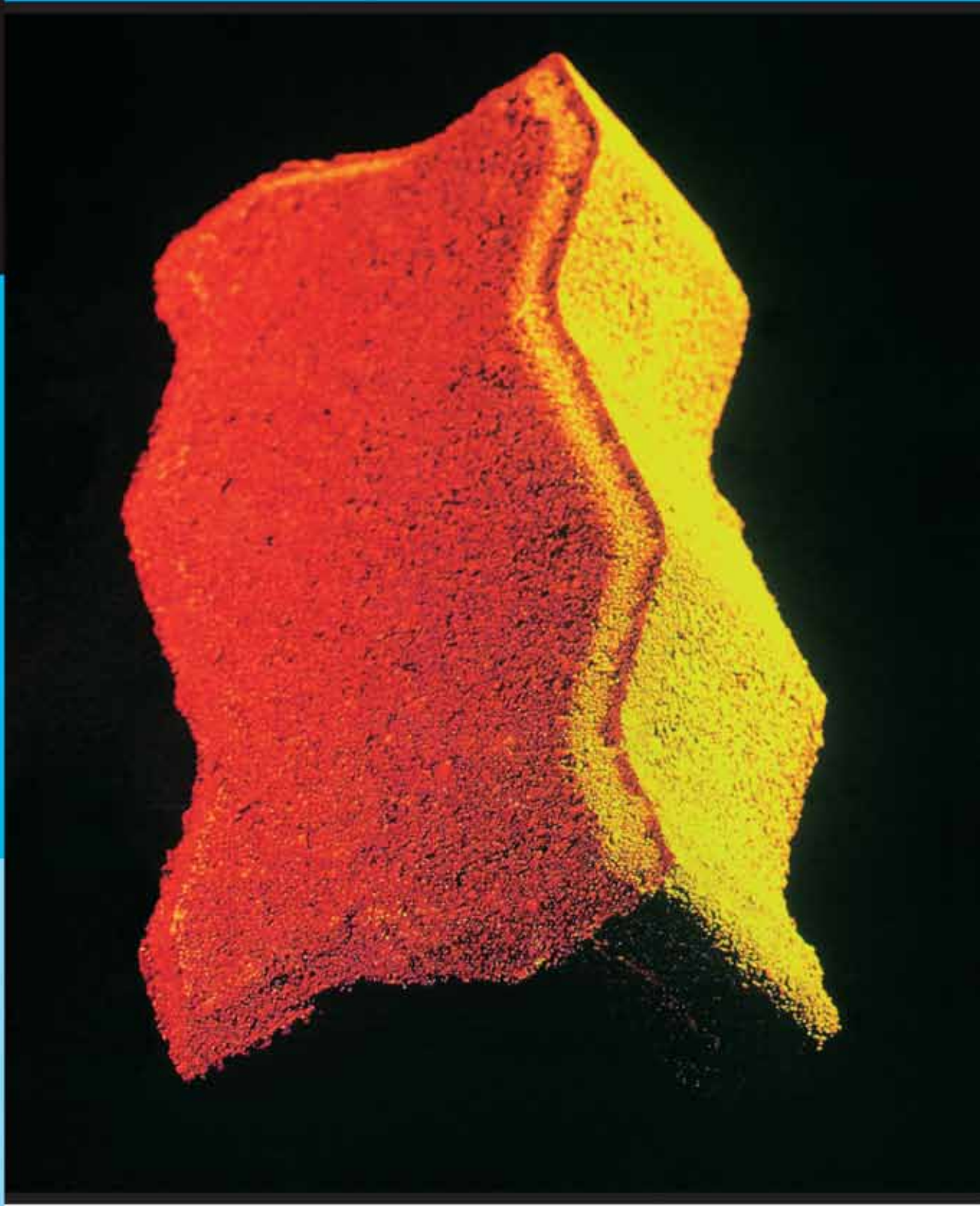
CONCRETE BLOCK PAVING

Book 5 – Training Manual



A walk-over in cost, looks and durability for Concrete Block Paving

CONCRETE MANUFACTURERS ASSOCIATION
Quality cast in concrete

CONCRETE
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LEARNING GUIDE

TRAINING PROGRAMME
LAYING CONCRETE BLOCK PAVING

Programme	**Laying Concrete block paving**
Duty [A]	**Laying concrete block paving**
Task [05]	**Paving special areas, islands and intersections**

INTRODUCTION

In this learning guide we will be dealing with the paving of special areas, such as drains and gratings as well as islands and intersections. It is important that you attain mastery of this task as there is no doubt that you will be called upon to perform this task, from time to time.

OBJECTIVES

PERFORMANCE OBJECTIVE

Given	This learning guide, materials, equipment and assistance
You Will	Pave special areas, islands and intersections
How Well	The completed task must conform to the standards of the test/s

PLEASE NOTE !!!! IF YOU THINK YOU ARE ABLE TO PERFORM THIS TASK TO THE LEVEL INDICATED ABOVE, THEN TAKE THE TEST.

LEARNING OBJECTIVES

1. Pave special areas
2. Pave islands and intersections

LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.1

Description:	Pave special areas

LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.1 describing the procedure to follow when paving special areas.	1. Instruction Sheet No.1
2. Complete Self Check No.1 to evaluate your work.	2. Self Check No.1
3. When successfully completed proceed to the next Learning Objective.	

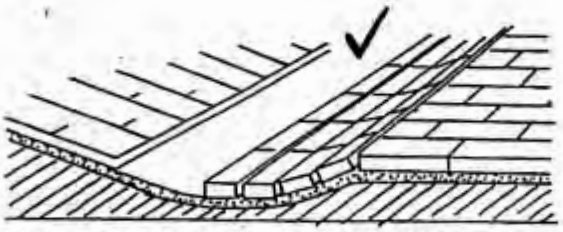
INSTRUCTION SHEET NO.1

Description:	Pave special areas

Special areas

Drains

Dish drains are often incorporated into the pavement surface to concentrate and remove rain water. Several methods are available to utilise the standard pavement materials and also specialist items by other manufacturers. Preparation for a dish drain incorporated into the standard pavement involves shaping the subgrade or subbase to the required profile, screeding to that profile, and placing blocks in the normal manner. As a normal precaution it is advisable to cement grout the joints in the drain.



Lay units along the drain to follow curves

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

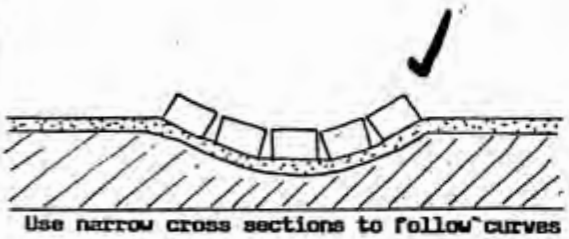
INSTRUCTION SHEET NO.1

Description:	Pave special areas

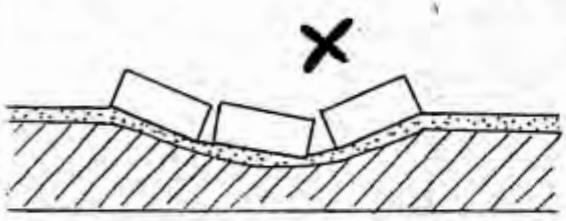
To achieve a smooth flowing surface within the drain itself it may be necessary to:

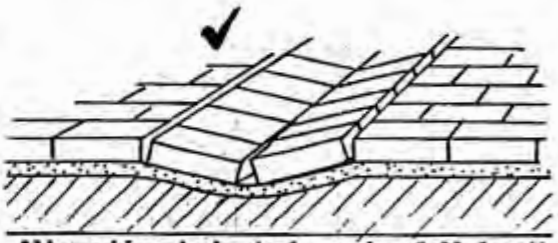
(a) change pattern
(b) change blocks
(c) cut blocks

Changing blocks can have extra advantages in indicating the position of the drain for maintenance purposes, or to alert unwary pedestrians of a change in surface levels. Both shape and colour, or a combination of both, will achieve this purpose.



Use narrow cross sections to follow curves





Alternative drain design using full length of units

FORMING DRAINS

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.1

Description:	Pave special areas

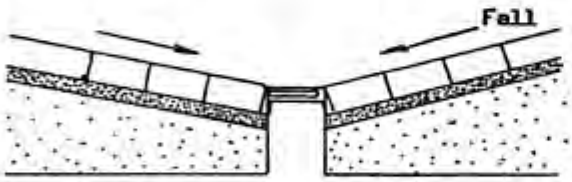
Grates

Large areas of paving must be profiled to direct surface water towards drains and gratings. The treatment of pavement in these areas can affect the efficiency of such drainage.

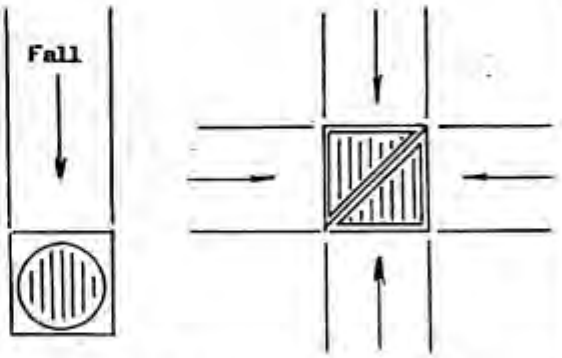
Positive drainage must be maintained right to the grating, which, itself must be set to receive and pass the correct amount of water.

Whenever possible, drainage grates should be set to finished level before paving begins. This means that the grate can then be used to set screeding levels and cannot be adjusted to suit incorrectly laid pavement levels.

Levels must ensure that the pavement is always higher by 5-10mm than the grating or drain entrance otherwise the entry of water will be restricted.



FALLS INTO GRATINGS



CONNECTING DISH DRAINS AND DRAINAGE GRATES

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.1

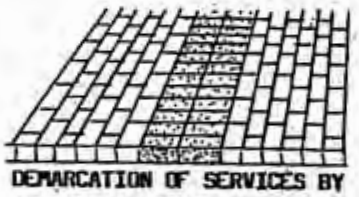
Description:	Pave special areas

Location of services

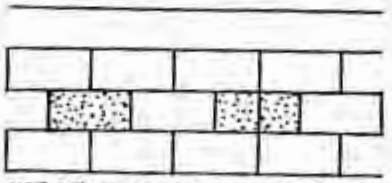
Local government, commercial and industrial sites often require special openings and markings to assist service personnel to locate or gain entry to underground services. Colours and different block shapes and laying patterns help meet this requirement.

For a service strip, use a more easily broken laying pattern such as stretcher bond or larger blocks over the area. Colours can identify both location and type of service which may be found under the paving.

A single block covering a control valve opening may be inserted in a different colour or if almost complete obscurity is desired, simply split the unit in half and use the split to identify position. If a unit is to be removed periodically then it may be custom made to suit. (See figures below and on following page)



DEMARCATION OF SERVICES BY COLOUR OR CHANGE OF LAYING PATTERN



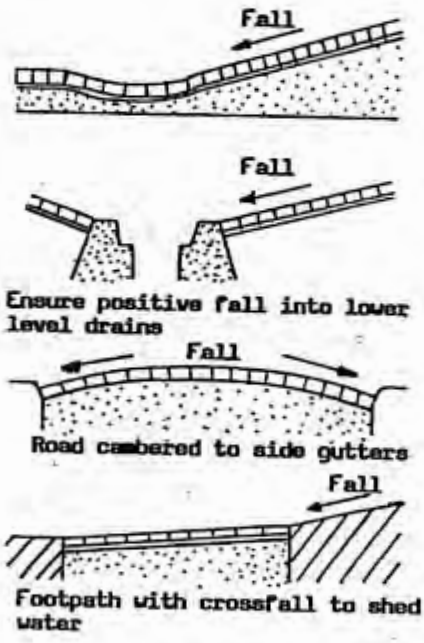
USE OF COLOURED OR SPLIT UNITS TO IDENTIFY A SERVICE

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.1

Description:	Pave special areas

Location of services (continued)



THE IMPORTANCE OF PROPER FALLS

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

PERFORMANCE SELF CHECK NO.1

Description:	Pave special areas

DIRECTIONS

1. Evaluate your work by responding to the items on the following page/s.
2. All items must receive a "Yes" response for successful completion of this Self Check.
3. Should you miss or answer any item incorrectly, review the Instruction Sheet or consult your Instructor.
4. Do not proceed any further until you have completed this Self Check successfully.

PERFORMANCE SELF CHECK NO.1
EVALUATION

Description:	Pave special areas

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
	Drains		
1	Was subgrade/subbase shaped to the required profile?		
2	Was screeding performed to the shaped profile?		
3	Were blocks placed in conformance with requirements?		
4	Were joints in drain grouted with cement?		
	Grates		
1	Was paving profiled to direct surface water toward grating?		
2	Was drainage grate set to the finished level?		
3	Was screeding done according to requirements?		
4	Was grate used to set screeding levels?		
5	Was paving laid in accordance with requirements?		
6	Is paving level 5-10mm higher than grating?		
7	Does all paving conform to specifications?		

LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.2

Description:	Pave islands and intersections

LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.2 describing the procedure to follow when paving islands and intersections.	1. Instruction Sheet No.2
2. Complete Self Check No.2 to evaluate your work.	2. Self Check No.2
3. When all Self Checks have been completed successfully take the test.	3. Performance Test

INSTRUCTION SHEET NO.2

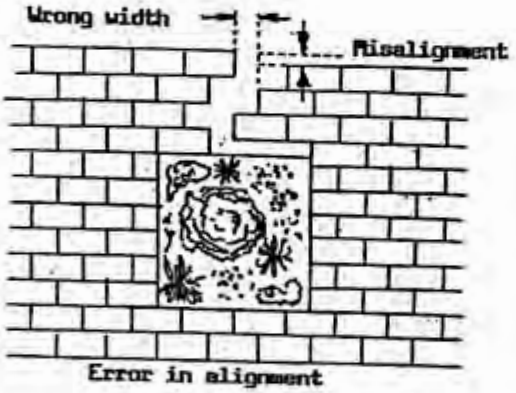
Description:	Pave islands and intersections

Islands and intersections

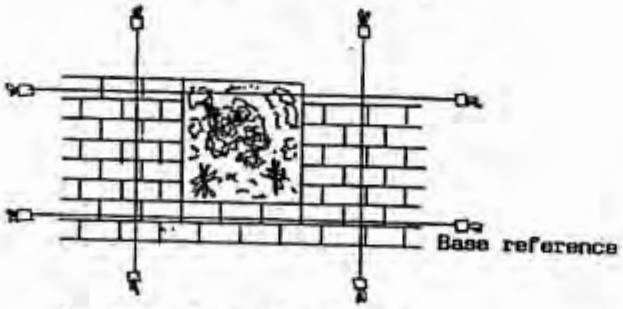
Paving around obstructions such as garden beds, small buildings, etc, can present special problems in keeping the pattern lines straight and to ensure that the paving matches up on the far side of the obstruction.

To overcome this problem, the string line is used to maintain accuracy in laying until the pavement again meets.

Parallel lines in two directions at right angles to each other are set right through the area around the obstruction to prevent the paving on one side of the obstruction from creeping ahead of that on the other side.



Error in alignment



Use stringline grid to check alignment

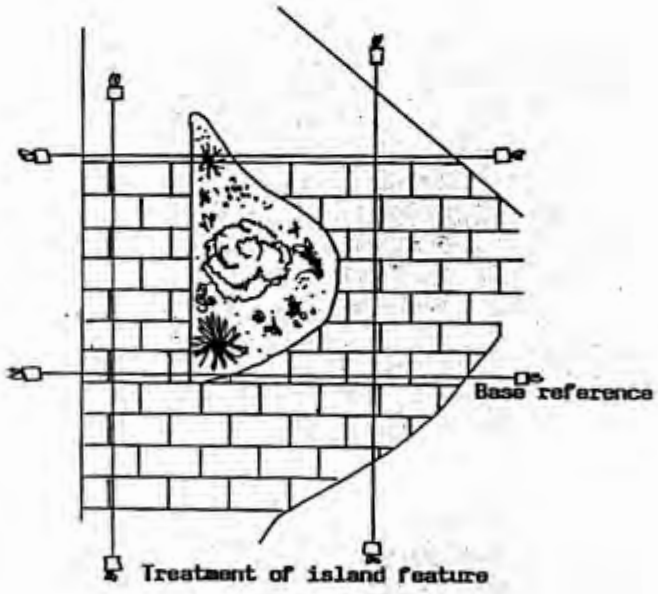
LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description:	Pave islands and intersections

The paving then proceeds simultaneously from each side, keeping strictly to the lines indicated.

Lines in the pattern which must be maintained over a bump cannot be set using a string line only. The string line can be used as a local guide but it must be adjusted regularly to conform to the 'line of sight'.



ALIGNING OF UNITS AT OBSTRUCTIONS

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description:	Pave islands and intersections

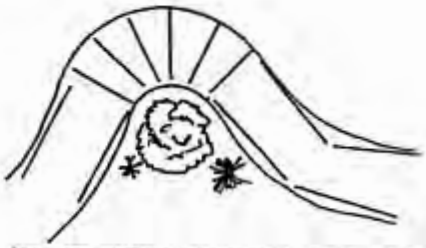
Rolling and freeform surfaces

Pavement are sometimes set to follow the natural features of the land to achieve both visual effect and economy of installation. This means that hills and hollows as well as natural or man-made obstructions must be negotiated with special techniques.

To duplicate the rolling surface of the landscape with the screeded bedding sand, it is necessary to utilise short length screeding rails to produce, in essence, a series of short straight sections approximating a curve. The same rails must be used to negotiate tight bends and varying widths of pavement where longer rails could not be used.

The slight error in producing the curves can be corrected with relative ease during the vibrating operation.

USE OF SHORT SCREEDING RAILS TO GAUGE THE CURVATURE



USE OF SHORT SCREEDING RAILS TO NEGOTIATE TIGHT TURNS

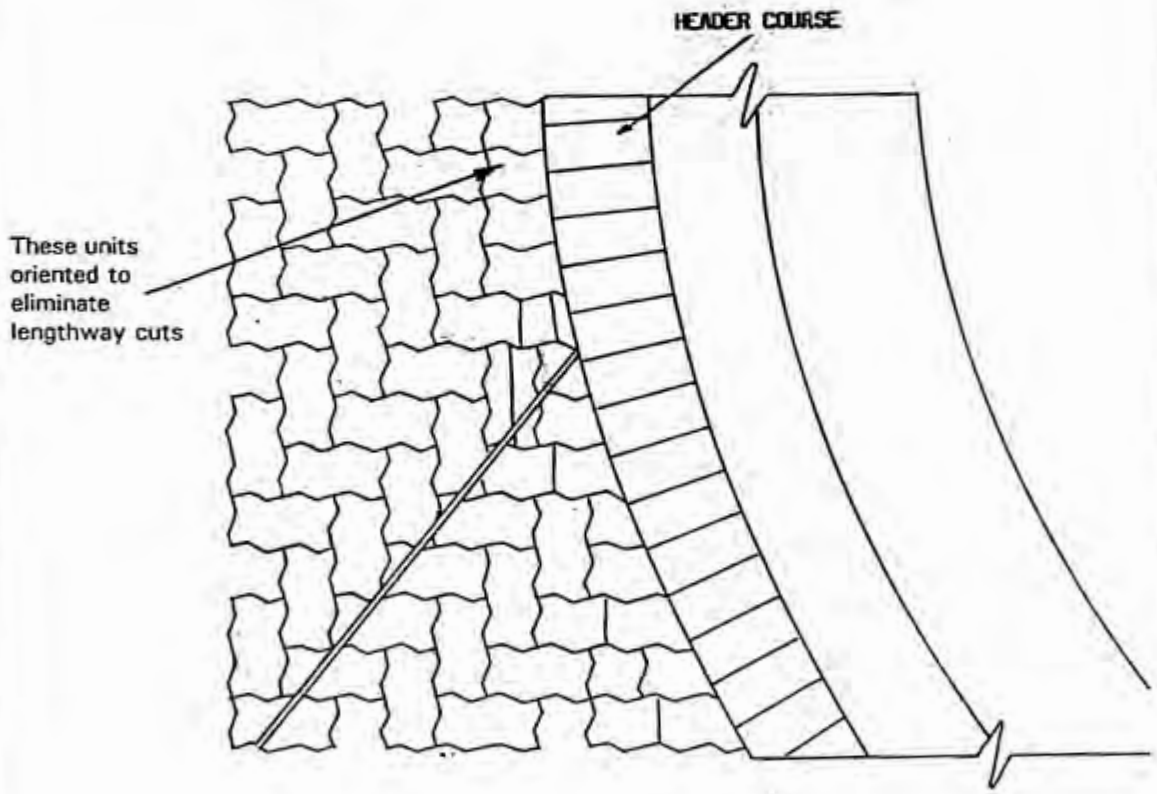
LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description:	Pave islands and intersections

Header Course

It is often advisable to place a header course along the edge of paving. A header course is a row of pavers laid parallel to each other. It is also advisable to orientate the last row of blocks in order to reduce cutting and eliminate small pieces of blocks.



LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description:	Pave islands and intersections

Herringbone Pattern

The herringbone pattern has the advantage that the pattern can be carried out around bends and corners without interrupting the pattern.

However, when working around islands and buildings it is inevitable that the paving will have to join at some point. This is best achieved by cutting blocks and creating a straight joint.

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

PERFORMANCE SELF CHECK NO.2

Description:	Pave islands and intersections

DIRECTIONS

1. Evaluate your work by responding to the items on the following page/s.
2. All items must receive a "Yes response for successful completion of this Self Check.
3. Should you miss or answer any item incorrectly, review the Instruction Sheet or consult your Instructor.
4. Do not proceed any further until you have completed this Self Check successfully.

PERFORMANCE SELF CHECK NO.2 EVALUATION

Description:	Pave islands and intersections

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
	Islands/Intersections		
1	Was setting out performed to suit requirements?		
2	Was paving started simultaneously from each side?		
3	Was paving performed accurately to strung lines?		
4	Does completed paving conform to specifications?		
	Rolling/Freeform surfaces		
1	Was setting out performed in accordance with requirements?		
2	Was a header course laid along paving edge?		
3	Was last row oriented to reduce cutting?		
4	Were blocks cut to create a straight joint?		
5	Does all laid paving conform to specifications?		

PERFORMANCE TEST

Description: Pave special areas, islands and intersections

DEMONSTRATE MASTERY OF THIS TASK BY DOING THE FOLLOWING

1. Before attempting the Performance Test, ensure that you have completed this Learning Guide successfully.
2. Obtain the Performance Test from your Instructor.
3. Before you attempt the Performance Test, be sure that you fully understand what is required of you.

PERFORMANCE STANDARDS

1. The correct procedures are to be adhered to.
2. All safety precautions are to be adhered to.
3. You are not allowed to refer to your Learning Guide or obtain any assistance.
4. You have _____ minutes to complete the Performance Test.
5. 100% will be required for mastery.

PERFORMANCE TEST EVALUATION

Description: Pave special areas, islands and intersections

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
	Drains		
1	Is subgrade/subbase shaped to desired profile?		
2	Is screeding in accordance with shaped profile?		
3	Are paving blocks laid in accordance with requirements?		
4	Are joints grouted with cement?		
5	Is paving clean and neat?		
6	Is completed paving in accordance with specifications?		
7	Was the time limit adhered to?		
	Grates		
1	Is paving profiled to direct surface toward grating?		
2	Is screeding in accordance with requirements?		
3	Is paving level 5-10mm above grating?		
4	Is paving clean and neat?		
5	Is completed paving in accordance with specifications?		
6	Was the time limit adhered to?		

PERFORMANCE TEST EVALUATION

Description: Pave special areas, islands and intersections

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
	Islands/Intersections		
1	Is setting in accordance with requirements?		
2	Is screeding in accordance with requirements?		
3	Is paving laid accurately?		
4	Is paving clean and neat?		
5	Is paving in accordance with specifications?		
6	Was the time limit adhered to?		
	Rolling/Freeform Surfaces		
1	Is setting out in accordance with requirements?		
2	Is screeding in accordance with requirements?		
3	Is header course laid in accordance with requirements?		
4	Is amount of cutting reduced?		
5	Are joints straight?		
6	Is paving clean and neat?		
7	Is paving in accordance with requirements?		
8	Was the time limit adhered to?		

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LEARNING GUIDE

TRAINING PROGRAMME
LAYING CONCRETE BLOCK PAVING

Programme	**Laying Concrete Block Paving**
Module [A]	**Laying concrete block paving**
Task [06]	**Reinstate paving after trench opening**

INTRODUCTION

Having now mastered the paving procedures you will now be given the knowledge and skills required to reinstate paving after trench opening. Consider it important that you master this task as you will be called upon to perform this task within the scope of your duties.

OBJECTIVES

PERFORMANCE OBJECTIVE

Given	This learning guide, materials, equipment and assistance
You Will	Reinstate paving after trench opening
How Well	The completed task must conform to the standards of the test/s

PLEASE NOTE !!!! IF YOU THINK YOU ARE ABLE TO PERFORM THIS TASK TO THE LEVEL INDICATED ABOVE, THEN TAKE THE TEST.

LEARNING OBJECTIVES

1. Prepare for reinstatement
2. Reinstate after trench opening

LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.1

Description:	Prepare for reinstatement

LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.1 describing the procedure to follow when preparing for reinstatement.	1. Instruction Sheet No.1
2. Complete Self Check No.1 to evaluate your work.	2. Self Check No.1
3. When successfully completed proceed to the next Learning Objective.	

INSTRUCTION SHEET NO.1

Description:	Prepare for reinstatement

Reinstatement of paving after trench opening

One if the major advantages accruing from the use of concrete block paving as a surfacing material is that access to underground services for maintenance purposes can be obtained, and reinstatement carried out in such a manner that the repair is invisible and not an unsightly scar, as would be the case with other paving materials. In order to achieve the best results with the minimum of subsequent settlement, the following method should be employed:

Concrete paving blocks which have been laid and trafficked for any length of time are tightly locked together, and it may be difficult to remove the first few blocks without breakage.

The traditional method of opening up an area for access, has been to break up two or three blocks to gain initial entry and then to carefully remove blocks over the required area. This method has the disadvantage of requiring replacement blocks for those which have to be broken.

LET YOUR INSTRUCTOR FULLY EXPLAIN THE ABOVE

INSTRUCTION SHEET NO.1.

Description:	Prepare for reinstatement

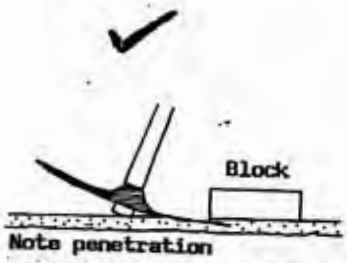
The following method on the other hand may permit the salvaging of whole blocks without the breakages which occur where other methods are applied.

Remove the first block.

1. Remove sand from the joints down to the sand bed layer using a bricklayer's small trowel or other suitable tool.

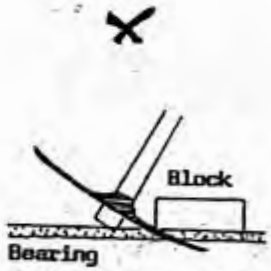
2. Insert two screwdrivers and ease the block out. Remove subsequent blocks.

3. Once the first block is removed, take out subsequent blocks by using a crowbar or pick, or other suitable tool and lift clear.



Note penetration
Pick with handle trimmed back.

THE RIGHT WAY



Bearing
Pick with protruding handle.

THE WRONG WAY

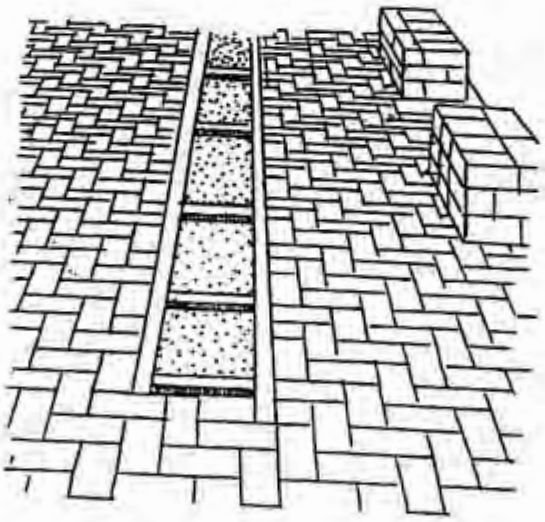
LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.1

Description:	Prepare for reinstatement

Because block paving locks up after trafficking, the force exerted by the crowbar may well cause the pavement to lift over a limited area around the operator. Passing a vibrating plate over the surface of the blocks adjacent to the opening may assist in breaking the interlock, or blocks adjacent to the area being loosened may be tapped down with the shaft of a hammer or other suitable tool.

Continue in this way until the area of paving has been removed. The blocks should then be stacked adjacent to the trench ready for reinstatement. Other materials removed from the trench should also be stockpiled at a suitable distance opposite the blocks. Placing this material on plastic sheeting reduces possible contamination of existing paved surfaces while facilitating subsequent return of material to the trench.



Blocks removed and stacked to side. Width opening approximately 0,4m. Trench work completed - cable laid. Trench back filled and compacted.

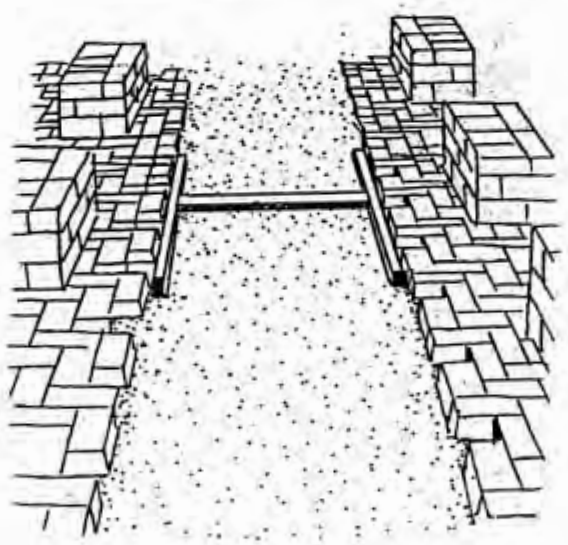
LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.1

Description:	Prepare for reinstatement

Should it be necessary to leave trenches open for a period of more than 2 days, it is strongly recommended that cross bracing be positioned between the two edges of paving , to prevent inward movement of the paving as well as the opening of joints.

Just before reinstatement of the pavement it is advisable to remove an area slightly larger than the width of the trench excavation, usually two rows of blocks, in order to facilitate replacement of the blocks during subsequent operations. This also permits the original bedding sand levels to be observed.



Width of opening increased to approximately 0,8m

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

PERFORMANCE SELF CHECK NO.1

Description:	Prepare for reinstatement

DIRECTIONS

1. Evaluate your work by responding to the items on the following page/s.
2. All items must receive a "Yes" response for successful completion of this Self Check.
3. Should you miss or answer any item incorrectly, review the Instruction Sheet or consult your Instructor.
4. Do not proceed any further until you have completed this Self Check successfully.

PERFORMANCE SELF CHECK NO.1 EVALUATION

Description:	Prepare for reinstatement

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
1	Was sand removed from joints down to sand bed layer using a small bricklayer's trowel?		
2	Were 2 screwdrivers inserted and block eased out?		
3	Were subsequent blocks removed using a crowbar or pick?		
4	Was process repeated until paving area had been removed?		
5	Were blocks stacked adjacent to trench ready for reinstatement?		
6	Were other materials stockpiled as required?		
7	Was material placed on plastic sheeting?		
8	If necessary, was cross bracing inserted between edges of paving?		
9	Was area slightly larger than width of trench excavation removed?		

LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.2

Description:	Reinstate paving after trench opening

LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.2 describing the procedure to follow when reinstating after trench opening.	1. Instruction Sheet No.2
2. Complete Self Check No.2 to evaluate your work.	2. Self Check No.2
3. When all Self Checks have been completed successfully take the test.	3. Performance Test

INSTRUCTION SHEET NO.2

Description: Reinstate paving after trench opening

When restoring the pavement it is important to pay adequate attention to the compaction of the materials replaced in the trench in order to minimise differential settlement and to provide uniform support.

Compaction should be carried out by infilling in layers not more than 150mm in depth, and compacting each layer with a plate or pneumatic trench vibrator.

