BEEKEEPING LEVEL-II

Learning Guide-02

Unit of Competence: Assist, Construct and Repair of Beehives

Module Title: Assisting in Constructing and Repairing of Beehives

LG Code: AGR BKGI M07LO2-LG-O7

TTLM Code: AGR BKGI M07sTTLM 0919v1

LO 2: Construct or repair bee hives.

Instruction Sheet	Learning Guide #2

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

- Identifying beehives require
- Repairing visually to identify scope of job and materials and tools required.
- Burning where visual inspection indicates presence of American foulbrood disease, beehives sent for irradiation.
- Assembling and repairing beehive components are using appropriate replacement parts, nails, ***joins, glues and construction techniques***.
- Applying appropriate ***timber treatments*** to beehive.
- Constructing or repairing beehive and all components are correctly and legibly ***marking*** in bee hive
- Undertaking work is in a safe and environmentally appropriate manner
- Maintaining and cleaning and safe work site while working.
- Reporting problems or difficulties in completing work

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 –

- Identifies beehives requiring repair visually to identify scope of job and materials and tools required.
- Burns where visual inspection indicates presence of American foulbrood disease, beehives sent for irradiation.
- Assemble and repairing beehive components are using appropriate replacement parts, nails, ***joins, glues and construction techniques***.
- Applies appropriate ***timber treatments*** to beehive.
- Constructs or repairing beehive and all components are correctly and legibly ***marking*** in bee hive
- Undertakes work is in a safe and environmentally appropriate manner
- Maintains and cleaning and safe work site while working.
- Reports problems or difficulties in completing work
- **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-check 1” in page 8.
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.
8. Read the information written in the “Information Sheet 2”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
9. Accomplish the “Self-check 2” in page 32.
10. 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 2).
11. Read the information written in the “Information Sheets 3 . Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
12. Accomplish the “Self-check 3” in page 34.
13. 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 3).
14. If you earned a satisfactory evaluation proceed to “self.
15. Conducting Checks and reporting all other materials and equipment and insufficient or faulty items
16. Identifying and reporting Occupational health and safety hazards.
17. Self check 4“”page 37. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
18. Read the “self check 4” and try to understand the procedures discussed.
19. If you earned a satisfactory evaluation proceed to “self check 6 in page 45. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
20. Read the “self check 7” and try to understand the procedures discussed.

21. If you earned a satisfactory evaluation proceed to “self check Sheet ” in page 51. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
22. Read the “Operation Sheet 1” and try to understand the procedures discussed in page53.
23. Do the “LAP test” in page 54 (if you are ready). Request your teacher to evaluate your performance and outputs. Your teacher will give you feedback and the evaluation will be either satisfactory or unsatisfactory. If unsatisfactory, your teacher shall advice you on additional work.

Information Sheet-1	Identify beehives and repair the visually required

1.1 Identify beehives and repair the visually require PPE or tools

In Your work shop identify the followings tools and equipments

Personal Protective Equipment (PPE)

Personnel participating in beekeeping activities should, at a minimum, wear a beekeeping hat and veil, elbow length gloves that are leather or nit rile, and closed-toe/closed-heel shoes.

Before entering the beekeeping area, personnel shall wear clean protective clothing/personal protective equipment. The protective clothing should be without holes to prevent bees from entry.

Beekeeping hat and veil

- The ventilated hat should keep its shape and be firm enough to support the veils that fit over them and provide space that keeps the veil away from the face.
- Veils are required when working closely with the bees. A folding wire veil should be fitted to the hat to ensure good separation between the beekeeper's face and the bees outside the veil.
- Dark felt hats and floppy hats should be avoided.

Beekeeping gloves

- Gloves need to be strong, but pliable;
- Elbow length cloth sleeves attached to the gloves should be worn when gaining access to the inside of the hive; or
- A band of elastic should be sewn into the cloth sleeve at the elbow end to make it bee-resistant.

Footwear

- Closed-toe and closed-heel shoes should be worn.

1. Tools and Materials required for hive construction

Thicknesses machine for adjusting thinness and surface smoothing Circular **saw** for cutting wood

Jointer machine for smoothing edges and creating side bar shoulders

Measuring tape Measuring tape

Digital calliper

Framing square or drywall

T-square

Table saw

Sabre saw (sword with a slightly curved blade that is sharp on one edge)

Putty knife or chisel

Hammer

Clamps

Power Drill-drill with bits Jigsaw Chop saw Sanding block Carpenters square (or a frame jig)

Carbide-tip blade

1.2 Materials

Waterproof wood glue

19 mm thick Waterproof plywood

5 mm thick Waterproof plywood

5 and 8 cm galvanized nails

3 cm hardened trim nails (small nails)

Cigar box nails (16 mm shoe nail)

Timber for frames

Timber for entrance block/reducer

Lumber of thickness 20 mm after finished the following are the images listed below look the diagrams for detail

- 
Ready to Go
A cheap & useful gift


Saw Blades
Shop our wide range of blades


OX


Oldham
Ultra-Finishing
7 1/4
60

-

Self check -1	Writing

Directions: Answer all the questions listed below. Encircle the letter

1write 6 tools and equipments used to construct hives? (4point):

_____----------_____

_____

_____

_____

_____

Answer Sheet Name: _____ Date:

_____

Score = _____

Rating: _____

Note: **Satisfactory rating – 4 points** **Unsatisfactory - below 4 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet-2	Burn where visual inspection indicates presence of American foulbrood disease

2.1. Diagnosing and Treating American Foulbrood in Honey Bee Colonies

Honey bee colonies can be infected with two bacterial diseases: *American Foulbrood* (AFB) and *European Foulbrood (EFB*). They are called 'Foulbrood' because both diseases affect the *brood* (the term for bee larvae and pupae) and these diseases cause the hive to have a particular foul odour. In this article, we will discuss how to identify and safely manage American Foulbrood, the more severe bacterial disease. Infection with AFB is serious, needs immediate attention, and may require the involvement of a veterinarian. Early diagnosis and prompt response is essential for preventing the spread of AFB.

note: different states and provinces have different laws and reporting requirements for honey bee diseases. make sure that you check with your state apiary inspector or local extension specialist if you suspect your colony has a bacterial disease. a list of state apiary inspectors is available at Inspection for disease

Take care when inspecting hives to prevent the transmission of bacteria or spores to healthy colonies. While unlikely, be aware that bacterial spores can be transmitted by hands, hive tools, smokers, and any beekeeping equipment. Wear nitrile or latex gloves when working in hives that may have foulbrood, remembering to remove and safely dispose of them before handling another hive. Do not wear leather beekeeping gloves when inspecting someone else's colonies, or when working with sick hives, as they cannot be cleaned. Wash beekeeping jackets and other equipment often.

Keep your hands clean. Wash your hands often and well. If water is not available at your site, use rubbing alcohol or hand sanitizer and rub vigorously. Remove all the wax and propels from your hands, as spores can remain in these materials. Best practice is to use nitrite gloves - being careful to remove and dispose of them after handling an infected hive.
Make sure that your hive tools are completely clean. After working suspect or sick hives, switch to a clean tool. If water is available soak your tools in bleach solution, and use a chlorinated scrubbing cleaner like comet as well as rubbing alcohol to remove all of the porpoise that can accumulate on the tool. Clean tools can be autoclaved if facilities are available. If no water is available, you can flame the tool, but some spores may still remain in any attached propels and wax. Photos by Sarah B. Scott.

American Foulbrood

American Foulbrood is an infectious and highly contagious disease caused by a gram-positive spore-forming bacterium, *Paenibacillus larvae.* AFB has been known to affect honey bees for hundreds of years. It is found all around the world, though different genotypes predominate in different areas. AFB is considered by many to be the worst disease of honey bees. There are three reasons why this disease is so serious:

AFB has a highly persistent spore form that can remain infectious for decades and spread easily to other colonies.

AFB can devastate an otherwise healthy hive. It does not require another stressor, and colonies do not spontaneously recover – AFB generally leads to death.

It is highly infectious – only a few spores are needed to cause infection in an otherwise healthy colony.

The infectious spore form is incredibly stable in the environment. It can persist for decades on equipment, honey, wax, pollen, etc., and can remain infectious years later, even after

freezing, droughts, and humidity. No other honey bee disease is known to be as persistent, and great care must be taken with the equipment of colonies known or suspected to be infected with AFB. If a beekeeper does not notice or appropriately deal with an infected colony, they can easily spread the spores throughout their entire operation through actions taken in routine apiary management.

A yard where two colonies were found to be infected with American Foulbrood. It is easy to tell what colony remained uninfected. The large colony is normal for this area at this time of year, while the two infected colonies had dwindled down to only a few frames of bees. This beekeeper faces the loss of the bees, equipment, and honey production from these colonies. Photo by Sarah B. Scott.

AFB spores infect the bee early in the larval stage (12 - 48 hours old), generally through infected food. Infection spreads quickly among the larvae, as nurse bees move from cell to cell during feeding. Only a few spores (<10) are required to cause disease in larvae. Adult bees can carry the spores, but are not affected. The spores germinate into the active vegetative form when they reach the larval intestine. They begin to reproduce, and the bacteria massively colonize the mid gut. In the mid gut, the bacteria release toxins and enzymes that digest the larval tissues. As the disease worsens, the gut epithelium (lining) is breached, and the infection spreads to all tissues, causing sepsis and death. In the strain of AFB found in the US, death occurs just as the larvae are capped (in a cocoon to commence pupation). The larvae completely breakdown into a glue-like biofilm. As conditions become

unfavourable for the vegetative form, the bacteria form spores. A single dead larva may contain millions of infectious spores.

Clinical Signs of American Foulbrood

The clinical signs of AFB are variable, and what you see will depend on the stage of the disease and the time elapsed since infection. At the beginning of an outbreak in a colony, only a few larvae may be infected. As the disease progresses, the population in the colony dwindles, as very few young bees survive.

