

LEARNER GUIDE



Hand spread asphalt



Training support material for:

RIICBS202E

Hand spread asphalt

Produced by:



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Hand spread asphalt



What type of work would a person that does hand spreading asphalt do in civil construction?

A person who performs hand spreading of asphalt in civil construction typically works on tasks related to the manual application and distribution of asphalt materials to create and maintain road surfaces, pavements, or other construction projects. Here are the key responsibilities and associated types of work for this role:

Surface Preparation: Before asphalt application, workers prepare the surface by cleaning, repairing, and ensuring proper drainage.

This may involve removing debris, filling cracks and potholes, and grading the surface to the desired level.

Handling Asphalt Material: Hand spreaders are responsible for handling, mixing and transporting the hot mix asphalt (HMA) material to the work site.

They coordinate with delivery trucks to ensure a steady supply of asphalt.

Hand Spreading: The primary task of a hand spreader is to manually distribute the HMA onto the prepared surface.

They use shovels, rakes, lutes, or other hand tools to achieve the desired thickness and even distribution of the asphalt material.

Hand spreading is particularly important in areas where automated paving equipment cannot reach or where precise placement is required.

Edging: Hand spreaders are responsible for creating clean and well-defined edges along the asphalt surface.

They use hand tools to shape the edges and ensure they meet project specifications.



Handling Asphalt Material



Hand Spreading



Edging

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Prepare to hand spread asphalt

Element 1



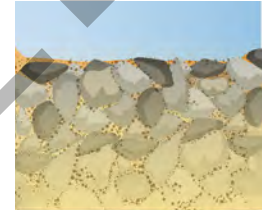
Types of Asphalt?

In civil construction and road engineering, Asphalt is a common material used for paving roads and surfaces. Asphalt comes in various types, each designed for specific purposes and conditions. Here's an overview of three common types of asphalt mixes used in civil construction:



Dense Graded Asphalt: This type of asphalt mix is also known as dense-graded aggregate (DGA) or simply "**asphalt concrete.**" It is a well-graded mixture of asphalt binder, mineral aggregate (such as crushed stone, gravel, or sand), and sometimes mineral filler.

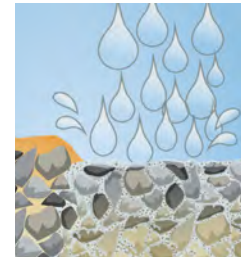
Dense graded asphalt is used for a wide range of applications, including roadways, highways, parking lots, and driveways. It provides a smooth and durable surface and is designed to withstand heavy traffic loads.



Dense Graded Asphalt

Open Graded Asphalt: Open graded asphalt, also known as open-graded friction course (OGFC), is designed to have a **high percentage of air voids.**

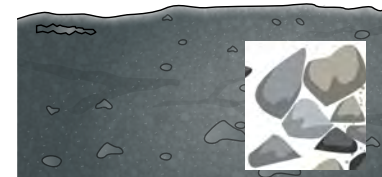
This type of mix is permeable, allowing **water to drain through it**, which helps reduce water buildup and improve road safety by reducing the risk of hydroplaning. Open graded asphalt is often used on highways and roads to enhance skid resistance and reduce noise.



Open Graded Asphalt

Stone Mastic Asphalt (SMA): Stone mastic asphalt is a durable and high-performance asphalt mix designed for heavy traffic and high-stress conditions. It contains a higher percentage of **coarse aggregates**, typically crushed stone, and a high-quality asphalt binder. SMA is known for its excellent rut resistance and durability, making it suitable for use on highways, bridges, and other critical infrastructure.

Each type of asphalt mix has its advantages and is selected based on the specific requirements of a construction project, including traffic volume, climate, and desired performance characteristics.



Stone Mastic Asphalt

What does it mean when it comes to density and viscosity with building a road in civil construction?

In the context of road construction in civil construction, density and viscosity are?

Density refers to the mass per unit volume of a material. In road construction, density is a critical parameter used to assess the compaction level of the materials.

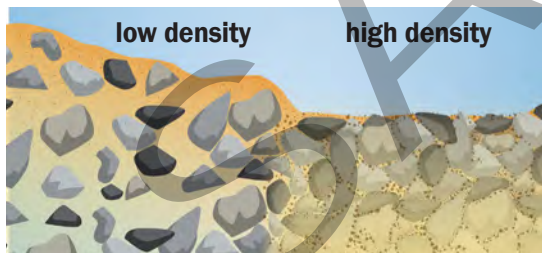
The density of the compacted layers, such as subbase, base course, and surface course, affects the strength, stability, and durability of the road.