Having completely backfilled and consolidated the trench, the compaction of the soil can be tested using a Dynamic Core Penetrameter (DCP). The compaction of the soil should be at least the same as the insitu material. The next step is to lay a bed of sand to receive the paving blocks. Once this has been done screed rails should be set into the sand, parallel to the sides of the trench at a level which will allow for a small surcharge of sand for further compaction when the blocks are vibrated.

The sand layer between the screed rails is now raked and smoothed using a short screed board. It will be necessary for this board to be slightly cambered over the width of the trench to counter any tendency for the trench fill material to settle after completion.

Sand screeded-off to required level

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description: Reinstate paving after trench opening

Before the original blocks are relaid they must be thoroughly cleansed of loose sand and extraneous materials. This can be done using a wire brush or trowel. The blocks can now be laid in the same way as new unused blocks.

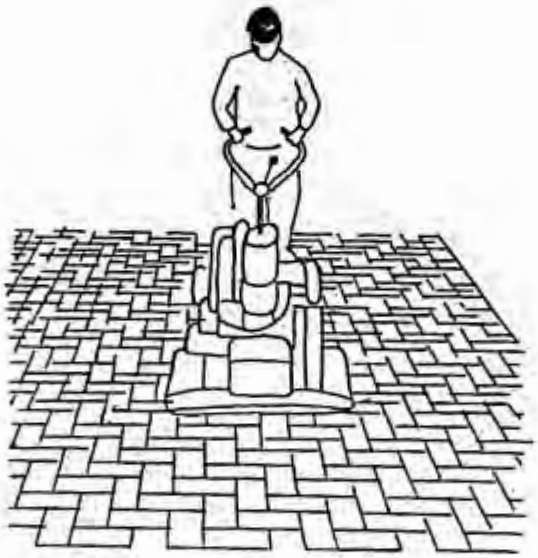
Blocks re-laid onto sand bed

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description: Reinstate paving after trench opening

Once the blocks have been relaid and bonded into the existing pavement on either side of the trench, compaction of the surface should be carried out by the usual method (Fig.5), and when no further compaction of the blocks can be achieved, jointing sand should be added and final vibration applied (Fig.6). This completes the process of reinstatement and the repairs will become completely invisible after a short period of weathering (Fig.7).

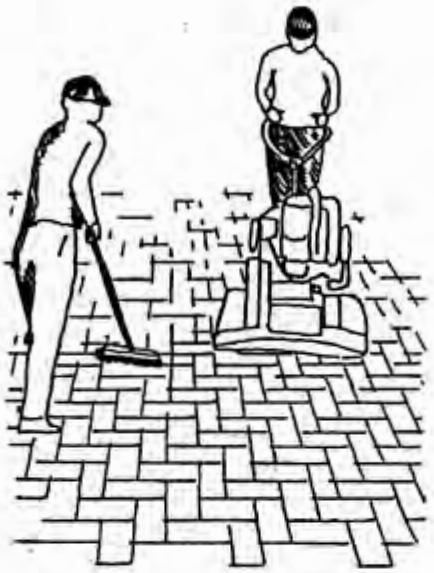


Initial bedding down with plate vibrator

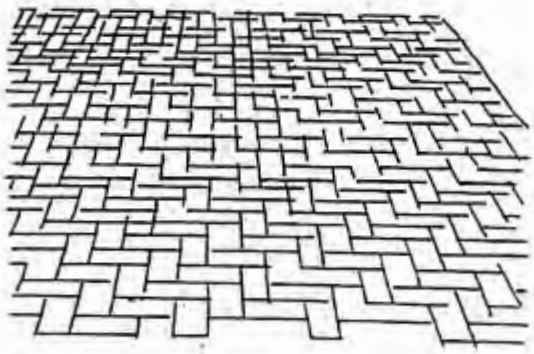
LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description: Reinstate paving after trench opening



Joint filling and final vibration



Reinstatement complete

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description: Reinstate paving after trench opening

General Note

When a pavement has been subjected to considerable traffic loads the subbase will have become fully compacted. If such a pavement is reinstated according to the recommended procedures further settlement of the reinstated area may occur.

It is therefore suggested that once the reinstated area and subbase have been well compacted, a sand surcharge should be laid to provide a finished block surface level slightly higher (ideally 2-3mm) than the surrounding area to allow for block settlement. This will ensure that final levels, after trafficking, are correct.

Should unacceptable settlement take place during the first few months, deformation of the surface over the trench will result. The correct level can be restored by removing blocks as previously described, adding backfill and compacting to level, correcting the sand layer to the required level plus surcharge, and then re-laying and compacting the blocks.

LET YOUR INSTRUCTOR FULLY EXPLAIN THE ABOVE

PERFORMANCE SELF CHECK NO.2

Description:	Reinstate paving after trench opening

DIRECTIONS

1. Evaluate your work by responding to the items on the following page/s.
2. All items must receive a "Yes" response for successful completion of this Self Check.
3. Should you miss or answer any item incorrectly, review the Instruction Sheet or consult your Instructor.
4. Do not proceed any further until you have completed this Self Check successfully.

PERFORMANCE SELF CHECK NO.2 EVALUATION

Description:	Reinstate paving after trench opening

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
1	Was consideration given to compaction of materials in trench?		
2	Was trench completely backfilled and consolidated?		
3	Was sand bed laid?		
4	Were screed rails set into sand parallel to trench sides?		
5	Was allowance made for small surcharge to accommodate further compaction?		
6	Was sand layer raked smooth using a short screed board?		
7	Were original blocks cleaned thoroughly?		
8	Were blocks laid in accordance with requirements?		
9	Was laid paving compacted?		
10	Was jointing sand added and vibration applied?		

PERFORMANCE TEST

Description: Reinstate paving after trench opening

DEMONSTRATE MASTERY OF THIS TASK BY DOING THE FOLLOWING

1. Before attempting the Performance Test, ensure that you have completed this Learning Guide successfully.
2. Obtain the Performance Test from your Instructor.
3. Before you attempt the Performance Test, be sure that you fully understand what is required of you.

PERFORMANCE STANDARDS

1. The correct procedures are to be adhered to.
2. All safety precautions are to be adhered to.
3. You are not allowed to refer to your Learning Guide or obtain any assistance.
4. You have _____ minutes to complete the Performance Test.
5. 100% will be required for mastery.

PERFORMANCE TEST EVALUATION

Description:	Reinstate paving after trench opening

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
1	Are removed blocks damage free?		
2	Are blocks stacked adjacent to trench?		
3	Are materials stockpiled on plastic sheeting as required?		
4	Is cross bracing correctly inserted?		
5	Is area slightly larger than width of trench excavation?		
6	Is trench completely backfilled and consolidated?		
7	Does sand bed conform to requirements?		
8	Are screed rails parallel to trench sides?		
9	Is allowance made for surcharge for further compaction?		
10	Are blocks thoroughly clean?		
11	Is reinstated paving in accordance with requirements?		
12	is paving compacted as required?		
13	Are joints in accordance with requirements?		
14	Does completed reinstatement conform to specifications?		
15	Was the time limit adhered to?		

CONCRETE
MANUFACTURERS'
ASSOCIATION

LEARNING GUIDE

TRAINING PROGRAMME
LAYING CONCRETE BLOCK PAVING

Programme	**Laying Concrete Block Paving**
Duty [A]	**Laying concrete block paving**
Task [04]	**Lay block paving units**

INTRODUCTION

Having mastered the preparation aspects of concrete block laying, you will in this learning guide obtain the necessary knowledge and skills required to lay paving block units, which includes the laying of patterns and paving compaction.

OBJECTIVES

PERFORMANCE OBJECTIVE

Given	This learning guide, tools, materials, equipment and assistance
You Will	Lay block paving units
How Well	The completed task must conform to the standards of the test/s

PLEASE NOTE !!!! IF YOU THINK YOU ARE ABLE TO PERFORM THIS TASK TO THE LEVEL INDICATED ABOVE, THEN TAKE THE TEST.

LEARNING OBJECTIVES

1. Place and screed sand bed
2. Place paving blocks
3. Lay patterns
4. Finish edges
5. Compact paving

LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.1

Description:	Place and screed sand bed

LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.1 describing the placing and screeding of the sand bed.	1. Instruction Sheet No.1
2. Complete Self Check No.1 to evaluate your work.	2. Self Check No.1
3. When successfully completed proceed to the next Learning Objective.	3. Performance Test

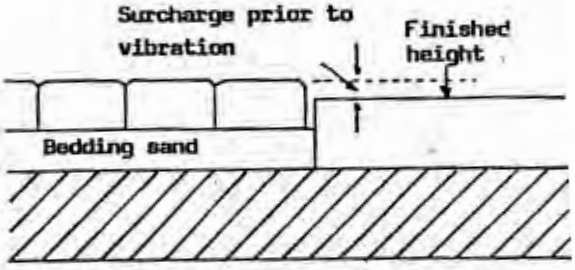
INSTRUCTION SHEET NO.1

Description:	Place and screed sand bed

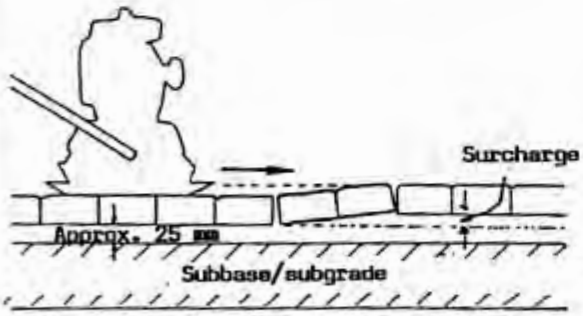
Placing and compacting of sand bed

This operation provides the bed of sand onto which the individual paving blocks are laid. As such it is an operation which can affect the outcome of the finished pavement as much as the preparation of the subgrade or subbase.

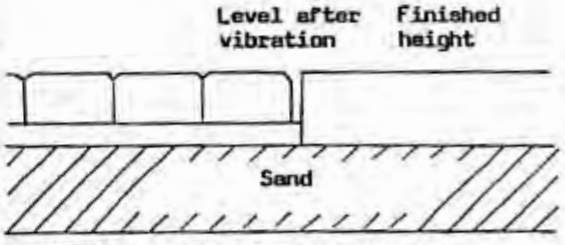
LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE PLACING OF THE SAND



ALLOWING SURCHARGE FOR COMPACTION



USING A VIBRATOR TO COMPACT THE PAVEMENT



CORRECT LEVELS AFTER COMPACTION

INSTRUCTION SHEET NO.1

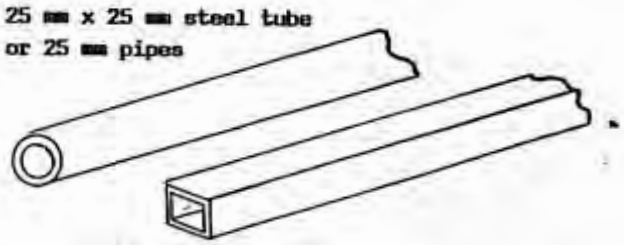
Description: Place and screed sand bed

Levels should be checked regularly as laying progresses. If levels change due to variation in the sand type or moisture, then the compaction as well as the final level will change and blocks may have to be lifted and sand raked and rescreeded to new levels before the blocks are relaid.

Screeding rails of 25 mm thickness are laid on the prepared subgrade/subbase not more than 2m apart.

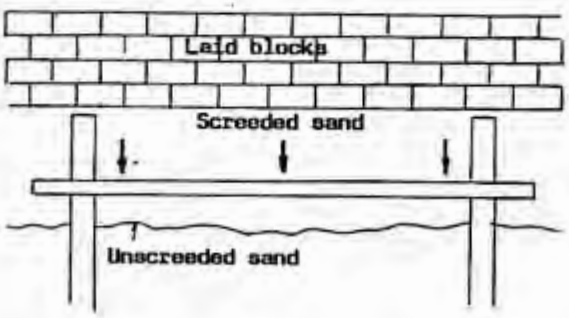
The thickness of the bedding sand after compaction should not be less than 15 mm.

Screeding Rails



LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

Now, distribute sand over the area to be screeded but only about 1 metre in front, i.e. the distance that can be reached without kneeling in, and thus compacting the sand.



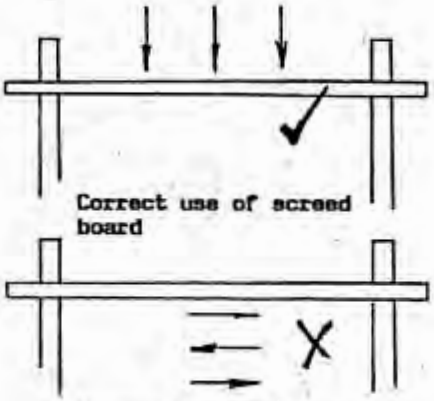
LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.1

Description:	Place and screed sand bed

Using a rigid, straight screeding board (125 x 50mm is ideal) which spans the distance between screeding rails, level the sand by drawing the screed board directly toward you. See-sawing of the board is slower and will cause uneven compaction of the sand bed.

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE



Correct use of screed board

Incorrect use of screed board

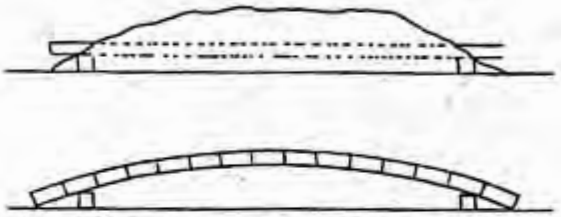
As small pockets or holes appear behind the screed, throw more loose sand onto the area and rescreed. Loose or poorly compacted areas should be treated in the same manner.

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.1

Description: Place and screed sand bed

Too much sand in front of the screed board will cause the board to bend which in turn will produce a cambered surface. It is better to take two or three passes with the screed board to ensure a true surface, flat and evenly compacted.

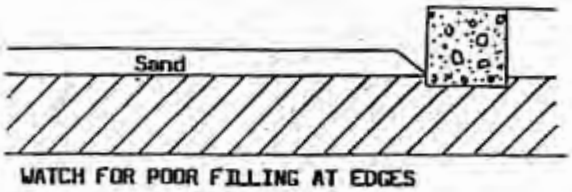


Too much sand causes screed board to bend resulting in a cambered surface

SCREEDING OF SAND

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

When screeding up to a fixed edge, check that the sand is properly filled and screeded in the corners. Hollow spots or bridging can occur and will result in the pavement settling lower than desired on the edges after vibrating. Excess sand left along edges and against walls by the screeding board is best removed with a steel float or trowel. A steel float is handy to slip under the excess, remove it and then smooth out any irregularities.



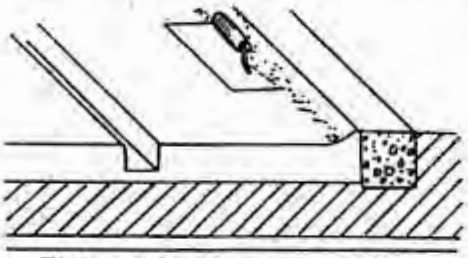
WATCH FOR POOR FILLING AT EDGES

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.1

Description:	Place and screed sand bed

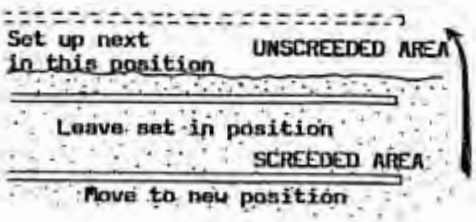
When the area to be screeded is wider than the screeding board, the board can be cantilevered over two screed rails to level the outlying areas. When screeding up to existing edge restraints, kerbs or footpaths, the surface should be checked for levels. It may be necessary to adjust sand levels locally to ensure the paving finishes and blends with the edging.



MAKE GOOD AFTER REMOVING SCREEDING RAILS

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

Standing or walking on the sand bed before and after screeding will result in areas of differing compaction. These areas can then affect the levels of the finished pavement and therefore must be loosened up with a rake and rescreeded to ensure even compaction. After screeding off the area, the screeding rails should be carefully removed by sliding them along their longitudinal axis. If continuing on in the same direction, about 500mm of the rail can be left in the groove. When an area parallel to the screeding rails is to be screeded, leave the closest screed rail in position and reset another in the new area.



PREPARING AND SETTING A SCREED RAIL FOR A PARALLEL AREA

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.1

Description:	Place and screed sand bed

Carefully fill in and level off the grooves remaining from the removal of the screeding rails. A wooden or steel float is best for this purpose to obtain a smooth surface.

Where a pile of sand has been placed and later spread, the sand from the base will be compacted by the mass of the original pile. This 'base' must be loosened up with a rake to ensure uniform compaction when screeding.

The sand should be dumped in small, well-distributed piles and covered to retain its moisture. In addition, the sand should not be too wet and by allowing each pile to stand for a short time excess water will drain off. The sand when compressed lightly in the hand should cling together rather than fall loosely apart when the hand is reopened.

Sand which is too wet will not screed properly and sand which is too dry may not compact satisfactorily.

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

PERFORMANCE SELF CHECK NO.1

Description:	Place and screed sand bed

DIRECTIONS

1. Evaluate your work by responding to the items on the following page/s.
2. All items must receive a "Yes" response for successful completion of this Self Check.
3. Should you miss or answer any item incorrectly, review the Instruction Sheet or consult your Instructor.
4. Do not proceed any further until you have completed this Self Check successfully.

PERFORMANCE SELF CHECK NO.1
EVALUATION

Description:	Place and screed sand bed

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
1	Were 25mm thick screeding rails 2 metres apart?		
2	Was sand distributed over the area to be screeded about 1 metre in front?		
3	Was a straight 125mm x 50mm screeding board used to level the sand?		
4	Was a drawing motion toward you used?		
5	Were holes filled by rescreeding if necessary?		
6	Were two or three passes taken instead of one?		
7	When screeding up to fixed edge was check made to ensure that sand was properly filled and screeded in corners?		
8	Was excess sand removed with a float or trowel?		
9	Were irregularities smoothed out?		
10	Was screeding board cantilevered over 2 screed rails to level outlying areas?		
11	Was surface checked for level?		
12	If necessary were sand levels adjusted to ensure paving finishes blend with the edging?		
13	Did you take care not to walk on the sand after screeding?		

PERFORMANCE SELF CHECK NO.1
EVALUATION

Description:	Place and screed sand bed

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
14	Were screeding rails removed by sliding along their longitudinal axis?		
15	If continuing in same direction was about 500mm of rail left in groove?		
16	For area parallel to screeding rails was closest rail left in position and another reset in the new area?		
17	Were grooves caused by rail removal filled in and levelled?		
18	Was the applicable float used?		
19	Where applicable was 'base' of sand pile loosened?		
20	Where applicable was sand dumped in small piles and covered?		
21	Does sand bed conform to requirements?		

LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.2

Description:	Place paving blocks

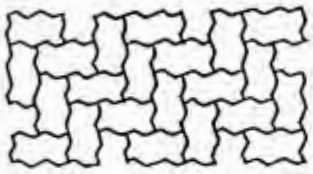
LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.2 describing the procedure to follow when laying paving blocks.	1. Instruction Sheet No.2
2. Complete Self Check No.2 to evaluate your work.	2. Self Check No.2
3. When successfully completed proceed to the next Learning Objective.	

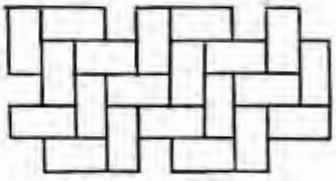
INSTRUCTION SHEET NO.2

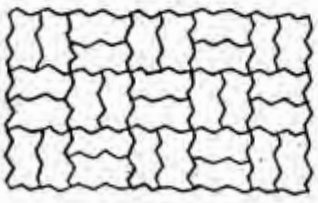
Description:	Lay paving blocks

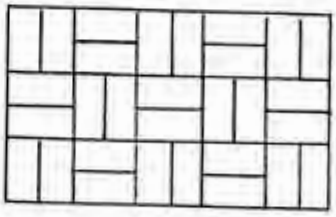
Laying patterns

Patterns fall broadly into three categories as shown in the figures below.





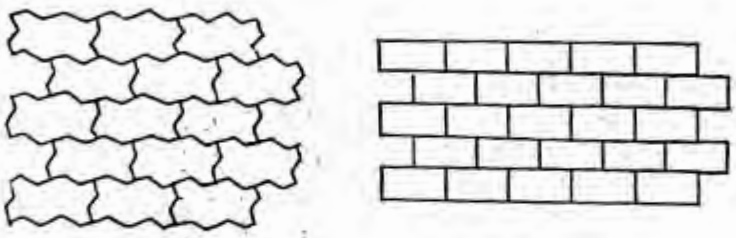




INSTRUCTION SHEET NO.2

Description:	Lay paving blocks

Laying patterns (continued)



Certain blocks can be laid in other specific patterns. Because there are numerous combinations of these, they are not included.

By combining colours, a vast number of patterns can be achieved. However, these patterns will be as directed by the architect or client.

Herringbone is the recommended pattern for industrial pavements.

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

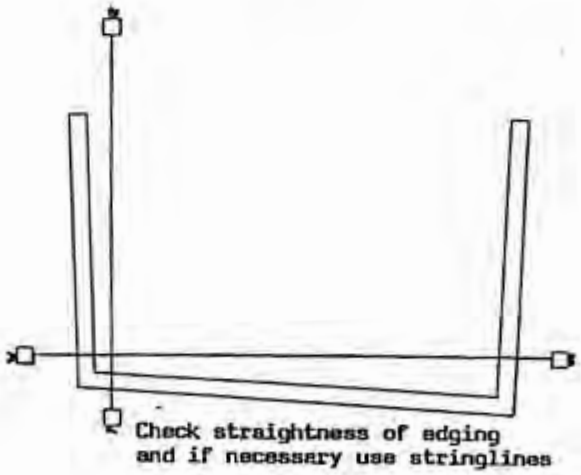
Description:	Lay paving blocks

Placing

Once the bedding course has been prepared, the feature to which the pattern of the pavement must be orientated can be decided. Generally, the pattern will be aligned along the direction of a roadway or drive, or parallel to a wall or restraint. To maintain such a line, the pavement must be set out to a string line and rechecked periodically as work continues.

Paving must progress from one starting point only. When paving is started from different points, it never matches up when the pavement from the two points finally meet.

Where existing edge restraints are not straight enough to lay the pavement to, a point must be selected slightly away (say half a block length) from the restraint and a string line used to set the alignment. (See figure below)



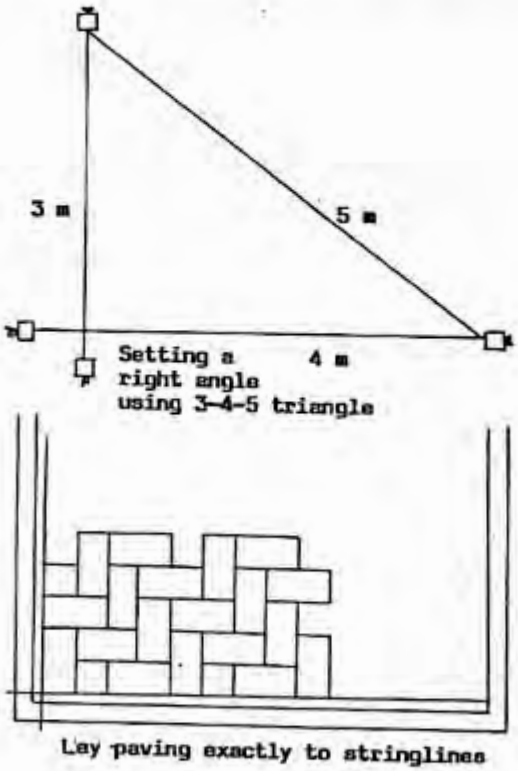
LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description:	Lay paving blocks

To establish the first few square metres of pavement, to ensure that blocks are placed correctly and that large gaps do not open up as laying proceeds, the area should be squared up. Using the **'3, 4, 5 triangle'**, construct a right angle based on the string line used for aligning the pattern.

Laying should now proceed, beginning in the right angle corner, working out both ways and keeping blocks lined up exactly with the string lines.

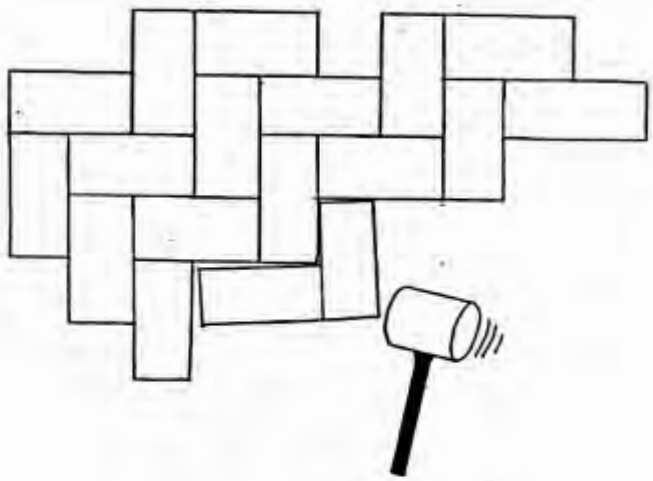


LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description:	Lay paving blocks

Any gap that opens up in the pattern should be closed up by tapping the units as required with a rubber mallet.



LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

Gaps of this nature can generally be traced to wandering away from the 90° guidelines.

Continue laying until a straight working face is built up and laying can progress in the desired directions.

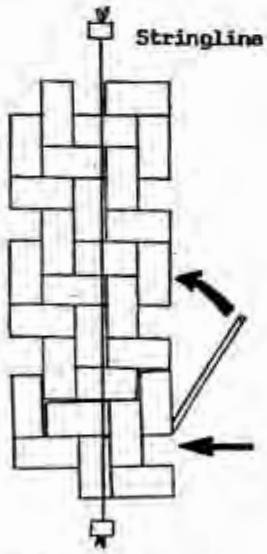
LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description:	Lay paving blocks

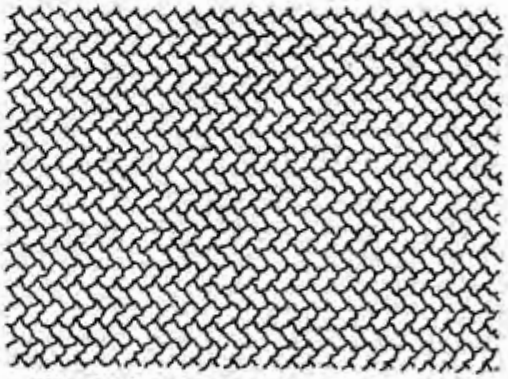
The alignment of the pattern must be checked regularly to a string line, otherwise a gradual straying of lines will result. This is important as crooked lines would affect the visual aspects of the patterns. Should misalignment occur, it can be corrected without lifting and relaying the paving. With a screwdriver or similar tool, individual blocks may be eased over in relation to adjoining blocks and whole sections of pavement can be moved over by using a shovel or crow bar to apply leverage from the edges. This operation requires extreme care to prevent damage to blocks.

Wherever patterns are incorporated into the pavement, crooked lines become highly visible.



Pushing Pavement over from edge to strenghten up the lines

METHODS OF ALIGNMENT



Straight pattern lines give good visual effects

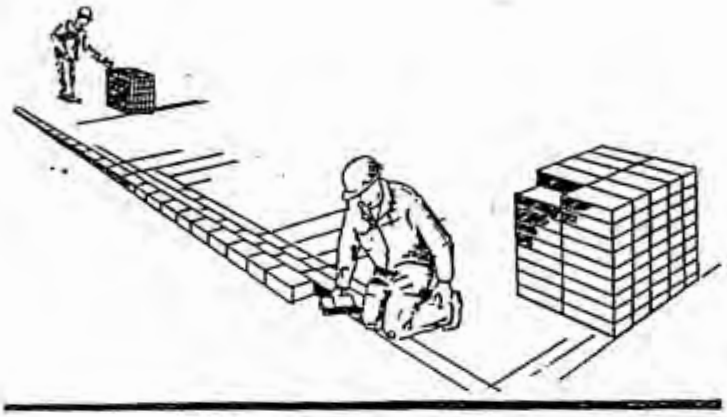
WELL ALIGNED UNITS

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

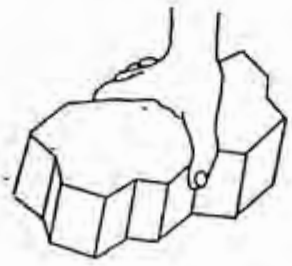
Description: Lay paving blocks

Placing paving blocks quickly and accurately with minimum effort is the key to the profitable operation of a paving team.



LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

Grasping of individual blocks varies with the size of blocks being laid. Brick size blocks are held between the thumb and four fingers so that the full rotation of the wrist and arm is utilised. In this manner each unit can be rotated through 180° to handle any laying pattern encountered.



Grasp between thumb and forefinger

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description:	Lay paving blocks

The top edge of each block will contact the thumb between tip and first joint to enable the block to be laid up against those already in position. In this position it is slightly above the sand bed and can be slid down squarely into position, releasing the thumb grip, but still maintaining finger pressure to hold it against the neighbouring blocks.

Place unit squarely against the adjacent unit, then slide down

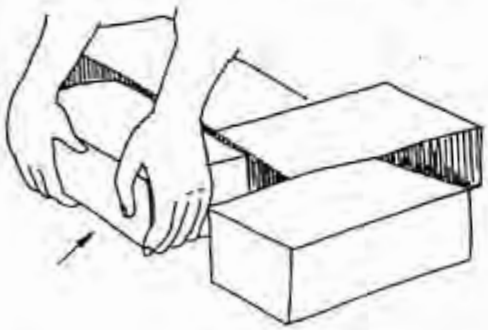
Positions possible using above grasp and standing position

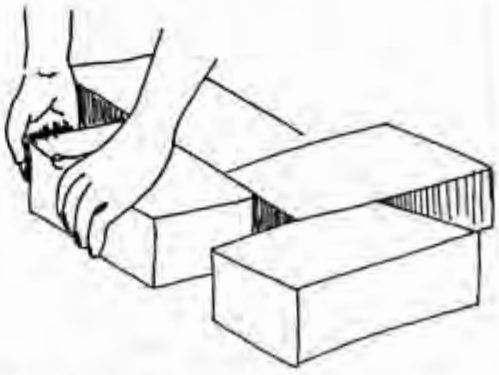
PLACING PAVING UNITS

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

This procedure ensures that the blocks are placed closely together with no possibility of the blocks actually tilting over and disturbing the sand bed. Standing too close to the edge will also tilt the blocks and disturb the sand bed.

When laying larger blocks, such as grass blocks, a two handed grip is necessary. Mass and size dictate that the block be supported underneath until it is placed up against adjoining blocks. The hands are then repositioned and the block slid down as for the smaller units.



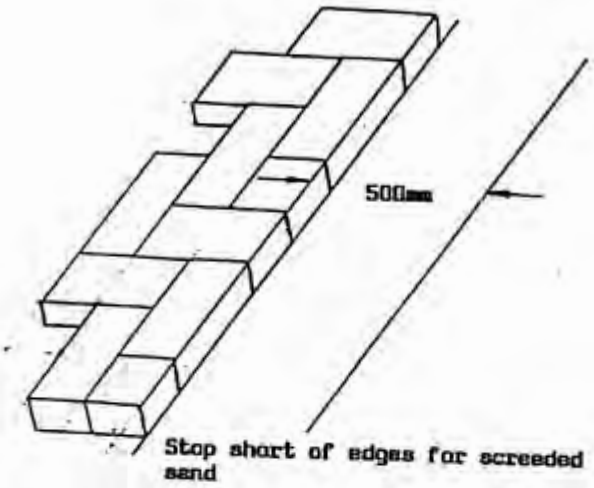


LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description:	Lay paving blocks

Laying should stop approximately 500mm short of the screeded sand edge, otherwise the unsupported sand may collapse away from the paving.



LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

Spacing of each block from its neighbour is desirable so that direct contact is avoided and bonding is achieved with sand vibrated into the joints. A space of 3mm is considered optimum but in practice is very difficult to achieve in a consistent fashion (3mm is about as wide as a match). Most blocks have a spacer nib on the side to assist you in maintaining a joint width of at least 2 mm.