As the infection continues, a particular foul

odder will develop. In a severely infected colony, the odder may be detectible without opening the hive. Some beekeepers can smell the odour easily, and can tell there is an infected hive as they enter the yard. Other beekeepers can never smell the odder, and may not recognize it, so an absence of smell does not mean AFB is absent. The presence of a bad smell does not necessarily mean that AFB is present, as larval decay for any reason will smell unpleasant.

In addition to the foul smell, AFB causes a characteristic set of visual signs in the brood nest of a hive:

Spotted brood pattern

Sunken capping

Off center holes in capping

Larval scale

*Caramel color of dead larvae**

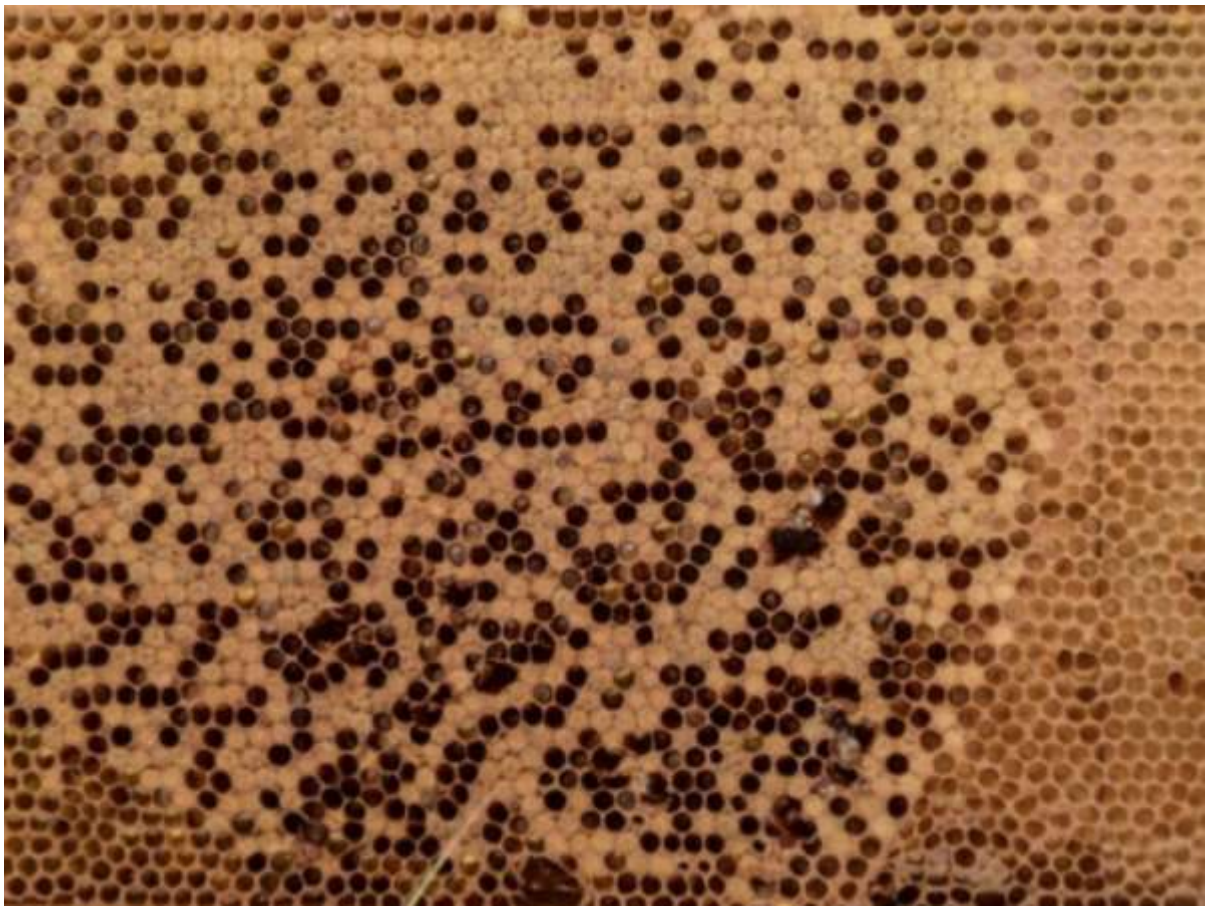
*Pupas tongue**

* These two signs (caramel color and pupil tongue are unique to AFB.

A healthy brood pattern: a few gaps in the brood are considered normal, but capped cells are generally touching other capped cells, and the capping look dry, even, and uniform. Photo by Sarah B. Scott.

Signs of AFB: Spotted or “shotgun” brood pattern

In a healthy colony, the cappings over the pupae should look uniform in shape and consistently colored. The larvae are generally raised in groups of the same age, so a healthy brood pattern would appear to be largely unbroken. In a heavily infected colony, few larvae live to emerge as adults, and the pattern becomes broken as they die and are replaced in a non-regular order.



A spotty brood pattern: This pattern is often referred to as “Shotgun” because it looks like shot sprayed on the frame. Photo by Sarah B. Scott.

Not all spotty brood patterns are caused by AFB. Many other factors can cause spotty brood: other diseases, a poor queen, or environmental factors such as chilling or poor nutrition. In this hive, we saw plenty of eggs, and there was plenty of food available, which suggested that the brood pattern was likely due to disease

Eggs are visible among the surviving pupae indicating that the spotty brood pattern is not due to a queen issue. Photo by Sarah B. Scott.

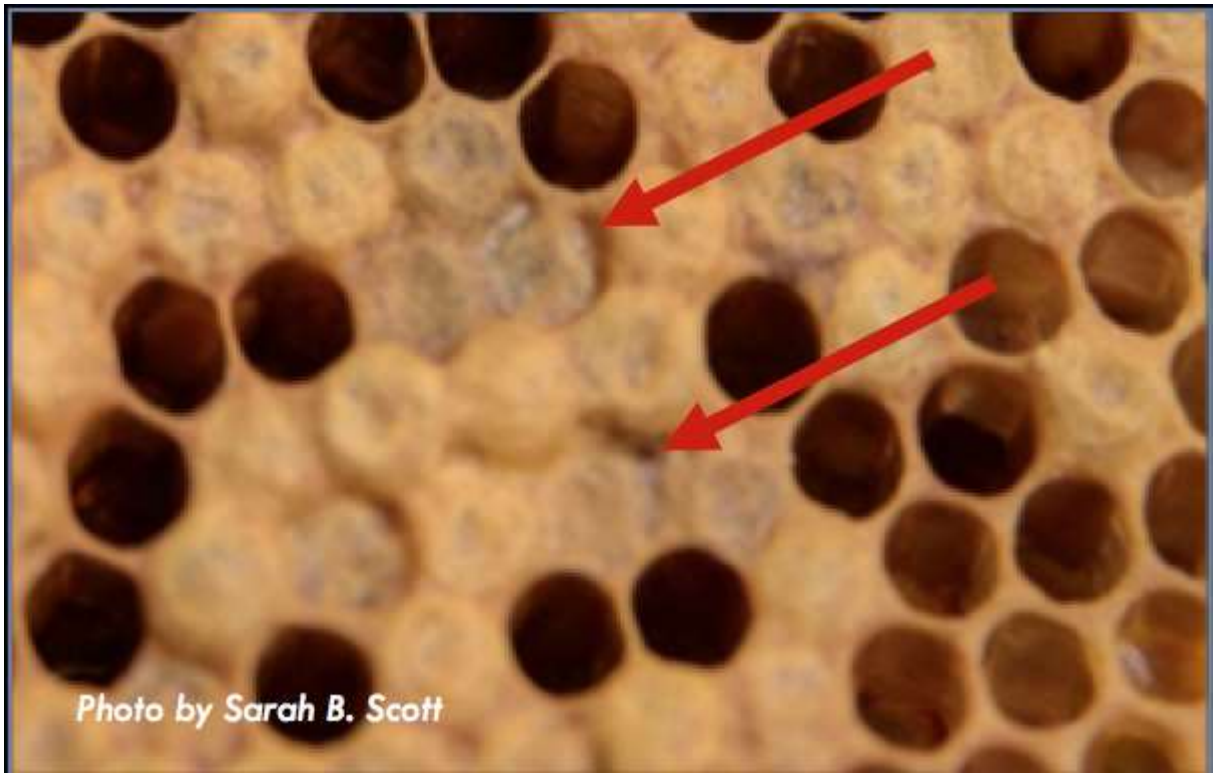
Don’t be mistaken! Not all shotgun patterns indicate AFB or other disease.

This brood pattern looks spotty, but it is actually from a very healthy hive which is ‘nectar bound’ a condition where the beekeeper failed to provide adequate space to allow for nectar storage outside of the brood nest. The queen and larvae are fine, but the nest is too crowded

with food for the queen to lay her normal pattern. This is an example of a spotty pattern that does not indicate the presence of disease. Photo by Sarah B. Scott.

Signs of AFB: Sunken cappings

Larvae that are infected with AFB die just after the cell is capped. The death of the larvae can cause the cap to shrink down, and appear deflated. Other diseases, including non-typical EFB can kill the larvae at this stage, so sunken cappings are usually present, but not unique to AFB.



Note the depressed edges around the capping, indicating the dead larva underneath.

Signs of AFB: Holes in capping

As the larvae continue to die, many of the cappings will darken, and develop a hole. The holes are generally jagged and off-center.

A typical frame of a colony in the early stages of AFB infection. Note the sunken, discoloured cappings beginning to form holes, as well as the spotty, irregular pattern. As infection progresses, it is common for these cappings to develop a wet or greasy appearance. Note also that the adult bees that are present will appear to be completely healthy. Photo by Sarah B. Scott.