The formula for density is $d = M/V$, where d is density (g/m^3), M is mass (g , grams), and V is volume (cubic centimeters, cm^3). Density is commonly expressed in units of grams per cubic centimeter.

Scenario:

A substance has a mass of 13.5g and occupies a volume of 5cm^3 what is its density?

Ans: $13.5\text{g} / 5\text{ cm}^3 = 2.7\text{ g}/\text{cm}^3$



Viscosity is a measure of a material's resistance to flow. In the context of road construction, viscosity is primarily associated with the asphalt binder used in asphalt pavement. Asphalt binder is a viscous liquid that serves as the glue holding the aggregates together in the asphalt mixture.

Viscosity corresponds to the resistance of a liquid to flowing, so it's a parameter strictly related to binder consistency and workability.

Water



Honey



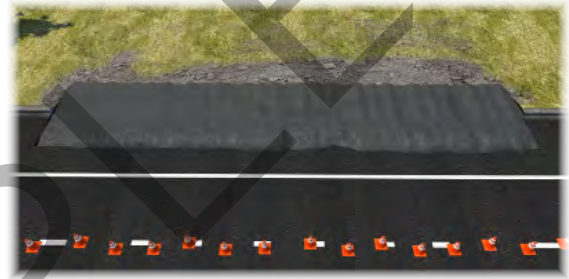
Calculations

Working out how much material you need

The work plan has an area which is 4 metres × 20 metres that must be covered by a layer of road base of 150 mm depth.

How many square metres of road base are to be laid?

How many cubic metres of road base will you need?



Step 1:

To work out the square metres, multiply the Length (L) by the Width (W).

$L \times W = \text{Square metres}$

$4 \text{ m} \times 20 \text{ m} = 80 \text{ square metres}$

This can also be written as:

80 m^2 or 80 square metres

Step 2:

Convert the layer thickness from millimeters to metres.

To do this divide the layer thickness by 1000

$150 \text{ mm} \div 1000 = 0.15 \text{ m}$

Step 3:

Multiply the square metres by the layer thickness to get the cubic metres.

$80 \text{ square metres} \times 0.15 \text{ m}$
 $= 12 \text{ cubic metres}$

This can also be written as:

12 m^3 or 12 cubic metres

Answer:

There are 80 square metres of road base to be laid.

You will need 12 cubic metres to cover the area to 150 mm depth.

Guide to using a lute or rake when hand spreading asphalt - (techniques)

When spreading asphalt in civil construction using a lute (also known as an asphalt rake or asphalt lute), it's typically best to push the lute away from yourself. Here's how to effectively use a lute when spreading asphalt:

1. Stand at the edge of the asphalt area where you want to start spreading.
2. Hold the lute handle with both hands, one near the top and the other lower down for stability and control.
3. Begin pushing the lute forward, keeping the lute's teeth in contact with the asphalt surface.
4. Distribute the asphalt evenly as you move forward, adjusting the angle and pressure on the lute to achieve the desired thickness and smoothness.
5. Overlap each pass slightly to ensure uniform coverage and a consistent finish. Now you move back.
6. Periodically check the thickness and smoothness of the asphalt layer to meet project specifications and grade requirements.



1. Stand at edge of asphalt area



2. Hold lute



3. Push lute forward



4. You move forward



5. You move backward

Guide to using a hand shovel when hand spreading asphalt - (techniques)

When spreading asphalt with a hand shovel in civil construction, it's important to follow proper techniques to ensure safety, efficiency, and quality results. Here are the recommended steps and tips:



1. Position and Stance

1.1 Stand Firm: Ensure you have a stable and balanced stance with your feet shoulder-width apart. This helps with stability and control.



Stand Firm

1.2 Face Forward: Stand facing the direction you want to spread the asphalt. Avoid turning your body while shoveling.

2. Scooping and Lifting

2.1 Proper Angle: Hold the shovel with both hands and push the blade into the asphalt pile. Angle the blade slightly to help scoop the asphalt effectively.



Scooping and Lifting

2.2 Use Your Legs: When lifting the loaded shovel, bend your knees and use your leg muscles rather than your back to reduce strain and minimize the risk of injury.