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description:	Lay paving blocks

It is sufficient to place the blocks without attempting to jam them up or to space them out. With a little practice, the block being placed can be bounced off the previously laid block the required distance. They will space out quite well when vibrated and sanded.

When more than one man is placing blocks especially on long laying faces, rotate the men to avoid one section of blocks being laid tighter than the other and resulting in an irregular pattern.

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

PERFORMANCE SELF CHECK NO.2

Description:	Lay paving blocks

DIRECTIONS

1. Evaluate your work by responding to the items on the following page/s.
2. All items must receive a "Yes" response for successful completion of this Self Check.
3. Should you miss or answer any item incorrectly, review the Instruction Sheet or consult your Instructor.
4. Do not proceed any further until you have completed this Self Check successfully.

PERFORMANCE SELF CHECK NO.2 EVALUATION

Description:	Lay paving blocks

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
1	Was paving pattern decided upon?		
2	Were existing edge restraints checked for alignment?		
3	If necessary was a point selected half a block length from the restraint to commence with the alignment?		
4	Was area squared up employing the 3,4,5 method?		
5	Was laying started in the right angle corner?		
6	Was laying commenced by working out both ways?		
7	Were blocks exactly aligned with string lines?		
8	Were gaps closed using a rubber mallet?		
9	Was a straight working face built up?		
10	Did laying progress in the desired directions?		
11	Was pattern alignment checked frequently?		
12	If necessary was misalignment corrected using the applicable tools?		
13	Was damage to blocks prevented?		
14	Were blocks handled and laid as demonstrated?		
15	Did laying stop approximately 500mm short of screeded sand edge?		
16	Does block spacing conform to requirements i.e. maximum of 3mm?		
17	Do laid paving blocks conform to specifications/		

LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.3

Description:	Lay Patterns

LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.3 describing the procedure to follow when laying patterns.	1. Instruction Sheet No.3
2. Complete Self Check No.3 to evaluate your work.	2. Self Check No.3
3. When successfully completed proceed to the next Learning Objective.	

INSTRUCTION SHEET NO.3

Description:	Lay patterns

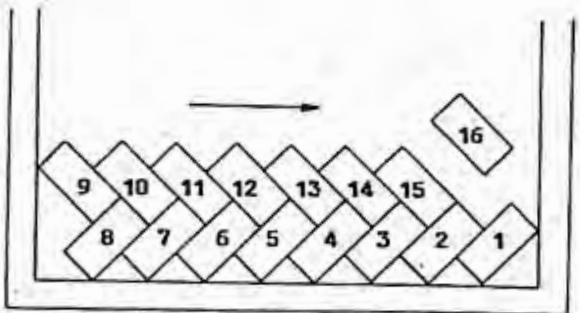
Starting patterns

The positioning of the first few blocks demands extra care. To give the required laying pattern, the blocks must be placed at the correct angle to the edge restraint or string line.

In the accompanying diagrams it has been assumed that the edge restraints are both straight and square, but this seldom occurs in practice!

Each block has to be placed very carefully so as not to disturb its neighbours, and it is not until three or four rows have been placed, that a normal rapid laying rate can be achieved.

The order of laying must ensure that the blocks can be placed easily and in such a way that it is never necessary to force a block between those already laid.



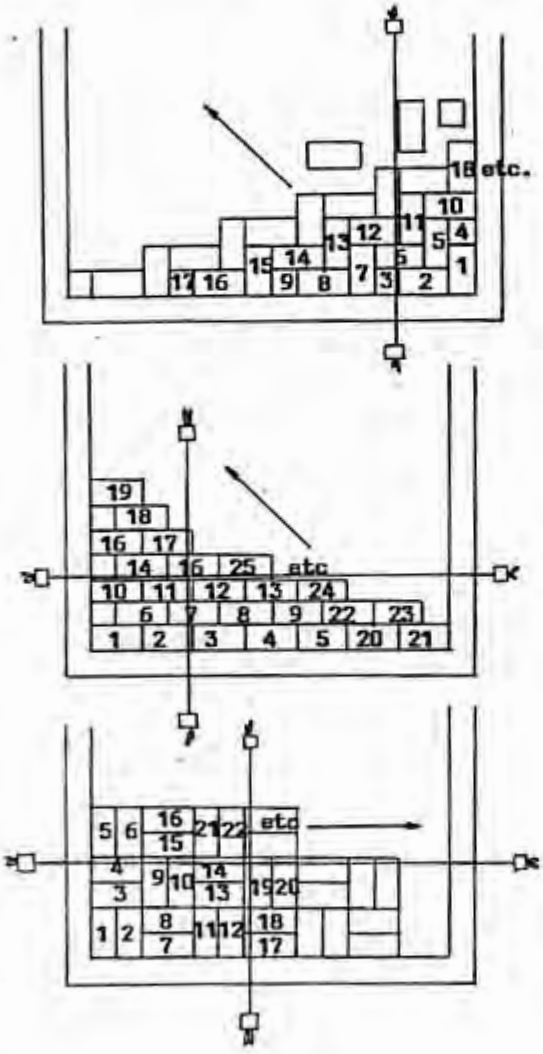
Starting a herringbone pattern with blocks at 45 degrees to the starting line

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.3

Description:	Lay patterns

By working outwards from the corner, the paving can be checked for squareness and adjusted if necessary by tapping the units around and into place. After achieving both squareness and alignment of pattern to the edge restraint and/or string line, proceed to build up the paving to a straight laying face in the desired direction.



Starting a herringbone pattern with blocks at 90 degrees to the starting line

Starting a stretcher bond pattern

Starting a basket weave pattern

STARTING PATTERNS

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.3

Description:	Lay patterns

Until sufficient area has been laid to justify vibrating (about 20-30m²) no attempt should be made to cut and infill at the starting edge or sides - only whole blocks should be laid.

The important feature about a cut edge is its uniformity or straightness.

A garden hose is used to set out the lines for a free form edge. Lay the hose out over the paving and arrange it to duplicate the desired curvatures. Fix the position of the hose by placing blocks on it at strategic points and then mark out the line with chalk.

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

PERFORMANCE SELF CHECK NO.3

Description:	Lay Patterns

DIRECTIONS

1. Evaluate your work by responding to the items on the following page/s.
2. All items must receive a "Yes" response for successful completion of this Self Check.
3. Should you miss or answer any item incorrectly, review the Instruction Sheet or consult your Instructor.
4. Do not proceed any further until you have completed this Self Check successfully.

PERFORMANCE SELF CHECK NO.3 EVALUATION

Description:	Lay patterns

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
1	When laying patterns was extra care taken with first few blocks?		
2	Were blocks placed at accurate angles to edge restraint/string line?		
3	Were blocks of first 4 rows placed so as not to disturb neighbouring blocks?		
4	Was laying done outwards from the corner?		
5	Was paving frequently check for squareness?		
6	If required were blocks tapped square using a rubber mallet?		
7	Was squareness and alignment of the pattern achieved?		
8	Was paving built up to a straight laying face in the desired direction?		
9	Was care taken to only lay whole blocks?		
10	Was a curvature formed using a garden hose?		
11	Was hose secured in desired position using blocks?		
12	Was line marked out using chalk?		
13	Does the laid pattern conform to requirements?		

LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.4

Description:	Finish edges

LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.4 describing the procedure to follow when finishing edges.	1. Instruction Sheet No.4
2. Complete Self Check No.4 to evaluate your work.	2. Self Check No.4
3. When successfully completed proceed to the next Learning Objective.	

INSTRUCTION SHEET NO.4

Description:	Finish edges

Edge finishing

Where whole blocks do not fit at the edges of the pavement, the spaces are filled with cut blocks. However, infill areas constituting less than 25% of a full block unit and of 25mm minimum dimension are filled with 25MPa concrete. Smaller areas are filled with cement mortar having proportions of 1 sack cement to 130 litres of good quality mortar sand. Cutting can be achieved using angle grinders, block splitters, bolster and hammer, etc, but very small pieces are best chipped off using a bolster or hammer.

To mark blocks for cutting, place a layer of blocks directly on top of the last full row of blocks parallel to the edge restraint. This puts them in the same relative position as that in which they will be laid. Measure the distance from edge restraint to block at both extremities and transfer each measurement to the blocks on the second layer. Note, the measurement is marked from the end of each unit away from the edge restraint. Join the two points using a straightedge or chalkline and use this line to set up and cut the blocks.

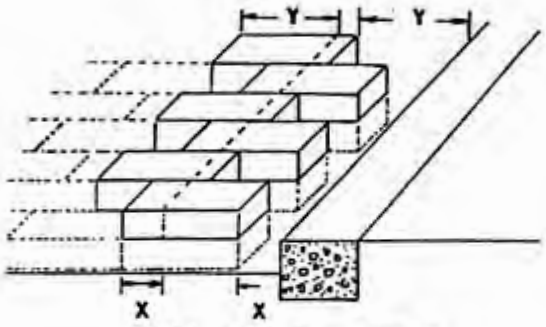
The same principle of setting out may be used for curved edges but the method of marking out is different. Measure the distance from restraint to block and transfer the new measurement to the second layer block as before. Using a compass fitted with a piece of chalk, set it to the distance from restraint to the point marked on the top block. Now scribe a line by drawing the compass along, maintaining the point against the restraint and square with the paving pattern.

LET YOUR INSTRUCTOR FULLY EXPLAIN THE ABOVE

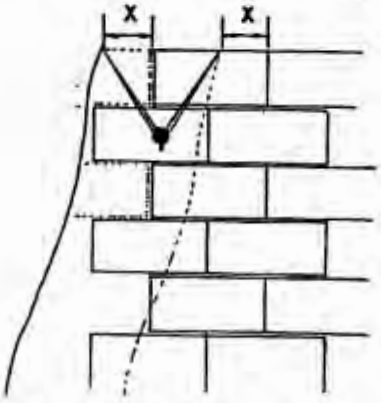
INSTRUCTION SHEET NO.4

Description:	Finish edges

The rate of cutting will vary depending on the pattern being laid and the methods used to mark out and cut. Obviously, it would be prudent to select a pattern which requires minimum cutting.



Marking out for cutting



Marking out an irregular shaped edge

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE MARKING AND CUTTING OF PAVING BLOCKS

INSTRUCTION SHEET NO.4

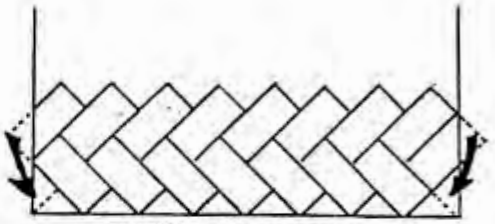
Description:	Finish edges

Where possible, select a pattern to minimise cutting.

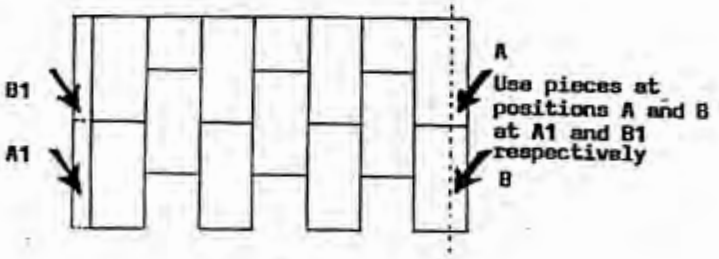
Both ends of a block, cut to suit a particular pattern, can be used on either side of a path or driveway provided that the path width is set to suit this method.

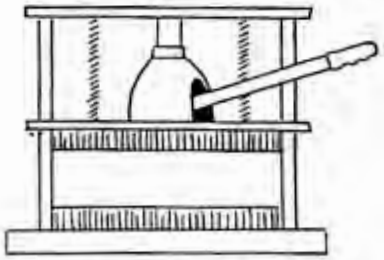
Marking out free form edging with garden hose

MARKING OF UNITS FOR CUTTING



ECONOMICAL CUTTING





TYPICAL BLOCK SPLITTER

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

PERFORMANCE SELF CHECK NO.4

Description:	Finish edges

DIRECTIONS

1. Evaluate your work by responding to the items on the following page/s.
2. All items must receive a "Yes" response for successful completion of this Self Check.
3. Should you miss or answer any item incorrectly, review the Instruction Sheet or consult your Instructor.
4. Do not proceed any further until you have completed this Self Check successfully.

PERFORMANCE SELF CHECK NO.4 EVALUATION

Description:	Finish edges

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
1	When marking blocks for cutting were they placed directly on top of last full row of blocks parallel to edge restraint?		
2	Was distance from edge restraint to block accurately measured and transferred to blocks on second layer?		
3	Were 2 points joined using the applicable tools?		
4	Were curves marked accurately using the applicable method and tools?		
5	Was a pattern with a minimum amount of cutting selected?		
6	Were the blocks cut accurately to suit requirements?		
7	Do finished edges conform to specifications?		

LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.5

Description:	Compact paving

LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.5 describing the procedure to follow when compacting paving.	1. Instruction Sheet No.5
2. Complete Self Check No.5 to evaluate your work.	2. Self Check No.5
3. When all Self Checks have been completed successfully take the test.	3. Performance Test

INSTRUCTION SHEET NO.5

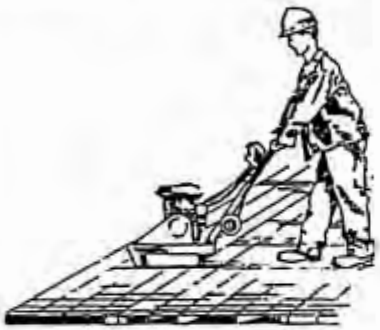
Description: Compact paving

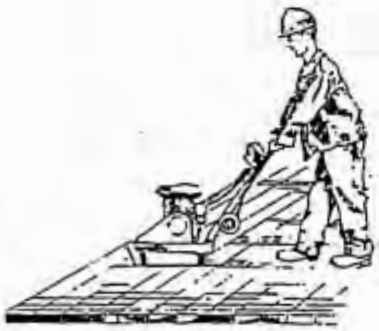
Compaction

Vibrating and compacting the pavers must be performed in the correct sequence:

1. compact pavement down thoroughly into the bedding sand layer
2. check for any damaged units and replace
3. take out pavers which are too high or too low and correct levels by removing or adding bedding sand
4. recompact areas where pavers have been replaced or adjusted
5. apply jointing sand and sweep into joints
6. vibrate sand into the joints
7. finally sweep over with broom

Vibrating the pavement down compacts the individual units into a semi-rigid interlocked surface layer. The addition of dry jointing sand, also vibrated, into the joints further improves the interlocking qualities of the pavement.





LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

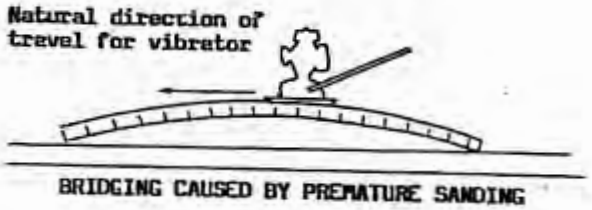
INSTRUCTION SHEET NO.5

Description: Compact paving

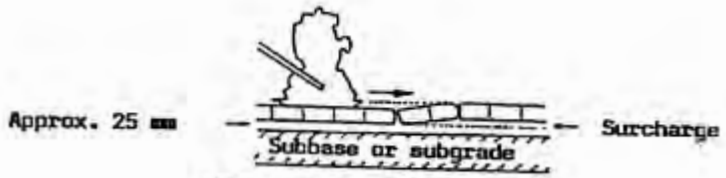
When jointing sand is applied before completing step 1, the paving will interlock and resist the tamping action of the vibrator. This can result in 'bridging' (creating hollow areas under the pavement) and result in an uneven surface on the finished job.

Two passes and sometimes three are normally required to bed the units. The need for additional passes is easily determined by observing the movement of individual units near the vibrator.

At this stage, it is important to rectify any irregularities in the paving. Broken blocks should be replaced. High and low blocks should be adjusted by uplifting the blocks, removing or adding some bedding sand and replacing the blocks.



BRIDGING CAUSED BY PREMATURE SANDING



COMPACTING PAVING UNITS

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.5

Description:	Compact paving

Dry jointing sand can now be spread over the surface and swept into the joints. For acceptable jointing sand, the specification application to the project in question should be consulted.

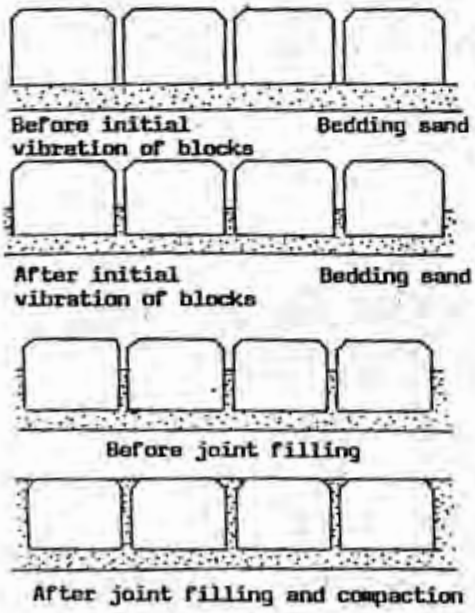
Dry jointing sand makes the job quicker and better as it penetrates to completely fill the joints. Wet sand will tend to compact between the vibrator plate and blocks, pushing the odd unit lower than its neighbour. Do not try to wash the jointing sand into the joints.

Note: Cement should not be mixed in with the jointing sand except in special situations. The only place where jointing sand with cement should be used is where there is a concentration of water, such as under a rainwater downpipe. In these cases a mix of 6 sand to 1 cement is recommended.

After vibrating, the sand will have compacted down into the joints so that a further sweeping will fill them up to surface level. Leave the excess sand on the pavement surface for a day or two as this will allow any minor settling of the joints to be rectified. One or two passes of the vibrator will be required to fully compact the sand into the joints. After each pass, sweep the sand into and refill each joint.

Plate compactors are suitable vibrators for paving. Steel wheel roller compactors should not be used.

If required by the engineer, a rubber tyred roller compactor can be used, but only after the paving has been properly sanded and compacted using a plate compactor.



LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

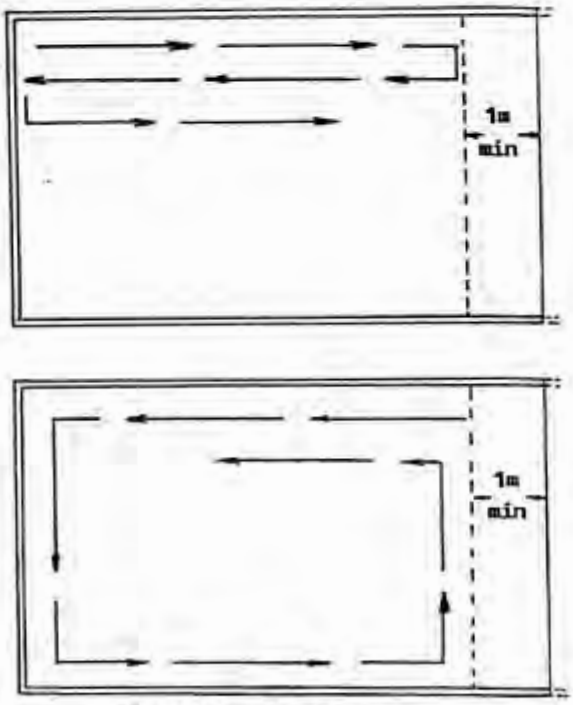
INSTRUCTION SHEET NO.5

Description:	Compact paving

The centrifugal action of the vibrator allows it to move in one direction more easily than another. To use this feature to advantage, it is best to keep the vibrator moving continually in the same forward motion by operating it in ever decreasing squares, or turning the unit at the end of each run. Do not vibrate within one metre of an unrestrained edge of the paving, as the units will open up with gaps and lose their level bedding.

Vibrating should not be undertaken until an area of 20-30 square metres has been laid, thus making it worthwhile to start up the equipment.

If the paving cannot be completed in a day, stop the paving approximately half a metre from the end of the screeded bedding sand layer. Install a temporary edge restraint against the pavers. Compact up to within 1 metre from the working face to prevent potential damage. If rain is expected, cover the unsanded paving and exposed bedding sand with plastic sheeting. Do not allow traffic onto paving which has not been properly compacted and joints filled.



COMPACTION PATTERNS

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

PERFORMANCE SELF CHECK NO.5

Description:	Compact paving

DIRECTIONS

1. Evaluate your work by responding to the items on the following page/s.
2. All items must receive a "Yes" response for successful completion of this Self Check.
3. Should you miss or answer any item incorrectly, review the Instruction Sheet or consult your Instructor.
4. Do not proceed any further until you have completed this Self Check successfully.

PERFORMANCE SELF CHECK NO.5 EVALUATION

Description:	Compact paving

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
1	Was paving compacted down thoroughly into bedding sand layer?		
2	Were 2 or 3 passes made?		
3	Was check carried out for damaged units?		
4	Where applicable were they replaced?		
5	Were pavers that were too high or too low removed and levels corrected?		
6	Were repaired areas recompacted?		
7	Was jointing sand applied?		
8	Was sand vibrated into joints?		
9	Were 1 or 2 passes made?		
10	Was completed paved area swept with a broom?		
11	If not completed same day, was paving stopped approximately half a metre from end of screeded bedding sand layer?		
12	Was temporary edge restraint installed against the pavers?		
13	Was unsanded paving covered with plastic sheeting?		
14	Was traffic kept away from paving in progress?		
15	Does compaction conform to requirements?		

PERFORMANCE TEST

Description:	Lay block paving units

DEMONSTRATE MASTERY OF THIS TASK BY DOING THE FOLLOWING

1. Before attempting the Performance Test, ensure that you have completed this Learning Guide successfully.
2. Obtain the Performance Test from your Instructor.
3. Before you attempt the Performance Test, be sure that you fully understand what is required of you.

PERFORMANCE STANDARDS

1. The correct procedures are to be adhered to.
2. All safety precautions are to be adhered to.
3. You are not allowed to refer to your Learning Guide or obtain any assistance.
4. You have _____ minutes to complete the Performance Test.
5. 100% will be required for mastery.

LEARNING GUIDE

TRAINING PROGRAMME
LAYING CONCRETE BLOCK PAVING

Programme	Laying Concrete Block Paving
Duty [A]	Laying concrete block paving
Task [03]	Organise work and handle materials

INTRODUCTION

This learning guide deals with work organisation and the handling of materials. Mastery of this task is important if you are to achieve proficiency in the laying of concrete block paving.

OBJECTIVES

PERFORMANCE OBJECTIVE

Given	This learning guide,materials, equipment and assistance
You Will	Organise work and handle materials
How Well	The completed task must conform to the standards of the test/s

PLEASE NOTE !!!! IF YOU THINK YOU ARE ABLE TO PERFORM THIS TASK TO THE LEVEL INDICATED ABOVE, THEN TAKE THE TEST.

LEARNING OBJECTIVES

1. Organise work
2. Handle materials

LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.1

Description:	Organise work

LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.1 describing work organisation. 2. Complete Self Check No.1 to evaluate your work. 3. When successfully completed proceed to the next Learning Objective.	1. Instruction Sheet No.1 2. Self Check No.1

INSTRUCTION SHEET NO.1

Description:	Organise work

Job organisation

Handling of materials on site is one of the major cost areas in paving operations. The following methods can help reduce this cost.

Bedding sand is generally delivered in large bulk loads and usually unloaded where it is most convenient for the driver of the truck - to the detriment of the paving operator. Wherever possible, bedding sand should be unloaded in small piles spaced over the area to be paved to minimise further handling. Bedding sand piles should be well drained but covered to prevent excessive drying out in hot or windy conditions.

Paving blocks are often unloaded with little thought about further movement on the job site. The paving supervisor should provide delivery instructions which ensure that the paving (and other material) is placed where it best suits the work in progress, i.e. closest to the work face.

Pallets of paving blocks should be spaced out along the work site and stacked in single height to reduce reaching up high for units. Pallets should be placed on even ground; otherwise, the stack may collapse onto the ground when the packing is removed - and most probably onto the feet of the nearest person.

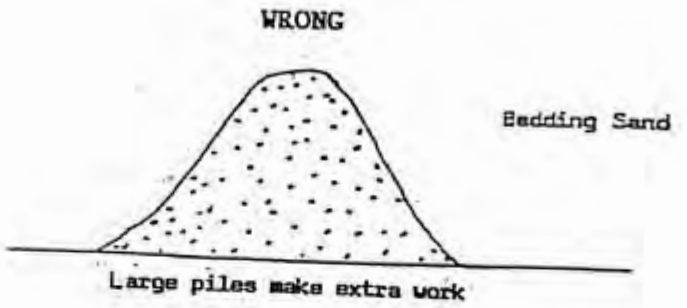
Paving blocks are positioned from the previously laid surface and supplies of blocks are also brought over those already in place. Sand is brought from the opposite direction, i.e. over the area still to be laid.

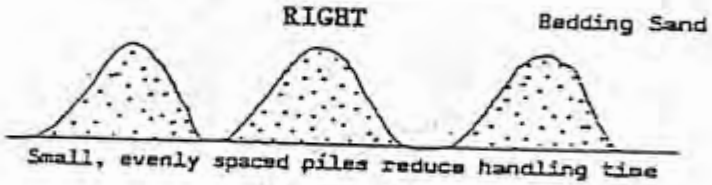
Paving should proceed uphill wherever possible, as this method prevents spaces opening up between units caused by gravity and movement by the laying crew.

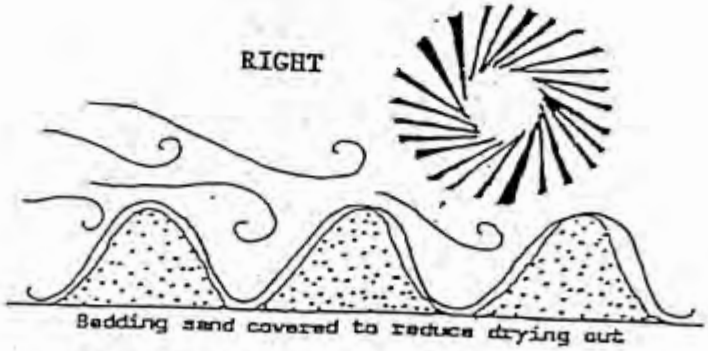
By scheduling the delivery of blocks as work progresses they can be placed close to the laying face. Unless alternative access is available, enough sand should be stockpiled ahead of the paving to avoid delivery over the laying face. See figures on following pages.

INSTRUCTION SHEET NO.1

Description:	Organise work



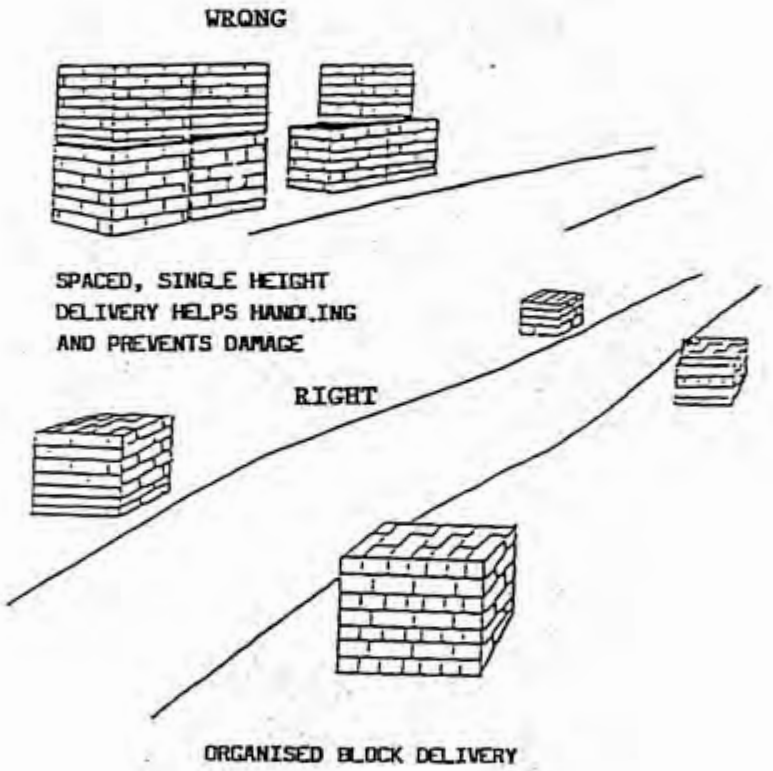




DELIVERY AND PROTECTION OF BEDDING SAND

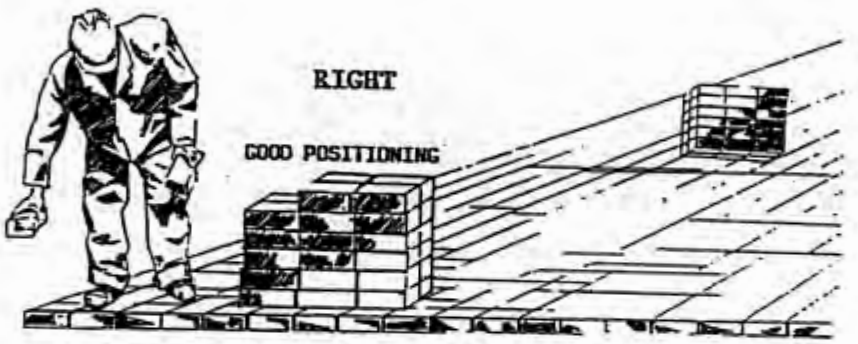
INSTRUCTION SHEET NO.1

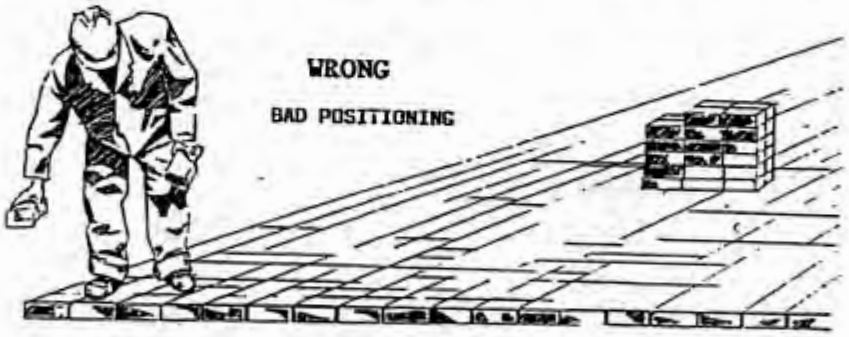
Description:	Organise work



INSTRUCTION SHEET NO.1

Description:	Organise work



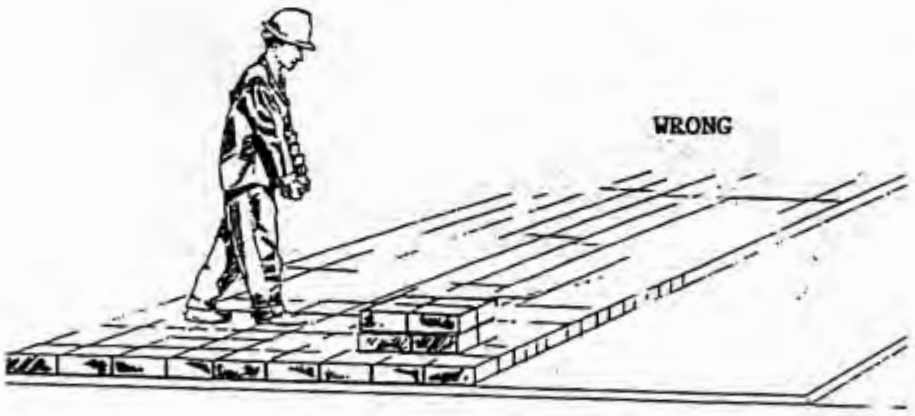


POSITIONING OF UNITS

INSTRUCTION SHEET NO.1

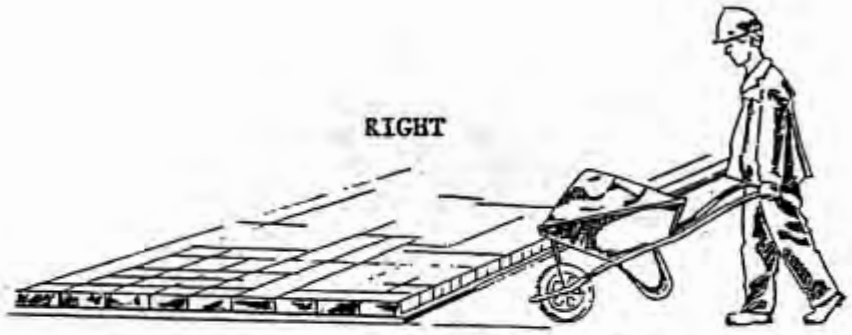
Description:	Organise work

DELIVERY OF UNITS TO LAYING FACE



INSTRUCTION SHEET NO.1

Description:	Organise work



DELIVERY OF BEDDING SAND

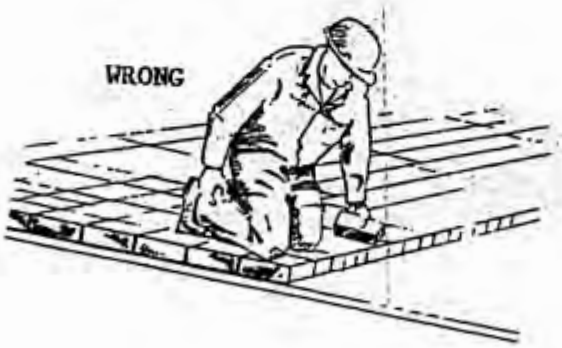
DON'T BRING BEDDING SAND OVER LAID PAVING