Holes in cappings of AFB-infected drone larvae (the caste is indicated by the larger size of the cell). AFB can infect workers, drones, and queens in the larval state. Photo by Sarah B. Scott.

Don’t be mistaken by healthy holes!

Holes in the cappings are not always indicative of AFB; there are situations where you can witness holes in the cappings in a healthy hive: during the capping process, when the bees are emerging from the cells, and due to hygienic behavior.

Holes due to the capping process (top image)- Note that the hole is generally centralized. The larvae in cells surrounding the capping with the hole are older – filling the whole cell, and about to be capped themselves. The larvae around the capping with the whole are white, pearly, and healthy.

A hole from elusion (middle image; the emergence of a newly formed adult bee from a capped cell)-If you look closely, you will see antennae and movement around the hole, and the emerging bee will be alive and healthy.

A hole due to hygienic behaviour (bottom image)- The bees opened the capping to inspect the pupae underneath. While the cell is not normally uncapped at this stage, but the pupae underneath appears white and healthy.

Signs of AFB: Larval scale

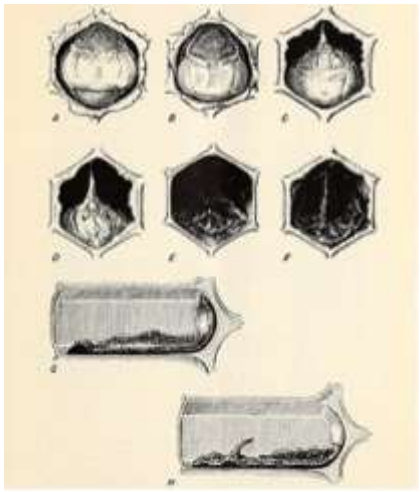
The larvae succumb to AFB just as they are capped. This means that signs of disease are visible in capped cells, as shown above, as well as in in the open cells of older larvae. Healthy larvae are always a brilliant, glistening, pearly white. As the larvae die, they darken and flatten against the lower cell wall, almost looking like they have melted into a goo. Newly dead larvae appear wet, and are light tan or caramel colored. They will continue to desiccate, eventually drying into a scale at the lower cell wall (the side that is parallel to the ground when the frame is in the normal position). The scale of AFB will be hard, and stuck to the cell wall.

Larval scale. Note the dried, blacked larvae on the wall of the cells (this side would be towards the ground in the hive). Each of these scales can contain millions of AFB spores.

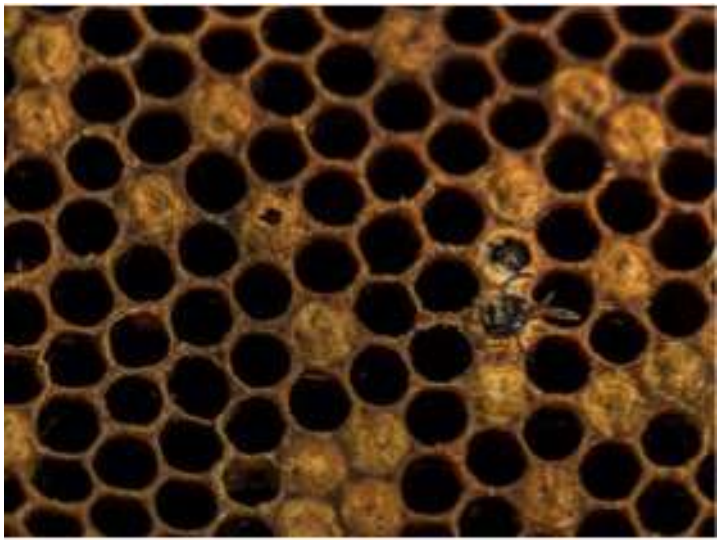
How to inspect for larval scale. Hold the frame with the top bar facing towards you with the sun over your shoulder. Look at the cell wall that is directly facing towards you to inspect for a dried black scale. Photo courtesy of Randy Oliver.

Signs of AFB: Pupal tongue

If the larvae live a bit after they are capped, then they can start to pupate. Larvae that die at this stage often leave what is called a 'pupal tongue' - the larvae melt, but the embryonic proboscis structure, which is more firm, does not melt, and can be retained as a visible point. This sign is less commonly seen, but is unique to AFB. If pupal tongue is not visible, you may still have AFB, but if you do see it, then you very likely are dealing with an AFB infection.



Decay of pupae infected with American Foulbrood. From 'Diagnosing bee diseases in the apiary' By C.E. Burnside. Panel A shows a healthy pupa, while panels B-F show the various stages of decay. The point visible in panel F is commonly referred to as the 'pupal tongue'. via Wikimedia Commons by Burnside, C. E.; Sturtevant, Arnold Parker [Public domain]

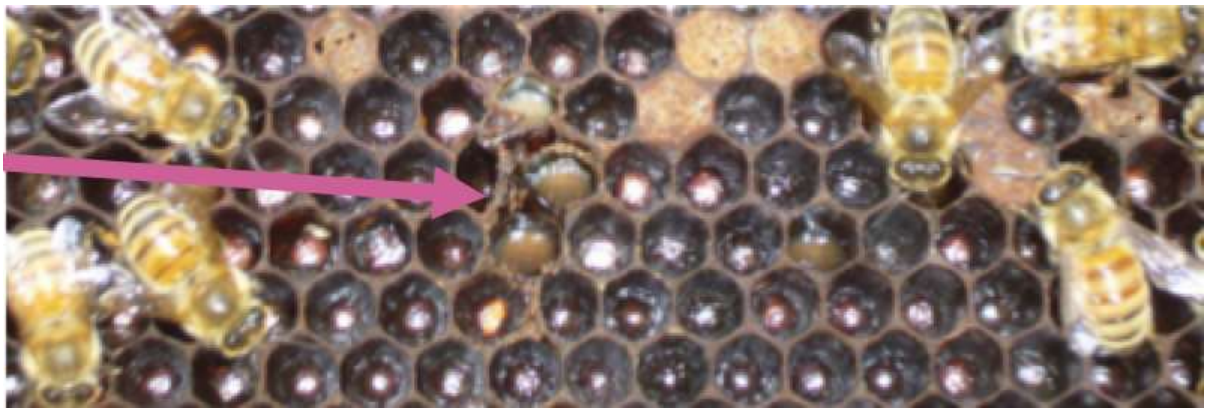


Don't be mistaken! This hive was sick, but not with AFB. This is an adult tongue, not a pupal tongue.

The photo on the left shows a bee that died just as it emerged from the cell. The tongue is visible, but this is NOT the same as pupil tongue. Note that the entire developed head is present. With AFB, only the tongue is identifiable as a single point, emerging from a scale. The bee on the left likely died from varroa-associated viruses. Photo by Sarah B. Scott.

Signs of AFB: Caramel color

As the bacteria breakdown the larvae, they form a caramel colour biofilm. This may not always be visible as this stage is only temporary. This colour is characteristic of AFB. Other diseases cause larval discoloration, but they generally range from yellow to gray.



Frame with AFB with characteristic caramel coloring. Photo by Randy Oliver.

A note on old equipment

Many new beekeepers are tempted to purchase used equipment or to use old equipment from a friend or family member. A common high-risk scenario is a beekeeper who wants to start beekeeping using their grandfather's equipment that they found out in the barn. If the grandfather stopped keeping bees in the 1930s - 1980s there is a real chance that they stopped beekeeping after they lost their bees to American Foulbrood, as the disease peaked during that era. It is highly likely that this equipment can still contain viable spores of AFB,

and pose a threat to bees. It is impossible to use any of the field tests to determine if the old equipment is safe. If a beekeeper wants to use old equipment of unknown origin or uncertain history, the frames should all be burned, and the rest of the woodenware should be sterilized as explained later in this document. If the used equipment is from a new beekeeper who quit beekeeping after 1-2 years of failure (which is also common), there is still a risk of AFB spores, but it is not likely. The current main epidemic is varroa-associated viruses, which are not known to be as environmentally stable. When starting new hives, the best practice is to always use new equipment and to carefully inspect any incoming equipment, such as during the purchase of nucleus colonies.

A typical looking frame from a colony that had died from AFB. Spores may still be present on this frame, and using it in a hive with a new colony will likely lead to infection of that colony. Photo by Randy Oliver

Visible AFB scales in an old frame. While other diseases may cause scales (e.g. non-typical EFB), the risk of AFB infection is too high to risk using these frames. Any frames with visible scales should be immediately burned. Photo by Randy Oliver

Diagnosis of American Foulbrood: Field tests

There are three field tests for identifying AFB in a hive. All three tests are highly specific, but not highly sensitive – a positive test result indicates that AFB is present, but a negative test result could be because the test missed the disease rather than the hive was truly free of AFB. A hive that produces negative field tests may still have infectious spores, so if AFB is suspected, the colony should still be dealt with appropriately. The field tests include

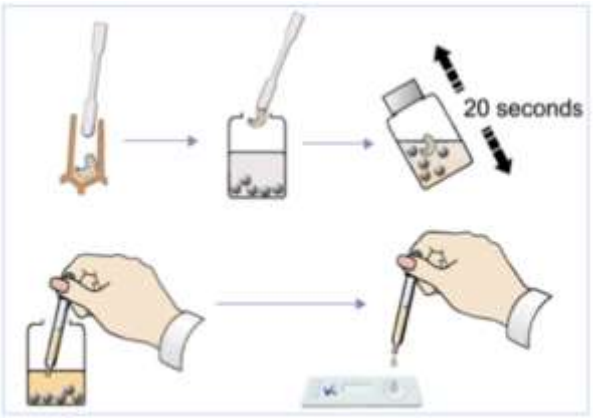
Commercial diagnostic kit

Match stick test

Holist milk test

AFB field tests: Commercial Diagnostic Kit

The commercially available kit looks similar to a standard pregnancy test - one line will appear to tell you the test worked, and if there is AFB, another line will appear indicating a positive result. The kits include all materials and instructions to test a hive in minutes.