2.3 Controlled Load: Avoid overloading the shovel with asphalt. It's better to take smaller, manageable loads to maintain control.



Controlled Load

Guide to using hand troweling and performing edge work when hand spreading asphalt - (techniques)

Ensure Grip the handles of the screed firmly with both hands to maintain control.

Direction of Work: Work from the farthest point away from you towards your body. This means troweling and edging towards yourself, not away from yourself. This technique allows you to have better control over the asphalt and ensures a more even finish.

Bend Knees: To reduce strain on your back, bend your knees and maintain a slight crouched posture while working. This posture will help you maintain better balance and control, especially when you need to apply pressure to the trowel or edging tool.

Use Hand Tools: Use **hand trowels** and **edging tools** specifically designed for asphalt work. These tools are essential for precise control and achieving the desired finish.

Consistent Pressure: Apply consistent pressure on the trowel or edging tool to create a uniform surface. Avoid using excessive force, which can lead to an uneven surface or damage the tools.

Overlap Strokes: When troweling or edging, overlap your strokes slightly to ensure a seamless finish. This prevents gaps or irregularities in the asphalt surface.

Maintain a Clean Edge: When working on edges, ensure that the asphalt meets the adjacent surface smoothly. Use edging tools to shape and define the edges cleanly.



Bend Knees



Guide to using a taper (compactor) when hand spreading asphalt - (techniques)

Here's a basic guide on how to effectively use a taper (compactor) when spreading asphalt.

Use the Taper (Compactor):

- Position the taper over the freshly spread asphalt.

(Hand Tapering)

- Position your 2 feet slightly apart with hand taper in the middle, lift and apply pressure to spread asphalt.
- Then lift taper higher and drop, letting gravity apply force, repeat over surface area.

(Mechanical)

- Start the taper's engine or power source, ensuring it is in good working condition.
- Carefully operate the taper over the asphalt surface.
- Use smooth, overlapping passes to compact the asphalt uniformly. Pay special attention to the edges and any joints to avoid uneven surfaces or air pockets.

Monitor Compaction: Keep an eye on the asphalt's compaction level as you work. The goal is to achieve the right level of compaction without causing any damage. Watch for any irregularities, low spots, or areas that need additional attention. You may need to make multiple passes with the taper in certain areas.

Edge Compaction: Pay extra attention to compaction along the edges to ensure a smooth transition between the paved surface and the surrounding area.

Check the Surface: After compacting, visually inspect the paved surface to ensure it is even, without any irregularities or depressions. Make any necessary adjustments.



Hand Taper



Small plant equipment
compactor / taper (mechanical)

Guide to using cold asphalt mix to patch a pothole - (techniques)

Using cold asphalt mix to patch a pothole is a relatively simple process that can be done with some basic tools. Here's a guide on how to patch a pothole using cold asphalt mix:

Tools and Materials Needed:

- Cold asphalt mix (pre-packaged or bulk)
- Shovel
- Tamp or compactor
- Wheelbarrow or mixing container
- Broom
- Water (optional)

Step-by-Step Instructions:

1. Clean pothole of any debris
2. Pour cold asphalt filler into pothole.
3. Overflow pothole so that it covers the area.
4. Using a shovel spread the cold mix
5. Using a taper, position your 2 feet slightly apart with hand taper in the middle, lift and apply pressure to spread asphalt.

Then lift taper higher and drop, letting gravity apply force, repeat over surface area.



1.



2.



3.



4.



5.



Question 34 What are potential hazards when hand spreading asphalt?

Skin and Respiratory Irritation: Bitumen is a viscous, black material that can cause skin irritation upon direct contact.

Prolonged or repeated skin exposure can lead to dermatitis. Inhaling bitumen or asphalt fumes or vapors can also irritate the respiratory system and cause respiratory discomfort.

Burns: Bitumen or asphalt is often heated to make it easier to work with, but it can cause severe burns if it comes into direct contact with the skin.

Hot bitumen can stick to the skin and cause thermal burns.

Asphalt Fumes: Heating bitumen releases fumes that contain various compounds, including volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs).

Inhalation of these fumes can lead to respiratory problems and other health issues.

Fire and Explosion: Bitumen is flammable, and heated bitumen can release flammable vapors.

There is a risk of fire or explosion if bitumen is exposed to open flames, sparks, or high heat sources.