INSTRUCTION SHEET NO.1

Description:	Organise work

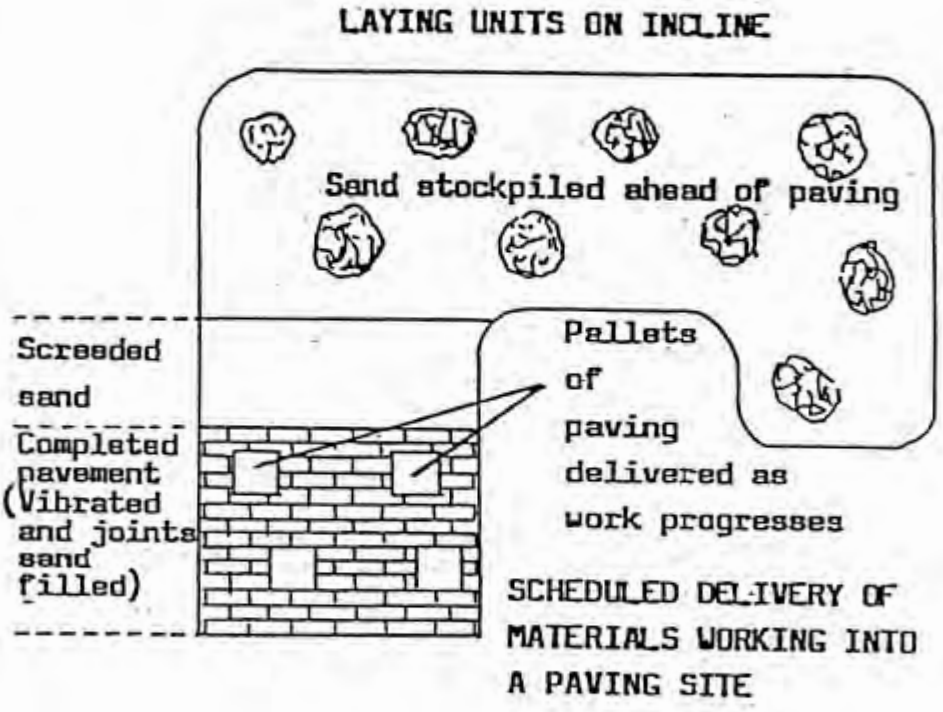
RIGHT

WRONG



INSTRUCTION SHEET NO.1

Description:	Organise work



KNOWLEDGE SELF CHECK NO.1

Description:	Organise work

DIRECTIONS

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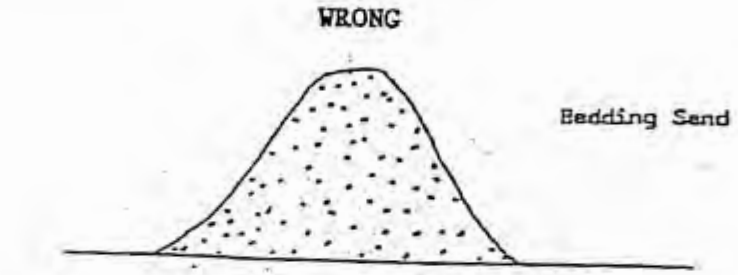
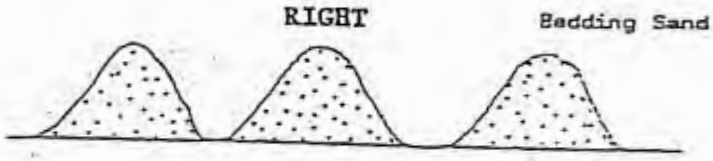
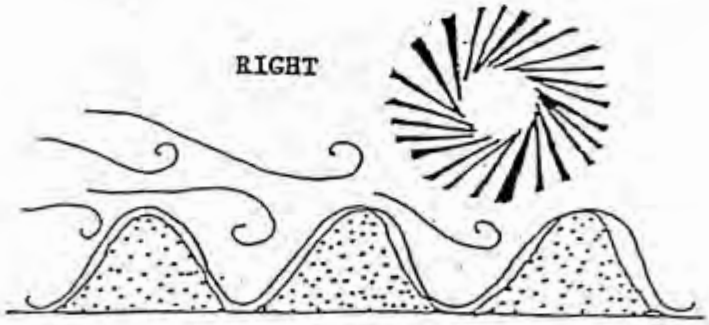
KNOWLEDGE SELF CHECK NO.1
ANSWER SHEET

Description:	Organise work

FILL IN THE KEYWORD QUESTIONS





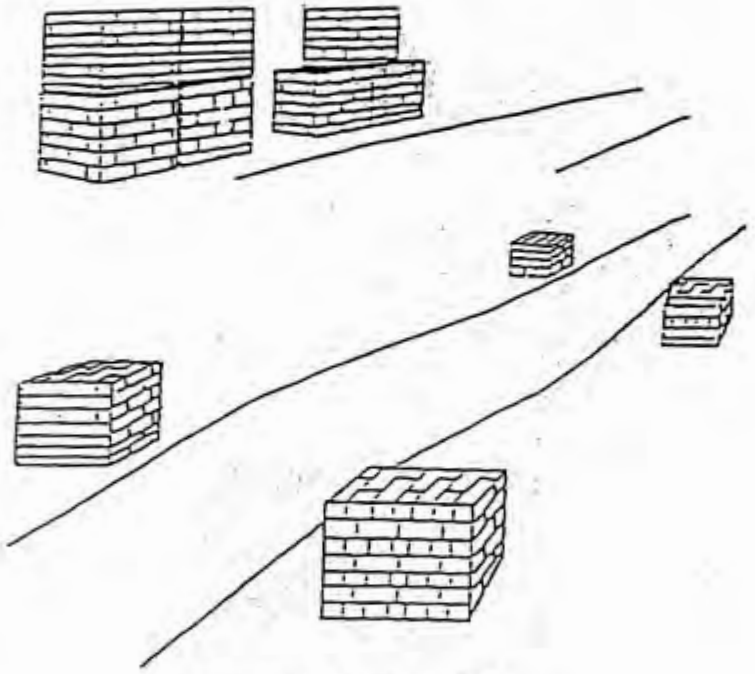


DELIVERY AND PROTECTION OF BEDDING SAND

KNOWLEDGE SELF CHECK NO.1
ANSWER SHEET

Description:	Organise work

FILL IN THE KEYWORD QUESTIONS

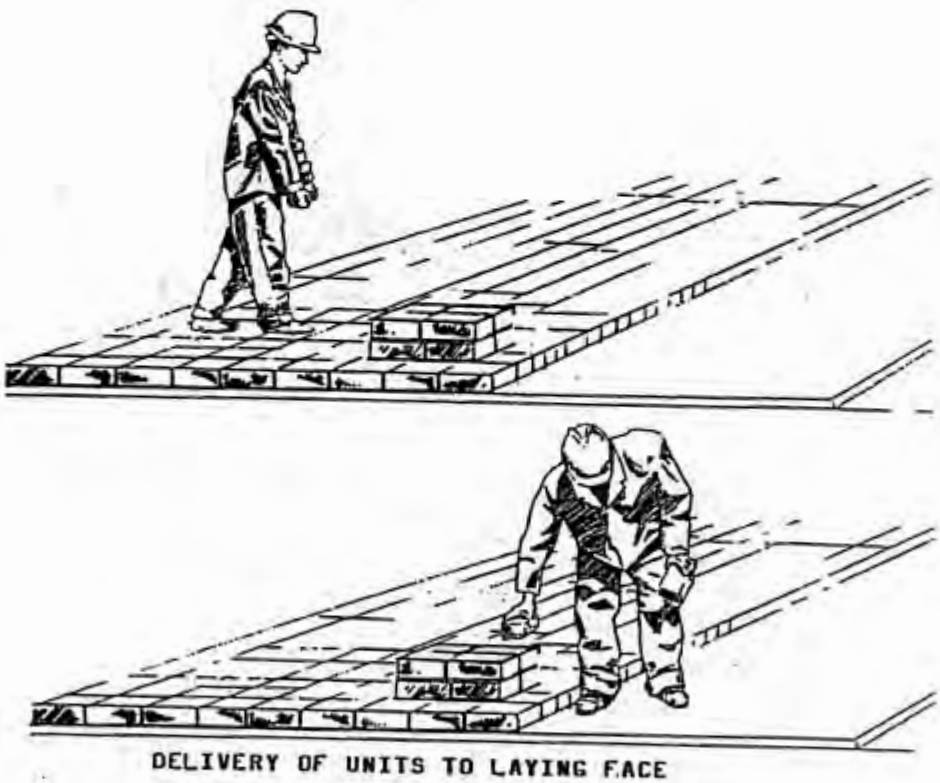


ORGANISED BLOCK DELIVERY

KNOWLEDGE SELF CHECK NO.1
ANSWER SHEET

Description:	Organise work

FILL IN THE KEYWORD QUESTIONS

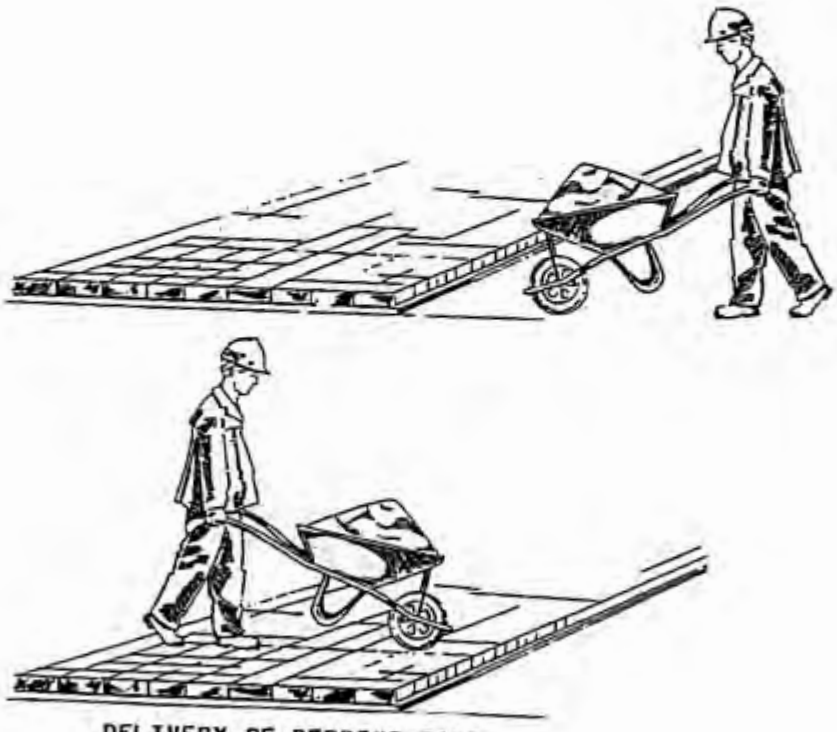


DELIVERY OF UNITS TO LAYING FACE

KNOWLEDGE SELF CHECK NO.1
ANSWER SHEET

Description:	Organise work

FILL IN THE KEYWORD QUESTIONS

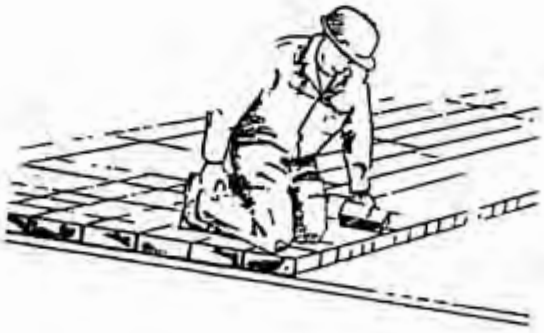


DELIVERY OF BEDDING SAND

KNOWLEDGE SELF CHECK NO.1
ANSWER SHEET

Description:	Organise work

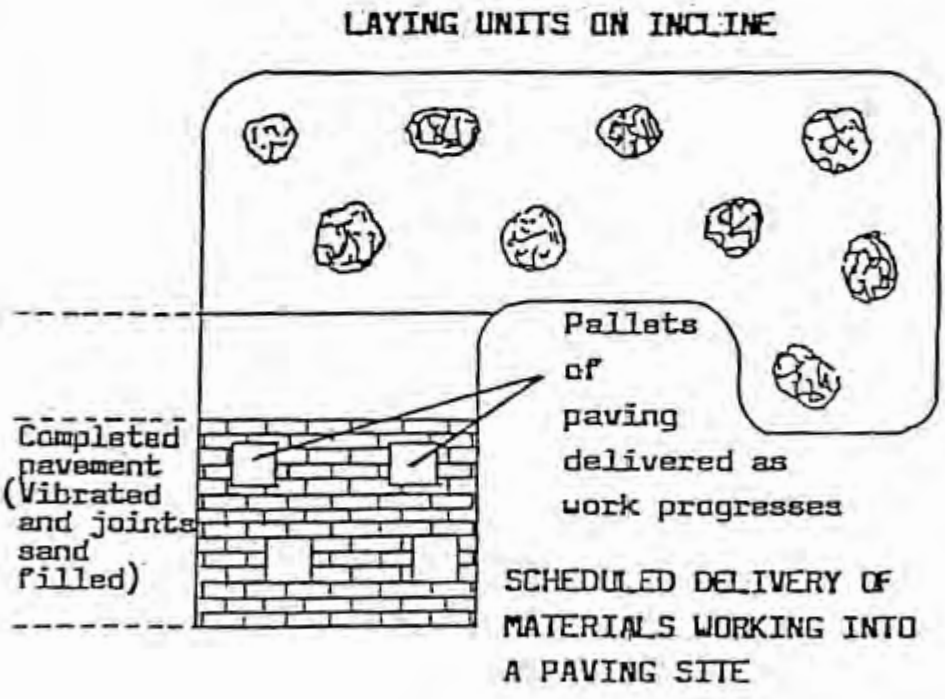
FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE SELF CHECK NO.1
ANSWER SHEET

Description:	Organise work

FILL IN THE KEYWORD QUESTIONS



LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.2

Description:	Handling materials

LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.2 describing material handling.	1. Instruction Sheet No.2
2. Complete Self Check No.2 to evaluate your work.	2. Self Check No.2
3. When all Self Checks have been completed successfully take the test.	3. Knowledge Test

INSTRUCTION SHEET NO.2

Description:	Handling materials

Handling

Delivery of paving blocks takes place in two distinct stages:

(i) bulk delivery by truck
(ii) delivery to the laying face

Wherever possible, bulk deliveries are best programmed to be brought over previously completed sections and unloaded near the laying face. This reduces the distances for Stage 2 delivery.

Blocks are taken from the bulk delivery and transferred to the laying face where the paving operator must be able to reach each required block without walking or stretching.

Several methods are used for this Stage 2 delivery, the most common being the everyday builder's wheelbarrow. Other methods can be applied according to the size of the job.

The builder's wheelbarrow is popular for smaller jobs because it is a normal and necessary item in the paving team's equipment. If used sensibly, the wheelbarrow is a very efficient unit for the transfer of paving blocks.

Loading the wheelbarrow from the bulk delivery is most effective if done in an orderly manner. Once loaded, the barrow is wheeled within easy reach of the layer where the blocks may be unloaded or laid directly from the wheelbarrow.

This method requires two barrows, one being loaded and wheeled while the other is unloaded. Some time overlap can occur due to site conditions, and either the layer or the transporter will occasionally need to assist the other, but as far as possible lay blocks directly from the barrow to avoid double handling.

Unloading each barrow into small stacks along the laying face is not good practice, as it only doubles the number of handling movements required to lay the pavement.

INSTRUCTION SHEET NO.2

Description:	Handling materials

The trolley and stool system is basically a refinement of the wheelbarrow which can save bending and reaching movements by the layer. With its long design, the stool is laid along the work face and the layer always has a block within easy reach, without needing to bend up and down. This system can be very useful on good surfaces with no narrow openings to restrict ovement. The equipment is cheap and easily transported. The blocks are best placed on the stools with a gap between them to enable a block to be picked up in one movement. This system enables one 'transporter' to feed several layers.

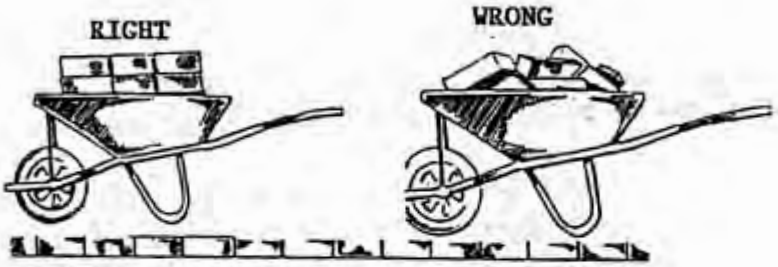
Manual handling operations from pallet to trolley are eliminated by using **clamping trolleys.** With specially bundled and strapped pallets the entire vertical side of a pallet load can be clamped to the trolley and directly transported to the laying face. The layer then works directly from this large stack. As the stacks in question contain up to 1 square metre of blocks, care must be taken in positioning them otherwise the layer could easily work his way out of reach of the stack.

This system is most suitable for level, surfaced areas as the mass carried prohibits its use on unmade or sloping surfaces. Use timber planks or plywood sheets to prevent rutting and tipping of the blocks caused by the trolley and barrow wheels.

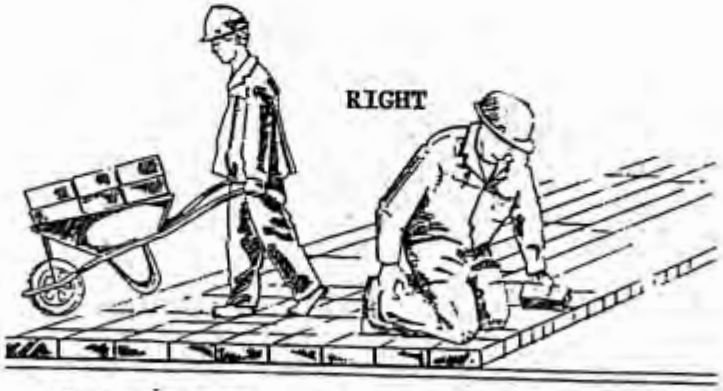
See figures on following pages

INSTRUCTION SHEET NO.2

Description:	Handling materials



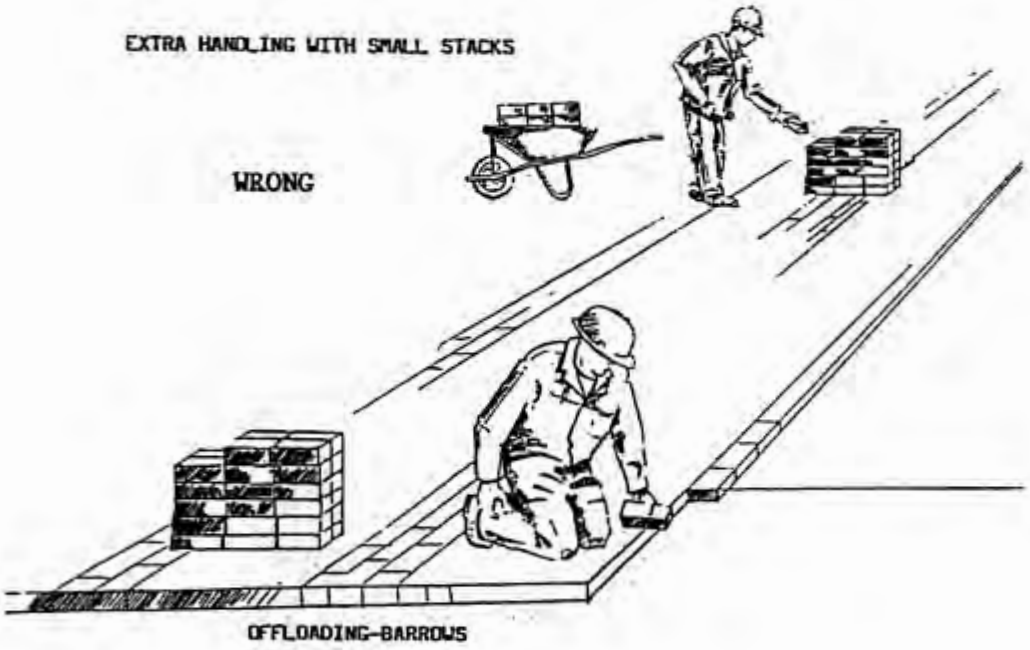
ORDERLY LOCATION OF STACKS IN WHEELBARROWS MAKES FOR EASY UNLOADING



IT IS RECOMMENDED TO LAY DIRECTLY FROM BARROW

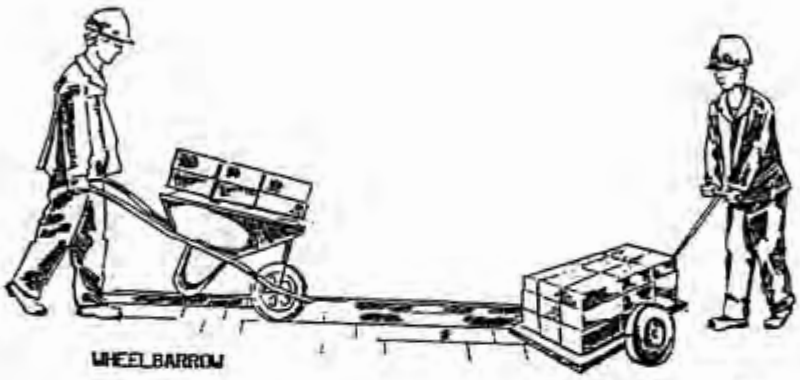
INSTRUCTION SHEET NO.2

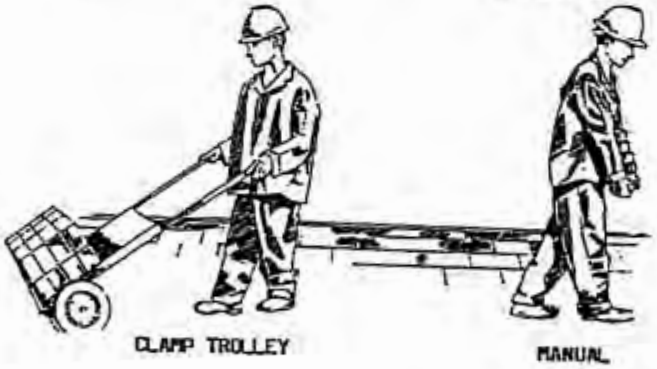
Description:	Handling materials



INSTRUCTION SHEET NO.2

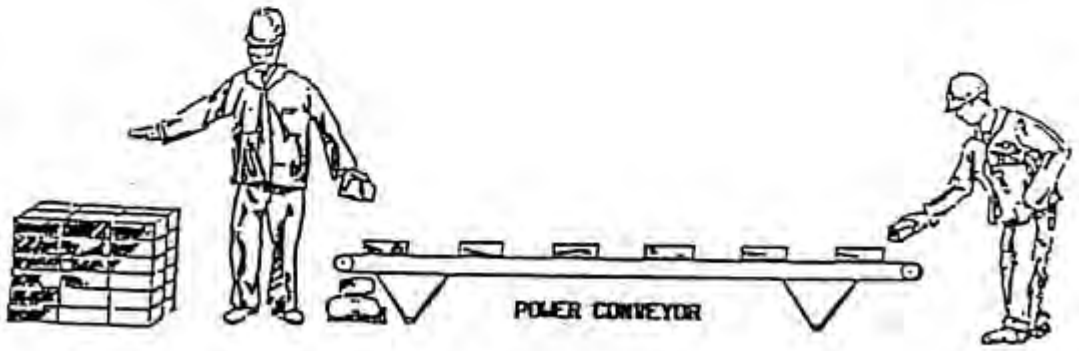
Description:	Handling materials

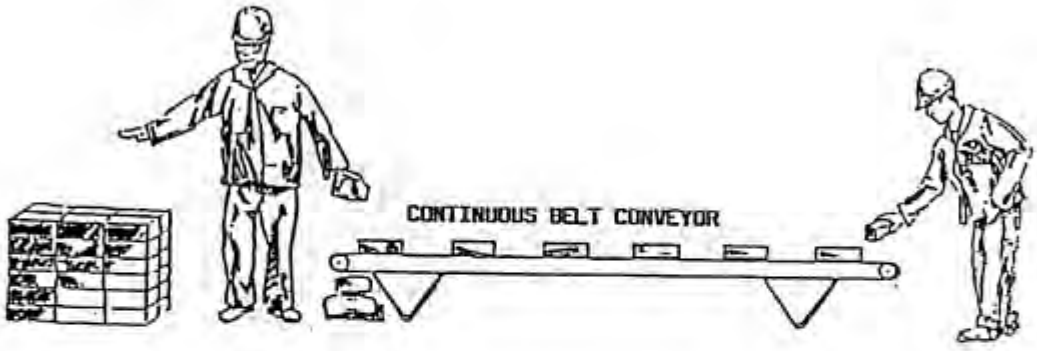




INSTRUCTION SHEET NO.2

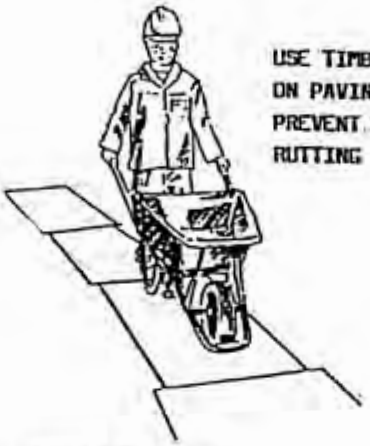
Description:	Handling materials





INSTRUCTION SHEET NO.2

Description:	Handling materials

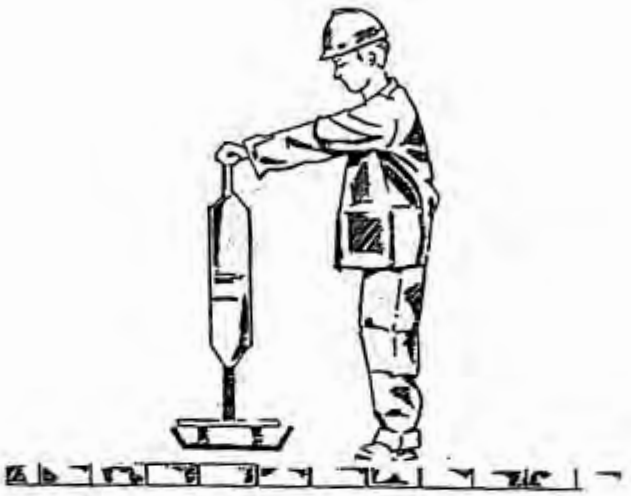


HANDLING METHODS

HANDLING METHODS

INSTRUCTION SHEET NO.2

Description:	Handling materials



INSTRUCTION SHEET NO.2

Description:	Handling materials

KNOWLEDGE SELF CHECK NO.2

Description:	Handling materials

DIRECTIONS

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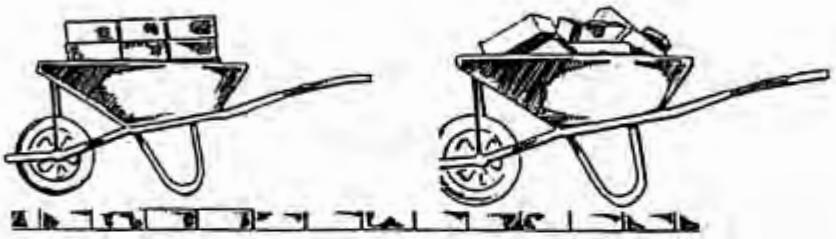
KNOWLEDGE SELF CHECK NO.2
ANSWER SHEET

Description:	Handling materials

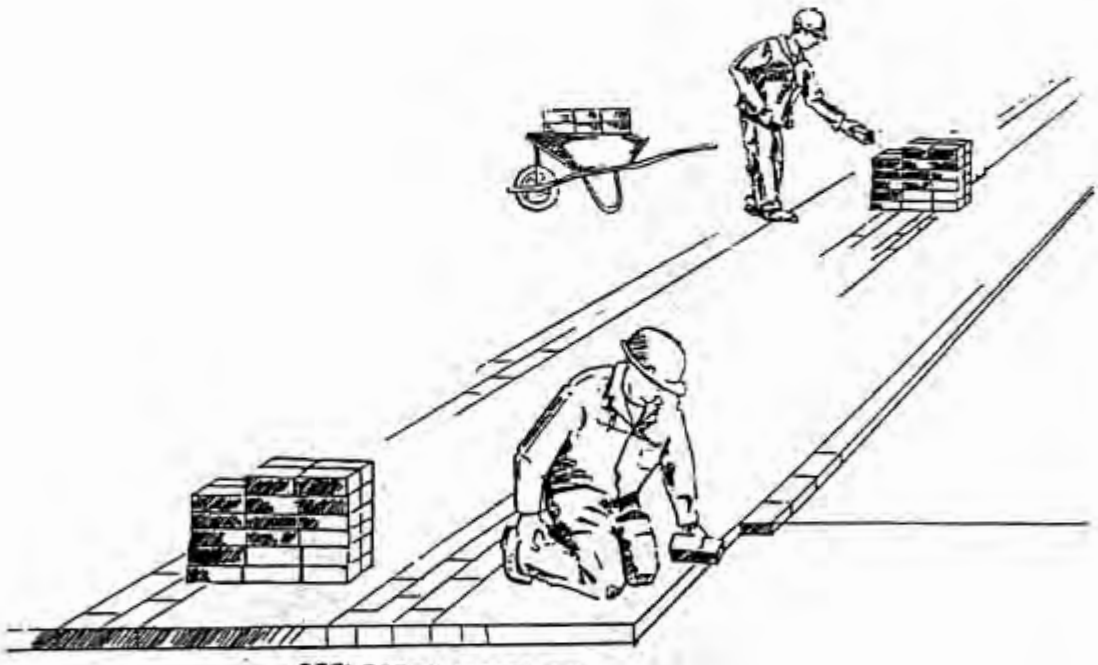
FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE SELF CHECK NO.2 ANSWER SHEET