Below are the methods used in the summer of 2017 – read the manufacturer's instructions carefully, as the process may change. Photos by Sarah B. Scott

1. Lay out all of the kit contents and pull a frame with suspect larvae.

3. Put the suspect larvae in the jar and screw the lid on tightly. Be careful not to tip or spill the jar as the contents (sodium azide) are toxic to humans.

4. Shake the jar vigroursly for 20 seconds.

T line indi

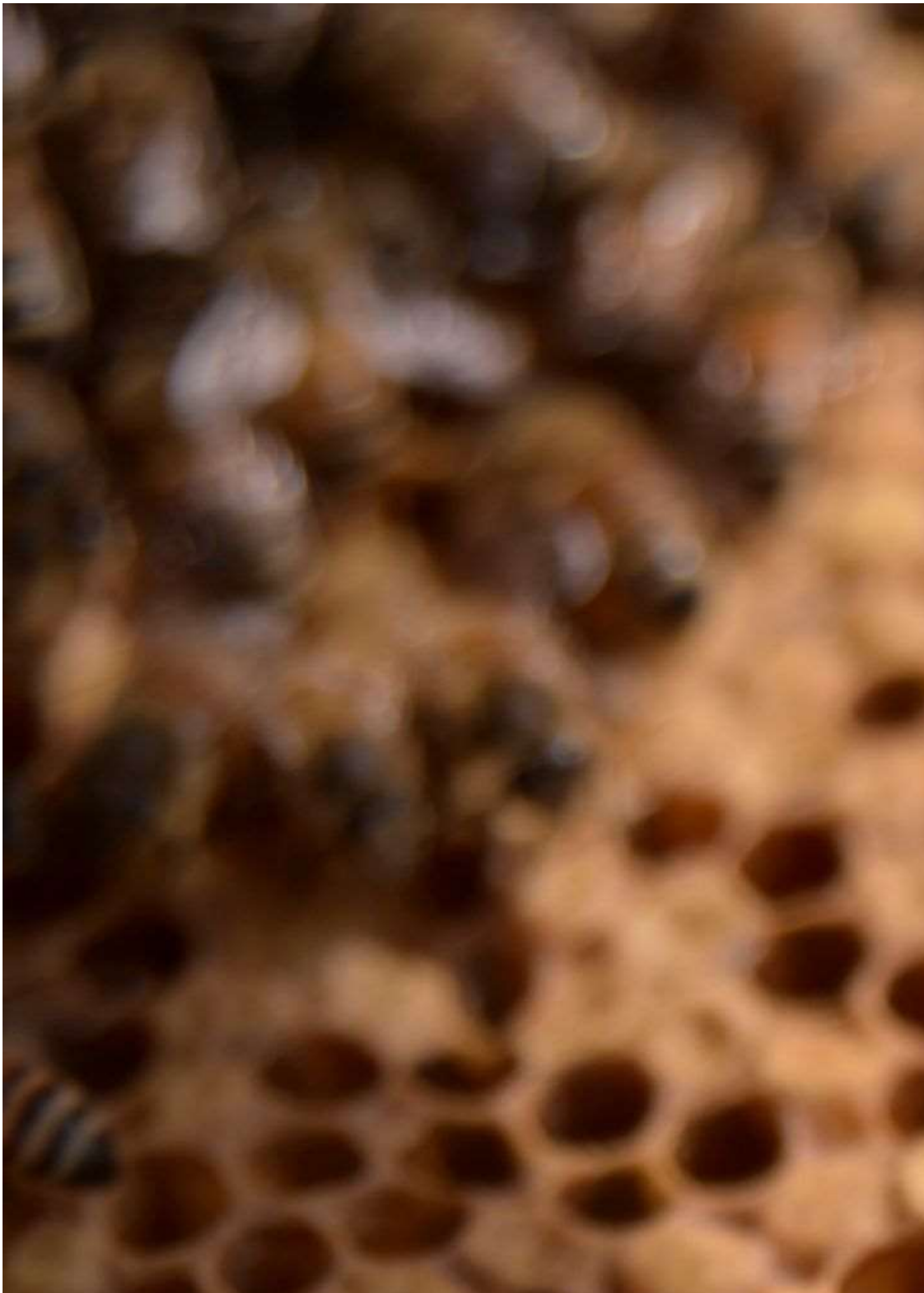
6. Use the pipette to remove a sample

7. Gently squeeze two drops onto the sample well of the

8. Wait un and read

AFB field tests: Match stick test

The match stick test can be performed on colonies with *active* infection. To perform the test, use a match stick, twig, coffee stirrer, toothpick, or any sort of tool that has a rough surface and is stiff enough to pierce a capping. Pierce any suspicious capping (sunken, discolored, or perforated), and slowly draw the stick out, trying to make the larvae draw with it. If the larval goo is ropey and draws out in a string greater than 2 cm (3/4 in), then it is considered a positive result for AFB. Dead and dying larva from many different causes will look unpleasant, and many will discolour, but only AFB will cause dead larvae to string out to this length. The larva must be in the correct stage of decay for the ropiness to occur, and it may be necessary to try multiple times. The failure of larvae to rope does not mean that AFB is not present.



A positive result of a match stick field test, indicating that this colony has AFB. The stick was used to pierce a suspicious capping, and was slowly removed, drawing out the contents inside. No other disease will cause the larvae to string out > 2 cm as shown. Photo by Sarah

What to do if you have a hive with American Foulbrood

An infected colony should be dealt with immediately. As the colony weakens and dies, the contents will be robbed by nearby colonies, and the foragers from the sick colony can drift into nearby colonies, resulting in disease spread. Your choice of action will depend on the regulations in your state, your ability to monitor, your willingness to accept risk, the number of infected colonies, the proximity to other apiaries, the size of the hives, and the time of year. The standard recommendation is to burn the colony the evening that you identify disease. After you burn the infected colony, you will want to treat the remaining colonies in the yard with antibiotics and monitor them closely to control the spread of disease.

Remember, in some states and provinces, AFB is a reportable disease. Contact your apiary inspector to learn the regulations in your area. A list of state and provincial inspectors can be found at the site of the Apiary Inspectors of

Some areas require that the hive and all of its contents be immediately burned. Even if you do not live in a state that requires burning, this is the best option for reducing the chance of transmission. Burning the hive is the safest way to rid the yard of the disease and to prevent transmission of the spores. Ideally, you will burn the hive on site, after dusk on the day AFB infection was identified. Waiting until after dusk will increase the number of foragers that are in the colony (so they do not return to other healthy colonies). The bees can be killed prior to burning if desired, but make sure that you do so quickly and safely.

Instructions:

1. Close up the hive to prevent bees and other hive materials from escaping during destruction.
2. Dig a hole, and start a small fire in the hole.
3. Add the hive and all its contents as well as any potentially infectious tools like gloves and brushes.
4. After the hive has burned down to ashes, bury the ashes.

Burning bee equipment is different from other fires: the wax is highly flammable, and will quickly combust; the boxes and flat surfaces of the covers and bottom boards can form a chimney effect; and the honey will not burn, but will run over the fire and the ground once the cappings melt- hence the need for burial. Some older bee equipment may have been painted with lead-based paint, so be careful not to inhale any smoke. Photo by Sarah B. Scott.

Be aware of all burn regulations in your area, and prepare the site well. If you are in an area where it is physically impossible to burn the hive (e.g. there is a burn ban, or it is not legal in your area), keep in mind that the goal is to make the equipment inaccessible for all other bees, and to eliminate the chance of robbing. You can double bag the equipment in thick contractor bags, and take the equipment to a landfill or commercial incinerator. Be extra careful when you transport infectious equipment – it can overheat in bags, causing wax to melt, and spore-laden honey to leak out.

Frame exchange / Shook swarm

Many beekeepers are resistant to burning their bees, and in many cases, it is not necessary to burn all of the equipment. If you live in an area that does not require burning, the colony is large, and it is early enough in the season for the bees to draw wax, you can make a 'shook swarm'. When making a shook swarm, the bees are shaken onto new equipment, emulating the swarming/ absconding behavior of a colony that leaves a nest when disease pressure is too high. This process of exchanging out all the frames is only recommended in states where there is no requirement to burn infected hives and there is enough time left in the season for the colony to rebuild and recover to wintering strength. If it is late in the season (fall) then the colony should be euthanized, and the equipment destroyed.

How to do a frame exchange/ shook swarm:

In this method you must be very careful to keep track of what you touch. Deal with infectious materials first, then change gloves/wash your hands and use new tools when handling the new equipment. Repeat anytime you touch anything that may be contaminated with spores.

Set up a new hive with new equipment

Shake the bees from the old equipment onto the new hive.

Destroy the frames.

Treat the colony with antibiotics.

In a successful frame exchange, all of the infectious larvae are removed from the hive. There will be a break in the brood cycle, and a lack of susceptible larvae for a few days as the bees draw the wax and the queen lays eggs. Some of the adult bees may still have infectious spores in and on their bodies, which is why antibiotics are necessary with this method to prevent reinjection.

Sterilizing equipment

Any equipment that is not burned can be sterilized to kill spores. AFB spores can be killed by 30 minutes at 130˚C (266˚F) dry heat, by 1.5% bleach, 1.5% caustic soda in boiling water, gamma rays, and flames. It is important to remove all potentially spore laden materials including wax and propolis. Simply soaking the boxes in bleach will not be sufficient. Disinfection of hive bodies /supers (boxes), bottom boards, and lids can be performed by scorching, followed by spraying bleach or caustic soda, and finally by immersion in hot microcrystallines wax. Remember to keep all potentially spore laden equipment away from bees before it is properly sterilized.

hoto by Sarah B. Scott.