Slips, Trips, and Falls: Spilled or leaked bitumen can create slippery surfaces, increasing the risk of slips, trips, and falls in the work area.

bitumen burn



asphalt fumes



bitumen is flammable



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What is Site Safety?

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Equipment Safety:

Regular Inspections: Conduct routine inspections and maintenance checks on equipment, including pavers and compactors, to ensure they are in good working condition.

Training: Ensure that operators are adequately trained and certified to operate heavy machinery safely. Regular refresher courses may be necessary.

Exhaust and Emissions Control: Equip machinery with exhaust systems and emission controls to minimize air pollution and protect workers from exposure to harmful fumes.

Safe Loading and Unloading: When handling asphalt materials, use proper lifting and loading techniques to prevent strain or injury. Adequate training is essential.

Emergency Shutdowns: Equip machinery with easily accessible emergency shutdown controls to halt operations quickly in case of accidents or malfunctions.

Fire Safety: Have fire extinguishers and firefighting equipment readily available and train workers in their use.

Hazardous Materials Handling: Properly store, handle, and dispose of hazardous materials, including asphalt and any associated chemicals, following relevant safety guidelines.

Spill Control: Implement measures to contain and clean up any spills promptly to prevent contamination.

Noise and Vibration Control: Utilize equipment designed to minimize noise and vibration to protect workers' hearing and reduce physical stress.

Warning Systems: Equip equipment with warning systems, like backup alarms and warning lights, to alert workers in the vicinity.



Regular Inspections



Question 38 What PPE should you use when performing hand spreading asphalt?

The following are examples of PPE you might need to use when hand spreading asphalt (note Heat-Resistant PPE):



Hard hat



Safety gloves
Heat-resistant gloves



Hi-vis vest



Dust mask
Respirator



Long
sleeved top



Ear muffs



Boots that cover the
whole foot heat-resistant



Safety glasses/goggles,
Sunglasses



Sunscreen

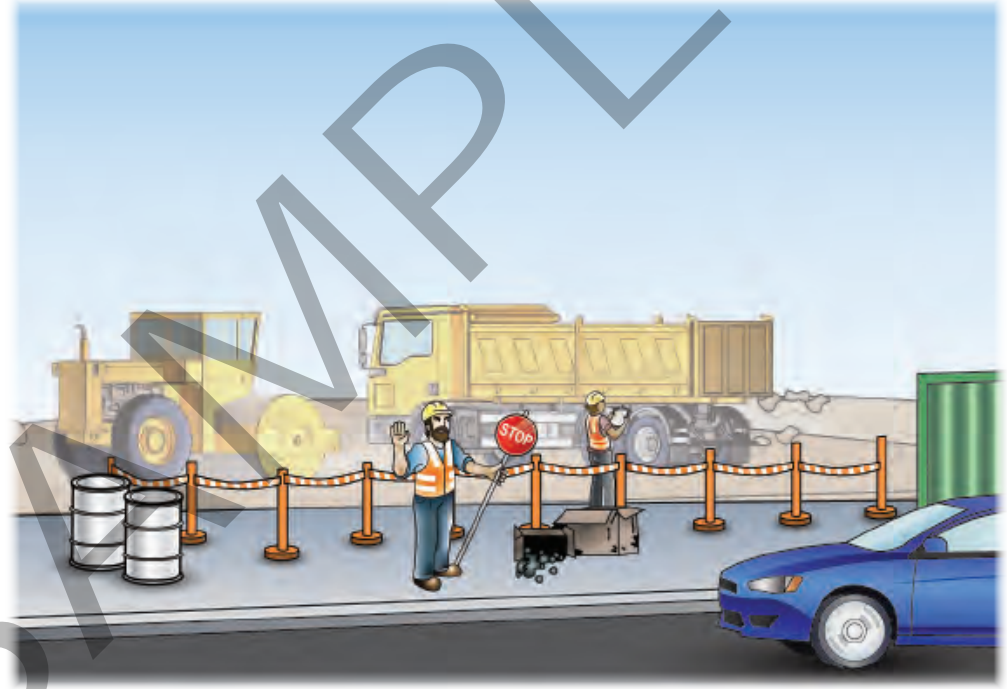
Long pants Heat-Resistant Clothing



Question 44

What does the traffic management plan (TMP) tell you?

It tells you how to control vehicles in and around the worksite.
It helps keep the site safe for you and others.
You may require a traffic control licence in your state or territory.