Description:	Handling materials

FILL IN THE KEYWORD QUESTIONS

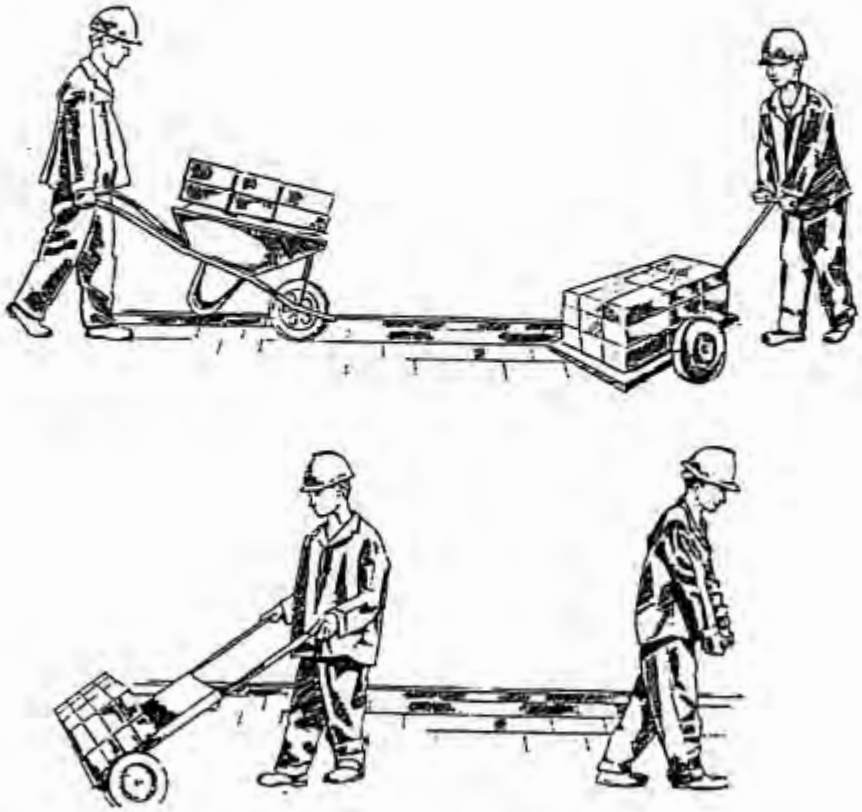


OFFLOADING-BARROWS

KNOWLEDGE SELF CHECK NO.2
ANSWER SHEET

Description:	Handling materials

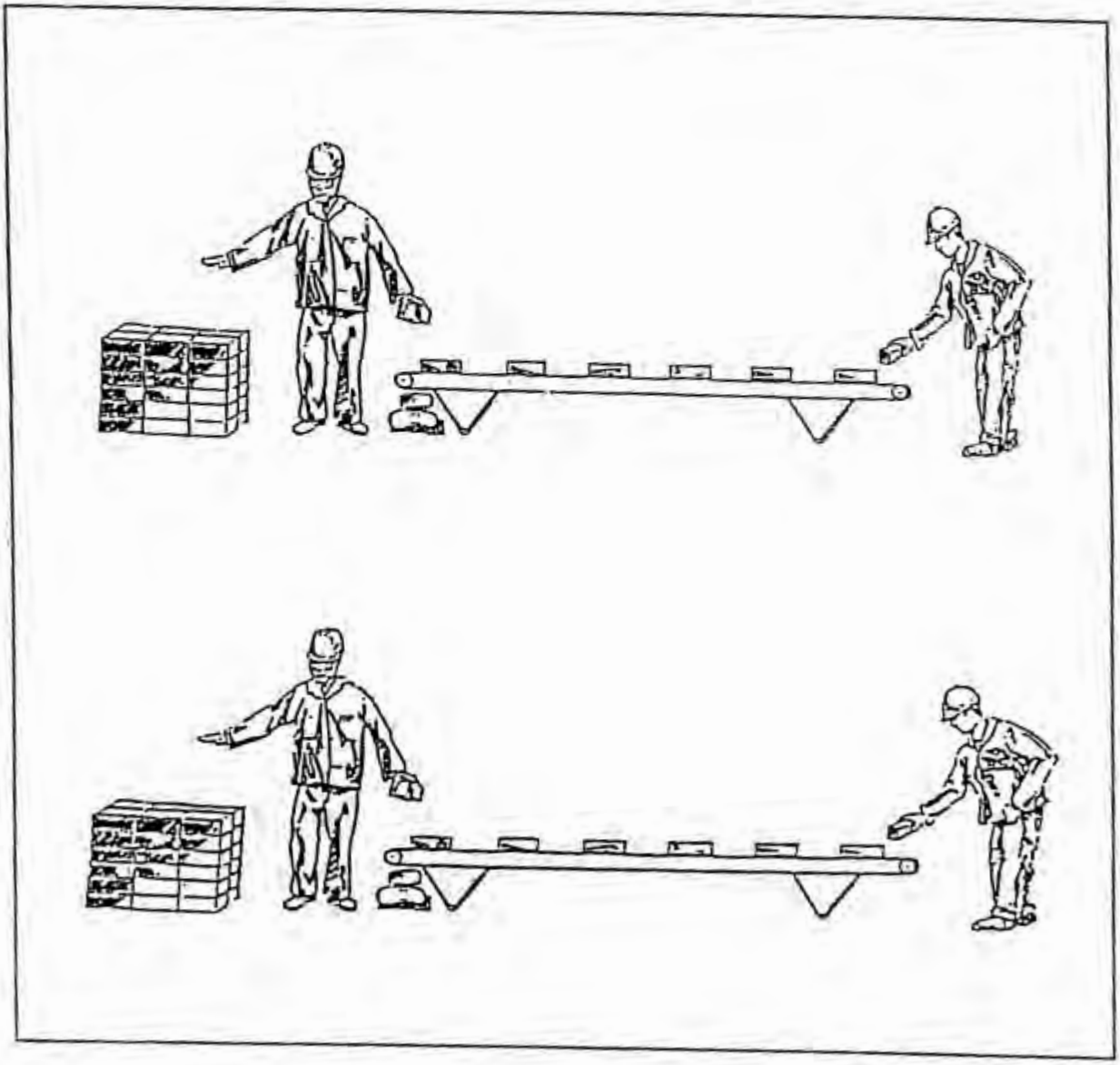
FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE SELF CHECK NO.2
ANSWER SHEET

Description:	Handling materials

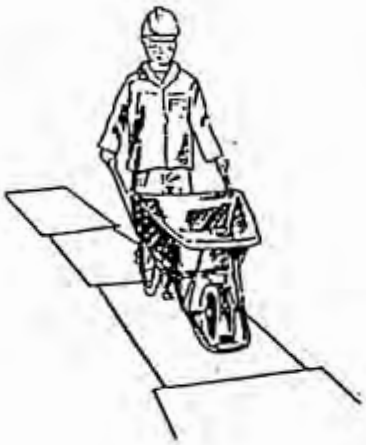
FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE SELF CHECK NO.2
ANSWER SHEET

Description:	Handling materials

FILL IN THE KEYWORD QUESTIONS



HANDLING METHODS

KNOWLEDGE TEST

Description:	Organise work and handling materials

DIRECTIONS

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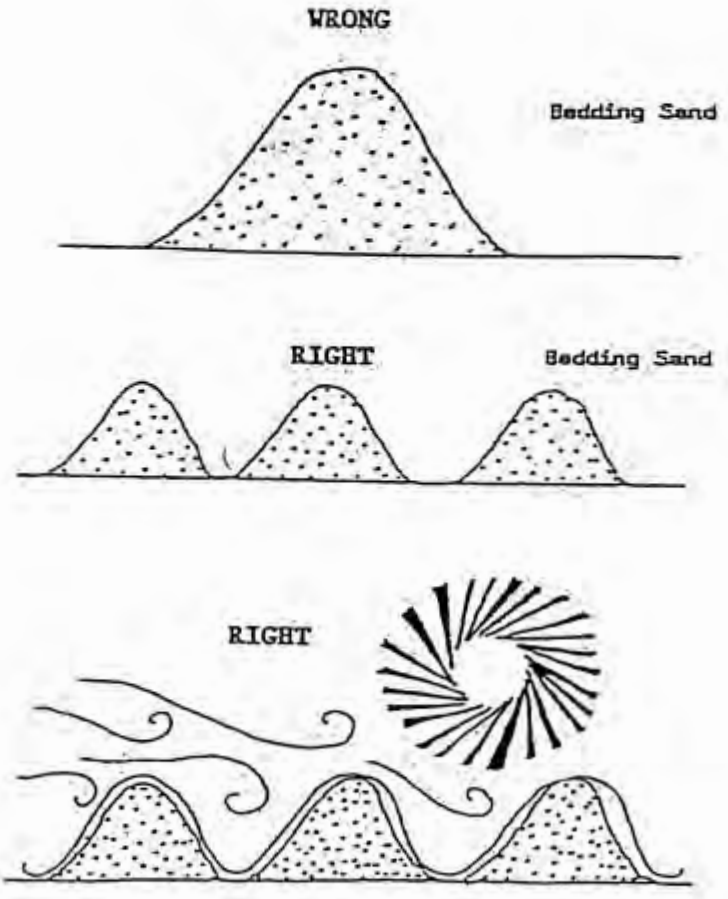
KNOWLEDGE TEST
ANSWER SHEET

Description: Organise work and handling materials

FILL IN THE KEYWORD QUESTIONS

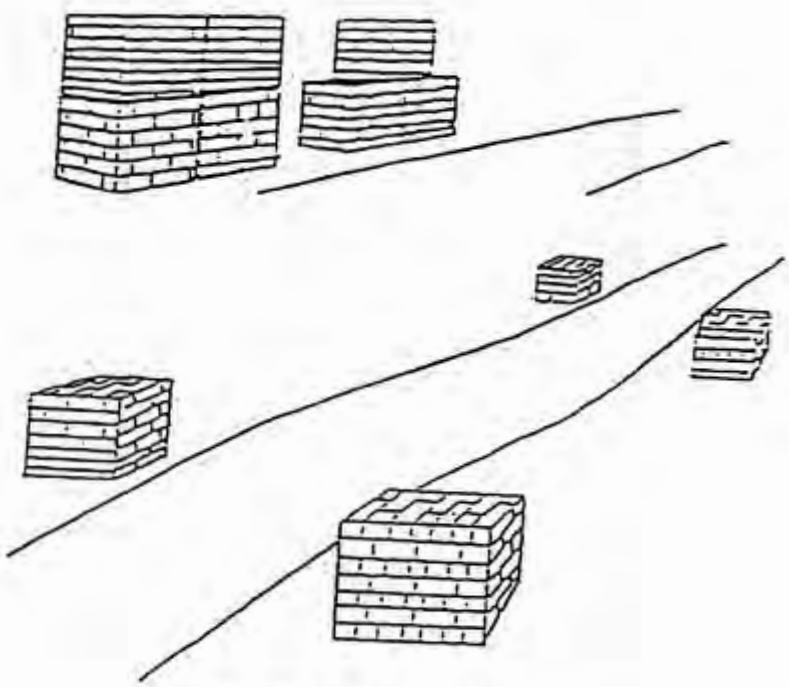


DELIVERY AND PROTECTION OF BEDDING SAND

KNOWLEDGE TEST ANSWER SHEET

Description: Organise work and handling materials

FILL IN THE KEYWORD QUESTIONS

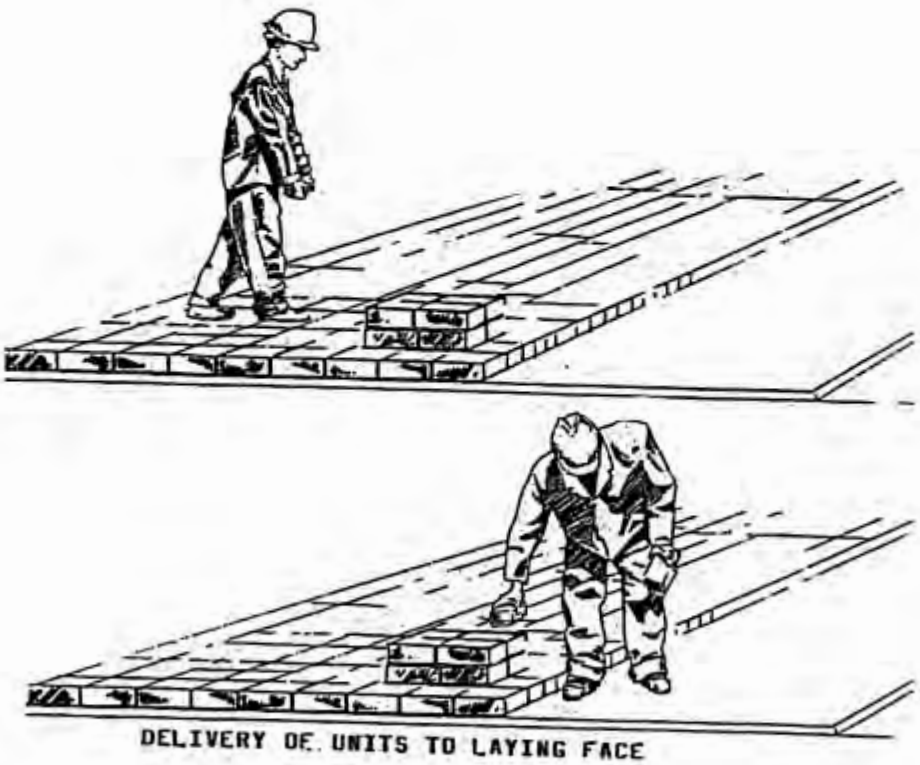


ORGANISED BLOCK DELIVERY

KNOWLEDGE TEST
ANSWER SHEET

Description: Organise work and handling materials

FILL IN THE KEYWORD QUESTIONS

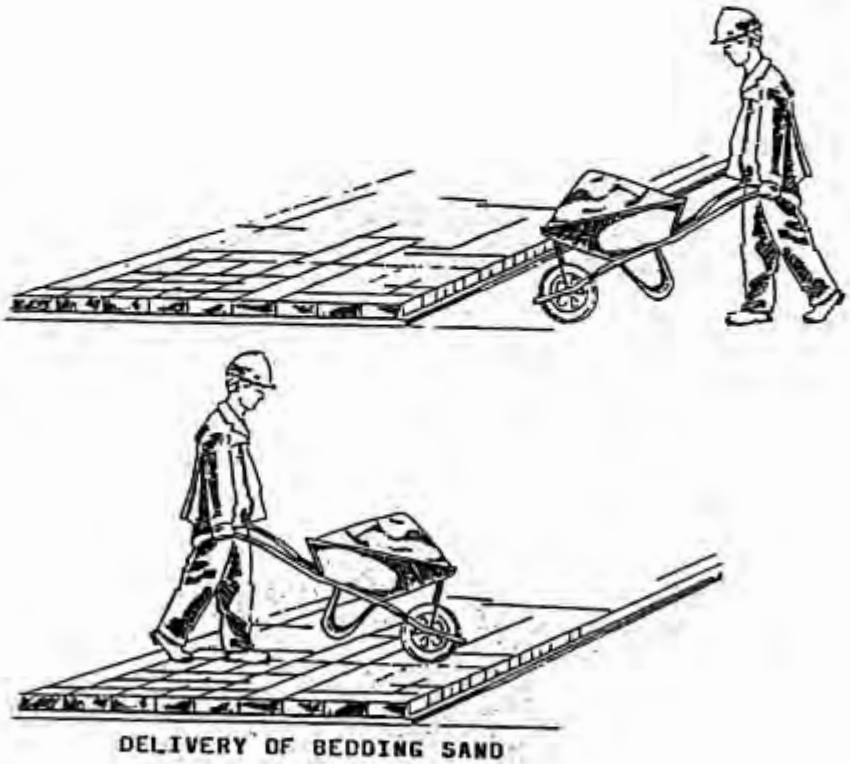


DELIVERY OF UNITS TO LAYING FACE

KNOWLEDGE TEST
ANSWER SHEET

Description:	Organise work and handling materials

FILL IN THE KEYWORD QUESTIONS



DELIVERY OF BEDDING SAND

KNOWLEDGE TEST
ANSWER SHEET

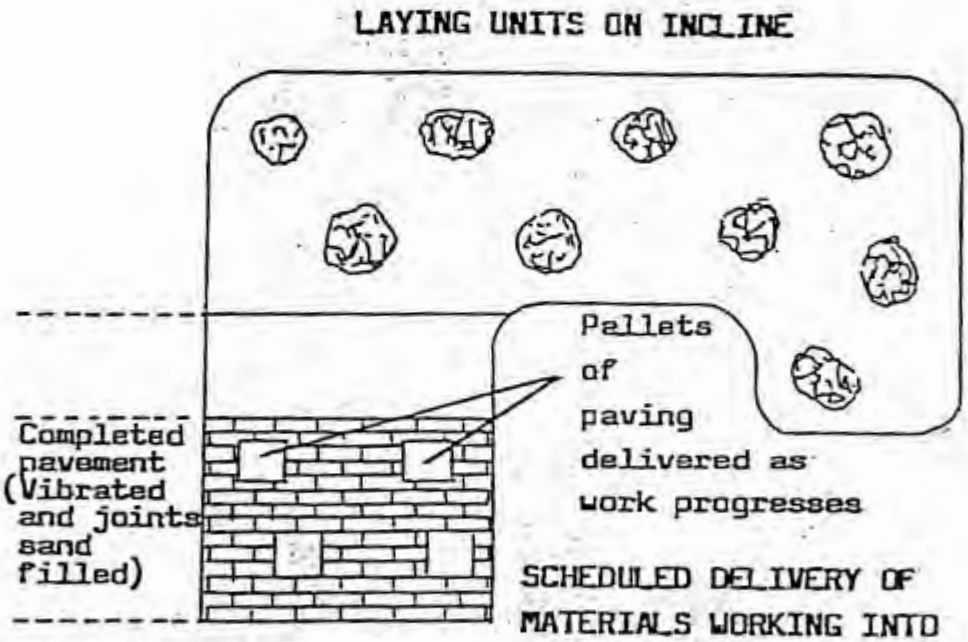
Description: Organise work and handling materials

FILL IN THE KEYWORD QUESTIONS

KNOWLEDGE TEST ANSWER SHEET

Description:	Organise work and handling materials

FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE TEST
ANSWER SHEET

Description: Organise work and handling materials

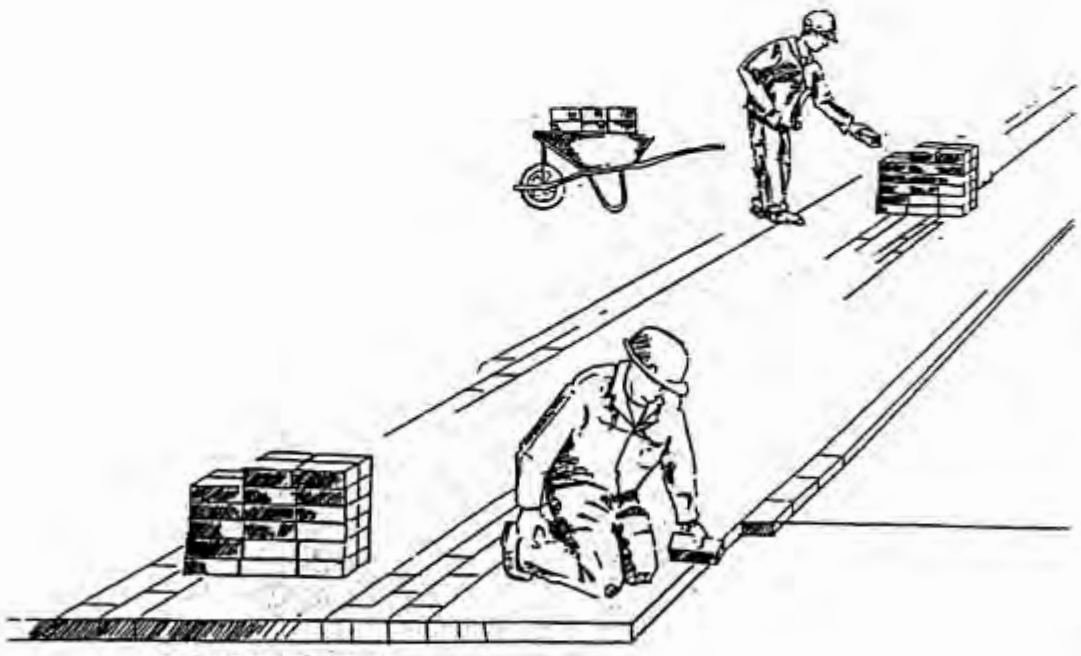
FILL IN THE KEYWORD QUESTIONS

OFFLOADING-BARROWS

KNOWLEDGE TEST ANSWER SHEET

Description: Organise work and handling materials

FILL IN THE KEYWORD QUESTIONS

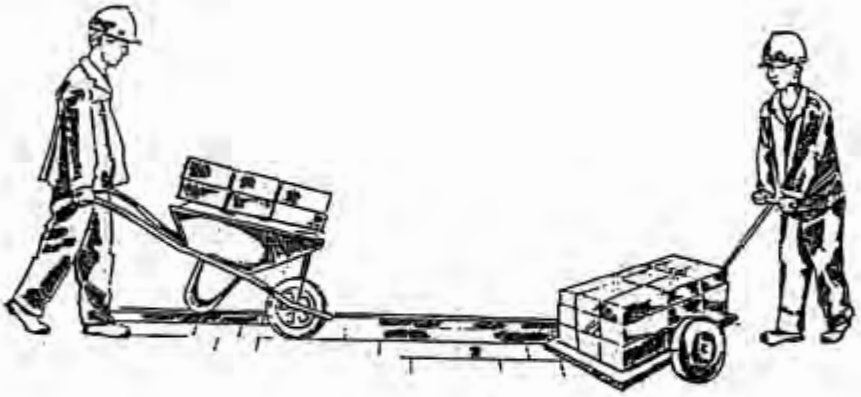


OFFLOADING BARROWS

KNOWLEDGE TEST
ANSWER SHEET

Description: Organise work and handling materials

FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE TEST
ANSWER SHEET

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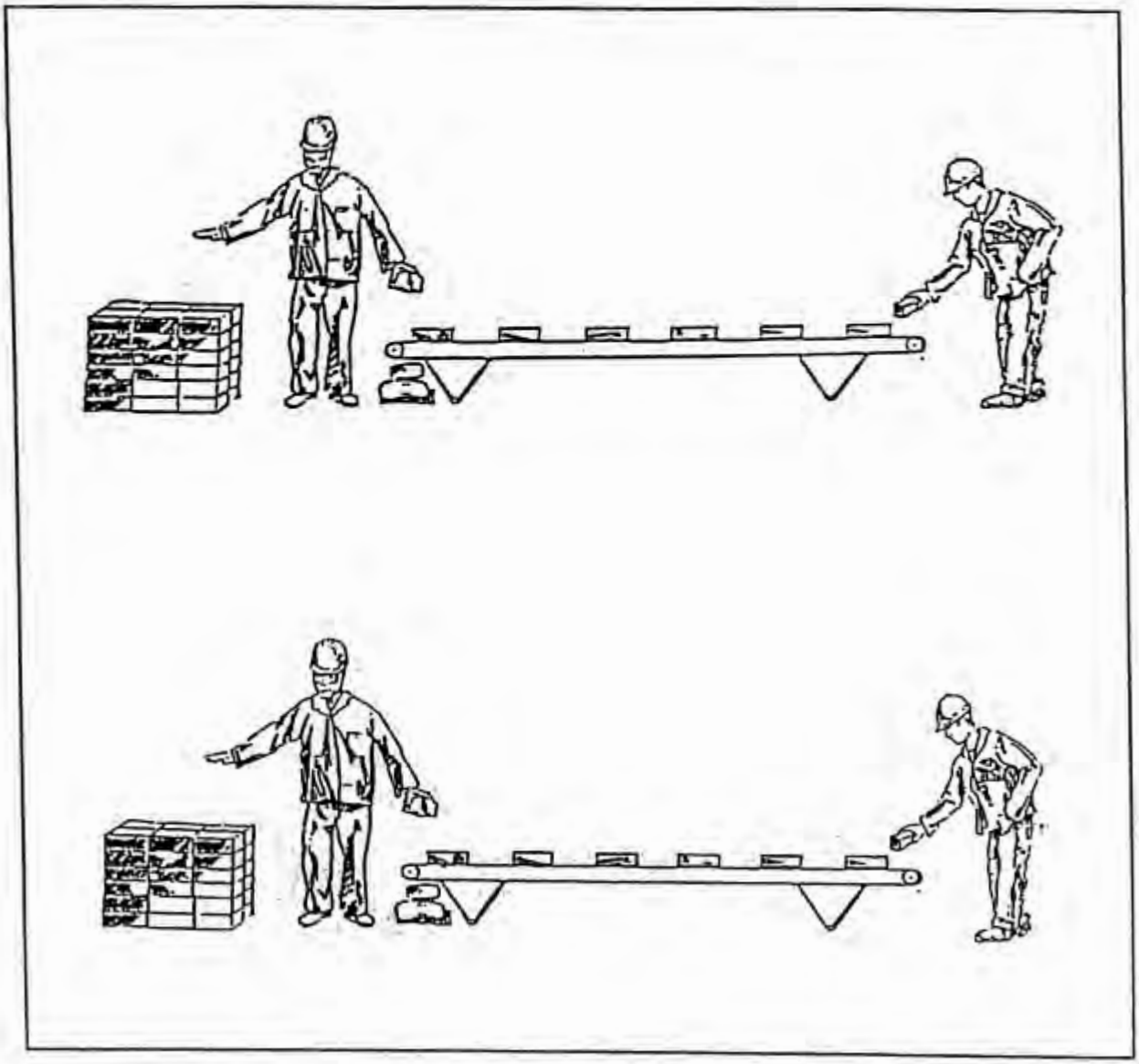
FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE SELF CHECK NO.1
ANSWER KEY

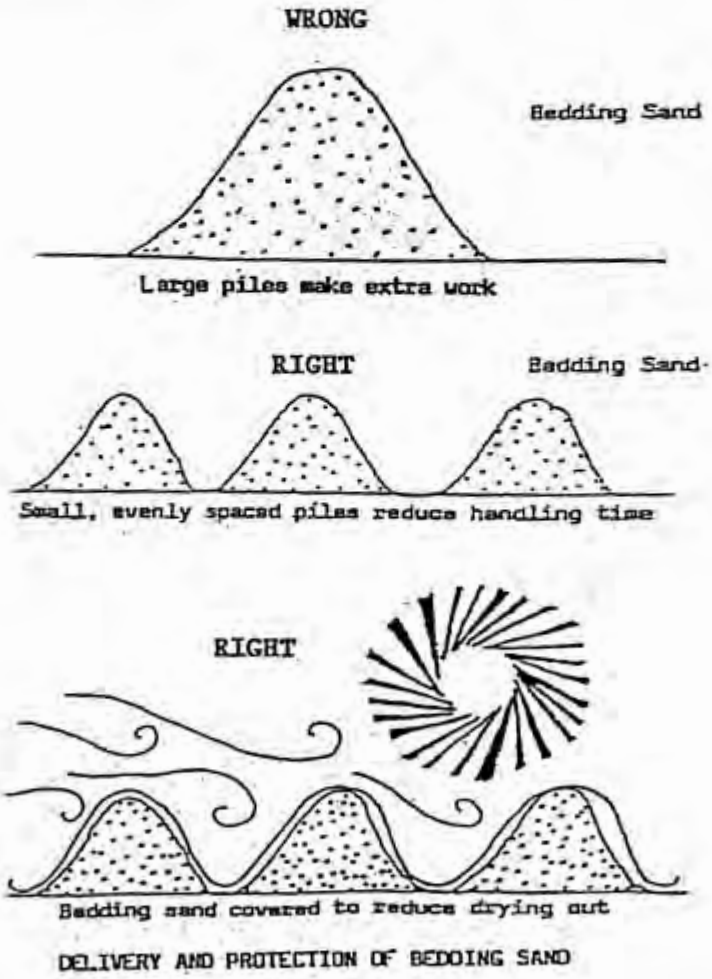
Description:	Organise work

FILL IN THE KEYWORD QUESTIONS

KNOWLEDGE SELF CHECK NO.1
ANSWER KEY

Description:	Organise work

FILL IN THE KEYWORD QUESTIONS

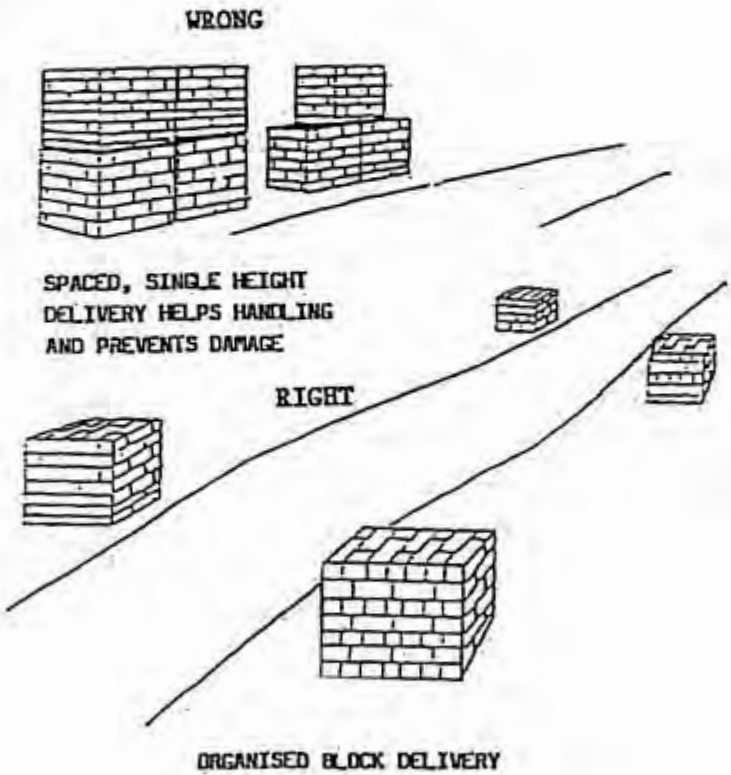


DELIVERY AND PROTECTION OF BEDDING SAND

KNOWLEDGE SELF CHECK NO.1
ANSWER KEY

Description:	Organise work

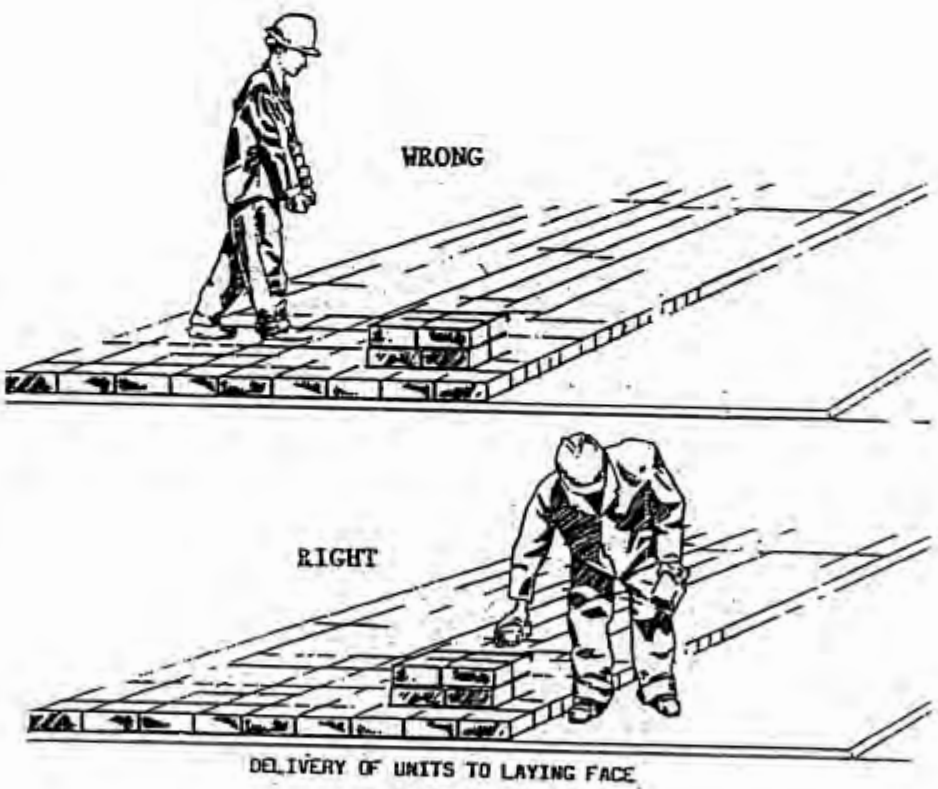
FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE SELF CHECK NO.1
ANSWER KEY