Wax dipping

Wax dipping is a good option as a follow up to scorching equipment as it can bring heat deep into the wood, reaching places that cannot be reached by flames. To kill spores, the wood must be submerged for at least 10 minutes at 160˚C (320˚F). This tank is filled with 2:1 paraffin wax to microcrystalline wax (though other combinations can be used). The boxes are kept submerged for at least 10 minutes, and the temperature is frequently checked.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Encircle the letter

1, One of the following is American Foulbrood controlling mechanism? (4point):

A .burning tools and Equipments if tools or equipments is can't treated by heat.

B . heated .30 minutes at 130˚C (266˚F) dry .

C. immersing in hot microcrystalline wax.

D. all of the above Answer Sheet Name: _____

Date: _____

Score = _____

Rating: _____

Note: **Satisfactory rating – 4 points** **Unsatisfactory - below 4 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet-3	Assemble and repairer beehive components

3.1. Assemble and repairer beehive components

The most important parts of Lang troth and Dadant beehive are:

A loose bottom board

A bottomless brood chamber, in front of which is entrance block with the entrance passage for the bees; the brood chamber holds 10 frames, which are kept separated at the right distance by means of side bars

Above the brood chamber is a queen excluder (not absolutely necessary), placed horizontally on top of the brood chamber

Based on the population of the colony are one or more honey supers with 10 frames are placed on top of the brood chamber or on the queen excluder

On top of the honey chambers is placed an inner cover of 5 mm thick

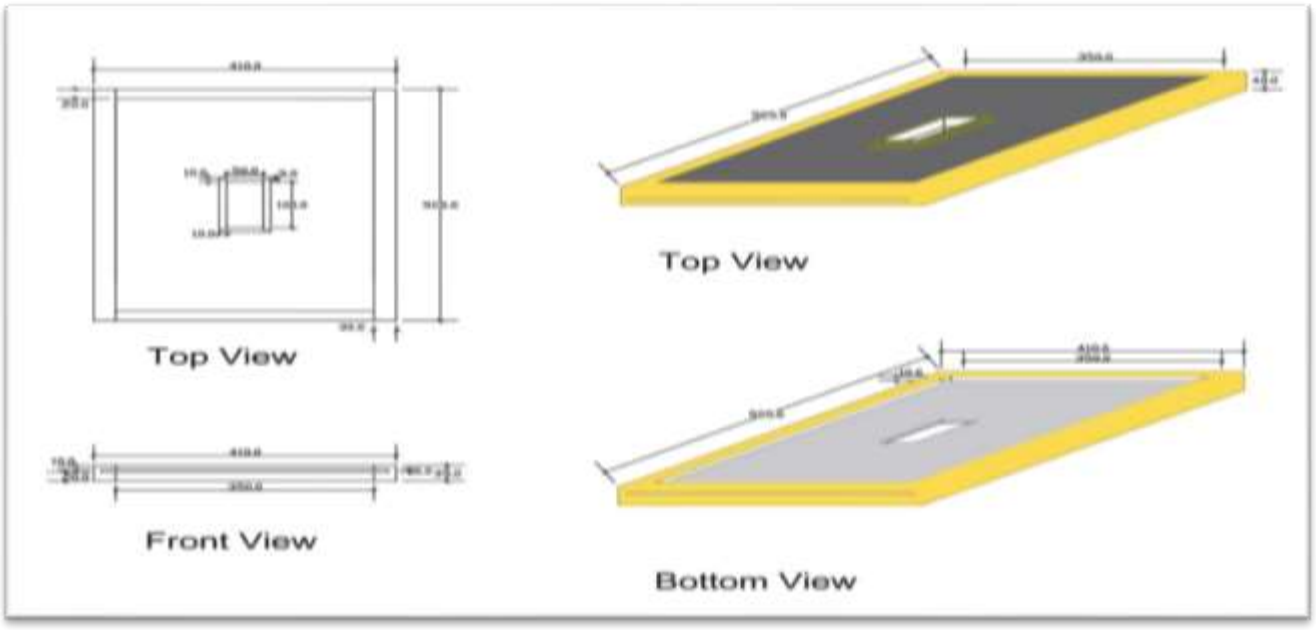
The total hive system is then covered by an outer cover made of wood, covered with zinc or aluminium sheet. This outer cover should fit easily over the honey super or brood chamber.

A complete assembled

Assembling order of modern beehive

A loose bottom board A bottomless brood chamber,

in front of which is entrance block with the entrance passage for the bees; the brood chamber holds 10 frames, which are kept separated at the right distance by means of side bars Above the brood chamber is a queen excluder (not absolutely necessary), placed horizontally on top of the brood chamber Based on the population of the colony are one or more honey supers with 10 frames are placed on top of the brood chamber or on the queen excluder On top of the honey chambers is placed an inner cover of 5 mm thick The total hive system is then covered by an outer cover made of wood, covered with zinc or aluminum sheet. This outer cover should fit easily over the honey super or brood chamber A complete assembled beehive looks like the following sketch.



The most important parts of Lang troth and Dad ant beehive are:

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Encircle the letter

1,Write modern hive assembling order? (4point)

_____
_____
_____
_____

Name: _____ Date: _____

Note: **Satisfactory rating – 4 points** **Unsatisfactory - below 4 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet-4	**Apply appropriate *timber treatments* to beehive**

4.1. Durability ***timber treatments*** **to beehive**

appropriate *timber treatments* For all the materials mechanical property data on their compressive, tensile, shear and tensional strengths. This data came with insights into the stiffness, resilience, elasticity, brittleness and plasticity of each material. For some materials can be made more durable through clever design and production techniques. Foams and plastics can have UV stabilizers added to extend their life expectancy. Concrete can be reinforced with fibbers to prevent brittleness. Wood can be treated and coated to minimize deterioration. Unfired clay can be coated with ash and lime to protect it from rain. You name it, I tried it. Most of the time block tests (making cubes of the material and experimenting constructed whole beehives. a great deal of fun breaking, freezing, wetting, burning and pounding the various materials.

4.2. Insulation

The insulation of the materials has been tested several times, with my experiments becoming more sophisticated each time. Initially, I used pre-existing material data to determine the insulation coefficient of each material. This information, that is available in several engineering manuals, helped predict which materials would be good insulators. To confirm the predictions, I built small blocks and boxes from each material and measured their surface temperatures and internal air temperatures in different climates. I simulated different climates by taking measurements on the materials when placed in an oven, left at room temperature and in a freezer room. Finally, I have been testing the materials when used as beehives. To do this I use a recording device to measure the change in outside temperature over 24 hours, as well as the temperature inside an empty beehive (control) and the temperature inside a beehive full of bees (brood chamber and super chamber). I have been recording data for over 2 years, taking measurements on cold, hot and average days. I also record honey production from the different beehives and use the figures as anecdotal evidence of better or worse temperature insulation capability.

There are intrinsic problems with using the information gathered on the temperatures of the live hives here. The problems are as follows:

Timber used for making beehives

The beekeeper should consult forestry authorities and wood craftsmen for advice on the best locally-available timber to use for beehive production. The wood must be **termite-proof,** resistant to the rotting effect of the sun and rain, warp-proof, and non-bee repellent.

The wood of three tree species, all found in the tropical evergreen rain and deciduous forests, manifest these desirable qualities: Terminal ivorensis, Chorophora excelsa and Piptadeniastrum africanum.

The common name of Terminal a ivorensis is "emir". It is a hard wood yet light in weight. It is used for fencing, building and as roofing beams. Termites find the wood sour-tasting, yet the flower provides the honeybee with sweet nectar. The wood is sawn into boards of various sizes: in Ghana, up to 65 centimeters wide and 6.5 meters long. Most beehives produced in that country are made of this timber, but the wax-moth larvae found in it can seriously damage both the hive body and the top-bars. Before the larvae turn into pupae, they eat away the wood to form shells which protect them during the pupil period. The beekeeper must be alert and quickly remove all combs from the hive if the bees abscond.

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Encircle the letter

1Write characteristic of woods?/timbers used to hive constriction? (4point):

2. **Define what the wood want to be?(3point**)

A .____

____

____

B.____

____

Name: _________________________ Date: _______________

Note: **Satisfactory rating – 4 points** **Unsatisfactory - below 4 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet-5	Construct or repair beehive and all components are correctly and legibly *marking*

As we have seen in the previous learning outcome hive has different parts . in this content the trainee learn about Assemble and repairer beehive components transitional hive and modern movable hive

5.1 transitional hive repairing and constricting

Manufacturing testing of concrete beehive mounding tools with small scale farmers.

Where hives already existed (made from the material) their market price was used to calculate the average cost, or manufacturers were contacted or interviewed to verify the costs. With materials that are suited to mass manufacture the cost was fairly calculated based on the larger scale manufacturing requirements. For the capital required to set up and produce the hives see Manufacturing above.

Transitional beehive is an intermediate hive. It is slightly better than the traditional hive by shape and internal mode of operation. The transitional hive has 27 to 30 top bars to be placed on top edge of the hive. It is easy to operate, inspect and harvest honey by removing the entire honey comb from

the bars. The comb once removed cannot be replaced again like frame hive combs.

The Ethiopian transitional hive is exactly the prototype of Kenyan top bar hive except for the change made in the construction materials. The Kenyan top bar hive is trapezoidal in shape . The top trapezoidal shape is wider than the lower edge of the rectangular edges being smaller.

Transitional hive 1.5 to 3 kg per honey per year.

Construction of Ethio-ribrab hive from non timber and locally available materials

Hives made from timber become relatively, expensive and are un affordable for many of ordinary farmers in the country. Despite the fact that efforts have been made for many years to adapt timber made box (Frame) and top bar, these products have not reached the majority of bee keepers in the country.

Considering these scenarios transitional hive made from non timber and locally available materials was developed and tested at research and farmers' levels and found to be suitable to socio-economic conditions of many beekeepers in the country. The hive can be produced

from different materials that can be found in different agro-ecological areas of the country and also elsewhere in the world.