Question 49 What plant, tools and equipment are used when hand spreading asphalt, outline the equipment types along with their characteristics and limitations?

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Equipment	Characteristics	Limitations
Hand Tamps	- Hand-held tool for compacting small areas.	- Suitable only for very limited and small patches.
	- Ideal for compacting around utility openings.	- Labor-intensive and time-consuming.
	- Easy to control and direct force.	- May not provide uniform compaction.
	- Suitable for smaller repair jobs.	- Limited to shallow compacted depths.
Paver (for edge work)	- Used for precision edge work.	- Not suitable for full-width asphalt placement.
	- Ensures neat and well-defined boundaries.	- Can be slower than other methods.
	- Adjustable and easy to control.	- Requires experienced operators.
	- Suitable for creating smooth edges.	- Limited to edge-related tasks.



Hand Taper



Small plant equipment compactor / taper (mechanical)



Sweeper to clean debris



Spreader Box

Question 50 What tools might you use when hand spreading asphalt?

Bitumen Boiler: Also known as a bitumen melter or tar boiler, this equipment is used to heat and melt bitumen to a liquid state for various applications, such as roofing or road construction.

Lance or Burner: A propane or gas burner, often attached to a lance, is used to apply heat to the bitumen for melting or repairing purposes.

Spreader or Lute: This is a long-handled tool with a flat blade used to spread and level bitumen on surfaces like roads or roofs.

Rollers: Rollers, such as vibratory or static rollers, are used to compact and flatten bituminous materials like asphalt. They ensure a smooth and durable surface.

Trowel: Trowels, which come in various sizes and shapes, are used for applying and shaping bitumen on small surfaces, such as when patching holes or cracks.

Brushes and Brooms: These are used for applying bitumen coatings or sealants on surfaces, such as roofs or driveways. Brushes are often used for detail work, while brooms are used for larger areas.

bitumen boiler



spreader or lute



trowel



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Squeegees: Squeegees are used to spread and distribute bitumen coatings evenly on surfaces.

They are commonly used in waterproofing applications.

Sprayers: Bitumen sprayers are used to apply bitumen emulsions or asphalt in spray form, typically in road construction or maintenance.

Safety Gear: When working with bitumen, it's essential to wear appropriate safety gear, including gloves, eye protection, respiratory protection, and protective clothing to safeguard against burns and fumes.

Pneumatic Tools: Depending on the specific job, pneumatic tools like jackhammers may be used to remove existing bituminous materials.

Measuring and Mixing Equipment: For some applications, precise measurement and mixing of bitumen with other materials or additives are necessary.

This may involve using calibrated containers, thermometers, and mixing equipment.

Transportation Equipment: Trucks and other vehicles are used to transport bitumen from storage tanks to the job site.

Testing Equipment: Various testing equipment, such as asphalt density gauges or thickness gauges, may be used to ensure that bituminous materials meet specifications and quality standards.

Measuring tools. (Hand tool - measuring tape or an app)



squeegee



bitumen sprayer



Pot hole measuring tool app



Depth

Spread asphalt

Element 2



Working around a paver while hand spreading asphalt

Conduct hand asphalt spreading in close but safe proximity to the paver, maintaining clear communication and awareness of surrounding hazards.

Unsafe areas can include zones where heavy machinery operates and remains outside the operator's line of sight. The following red zones are areas that are unsafe to operate.



Sample policy procedures steps to follow when hand placing asphalt to the required level and lining it according to job requirements.

Easy Guides policy procedures steps to follow when hand placing asphalt to the required level and lining it according to job requirements.

Ensure Preparation: Ensure that the work area is clear of debris, obstacles, and loose materials that could interfere with the paving process. Confirm that the base or existing surface is prepared and compacted correctly.

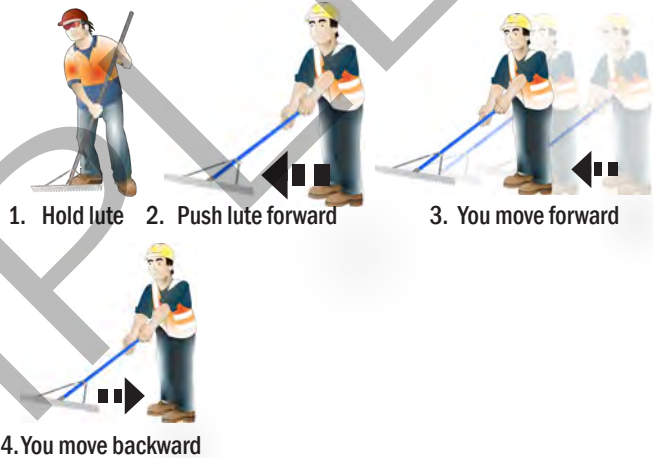
Asphalt Delivery: Coordinate with the asphalt supplier to have the material delivered to the work site. Ensure that the asphalt mix meets the specifications and quality requirements for the project.