Description:	Organise work

FILL IN THE KEYWORD QUESTIONS

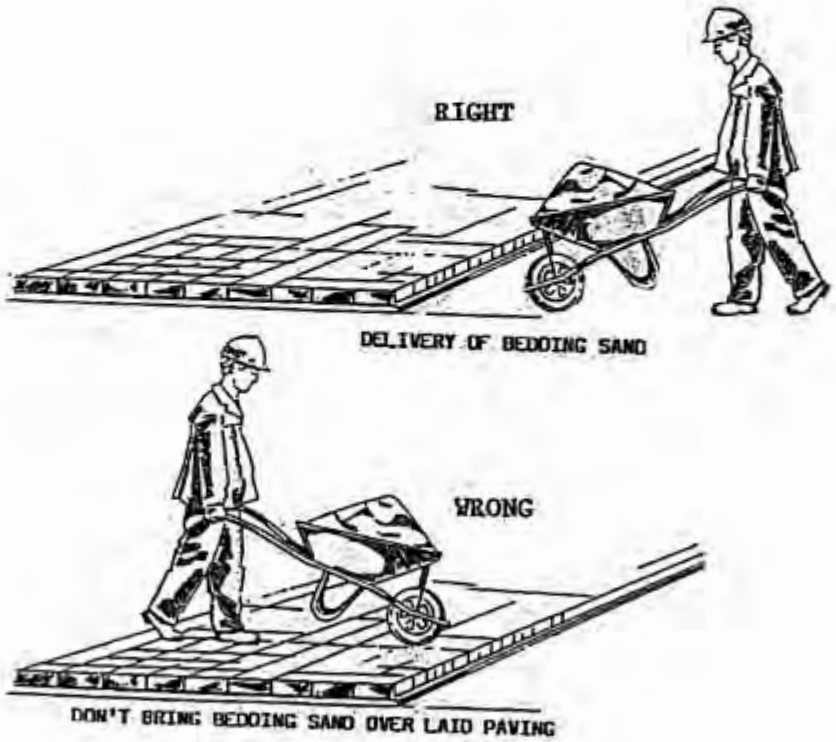


DELIVERY OF UNITS TO LAYING FACE

KNOWLEDGE SELF CHECK NO.1
ANSWER KEY

Description:	Organise work

FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE SELF CHECK NO.1 ANSWER KEY

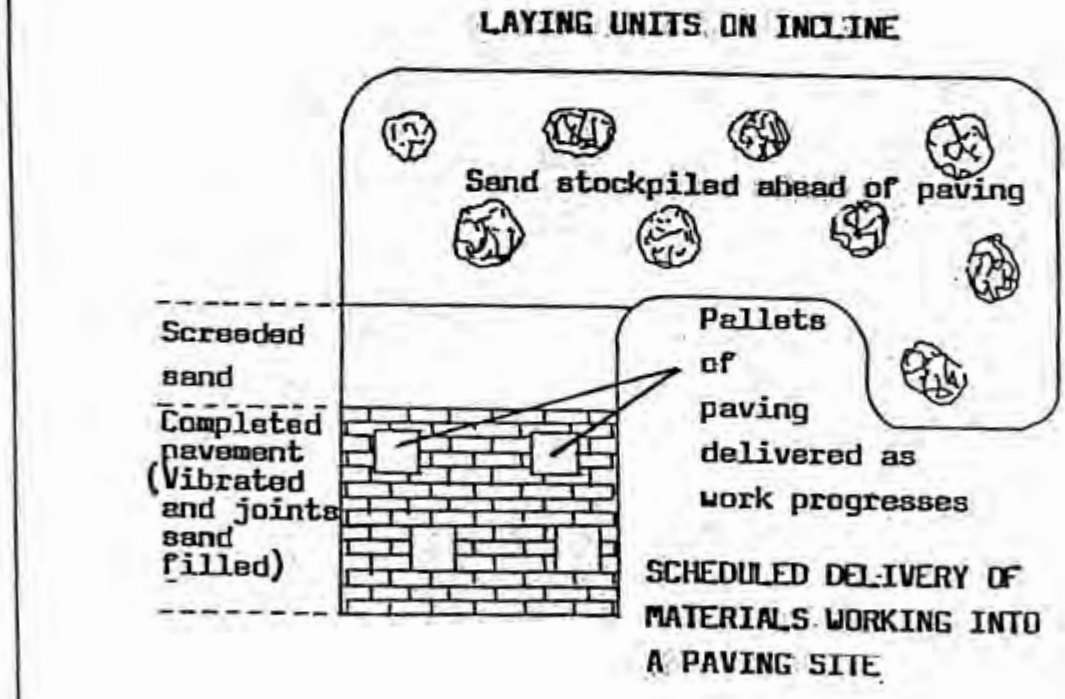
Description:	Organise work

FILL IN THE KEYWORD QUESTIONS

KNOWLEDGE SELF CHECK NO.1
ANSWER KEY

Description:	Organise work

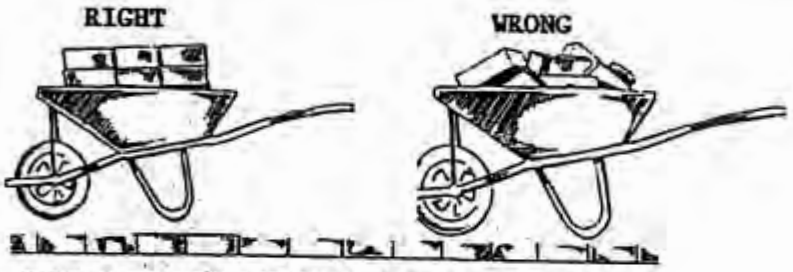
FILL IN THE KEYWORD QUESTIONS



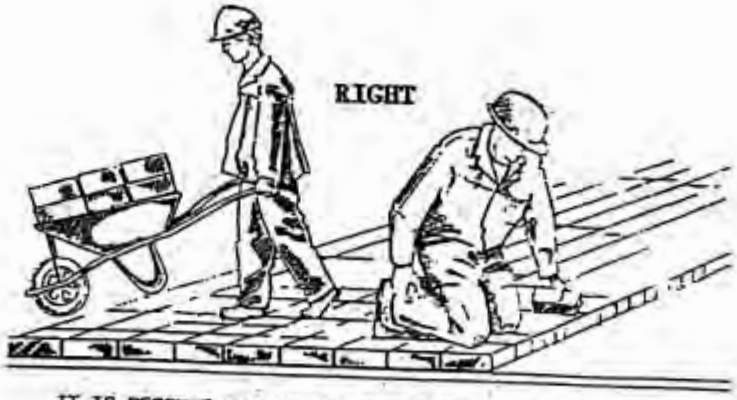
KNOWLEDGE SELF CHECK NO.2 ANSWER KEY

Description:	Handling materials

FILL IN THE KEYWORD QUESTIONS



ORDERLY LOCATION OF STACKS IN WHEELBARROWS MAKES FOR EASY UNLOADING

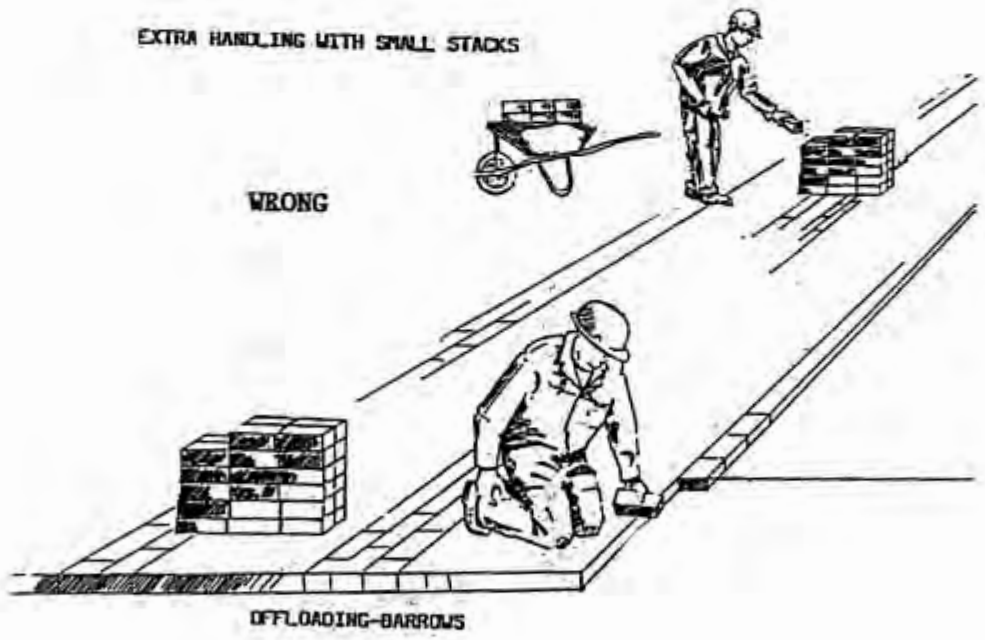


IT IS RECOMMENDED TO LAY DIRECTLY FROM BARROW

KNOWLEDGE SELF CHECK NO.2
ANSWER KEY

Description:	Handling materials

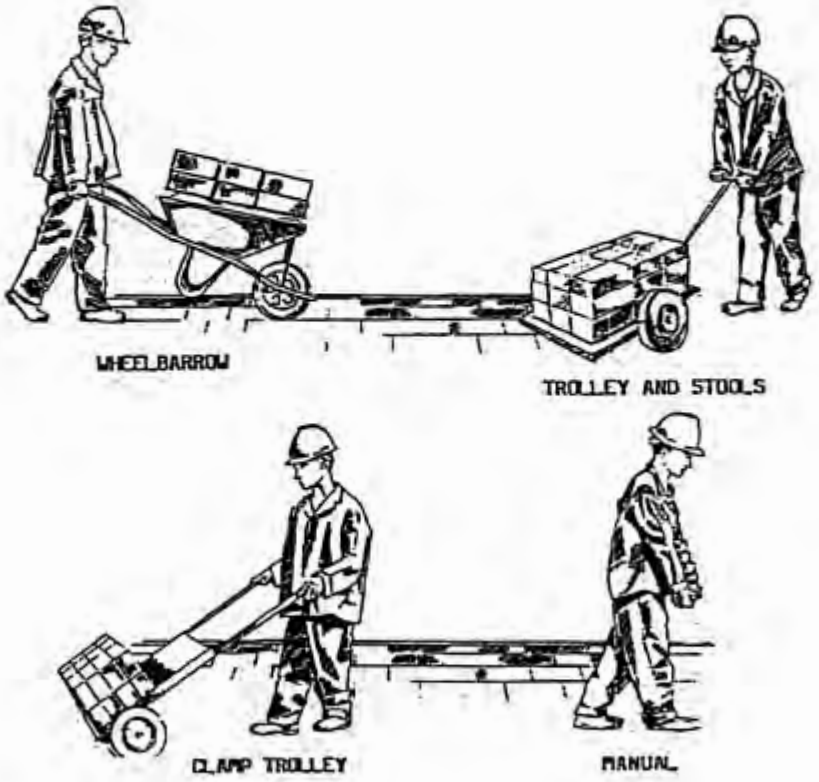
FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE SELF CHECK NO.2 : ANSWER KEY

Description:	Handling materials

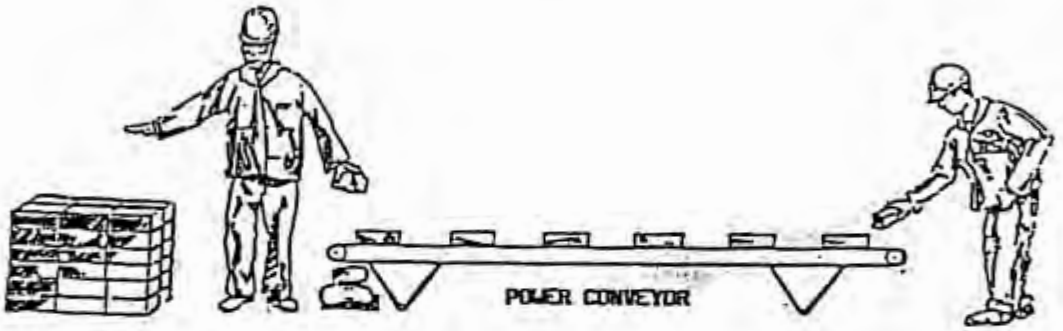
FILL IN THE KEYWORD QUESTIONS

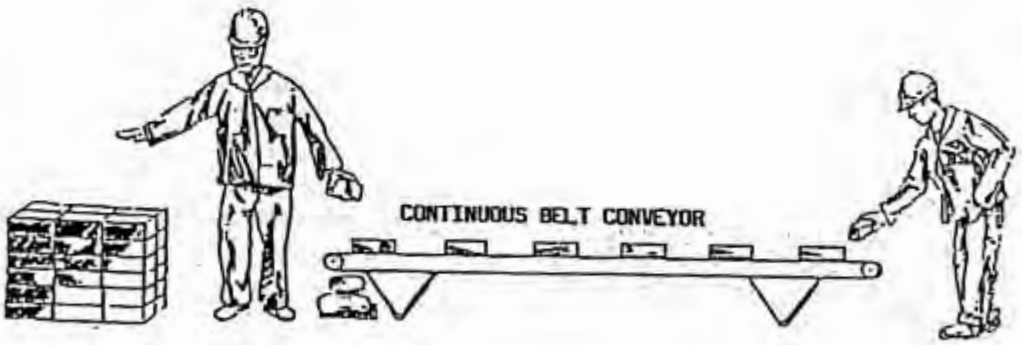


KNOWLEDGE SELF CHECK NO.2
ANSWER KEY

Description:	Handling materials

FILL IN THE KEYWORD QUESTIONS

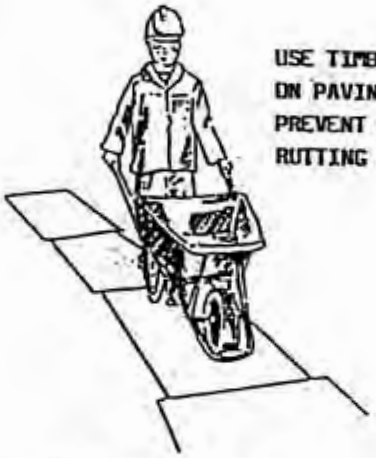




KNOWLEDGE SELF CHECK NO.2
ANSWER KEY

Description:	Handling materials

FILL IN THE KEYWORD QUESTIONS



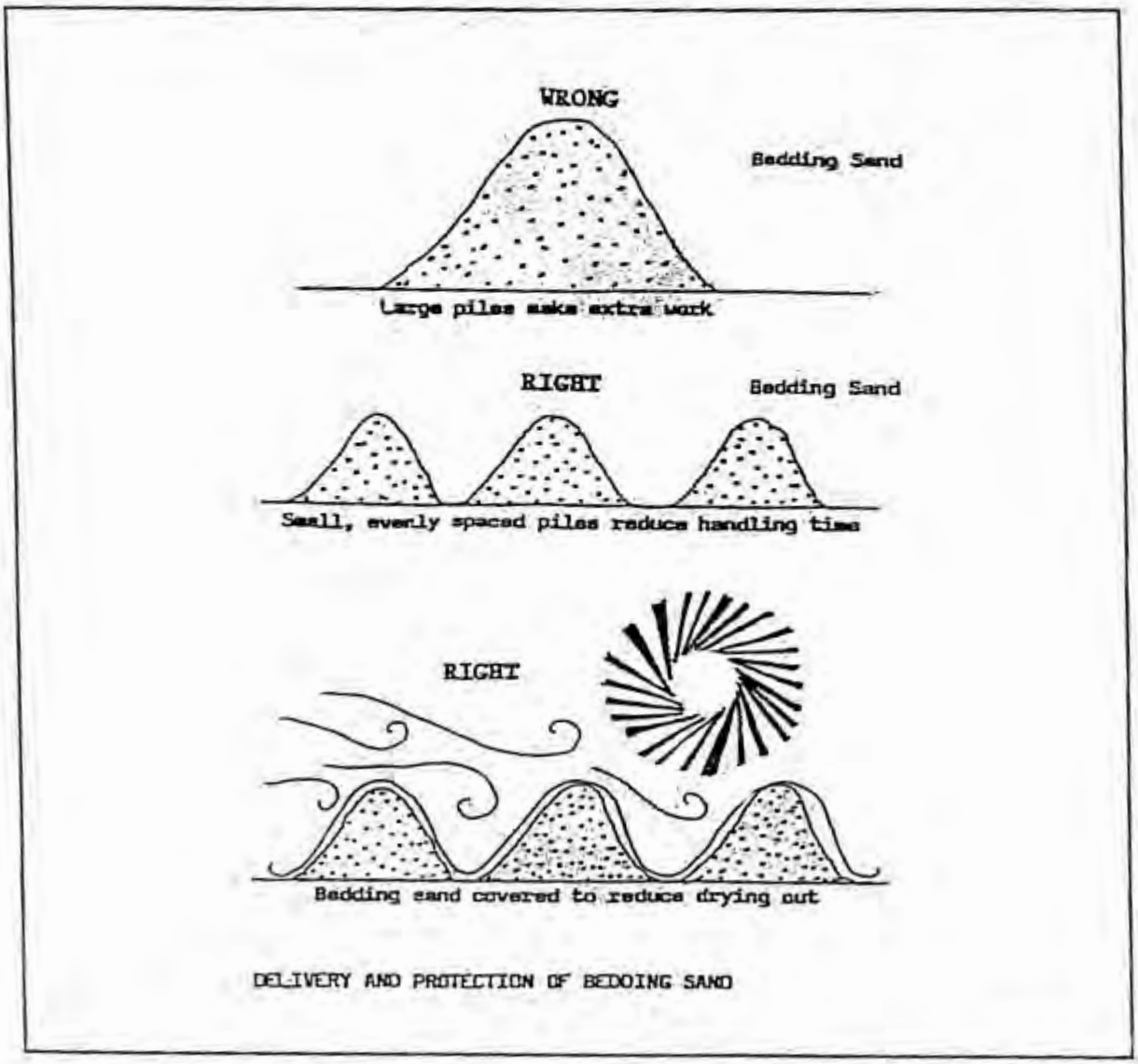
HANDLING METHODS

HANDLING METHODS

KNOWLEDGE TEST
ANSWER KEY

Description: Organise work and handling materials

FILL IN THE KEYWORD QUESTIONS

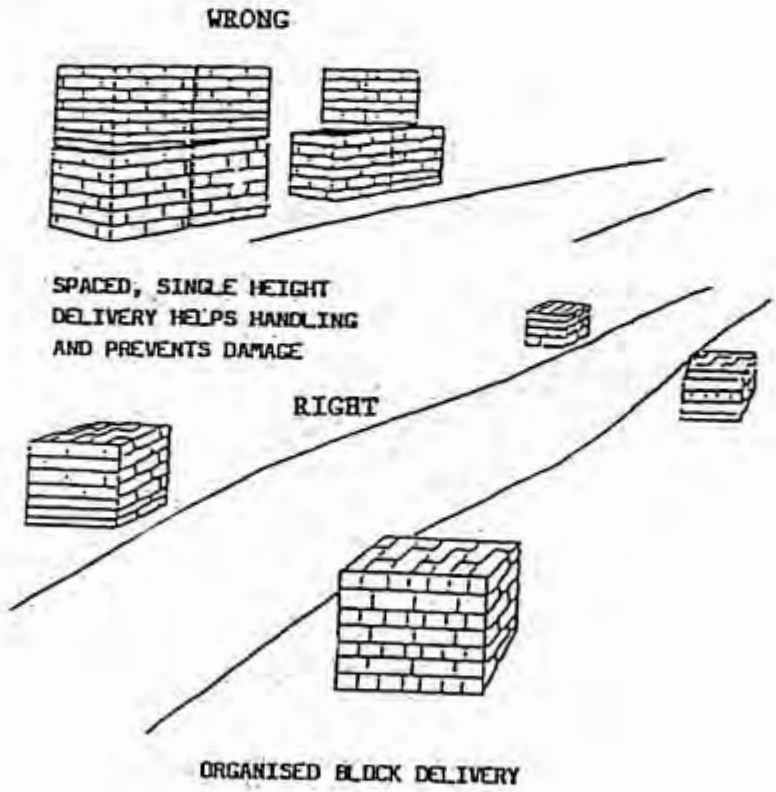


DELIVERY AND PROTECTION OF BEDDING SAND

KNOWLEDGE TEST ANSWER KEY

Description: Organise work and handling materials

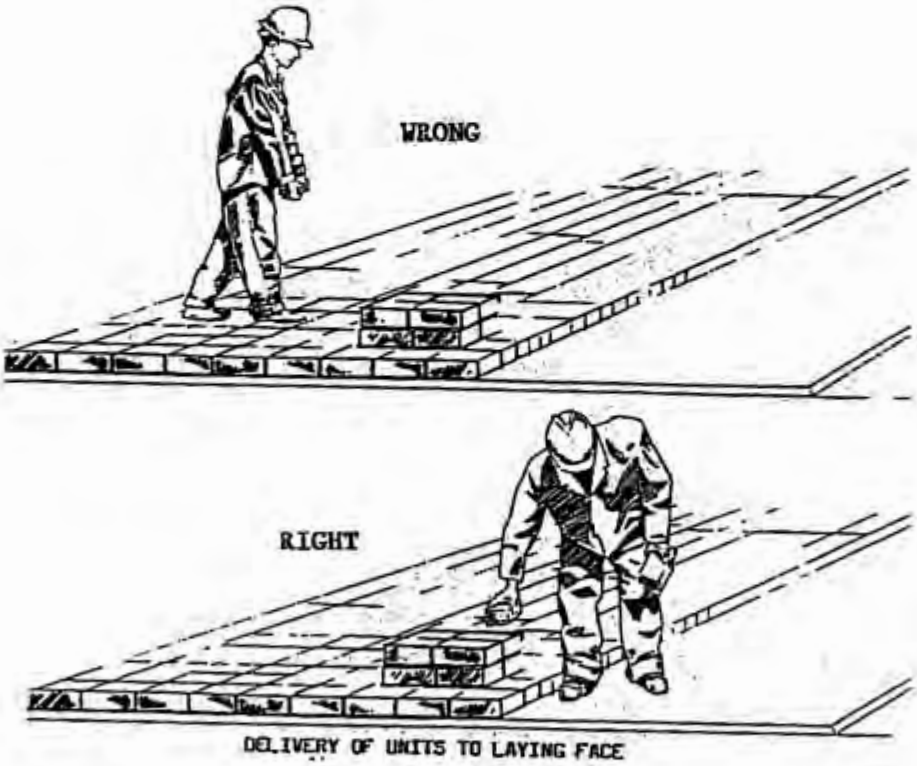
FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE TEST
ANSWER KEY

Description: Organise work and handling materials

FILL IN THE KEYWORD QUESTIONS

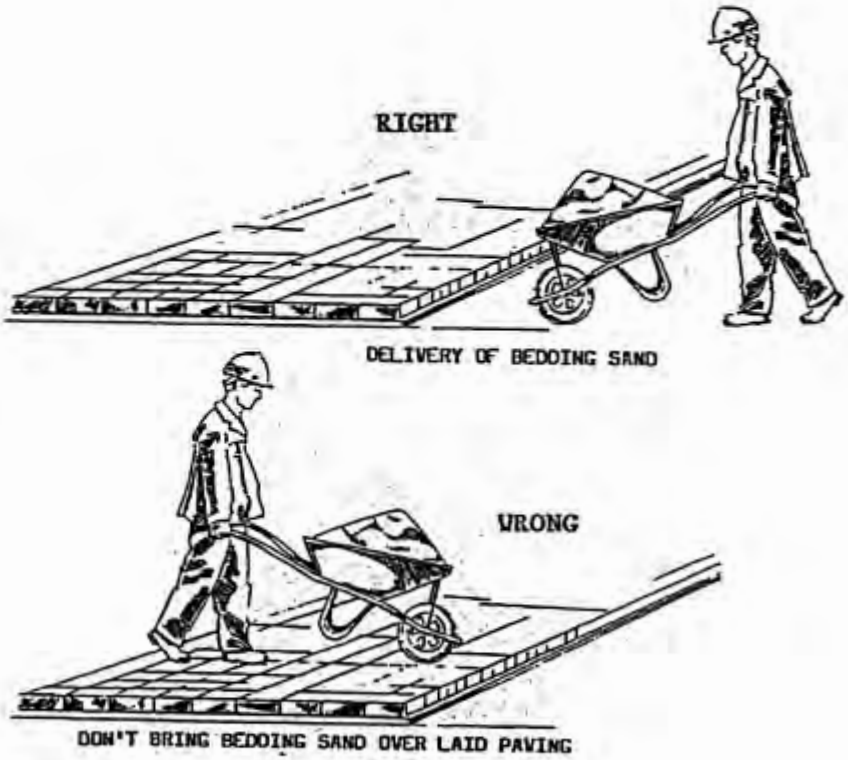


DELIVERY OF UNITS TO LAYING FACE

KNOWLEDGE TEST
ANSWER KEY

Description: Organise work and handling materials

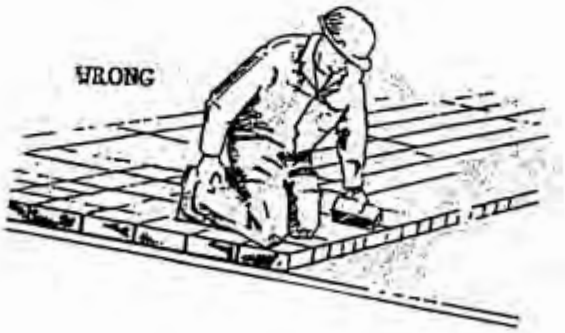
FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE TEST
ANSWER KEY

Description: Organise work and handling materials

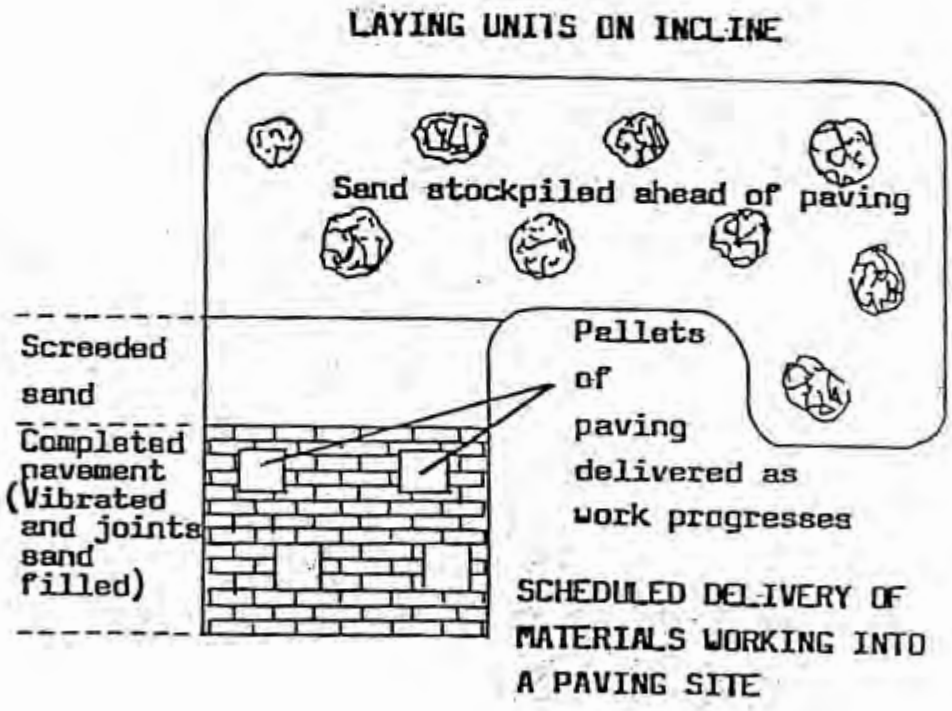
FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE TEST ANSWER KEY