The general shape and dimension of the hive are more or less similar to the Kenyan top bar hive. However, so many amendments and modifications were made to overcome some of the limitations of Kenya top bar hive and also to make the hive more suitable to local conditions.

To construct the hive. Since the dimensions of the materials can vary, there is need to consider and maintain the inner side measurements.

Construction of the frames of Ethio-ribrab hive wall

For the construction of this hive first prepare well matured, dry and straight eucalyptus and any other straight sticks. Prepare four straight sticks with one meter length and four straight sticks with 30 cm length both with more or less four to five cm diameter thick for the construction of hive body wall frames;

Then construct the frame of one side wall by fixing the two one meter long sticks with two 30 cm long sticks in rectangular shape. This has to two with 40 cm length from the top side and the other two with 22 cm long from bottom to form the short sides. These four sticks should be five to six cm thick in diameter. During connection two options can be used. The first one is cutting the sticks exactly according to the same lengths given above and fixing them between the two sides. The second option is to cut all the sticks adding five cm from both ends that mean instead of 40 cm cutting at 50 cm and instead of 22 cm cutting at 32 cm so that extra five cm will be at end of every stick. During fixing these extra five cm from each stick will be partially removed by splitting. It would be good to remove the two third of the thickness of the extra five cm and leaving one third of the thickness. These partially removed extra parts will help to fix the two sides from the outside maintaining the same internal dimension 40 cm from the top and 22 cm from the bottom This way of fixing help to maintain the straight angle of the hive and also avoid splitting of the sticks during nailing and the fixing will be also more firm. Once the two short sides are fixed; at the canter of each side one stick should be fixed. While fixing be careful in that all the three vertical sticks are aligned sprightly. Finally fix straight the bottom of the hive using four reinforcement sticks.

Making of the hive wall Constructing hive wall starting from the small side and then the longer sides

Grooves on the two longer sides

Once the construction of the wall is finished two grooves should be made from the two longer sides exactly at the centre of the wall. The grooves can be made by fixing two sticks in parallel way. The grooves should be one cm wide and one cm depth. The importance of the

groove is to insert partition board when the colony becomes weak and also to insert queen excluder to separate the honey chamber from brood chamber. Both the partition board and the queen excluder should be prepared by measuring the space before transferring of the colony. Be very sure both can easily and perfectly fit to the groove .The queen excluder can also be used to confine the queen during colony splitting for queen multiplication purpose.

Partition board and queen exclude Plastering of the hive

After finishing of the construction of the hive it should be plastered with well fermented and soft mud. The mud should be prepared at least for one week before plastering. During plastering care should be taken not to use unnecessarily too much mud that makes the hive very heavy. Moreover, during plastering all the inner side walls should be made uniform and smooth using piece of wood deepening with water. When the first plastered mud become well dry and crack it should be plastered again using smooth mud or using animal dung mixed with wood ash

Hive cover making

To make the hive cover considers the dimension of the finished hive; because the size of the cover may vary slightly depending on the thickness

of the materials used. Measure the dimension of the finished hive by adding two cm extra space from all sides of the hive which is very important to easily open and close the cover. However, generally one can take standard measurements that are 110 cm long stick for the length and 60 cm long for the width (Then after, reinforcement sticks should be fixed after every 15cm parallel to the corner (60cm long) sticks.

To void the influence of the external weather the inner part of the hive cover should be prepared with insulating materials like splits of bamboo, shembeko and thin eucalyptus sticks

Preparation of top bars

In the construction of Ethio-ribrab hive; the very important part of the hive that requires great care is preparing and maintaining the correct dimensions of the top bars

Top bars are very important because it affects the nature of comb construction.

If the top bars are not straight and not with the required thickness, bees will construct irregular combs. This attaches one top bar with another which makes the hive operation more difficult.

If it is not possible to prepare or if suitable materials are not available, it is better not to use such hive.

For top bar preparation one has to select physically matured materials; the materials should be straight and dry. The diameter or the width of top bars must be between 3.5cm - 4.0 cm. Top bars below or above this dimension should never be used. For top bars two types of

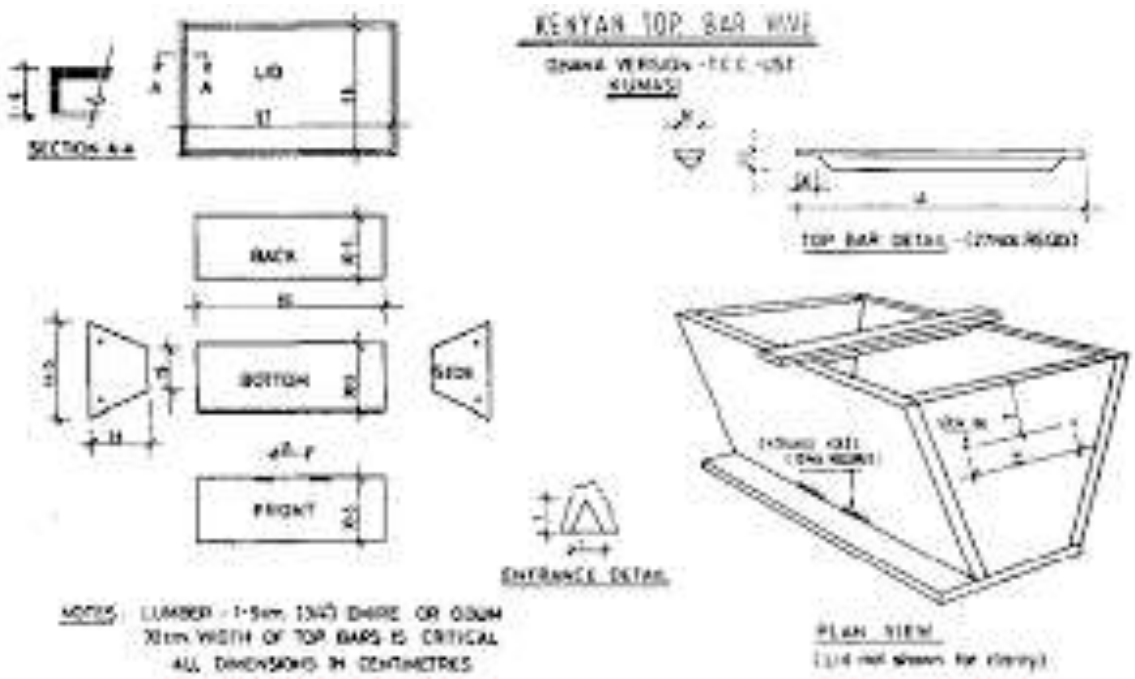
shapes can be used, flat and round types. The length of the top bars in average should be 48 cm.

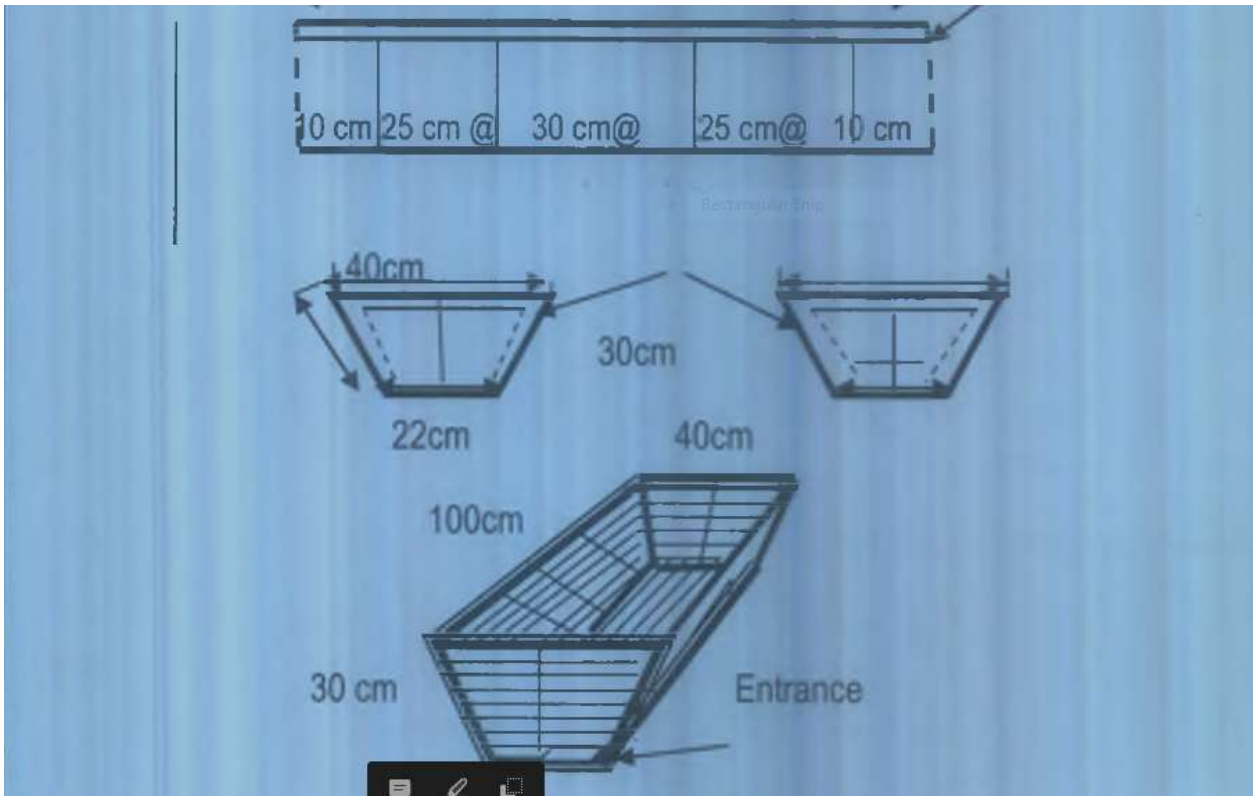
Each top bar should be longer than the width of the hive by at least one cm from both sides which is important to pick and handle the top bars during hive inspection and honey harvesting.

