready for further use. This should be a routine task of operators of the machine and done by following the following general procedures.

#### A. shutting down the machine

Machines have their safe shutting down procedures. It is advisable to shut machines following their procedures, if there is an accident. This is because the procedures designed for safe restoration of machine parts. To shut down the faceting machine, stop rotational speed, make direction of rotation at neutral and press on/off switch.

- **Removing products**

The products should be removed after switching off the machine. Attempting to pick up the product while the machine is running is very dangerous .Picking up should be performed after every moving part of the machine is in static condition.

- **Cleaning and storing equipment and work area**

- By using cleaning consumables the machine should be properly cleaned and the work area too be cleaned by using detergents. Here, Occupational health and safety should be taken into account. This is because stone chips may harm our fingernails if not properly handled, the smell from tank may affect our respiratory system etc.

The common waste and dirt to be removed include:

- stone chips
- mud resulting from stains of soil
- wooden chips from the vice
- Thick slurry of oil, kerosene other chemicals

The equipment should also be inspected for its normality, and its areas of friction like tool guides, screw, etc should be lubricated to reduce heat that may be produced by friction causing chipping and breaking down of the parts.

More over the coolant level of the machine should be adjusted by adding additional oils for losses during operation.

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<b>Self-Check -1</b>	<b>Written Test</b>
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**Direction 1: Short answer items**

**Instruction1-** Read the following questions and give answers for each.2 pts each

1. What are the common dirt and waste materials to be cleaned from slab saw machinery and workshop?
2. What are the friction areas of a machinery part to be oiled while cleaning and maintaining
3. What are the general procedures that an operator should follow while cleaning machinery and working area?

**Note: Satisfactory rating - 4 points**

**Unsatisfactory - below 4 points**

**Answer Sheet**

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Short Answer Questions**

<b>Information Sheet-2</b>	<b>Disposing Waste</b>
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## 1. Disposing Waste

### 1.1 Definitions

**Disposing waste is the process of discarding the waste away from the work and living environment. The major wastes in a lapidary work shop are of two types:**

- **Liquid wastes**
  - **mineral oils, gases and water which has already been used in cleaning.**
- **Solid wastes**
  - Rock mud, stone chips and other clay materials

### 1.2 Wastes from coolant tank and shop floor

slab saws require periodic routine maintenance to remove the buildup of rock mud (sludge) and dirty lubricating fluid from the reservoir. It will be apparent to the user that the lubricating fluid is dirty and needs to be changed if the oil residue on the saw table after cutting is thick and dark with rock sludge build up. The oil liquid can be removed rapidly using the drain hose at the base of the oil reservoir. A five gallon bucket or collection container can be placed under the outlet cap and the cap removed with an adjustable wrench to let the oil flow free into the bucket for proper disposal. The sludge residue will likely not flow through the drain hose and will remain inside the oil reservoir, therefore, the sludge should be removed by hand. Extract the sludge with a spatula or spoon out of the bottom tank hole. With motor side secure on table top, move hole over table edge and remove plug. Sludge can be put through the hole for removal. Once the sludge is removed, wipe clean the inside of the tank with a disposable towel.

### 1.3 Modes of waste disposal

After cleaning and collecting liquid and solid wastes, disposal its disposal is very critical issue that is to be dealt with. The waste should not be disposed anywhere. This is because of their capability of polluting the environment and obstructing the sewerage system. Thus they should be disposed by the following ways because wastes have high environmental pollution effects

- Burning flammable (like sludge containing gases and oils) wastes collecting in confined area
- Burring the waste mix in the hole prepared for it.
- Reusing the gemstone chips for building decoration like as tiles

Finally, replace sludge plug and hose cap and refill with cutting lubricant to cover the bottom 1/4" of the blade. The fluid will be absorbed onto the rock material, combine with rock mud (sludge) and be lost due to heat misting and evaporation

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<b>Self-Check -2</b>	<b>Written Test</b>
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**Direction 1: Short answer items**

**Instruction1-** Read the following questions and give answers for each.

1. List down all the liquid wastes of slab saw machinery workshop.
2. Write the modes of waste disposal.
3. What are the environmental effects of any where disposing of lapidary slab machinery and workshop waste?

**Note: Satisfactory rating - 3 points**

**Unsatisfactory - below 3 points**

**Answer Sheet**

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Short Answer Questions**

**LG Code: MIN LAP1M04LO4-LG-16**

**TTLM Code: MIN LAP1MTTLM0421v1**

<b>LG #16</b>	<b>LO #4- Sort finished pieces</b>
<b>Instruction sheet</b>	
<p>This learning guide is developed to provide you the necessary information regarding the following <b>content coverage</b> and topics –</p> <ul style="list-style-type: none"> <li>• <b>Sorting Materials by type, size and color/pattern</b></li> <li>• <b>completing documentation</b></li> </ul> <p>This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, <b>you will be able to –</b></p> <ul style="list-style-type: none"> <li>• <b>Sort Materials by type, size and color/pattern</b></li> <li>• <b>Complete documentation</b></li> </ul>	
<b>Learning Instructions:</b>	
<ol style="list-style-type: none"> <li>1. Read the specific objectives of this Learning Guide.</li> <li>2. Follow the instructions described in number 3 to 20.</li> <li>3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.</li> <li>4. Accomplish the “Self-check 1” <b>in page 4</b></li> <li>5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).</li> <li>6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to</li> </ol>	

## Learning Activity #1.

7. Submit your accomplished Self-check. This will form part of your training portfolio.

## Information Sheet 1- Sorting finished materials and completing documentation

### 1. Sorting finished materials and completing documentation

#### 1.1 Sorting finished materials

Finished slabs gem materials should be sorted by different characteristics of the products. Sorting is important to simplify the price determination of the product. For example slabs with attractive patterns are more expensive than those with no pattern.

The major dimensions for sorting are:

- Type : by the name of the gem e.g agate ,opal, ruby,emerald etc
- Size : small, medium, larg
- Color : green, red, blue etc
- Pattern:

#### 1.2 Completing documentation

After sorting finished slabs, it important to put in order and designate their dimensions like size, type and others. All this data of the product should be properly documented as a reference to easily access the product. Completing documentation is essential to manage the inventory of the product.

During documentation plan, acquire tools and equipment, recording correct spelling, and grammars, Confirm that all hyperlinks work properly. Content conform to common writing best practices (use of consistent tense, personal pronouns, etc.), keeping document hierarchy are important points



<b>Self-Check -1</b>	<b>Written Test</b>
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### Direction 1: Short answer items

**Instruction1-** Read the following questions and give answers for each.

1. Mention the important characteristics of slabs used to sort them.
2. What is the main advantage of documenting the product.
3. Why patterned slabs are more expensive than slabs with no pattern?

**Note: Satisfactory rating - 3 points**

**Unsatisfactory - below 3 points**

#### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Reference

**1- Diamond pacific(slab saw manufacturer)**