Setting the Grade: Use surveying and measuring tools, such as a theodolite, laser level, or string line, to establish the desired grade (level) and slope for the asphalt surface. **Accurately set the grade stakes** or reference points to guide the placement of the asphalt.

Distributing Asphalt: Load a small amount of hot mix asphalt material onto a wheelbarrow, asphalt lute, or shovel for hand spreading. Start at one end of the area to be paved and spread a uniform layer of asphalt material along the predetermined grade and slope. Pay close attention to the thickness of the layer to ensure it matches the project specifications.

Hand Raking and Compaction: Use hand rakes or lutes to distribute and shape the asphalt to match the desired contour and thickness. Compact the material with hand tampers or rollers to achieve proper density and consolidation.

Hand spreading asphalt using a rake/lute



Hand spreading asphalt using a shovel



See hand spreading asphalt - (techniques) for more detailed information

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Sample policy procedures steps to follow when hand placing asphalt to the required level and lining it according to job requirements.

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Checking the Level: Continuously check the level and slope using the established reference points, such as grade stakes or a string line. Make necessary adjustments while paving to maintain the correct grade and slope.

Edge Shaping: Ensure that the edges of the asphalt surface are properly shaped and tapered to provide a smooth transition to adjacent surfaces, such as curbs or existing pavement.

Line Marking and Finishing: Mark the asphalt surface with appropriate lines and markings according to job requirements. This may include centerlines, lane markings, or other symbols. Use hand tools or templates to create precise line markings.

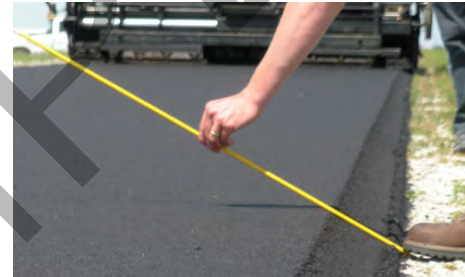
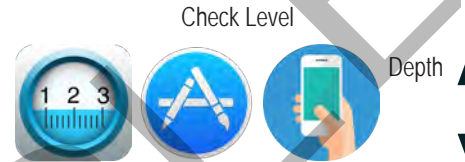
Quality Control: Conduct quality checks during and after the placement to verify that the asphalt surface meets the required specifications, including thickness, density, and smoothness.

Cleanup: Clean and remove any excess asphalt material from the work area to ensure a neat and finished appearance.

Safety Measures: Always follow safety protocols when working with hot asphalt, including wearing appropriate personal protective equipment (PPE) and adhering to safety guidelines to prevent burns and injuries.

Documentation: Maintain records and documentation of the work, including any measurements, adjustments, or changes made during the process.

Consultation: Communicate regularly with the project supervisor, foreman, or engineer to address any issues or modifications required to meet job specifications.



Question 61 What does the task "Achieve even finish when raking and construct joints to the correct level according to job requirements" involve in asphalt construction?

- a. Ensuring that the asphalt surface is perfectly flat and level.
- b. Spreading asphalt material using a lute to create an even surface.
- c. Creating joints between asphalt sections to the correct depth and alignment.
- d. Applying a sealcoat to the asphalt surface.



Correct Answer: c. Creating joints between asphalt sections to the correct depth and alignment.

How to fix low spots, high spots and defects in the mat before and during operation?

Here are some common **defects** found in asphalt paving in civil construction, along with steps on how to fix them (Repair Steps):

❑ Cracks:

- Clean the crack by removing debris and loose materials.
- Apply a hot sealant or crack filler to the crack.
- Compact the filler to ensure proper bonding and a smooth surface.



Cracks

❑ Potholes:

- Remove loose and deteriorated material from the pothole.
- Clean and dry the area.
- Fill the pothole with hot asphalt mix.
- Compact the asphalt to ensure proper compaction and a level surface.