Round top bar preparation

Round top bars can be prepared from eucalyptus sticks, shembeko, shimel and from any round and straight sticks For round top bars half of the thickness (about five cm length from both ends) should be removed

Damnation of etio rbrab hive

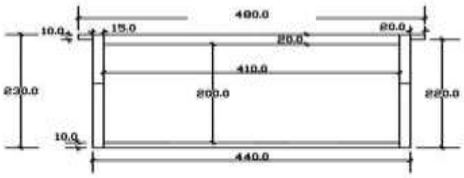




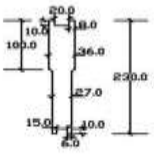
Preparation of fiat top bars

Mostly flat top bars are prepared from bamboo splits. As has been used for round top bars, the bamboo tree selected for top bars should be mature, straight and dry. If possible the inter node distances should not be less than

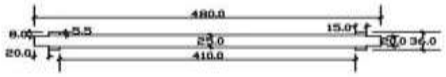
48 cm length . Bamboos have good quality as they split easily and straight using hand tools like knife.



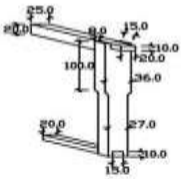
Side View



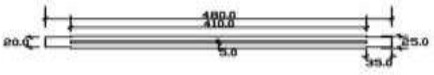
Side Bar



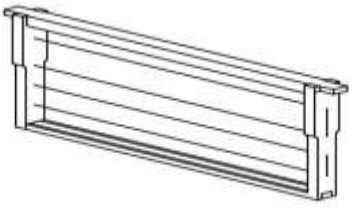
Top Bar Top View

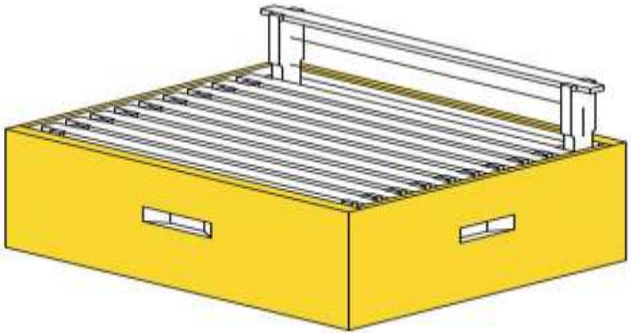


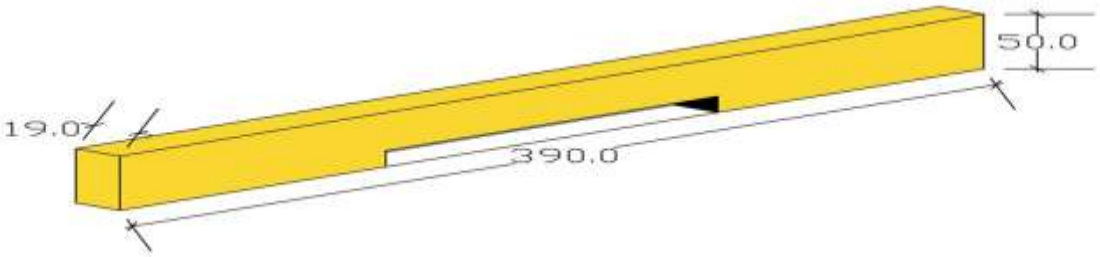
Frame Detail



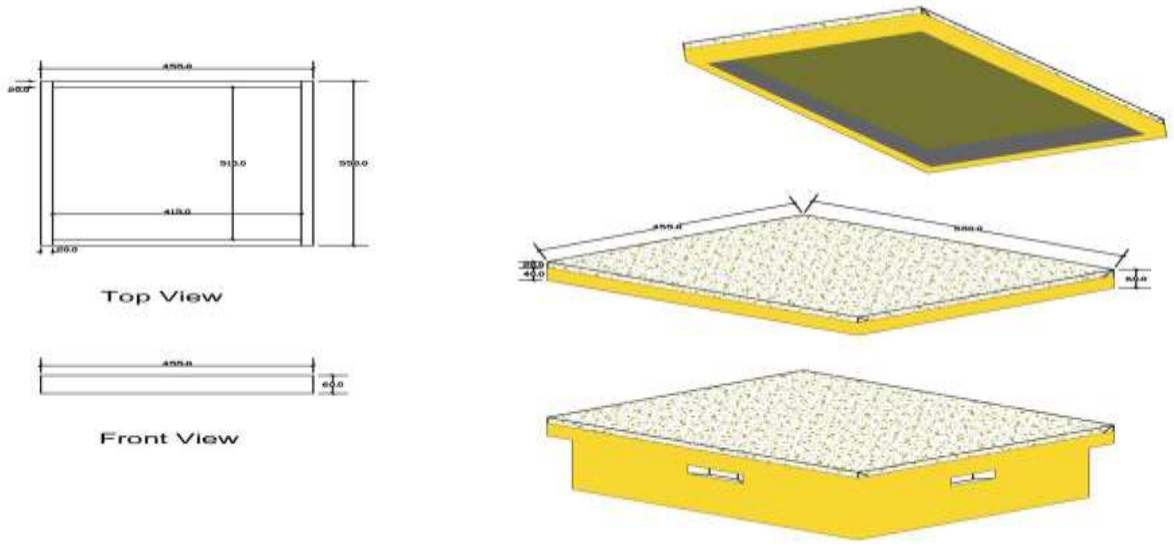
Top Bar Bottom View



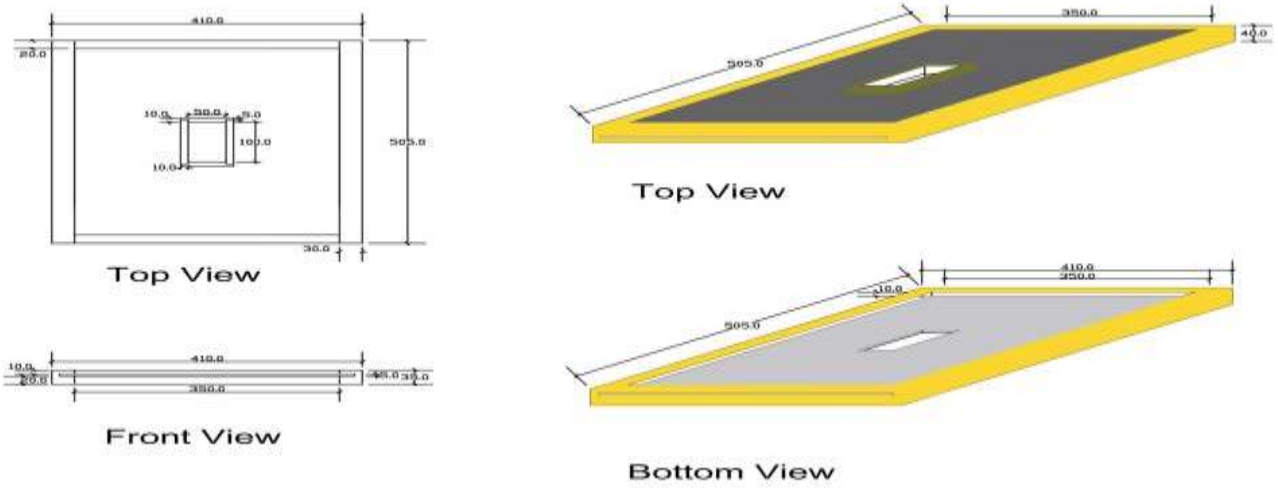




Entrance block and its dimension for beehive



Different views of top hive cover for standard Lang troth hive



Dimensions and views of inner cover equipped with wooden rims on bottom and top parts

Important remark

Unlike machine made top bars or frames (in box hive) there is no mechanism to guide bees to construct straight combs on each bar without attaching one to another. So in this hive great care should be taken to properly fix combs that are removed from traditional hives during colony transferring. The combs should be with brood, pollen, honey and /or nectar.

The combs should be cut in the shape of the hive and should not reach the side and the bottom of it. A minimum of three combs is necessary to fix.

Combs that are fixed are not only useful to guide bees to construct straight combs, but are also important to attract the transferred bees to establish and adapt in the new hive. After a week, the transferred colony should be inspected and any irregular comb being constructed by the bees should be removed and/or corrected.

Self-Check -5	Written Test

Directions: short Answer all the questions listed below.

1,write the part of Ethio-rbrab hive.(5points)

2, write the part of modern hive hive.(5points)

name: _____

Date: _____

Note: **Satisfactory rating – 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Information sheet-6	Undertake work is in a safe and environmentally appropriate manner

Personal protective clothing and equipments

This is always the last control measure to be considered. There is still a potential risk to the individual because the effectiveness relies on wearing and using PPE properly. Although PPE is effective for the individual using it, PPE provides no protection for other workers or bystanders. If you have controlled or eliminated the risk by some other method you may not need to wear PPE. PPE includes

- face shields
- respirators
- dust masks
- earmuffs or gloves
- Jacket or suit
- Rubber boots
- Hive tool
- Smoker
- Bee brush
- Personal protective equipment is often used in conjunction with other risk control measures.

Personal protective equipment (PPE) means all equipment (including clothing giving protection against the weather) which is worn or held to protect against risks to health or safety. PPE includes the following, when worn for health and safety protection:-

(a) Protective **clothing** (e.g., aprons, gloves, footwear, helmets, high visibility waistcoats)

(b) Protective **equipment** (e.g., eye protectors, respirators, safety harnesses).