Description:	Organise work and handling materials

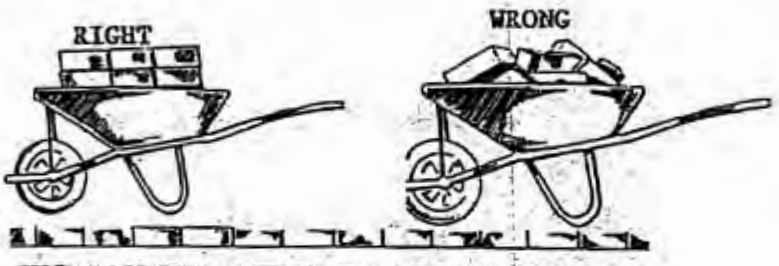
FILL IN THE KEYWORD QUESTIONS



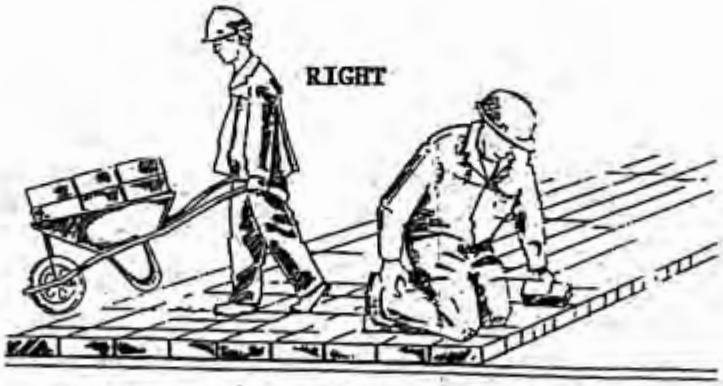
KNOWLEDGE TEST
ANSWER KEY

Description:	Organise work and handling materials

FILL IN THE KEYWORD QUESTIONS



ORDERLY LOCATION OF STACKS IN WHEELBARROWS MAKES FOR EASY UNLOADING

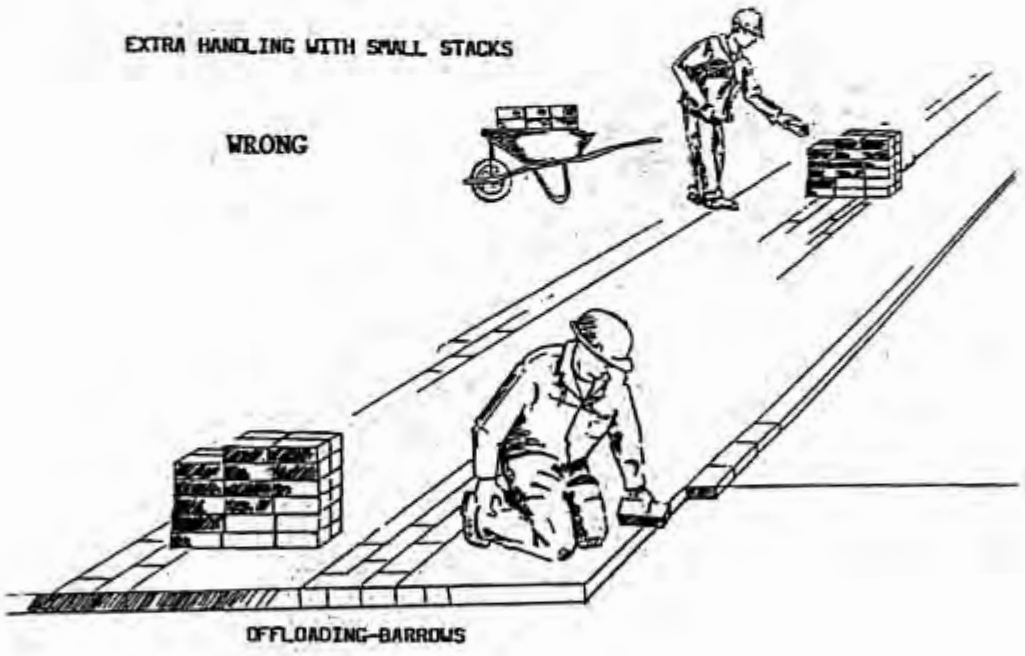


IT IS RECOMMENDED TO LAY DIRECTLY FROM BARROW

KNOWLEDGE TEST
ANSWER KEY

Description: Organise work and handling materials

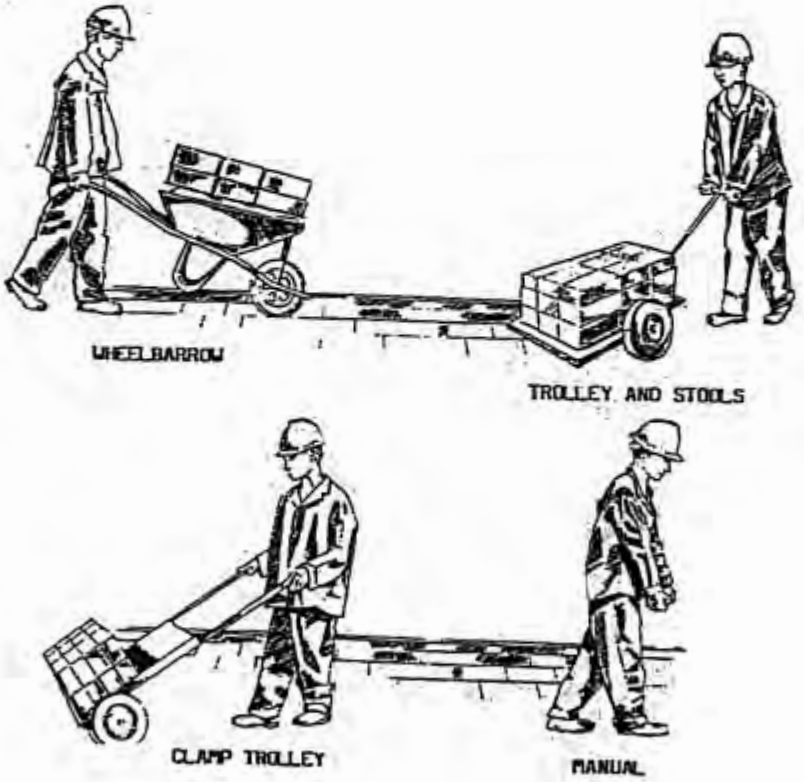
FILL IN THE KEYWORD QUESTIONS



KNOWLEDGE TEST
ANSWER KEY

Description:	Organise work and handling materials

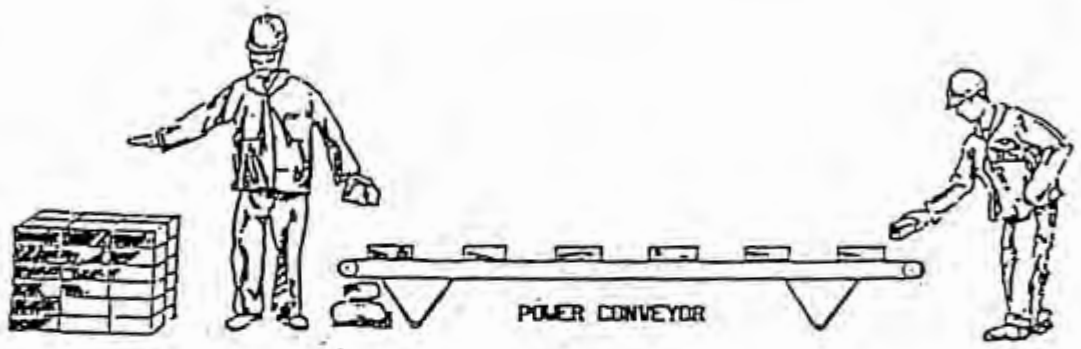
FILL IN THE KEYWORD QUESTIONS

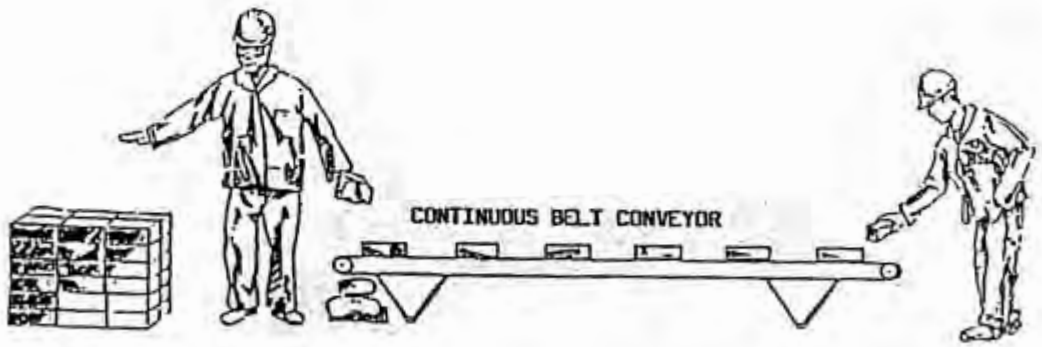


KNOWLEDGE TEST
ANSWER KEY

Description: Organise work and handling materials

FILL IN THE KEYWORD QUESTIONS

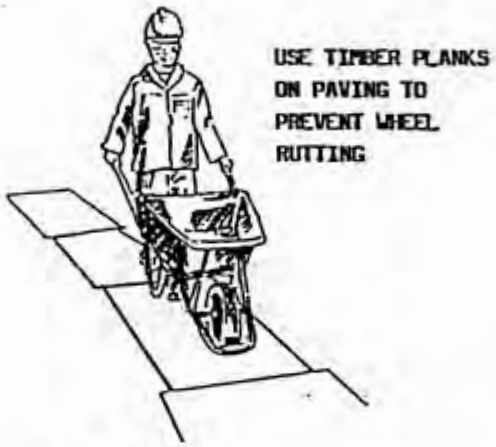




KNOWLEDGE TEST
ANSWER KEY

Description:	Organise work and handling materials

FILL IN THE KEYWORD QUESTIONS



HANDLING METHODS

HANDLING METHODS

CONCRETE
MANUFACTURERS'
ASSOCIATION

LEARNING GUIDE

TRAINING PROGRAMME
LAYING CONCRETE BLOCK PAVING

Programme	Laying Concrete Block Paving
Duty [A]	Laying concrete block paving
Task [01]	Identify paving blocks and describe segmented paving

INTRODUCTION

In this learning guide you will be introduced to precast concrete blocks and the segmented paving system. Mastery of this task is important as it provides the background required to master the tasks that follow.

OBJECTIVES

PERFORMANCE OBJECTIVE

Given	This learning guide, materials, equipment and assistance
You Will	Identify paving blocks and describe segmented paving
How Well	The completed task must conform to the standards of the test/s

PLEASE NOTE !!!! IF YOU THINK YOU ARE ABLE TO PERFORM THIS TASK TO THE LEVEL INDICATED ABOVE, THEN TAKE THE TEST.

LEARNING OBJECTIVES

1. Describe segmented paving
2. Identify paving blocks

LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.1

Description:	Describe segmented paving

LEARNING STEPS	RESOURCES
1. View the videos listed in the resources column.	1. Videos a) Paving in roads b) Construction and detailing c) Roads and the RDP
2. Read Instruction Sheet No.1 describing segmented paving.	2. Instruction Sheet No.1
3. Complete Self Check No.1 to evaluate your work.	3. Self Check No.1
4. When successfully completed proceed to the next Learning Objective.	

INSTRUCTION SHEET NO.1

Description:	Describe segmented paving

Introduction

Please Note !!!!

> **This training programme does not include the earthworks, as this is done by an appointed civil contractor. Therefore, this training programme only addresses the paving knowledge and skills.**

Segmented concrete paving is a system of individual, shaped blocks arranged to form a continuous hard wearing surface overlay. Used in the construction of roads, footpaths, play areas, industrial parks or other applications, segmented pavement offers long life, low maintenance and an attractive, easy-to-lay alternative to conventional paving types.

Segmented paving is versatile in pattern, colour and utility. It can be altered, repaired, removed and replaced without major cost, or having to use expensive construction equipment.

LET YOUR INSTRUCTOR FULLY EXPLAIN THE PURPOSE/APPLICATION CONCRETE BLOCK PAVING

INSTRUCTION SHEET NO.1

Description:	Describe segmented paving

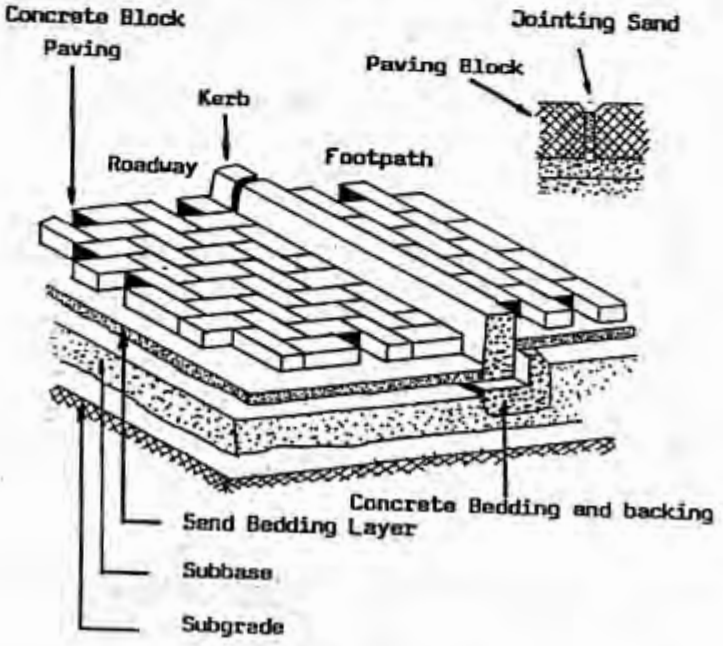
Segmented pavement

There are seven key elements that make up the completed segmented pavement:

(i) subgrade, the natural earth material found on site;
(ii) subbase, an introduced layer of road-making material;
(iii) bedding sand, a thin layer of selectively graded sand;
(iv) segmental paving block, the surface wearing course;
(v) edge restraint, a positive support used around the perimeter of the pavement;
(vi) Jointing sand (Compaction);
(vii) Drainage.

Subbase material is only necessary if subgrade conditions are poor and traffic conditions are heavy.

LET YOUR INSTRUCTOR PROVIDE YOU WITH A DETAILED DESCRIPTION OF SEGMENTED PAVING



INSTRUCTION SHEET NO.1

Description: Describe segmented paving

General

A **subbase** consists of a layer or layers of untreated or treated material of quality higher than that of the subgrade such as gravel crusher run or gravel and materials that have been treated with lime or cement.

The **subgrade** consists of the insitu earthworks within the road prism prior to the application of any subbase or sand bedding layer.

LET YOUR INSTRUCTOR FULLY EXPLAIN THE ABOVE

Bedding Sand is coarser and similar to river sand which contains no clay.

Jointing Sand is finer and similar to plaster sand.

LET YOUR INSTRUCTOR FULLY EXPLAIN AND DEMONSTRATE THE DIFFERENCES BETWEEN BEDDING AND JOINTING SAND

Edge restraint is required along the edges of a block pavement to prevent the outward migration of blocks, which would result in the opening of joints and loss of interlock.

Edge restraints can be either, precastor cast insitu kerb, or existing structure (i.e. manhole, island or pavers laid vertically).

The construction of subgrades and subbases follows normal road engineering practice. Uniformity of these layers is achieved by controlling the uniformity of material, density (through compaction) and moisture content is as important in block paving as in other types of pavements.

LET YOUR INSTRUCTOR FULLY EXPLAIN THE ABOVE

KNOWLEDGE SELF CHECK NO.1

Description:	Describe segmented paving

DIRECTIONS

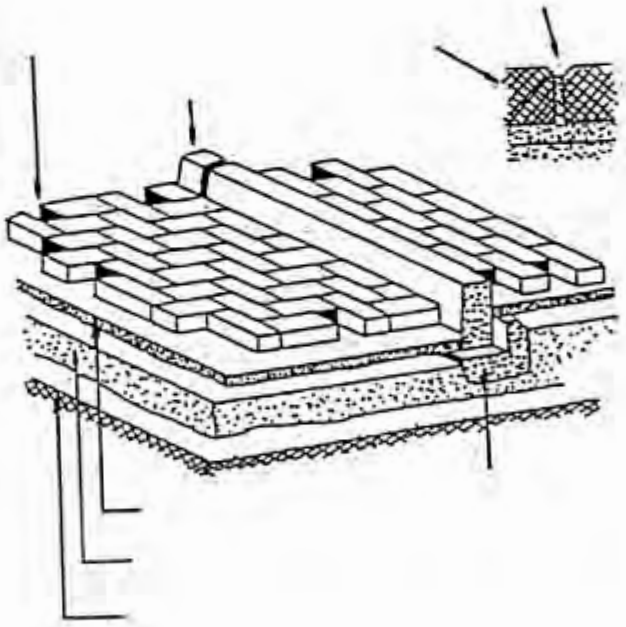
1. The questions on the following page/s are from the Instruction Sheet you have just completed.
2. They are filling in the keyword questions.
3. Use the answer sheet provided and fill in the word/s you think are correct.
4. All your answers must agree with the answer key at the back of this learning guide.
5. Should you miss or answer any items incorrectly review the Instruction Sheet or consult your Instructor.
6. Do not proceed any further until you have completed this Self Check successfully.

KNOWLEDGE SELF CHECK NO.1
ANSWER SHEET

Description:	Describe segmented paving

FILL IN THE KEYWORD QUESTIONS

In the diagram below fill in the applicable words in their appropriate places.



LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.2

Description:	Identify paving blocks

LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.2 describing the identification of paving blocks.	1. Instruction Sheet No.2
2. Complete Self Check No.2 to evaluate your work.	2. Self Check No.2
3. When all Self Checks have been completed successfully take the test.	3. Knowledge Test

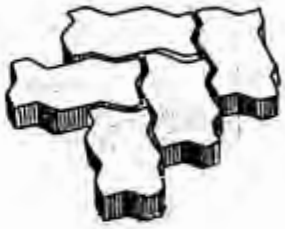
INSTRUCTION SHEET NO.2

Description:	Identify paving blocks

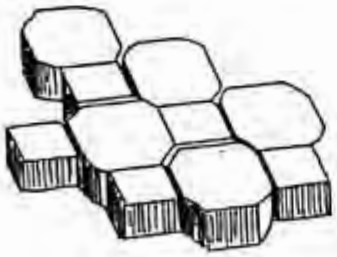
Paving blocks

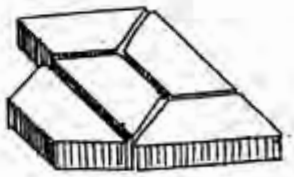
Segmented paving blocks are divided into three types, S-A, S-B or S-C.

Block type S-A allows geometrical interlock between all faces of adjacent blocks. When keyed together these blocks resist the spread of joints by their plan geometry. Generally, these blocks can be laid in herringbone pattern parallel to both the longitudinal and transverse axes of the joints. Block type S-A is used in roads and heavy-duty pavements.



Block type S-B allows geometrical interlock between some faces of adjacent blocks which, when keyed together, resist the spread of joints parallel to the longitudinal axes of the blocks.





INSTRUCTION SHEET NO.2

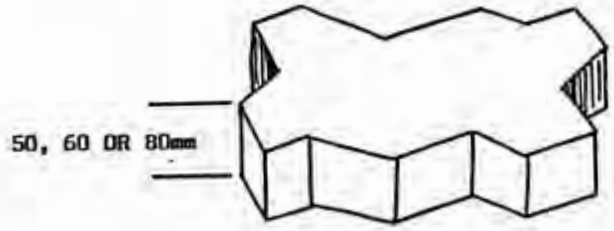
Description:	Identify paving blocks

Block type S-C allows no geometrical interlock between adjacent faces and relies on its dimensional accuracy and the accuracy of laying to develop interlock.

Thickness

Blocks of 50, 60 and 80 mm thickness are readily available ex stock. The thickness of the block to be used should be based on site conditions, design requirements and cost. The specifying of unnecessarily thick blocks will only increase cost without improving service performance.

Blocks of 50 mm and 60 mm thickness are used for light traffic and blocks of 80 mm thickness are used for heavy industrial traffic

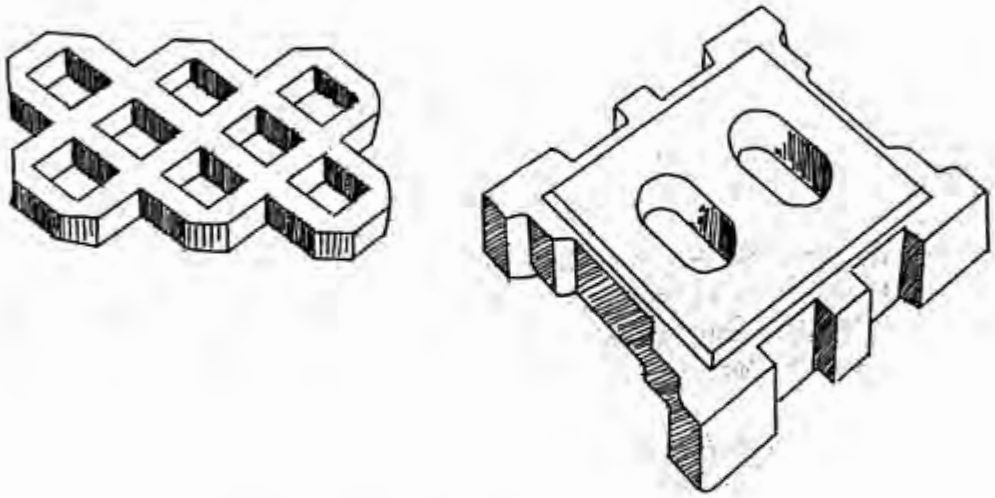


LET YOUR INSTRUCTOR FULLY EXPLAIN THE ABOVE

INSTRUCTION SHEET NO.2

Description:	Identify paving blocks

GRASS BLOCKS



Various other shapes are also available.

LET YOUR INSTRUCTOR FULLY EXPLAIN THE PURPOSE/APPLICATION OF THE VARIOUS PAVING BLOCKS

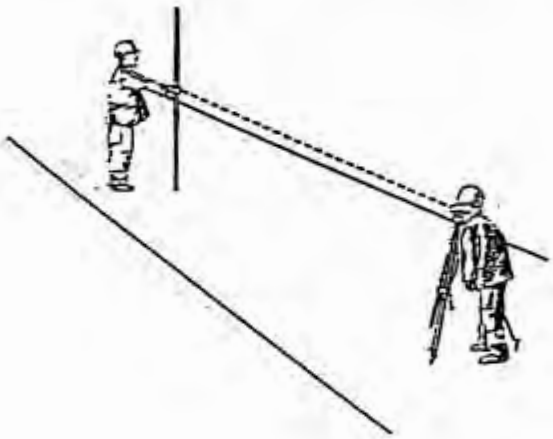
INSTRUCTION SHEET NO.2

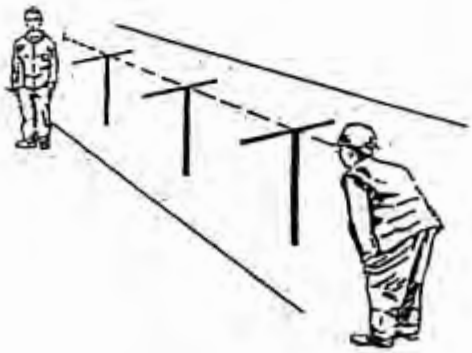
Description:	Identify paving blocks

Basic operations of paving

The basic laying operations for all segmental block pavements are illustrated below. Grass blocks are an exception because they are hand tamped into the bedding sand and then filled with a suitable soil filling in which the lawn is grown.

LET YOUR INSTRUCTOR FULLY EXPLAIN THE BASIC OPERATIONS OF PAVING

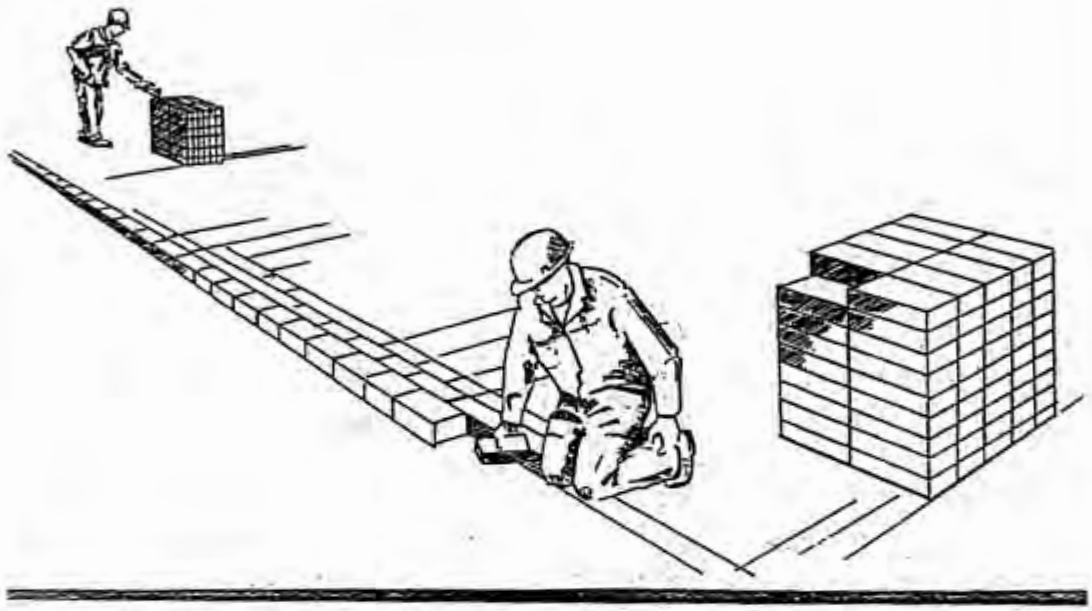




INSTRUCTION SHEET NO.2

Description:	Identify paving blocks

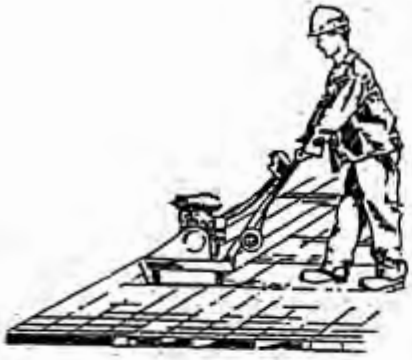
Basic operations of paving (continued)

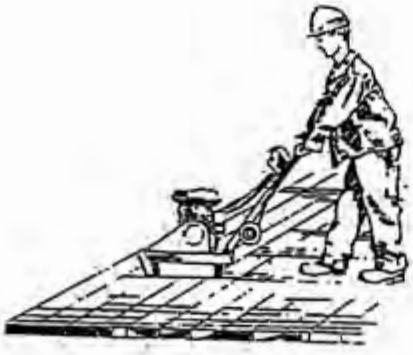


INSTRUCTION SHEET NO 2

Description:	Identify paving blocks

Basic operations of paving (continued)





KNOWLEDGE SELF CHECK NO.2

Description:	Identify paving blocks

DIRECTIONS

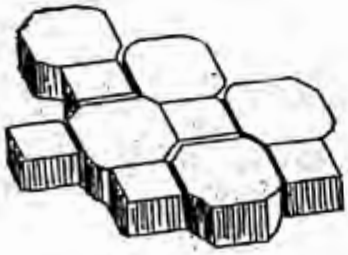
1. The questions on the following page/s are from the Instruction Sheet you have just completed.
2. They are filling in the keyword questions.
3. Use the answer sheet provided and fill in the word/s you think are correct.
4. All your answers must agree with the answer key at the back of this learning guide.
5. Should you miss or answer any items incorrectly review the Instruction Sheet or consult your Instructor.
6. Do not proceed any further until you have completed this Self Check successfully.

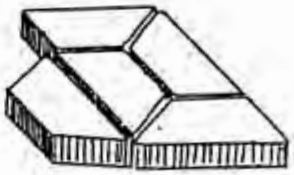
KNOWLEDGE SELF CHECK NO.2
ANSWER SHEET

Description:	Identify paving blocks

FILL IN THE KEYWORD QUESTIONS

In the diagrams below fill in the names of the blocks on the line provided





KNOWLEDGE SELF CHECK NO.2
ANSWER SHEET

Description:	Identify paving blocks

FILL IN THE KEYWORD QUESTIONS

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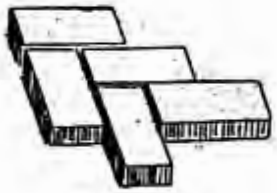

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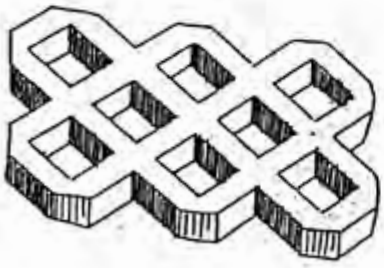
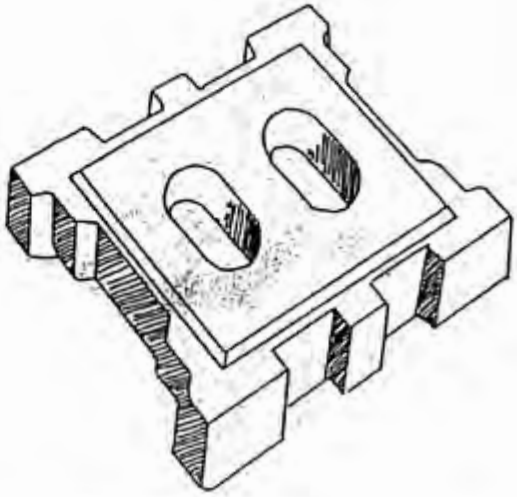




KNOWLEDGE TEST

Description:	Identify paving blocks and describe segmented paving

DIRECTIONS

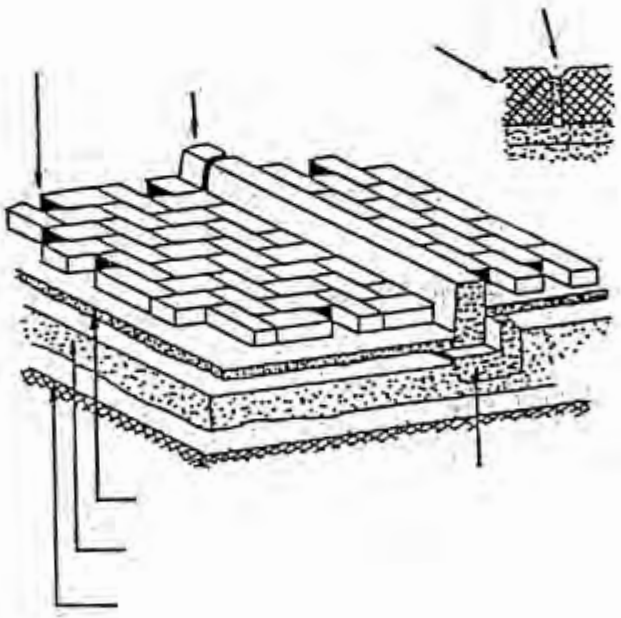
1. The questions on the following page/s are from the learning guide you have just completed.
2. The questions are either filling in the keywords, true or false or multiple choice.
3. Write the answers you think are correct on the applicable answer sheet.
4. You are not allowed to refer to your learning guide or obtain assistance.
5. You have _____ minutes to complete the test.
6. 90% will be required for mastery.

KNOWLEDGE TEST
ANSWER SHEET

Description:	Identify paving blocks and describe segmented paving

FILL IN THE KEYWORD QUESTIONS

In the diagram below fill in the applicable words in their appropriate places.



KNOWLEDGE TEST
ANSWER SHEET

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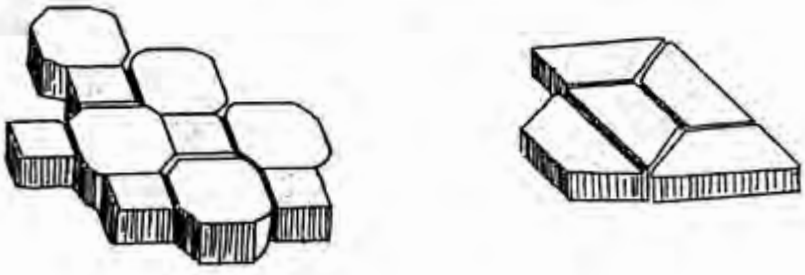
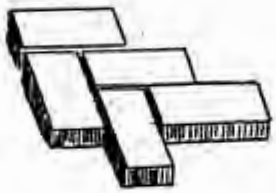


KNOWLEDGE TEST
ANSWER SHEET

Description: Identify paving blocks and describe segmented paving

FILL IN THE KEYWORD QUESTIONS

_____



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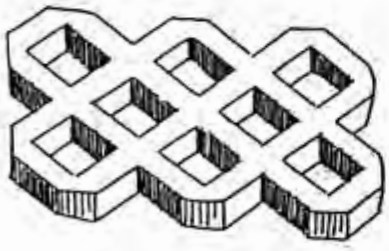
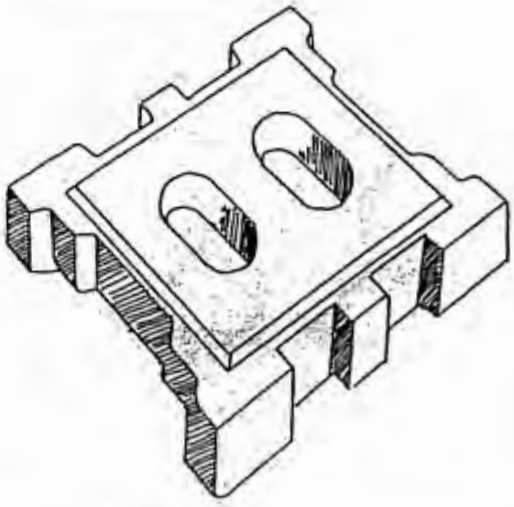




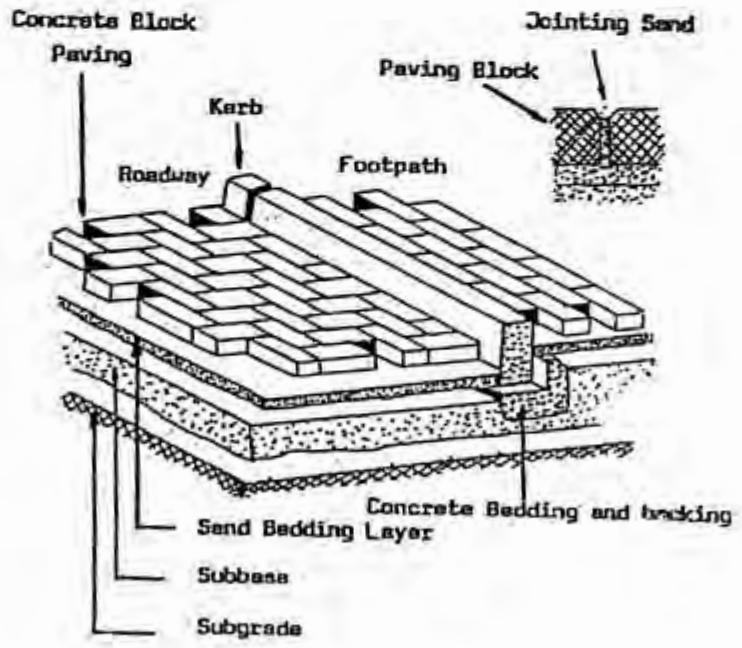
_____

KNOWLEDGE SELF CHECK NO.1
ANSWER KEY

Description:	Describe segmented paving

FILL IN THE KEYWORD QUESTIONS

In the diagram below fill in the applicable words in their appropriate places.