Bumps / lumps

❑ Rutting:

- Mill or remove the rutted area.
- Replace with fresh asphalt.
- Compact the new asphalt to the proper density.

❑ Segregation:

- Identify the areas with segregation.
- Remove and replace the segregated areas with properly mixed asphalt.
- Compact the new asphalt uniformly to avoid future segregation.

❑ Bumps:

- Identify the bump areas.
- Mill or remove the elevated asphalt.
- Replace with fresh asphalt mix and ensure even compaction.



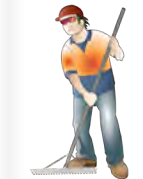
Voids / pothole



Clean debris



Apply /
Fill asphalt



Spreader



compact /
(mechanical)

Clean up

Element 3



Sample Workplace Procedure: Clearing and Disposing of Materials in a Construction Area

The following is a sample workplace procedure for clearing and disposing of materials in a construction area when hand spreading asphalt. By adhering to this process, construction sites can maintain cleanliness, safety, & environmental responsibility in their operations, reducing the impact of construction activities on the environment.

Workplace Procedure: Clearing and Disposing of Materials in a Construction Area

Procedure:

1. Clear the Work Area:

- Remove all construction tools, equipment, and materials that are no longer needed for the project.
- Segregate waste materials into categories like wood, concrete, metal, plastics, etc., for efficient disposal and recycling.

2. Waste Segregation:

- Separate recyclable materials from non-recyclable waste. Common recyclable items include concrete, metals, plastics, and wood.

3. Recycling:

- Contact a local recycling facility to determine which materials can be recycled.
- Place recyclable materials into designated containers.

4. Dispose of Non-Recyclable Materials:

- Identify non-recyclable waste, such as hazardous materials or materials that do not meet recycling criteria.
- Follow proper disposal procedures for non-recyclable materials. Consult waste disposal guidelines and regulations for proper disposal methods.

5. Container Labelling:

- Clearly label containers for waste and recyclable materials. Indicate the type of material in each container.

6. Transportation:

- Ensure that waste and recyclables are securely stored in appropriate containers.
- Arrange for the transportation of waste materials to designated disposal sites and recyclables to recycling facilities. Adhere to transportation regulations.

7. Documentation: Maintain records of waste disposal and recycling activities. Include details such as types and quantities of materials disposed of and recycled.

8. Cleaning: After materials are removed, perform a thorough cleaning of the work area to remove any remaining debris and waste.

9. Safety: Always observe safety procedures and use the necessary PPE during waste handling and disposal.

Environmental Compliance:

- Ensure that all activities comply with environmental requirements and regulations.
- Report any environmental incidents or concerns to the appropriate authorities.

Completion: Once the work area is cleared, waste is disposed of, and recyclables are sent to recycling facilities, confirm that the cleanup is complete.

Signature and Date: I, _____, confirm that I have followed this procedure to clear the work area and dispose of/recycle materials in compliance with workplace procedures and environmental requirements.

Question 65 How do you clear the work area, dispose of and recycle asphalt materials?

Clear Work Area: After completing a construction project or a specific phase of work, the first step is to clear the work area of all tools, equipment, and debris. This includes removing any construction equipment, materials, and waste that are no longer needed.

Dispose of Materials: Construction sites often generate various types of waste materials, including excess construction materials, damaged equipment, or debris. Proper disposal of these materials is crucial. It may involve transporting waste to designated disposal sites, such as landfills or recycling centers.

Recycle Materials: In an effort to reduce environmental impact, many construction projects aim to recycle materials whenever possible. This includes segregating recyclable materials like concrete, metal, wood, and plastics and sending them to recycling facilities instead of landfills.

Follow Workplace Procedures: Each construction site may have specific procedures for clearing and cleaning up the area. These procedures may include guidelines for waste segregation, disposal, and recycling. Workers should follow these procedures to ensure that the cleanup is conducted efficiently and safely.

Environmental Requirements: Environmental regulations and requirements vary by location. Construction sites must adhere to local, state, and federal environmental regulations regarding waste disposal, recycling, and pollution control. Ensuring compliance with these requirements is essential.

By adhering to this process, construction sites can maintain cleanliness, safety, and environmental responsibility in their operations, reducing the impact of construction activities on the environment.



Clean work area and tools



Dispose of Materials



Recycle Materials