1. Provision of PPE: Employers must ensure that suitable PPE is provided to employees exposed to a risk to their health or safety except where the risk has been adequately controlled by other equally, or more effective means. 'Suitability' is by reference to:

- Being appropriate to the risks and workplace conditions.
- the ergonomics and state of health of the person
- being capable of fitting the wearer correctly

- Being effective in preventing or adequately controlling the risk without increasing an overall risk.
- Complying with any other provision implementing any PPE EC Directive.

PPE should be seen as a last resort in the hierarchy of control measures; it should be made readily available (in most cases on a personal basis); no charge can be levied; ergonomic factors should be considered i.e., match the PPE to the person; quality must be ensured i.e., to be certified ('CE' marked) as meeting basic safety requirements.

2. **Compatibility of PPE**: This is required where more than one piece of PPE is worn.

3. **Assessment** is needed to ensure the suitability of the PPE to be provided. This should include assessment of the risks, the PPE risk protection characteristics and a comparison of PPE available.

4. **Maintenance and Replacement**: PPE should be maintained (including replaced or cleaned as appropriate) in an efficient state, in efficient working order and in good repair. Responsibilities, procedures (including frequencies) should be established and appropriate records kept.

5. **Accommodation**: Suitable accommodation must be provided for the safe storage of PPE. Contaminated or defective PPE should also be segregated.

6. **Information, instruction and training** needs to be provided in a systematic way; it should cover users, managers/supervisors and repair/maintenance/test personnel. Records should be kept. Training to be both theoretical and practical, induction and refresher as necessary.

7. **Use of PPE**: There are duties on employers, self-employed persons and employees to ensure the proper use of PPE.

8. **Reporting of loss/defect** - to the employer.

1.2. Assessing and identifying hazards and risks at workplace

A hazard is defined as an agent, element or event that possesses potential harm, an adverse event or adverse outcome. Or, a **hazard** is any situation, condition or thing that may be dangerous to the safety or health of workers.

A hazard is a source of potential harm or a situation with a potential to cause loss to:

- ✓ People - Injury
- ✓ Allergy of bee sting

- ✓ Equipment - Breakage
- ✓ Fire burning

It is the process used to identify all the possible situations in the workplace where people may be exposed to injury, illness or disease. It is a categorization step identifying biological agents and genotypic and phenotypic hazards, as potential hazards or not, which could potentially be introduced with a commodity or activity and for which pathways exist for exposure of the agents to susceptible animals

Why it is important?

The first step in preventing incidents, injuries or illness in the workplace is identification of all the hazards within the workplace that could cause injury or illness. As an employer, you have your business objectives as well as moral and legal obligations to provide and maintain a safe and healthy workplace.

To effectively manage the business (including health and safety in the workplace) and discharge both moral and legal obligations, it is imperative for:

- ✓ any potentially hazardous situations (which may cause injury, illness or disease) in the workplace to be
- ✓ identified on an ongoing basis before they occur;
- ✓ the likelihood of each of the hazardous situations occurring to be assessed;
- ✓ if there is any likelihood of occurrence, appropriate measures to prevent their occurrence to be identified and effectively implemented; and
- ✓ the measures to be continually reviewed to ensure their effectiveness.

1.3. Hazards in beekeeping farm

Beekeeping farms (workplaces) can be dangerous. There are many hazards that have the potential to kill, injure or cause ill health or allergy. Exposure to the hazard is depending on the type of activities carried out in different farms. different activity that lad to hazard in beekeeping farm are

- ❖ Harvesting of honey
- ❖ Colony transferring
- ❖ Colony splitting
- ❖ Internal hive inspecting
- ❖ Other work near to the hive

Behavior and handling - bees.

A. Behavior

- **Worker bees are aggressive**
- **Bee not like color full cloth**
- **Bee sting animals poultry and humans**

1.4. Recognizing and reporting hazards in workplace

Identifying Occupational Health and Safety (OHS)

The sting

The worker sting is a highly modified for its defensive purpose.

The sting is found in the sting chamber, invisible, last segment. The entire pack of the sting is divided into two regions.

Factors affecting the sting of a worker honey bee

1. Genetic make up

Some are highly aggressive Eg. Tropical bees

Some bees are highly gentle/docile/. Eg. European bees

2. Condition of time

 When there is scarcity of forage or less nectar flow

 During this time the bees use high venom

3. When the colony becomes queen less during this time they get exited

4. Insecticide poison, mostly organophosphate

Reactions of stings

In human reactions to stings take place on three levels

1. Localized reaction
2. Systematic reaction
3. Anaphylactic

1. Localized reaction

In the first kind of reaction the initial localized swelling is followed by more extensive swelling a few hours later and the affected area may be red, itchy and tender for 2-3days.

2. Systematic reaction

A systematic reaction generally occurs within a few minutes of stinging and it may involve a whole body rash wheezing, nausea, vomiting, abdominal pain and fainting.

3. Anaphylactic reaction

In this reaction symptoms can occur within a seconds, and they include difficulty in

- Breathing
- Confusion
- Vomiting
- Falling blood pressure that can load to loss of consciousness and death from

circulatory and respiratory collapse.

Generally, one can develop some resistance to beestings the more one is stung although the reaction to stings can become shuddery acute for no apparent reason. Those who are extremely sensitive may die from a single sting.

First aid for sting

The sting should be removed with a sharp needle or by scraping it away from the side with a knife or fingernail.

An ice-cold compress applied after sting has been removed will relieve the pain

Anti-histamine;

In the form of (1) Ointment (2) Injection

Adrenaline injection

In addition to these;

Work with bees in the late or in the evening

Avoid working bees in rainy, windy time

Smoke under the frame and wait two minutes before opening

While moving in the apiary, move slowly and quietly

Avoid crashing

Wash your protecting materials (glove, overall, etc) after three operation times.

When bee stings develop into large swelling and rash, medical advice should be sought straight away.

Anyone who is acutely allergic to bee sting and knows that unconsciousness may our a few minutes after a sting, must immediately inform someone, so that they may be transported as soon as possible to a doctor or a hospital for emergency injection treatment.

Finally, any beekeeper suffering abnormal aping side effects from bee stings should give up keeping bees. A procedure for reporting and addressing occupational health and safety hazards and issues needs to be established. This procedure should also include a process for resolving issues or disputes. If an employee identifies a hazard or occupational health and safety issue they should report it to their direct supervisor or manager and health and safety representative, and established procedures should be followed

Workplace hazards can be divided into six groups:

Physical hazards such as noise, electricity, heat and cold;

Chemical hazards such as toxic gases, noxious fumes and corrosive liquids;

Ergonomic hazards such as the height of a workbench, the shape of a vehicle seat and the length of a control lever;

Radiation hazards, for example, from x-ray machines, high powered lasers, radioactive materials;

Psychological hazards such as stress from using equipment without proper training or instructions, overwork, or being coerced into using faulty equipment which carries a risk of injury; and

Biological hazards such as syringes containing potentially infected blood, specimen containers carrying potentially infected materials and bacteria and viruses from air conditioning systems. Therefore these all hazards have to be reported **as soon as they occur based on the report format**

Self-Check -6	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List hazard control PPE. (3 points)

_____

_____

_____

2. Write bee behavior related to hazard (3 points)

_____

_____

_____

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Information sheet-7	**Maintaining and cleaning and safe work site while working**

7.1 cleaning. It means cleaning equipment, facilities and floor space in the workplace, and ensure that they are in good operating

it is better clean and disinfect hives after accomplishing of works.

make sure that you do so quickly and safely.

Instructions:

1. Close up the hive to prevent bees and other hive materials from escaping during destruction.
2. Dig a hole, and start a small fire in the hole.
3. Add the hive and all its contents as well as any potentially infectious tools like gloves and brushes.

4. After the hive has burned down to ashes, bury the ashes

Use of cleaning

- **To avoid rodent**
- **To prevent disease**
- **To make safe working area**
- **To produce quality hive products**

Self-Check -7	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is cleaning means?. (3 points)

   _____

   _____

   _____

2. Write advantage of bee hive cleaning(3 points)

   _____

   _____

   _____----------

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Operational shet-1	Preparing modern hive

Stape1, collect consumable and non consumable materials

Stape,2 use prorate measurement timbers

Stape3, make each part of hive

Stape4.joint each parts appropriately

Stape5, paint with yellow colour

Stape6, make covers

Operational shet-2	Assembling order of modern beehive

Stape1,A loose bottom board A bottomless brood chamber, in front of which is entrance block with the entrance passage for the bees;

Stape2, the brood chamber holds 10 frames, which are kept separated at the right distance by means of side bars Above the brood chamber is a queen excluder (not absolutely necessary),

Stape3, placed horizontally on top of the brood chamber Based on the population of the colony are one or more honey supers with 10 frames are placed on top of the brood chamber or on the queen excluder On top of the honey chambers is placed an inner cover of 5 mm thick The total hive system is then covered by an outer cover made of wood,

Stape4, covered with zinc or aluminum sheet. This outer cover should fit easily over the honey super or brood chamber A complete assembled beehive looks like the following sketch.

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 8-12 hours.

Task 1: demonstrate transitional hive assembling process.(5point)

Task 2: demonstrate modern or movable hive assembling process.(5point

Task 3:Identify plats used to cons tract hive around your place.(5point)

Instructions: write the appropriate answer for the following questions

3. List the general rules for hive inspection.(5point)

4. Write equipments that are used to make foundation sheet .(5point)

5. What are the two techniques of bee colony Inspection.(5point)

List of Reference Materials

- Deliverable: Manual on Beehive Construction and Operation University of Kassel (UNI KASSEL)Date:15-June 2018
- BEEGIN BEEHIVE MATERIALS RESEARCH SUMMARY Ivan Leroy Brown M Tech Industrial Design November 2018
- ADVANCED BEEKEEPING MANUAL Ethiopian beekeeper association JUNE 2011