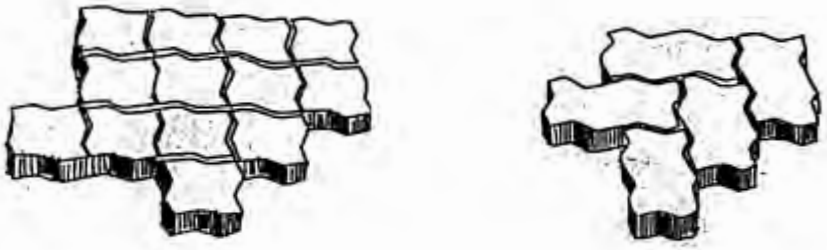
KNOWLEDGE SELF CHECK NO.2
ANSWER KEY

Description:	Identify paving blocks

FILL IN THE KEYWORD QUESTIONS

In the diagrams below fill in the names of the blocks on the line provided

BLOCK TYPE S-A



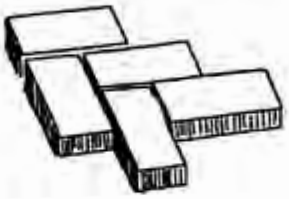
BLOCK TYPE S-B

KNOWLEDGE SELF CHECK NO.2
ANSWER KEY

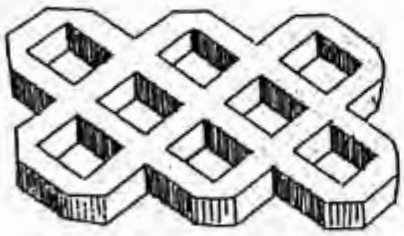
Description:	Identify paving blocks

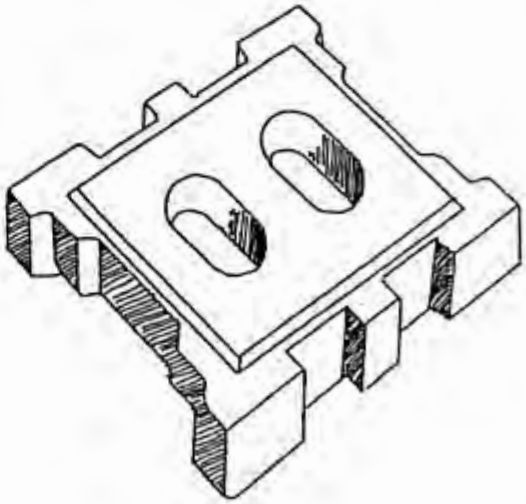
FILL IN THE KEYWORD QUESTIONS

BLOCK TYPE S-C



GRASS BLOCKS



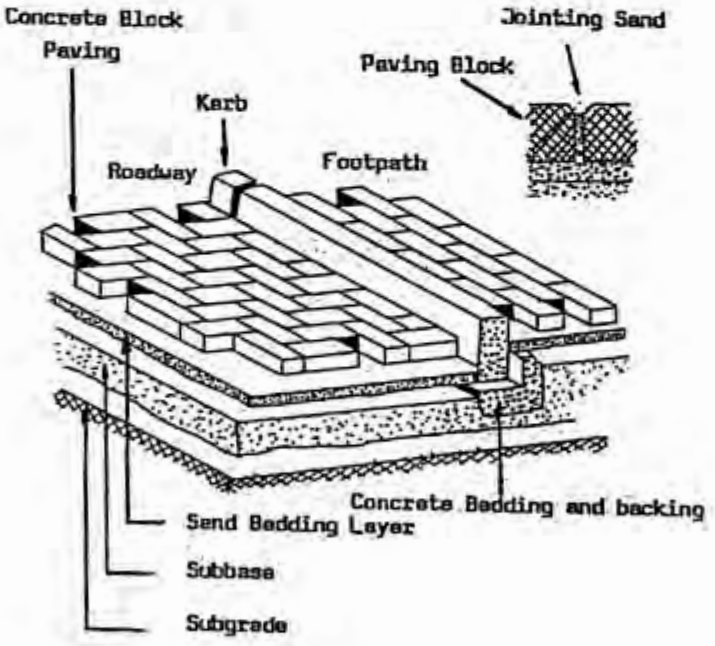


KNOWLEDGE TEST
ANSWER KEY

Description: Identify paving blocks and describe segmented paving

FILL IN THE KEYWORD QUESTIONS

In the diagram below fill in the applicable words in their appropriate places.



KNOWLEDGE TEST ANSWER KEY

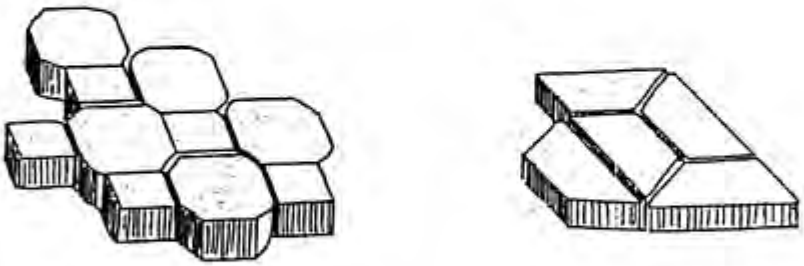
Description: Identify paving blocks and describe segmented paving

FILL IN THE KEYWORD QUESTIONS

In the diagrams below fill in the names of the blocks on the line provided

BLOCK TYPE S-A

BLOCK TYPE S-B

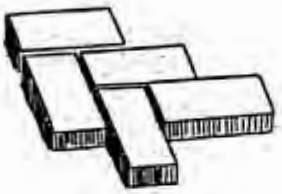


KNOWLEDGE TEST
ANSWER KEY

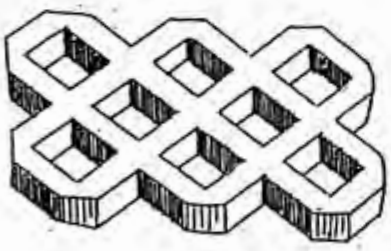
Description:	Identify paving blocks

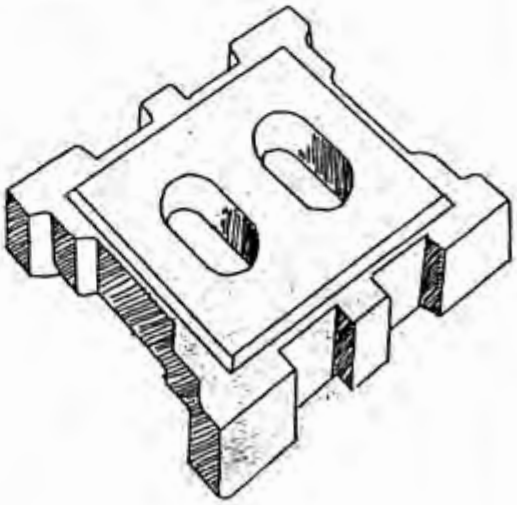
FILL IN THE KEYWORD QUESTIONS

BLOCK TYPE S-C



GRASS BLOCKS





CONCRETE
MANUFACTURERS'
ASSOCIATION

LEARNING GUIDE

TRAINING PROGRAMME
LAYING CONCRETE BLOCK PAVING

Programme	Laying Concrete Block paving
Duty [A]	Laying concrete block paving
Task [02]	Construct edge restraints

INTRODUCTION

This learning guide will provide you with knowledge and the skills, that will enable you to construct edge restraints and place and compact the sand bed in a competent manner. Mastery of this task should be regarded as important as it will enable mastery of the tasks that follow.

OBJECTIVES

PERFORMANCE OBJECTIVE

Given	This learning guide, materials, equipment and assistance
You Will	Construct edge restraints
How Well	The completed task must conform to the standards of the test/s

PLEASE NOTE !!! IF YOU THINK YOU ARE ABLE TO PERFORM THIS TASK TO THE LEVEL INDICATED ABOVE, THEN TAKE THE TEST.

LEARNING OBJECTIVES

1. Identify edge restraint designs
2. Construct edge restraints

LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.1

Description:	Identify edge restraint designs

LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.1 describing the identification of edge restraint designs.	1. Instruction Sheet No.1
2. Complete Self Check No.1 to evaluate your work.	2. Self Check No.1
3 When successfully completed proceed to the next Learning Objective.	

INSTRUCTION SHEET NO.1

Description:	Identify edge restraint designs

Edge Restraints

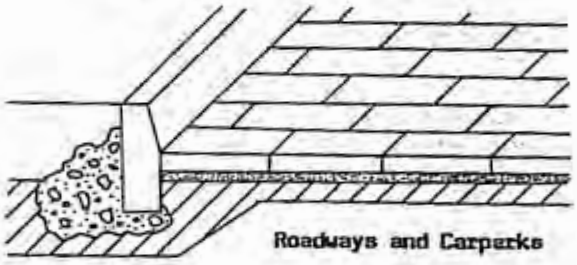
Edge restraints are absolutely necessary along the perimeter of all paving. The purpose of the edge restraint is to contain the paving in order to prevent the outward movement of pavers.

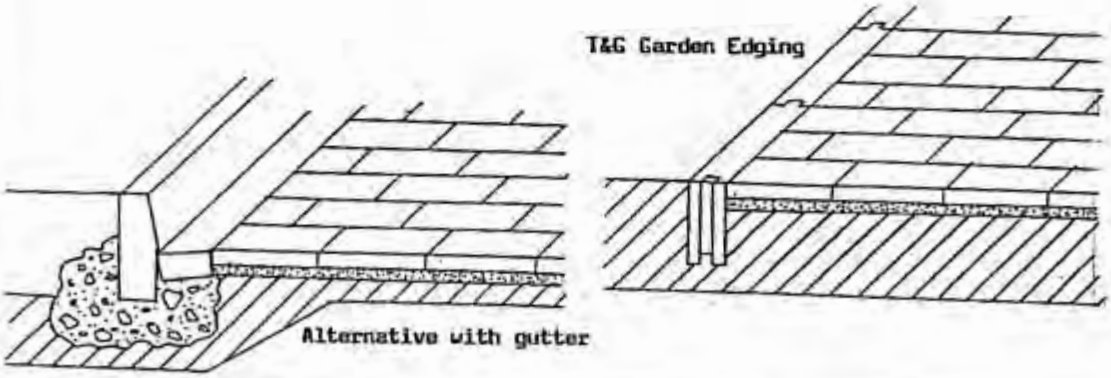
Various designs of edge restraints are illustrated below and on the following page and the choice of which design to use is determined by factors such as service loading, life, aesthetic appeal and cost. Each type shown has been successfully implemented in particular situations.

Soil compacted edges may be considered for light domestic situations, but are generally not recommended.

LET YOUR INSTRUCTOR FULLY EXPLAIN THE ABOVE

Edge Restraint Designs

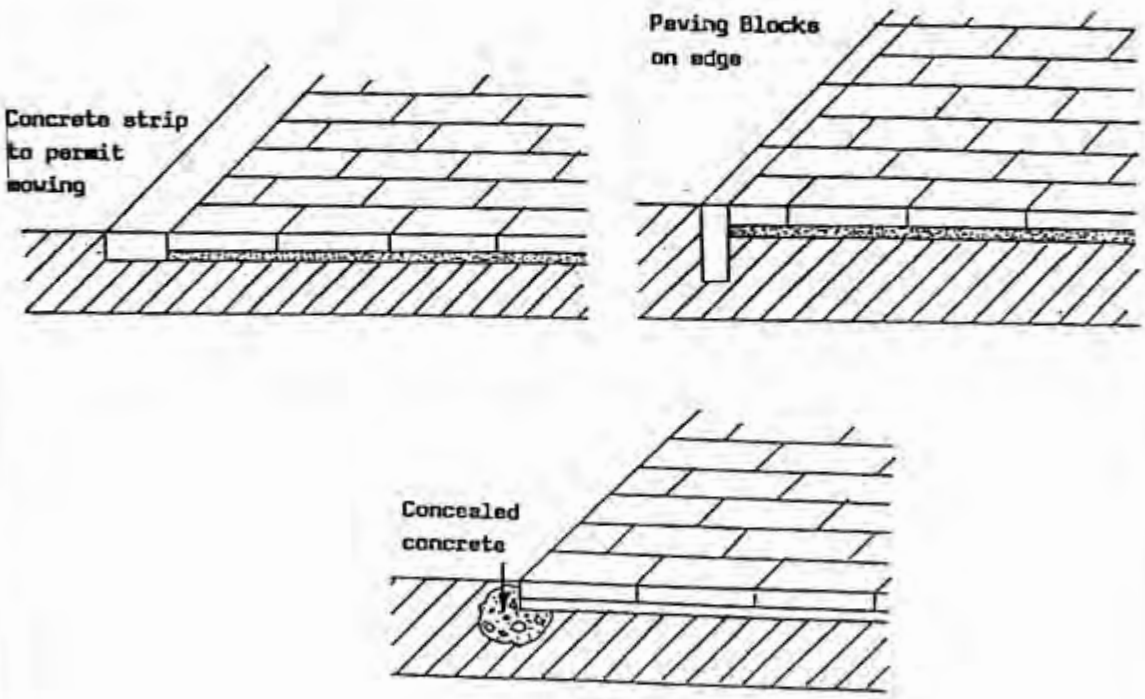




INSTRUCTION SHEET NO.1

Description: Identify edge restraint designs

Edge Restraint Designs



KNOWLEDGE SELF CHECK NO.1

Description:	Identify edge restraint designs

DIRECTIONS

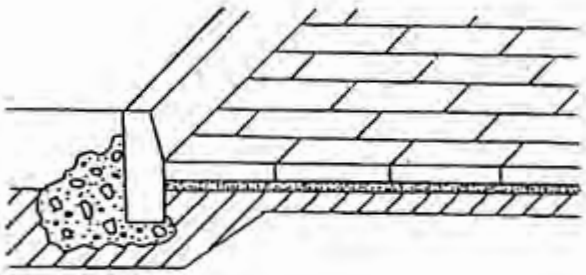
1. The questions on the following page/s are from the Instruction Sheet you have just completed.
2. They are filling in the keyword questions.
3. Use the answer sheet provided and fill in the word/s you think are correct.
4. All your answers must agree with the answer key at the back of this learning guide.
5. Should you miss or answer any items incorrectly review the Instruction Sheet or consult your Instructor.
6. Do not proceed any further until you have completed this Self Check successfully.

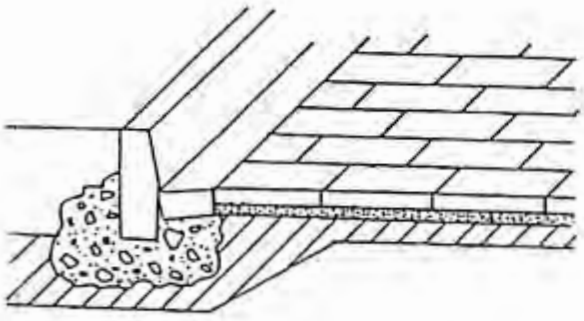
KNOWLEDGE SELF CHECK NO.1
ANSWER SHEET

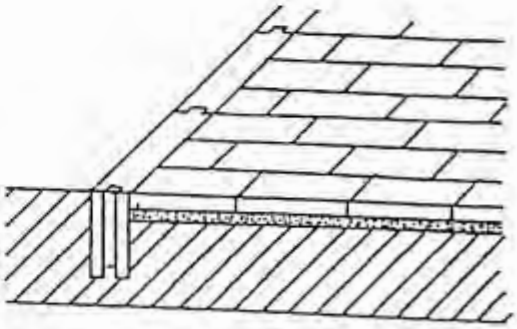
Description:	Identify edge restraint designs

FILL IN THE KEYWORD QUESTIONS

In the diagram below fill in the applicable words in their appropriate places.





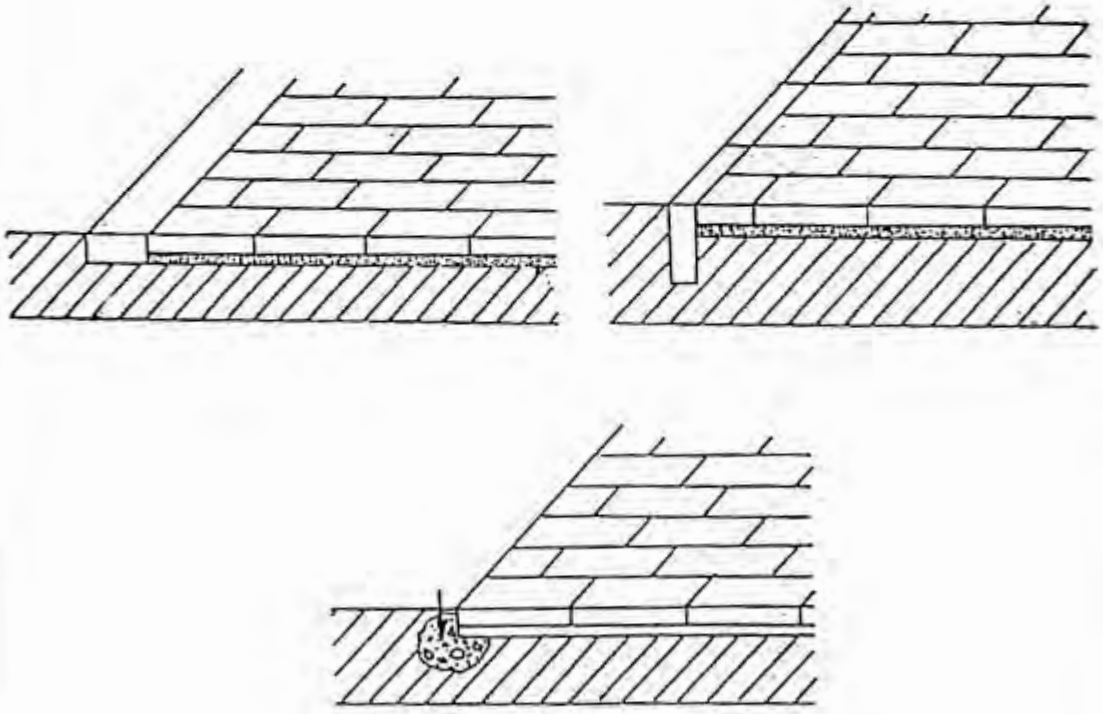


KNOWLEDGE SELF CHECK NO.1
ANSWER SHEET

Description:	Identify edge restraint designs

FILL IN THE KEYWORD QUESTIONS

In the diagram below fill in the applicable words in their appropriate places.



LEARNING ACTIVITIES
LEARNING OBJECTIVE NO.2

Description:	Construct edge restraints

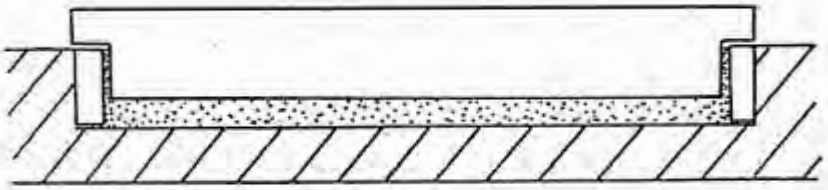
LEARNING STEPS	RESOURCES
1. Read Instruction Sheet No.2 describing the construction of edge restraints.	1. Instruction Sheet No.2
2. Complete Self Check No.2 to evaluate your work.	2. Self Check No.2
3. When all Self Checks have been completed successfully take the test.	3. Performance Test

INSTRUCTION SHEET NO.2

Description:	Construct edge restraints

Construction of edge restraints

Edge restraints should be installed before paving work commences. In this way the edging can be used for reference levels and often as the screeding surface itself, with a screed board cut to screed the sand the required distance below the top of the edge restraint. (See figure below)



LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

Edge restraints may be cast ***in situ*** or consist of precast units. The construction follows normal practices for roads and highways.

Cast ***in situ*** mowing strips are constructed using parallel strips of timber held in place with wooden or steel pegs.

Timber sizes are generally 100 x 25mm, but where curved forms are used, 100 x 6mm strips of hardboard (Masonite) are most suitable.

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE

INSTRUCTION SHEET NO.2

Description:	Construct edge restraints

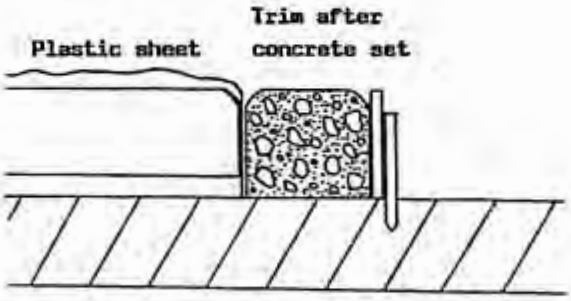
Where mowing strips are to be installed after the paving is laid, the paving itself is used as one side of the form. This method suffers the following disadvantages:

1. It is difficult to obtain a neat edge on the paved side;

2. Possible staining of pavement with concrete. However,if plastic sheeting is placed over the paving edge and laid back over the paving surface it will prevent the pavers being stained. (See figure below)

The plastic sheeting is left in place until the concrete has cured when it may be trimmed off with a knife.

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE



INSTRUCTION SHEET NO.2

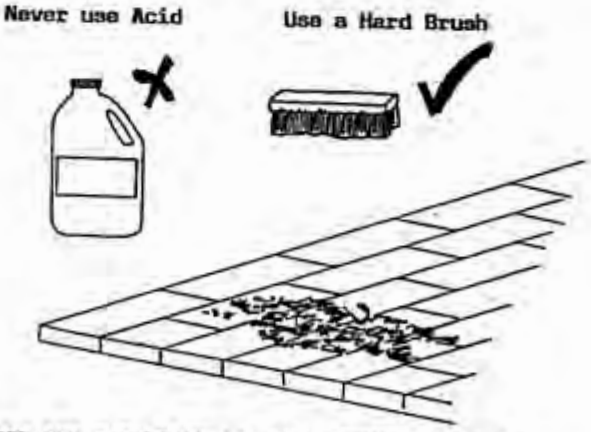
Description:	Construct edge restraints

Caution !!!!!

Should concrete stains occur on the pavement, never use acid to remove them. Acid will alter the colour of the paving, giving a patchy look to the surface.

Wait until the concrete has dried, then remove it using a stiff hard brush. When concrete is used it is wise to use colour similar to that of the paving units.

LET YOUR INSTRUCTOR EXPLAIN AND DEMONSTRATE THE ABOVE



GOOD AND BAD PRACTICES FOR REMOVING CONCRETE STAINS

PERFORMANCE SELF CHECK NO.2

Description:	Construct edge restraints

DIRECTIONS

1. Evaluate your work by responding to the items on the following page/s.
2. All items must receive a "Yes" response for successful completion of this Self Check.
3. Should you miss or answer any item incorrectly, review the Instruction Sheet or consult your Instructor.
4. Do not proceed any further until you have completed this Self Check successfully.

PERFORMANCE SELF CHECK NO.2
EVALUATION

Description:	Construct edge restraints

ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
1	Did your instructor fully explain and demonstrate all procedures?		
2	Were edge restraints installed before paving work started?		
3	Were edge restraints used for reference levels?		
4	Was correct size timber selected for screed board?		
5	Was screed board accurately cut for screeding sand?		
6	Was sand screeded required distance below top of edge restraint?		
7	Was correct timber selected for construction of mowing strips?		
8	Was timber for mowing strip construction cut accurately?		
9	Did your instructor fully explain the disadvantages installing mowing after the paving is laid?		
10	Did your instructor fully explain and demonstrate the use of plastic sheeting to prevent staining of paving?		
11	Does edge restraint construction conform to requirements?		

PERFORMANCE TEST

Description:	Construct edge restraints

DEMONSTRATE MASTERY OF THIS TASK BY DOING THE FOLLOWING

1. Before attempting the Performance Test, ensure that you have completed this Learning Guide successfully.
2. Obtain the Performance Test from your Instructor.
3. Before you attempt the Performance Test, be sure that you fully understand what is required of you.

PERFORMANCE STANDARDS

1. The correct procedures are to be adhered to.
2. All safety precautions are to be adhered to.
3. You are not allowed to refer to your Learning Guide or obtain any assistance.
4. You have _____ minutes to complete the Performance Test.
5. 100% will be required for mastery.

PERFORMANCE TEST EVALUATION

Description:	Construct edge restraints

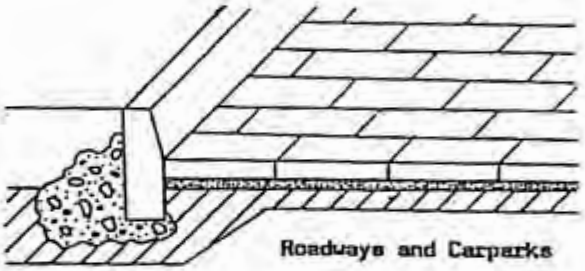
ITEM	ALL ITEMS MUST RECEIVE A "YES" RESPONSE	YES	NO
1	Are edge restraints installed in accordance with requirements?		
2	Are edge restraints level?		
3	Is screeding in accordance with requirements?		
4	If required is mowing strip constructed in accordance with requirements?		
5	Do the completed edge restraints conform to specifications?		
6	Was the time limit adhered to?		

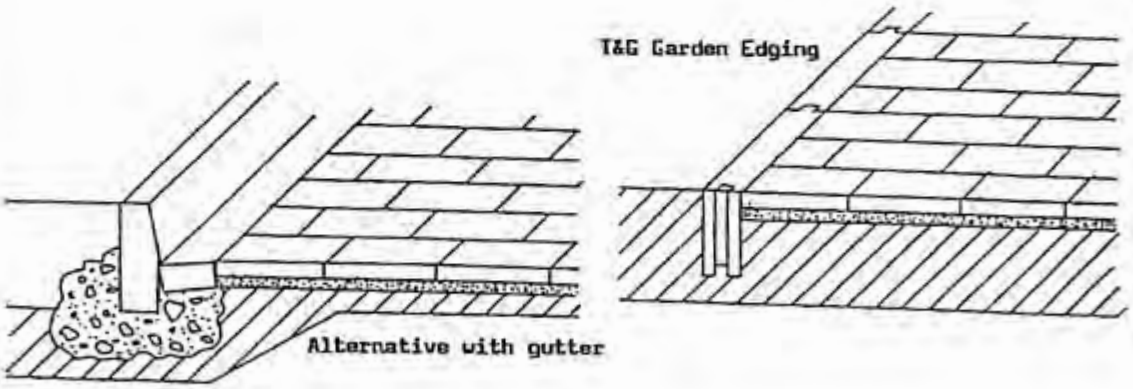
KNOWLEDGE SELF CHECK NO.1
ANSWER KEY

Description:	Construct edge restraints

FILL IN THE KEYWORD QUESTIONS

In the diagram below fill in the applicable words in their appropriate places.



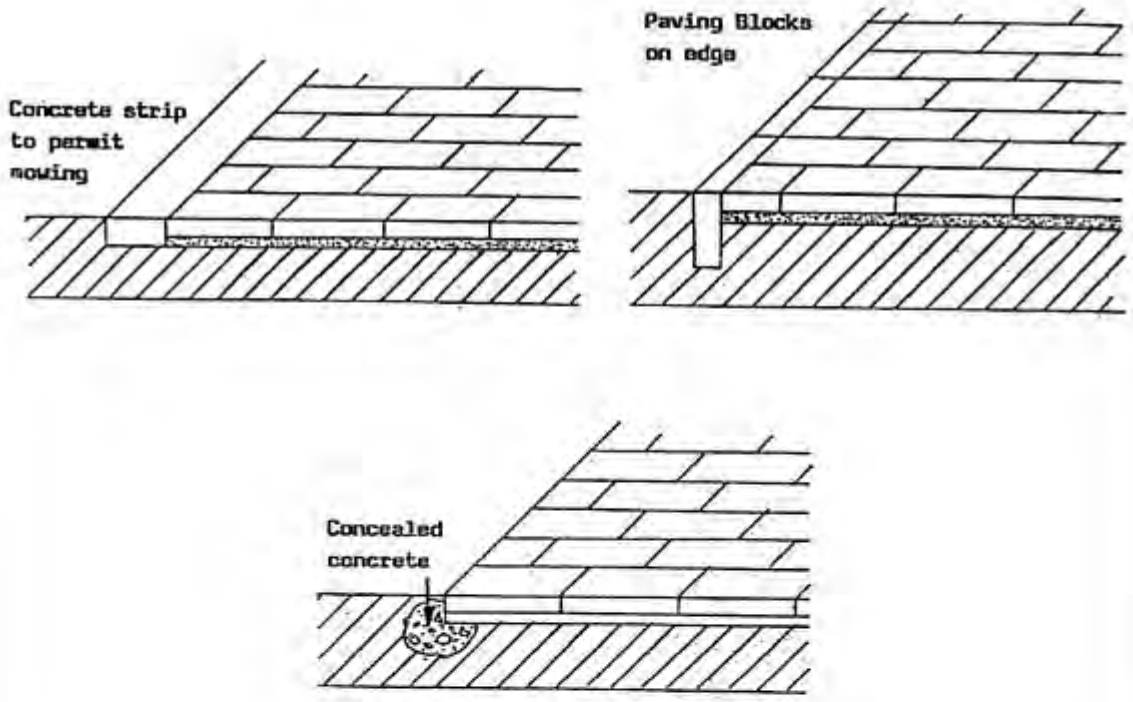


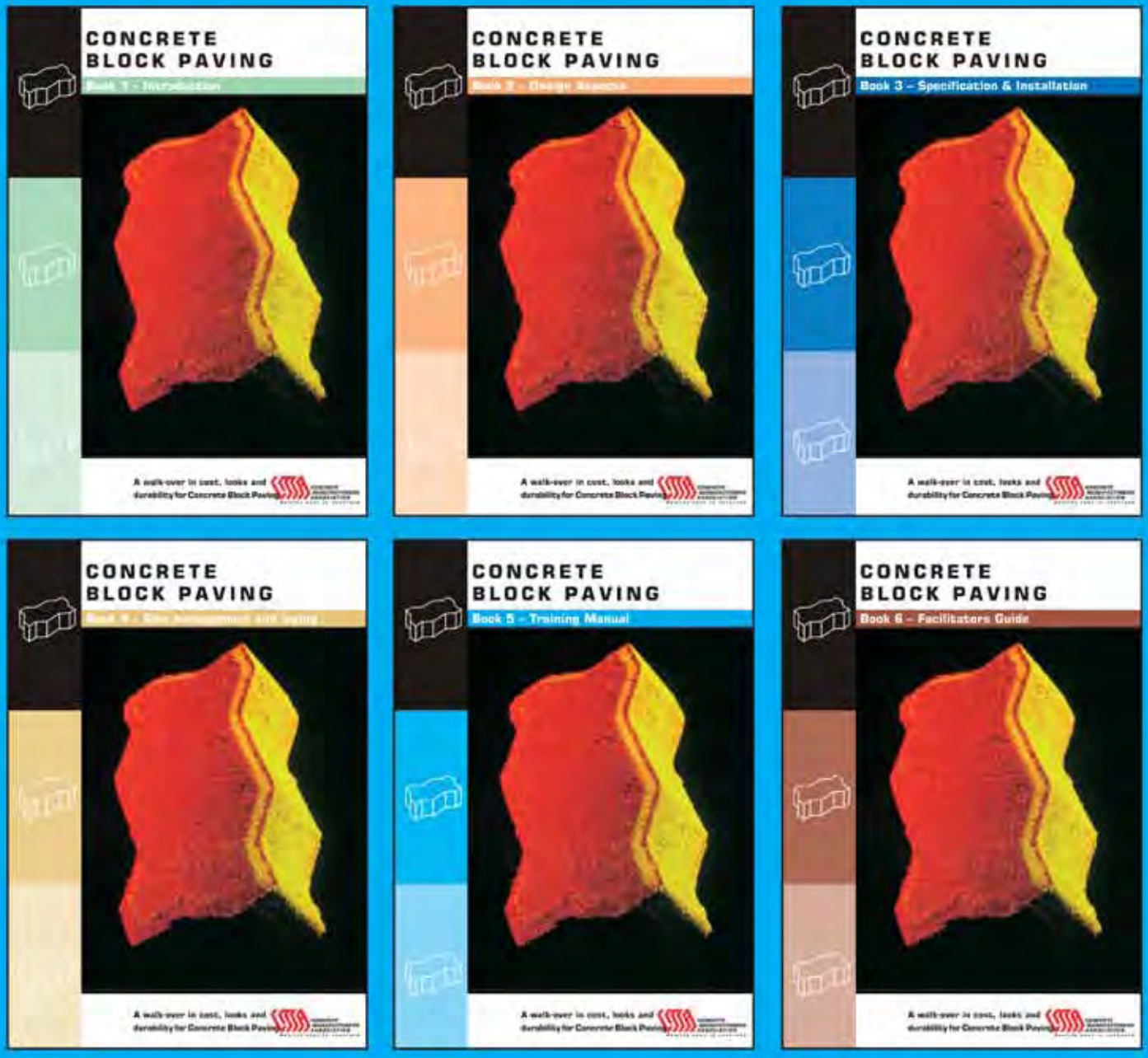
KNOWLEDGE SELF CHECK NO.1
ANSWER KEY

Description:	Construct edge restraints

FILL IN THE KEYWORD QUESTIONS

In the diagram below fill in the applicable words in their appropriate places.





CONCRETE MANUFACTURERS ASSOCIATION
Quality cost in concrete

Block D, Lone Creek, Waterfall Office Park, Bekker Road, Midrand
PO Box 168 Halfway House 1685
Tel +27 11 805 6742, Fax +27 86 524 9216
e-mail: main.cma@gmail.com website: www.cma.org.za