



PARTICULAR SPECIFICATION



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101. GENERAL REQUIREMENTS

101.1 APPLICATION OF PARTICULAR SPECIFICATION

This Particular Specification is to be read and construed together with the General Specification contained in Volume 3 of the Contract Documents for this Tender. In case of ambiguities or discrepancies between this Particular Specification and the General Specification, the Particular Specification shall prevail, except if and to the extent otherwise provided by the Contract or directed by the Engineer.

Whenever the term “Specification” without further qualification is used in the Contract Documents, it shall mean the General Specification together with the Particular Specification.

101.2 LOCATION OF WORKS

The project includes the provision of material for construction of 2 main canals in Kfar Melke and El Moqaitaa and secondary canals in Moqaitaa, Qaabrine, Kfar Melke, Rmoul, Kliaat and in Sahel Akkar.

101.3 SCOPE OF WORK

The scope of works covered by this contract includes the following:

- Supply of rip rap, drain and filter material.
- Equipment for trench excavation and backfilling.
- Supply and of Sluice gate.
- Supply material for construction of regulating chambers.
- Supply material for concrete works.
- Other

201. PARTICULAR SPECIFICATIONS

The following Specifications are prepared for civil work applying Labour based appropriate technology road works. Each item corresponds to the item in the Bill of Quantity in the contract. These Specifications cover: Specification, irrigation canal work, structure and retaining walls

202. GENERAL ITEMS

203. MATERIAL TESTING

203.1 DESCRIPTION

This item is the testing of material in a laboratory such as gravel for surfacing, compressive strength test for concrete for major structures and gradation test for aggregate and sand to be used for major structures. The lump sum figure in the BOQ is the maximum available amount for this activity and fixed by the project.

203.2 DETAILS

- **Test for gravel:** This activity is the testing for gravel before selection of a gravel quarry. The test should include: Gradation test, Plasticity test, Proctor test and CBR test. The result of the test shall be submitted to LebRelief office before deciding whether or not to use the quarry.

- **Testing for concrete (compressive strength test):** This activity is the testing for concrete strength for major structures such as a bridge or drift or concrete for a big box culvert. during mixing the concrete and curing for 7 days then send the moulds for compressive strength test.
- **Gradation test for aggregate or sand.** This activity is the gradation test in laboratory for aggregate or sand to use for concrete work or road base.
- **Geotechnical investigation:** The purpose of the activity specified herein is to determine the type, nature and characteristics of subsurface materials and the extent and conditions of the various materials of soils foundation and assess soils bearing capacity. This is to be accomplished by means of core drilling, field testing sampling, laboratory testing and analysis. The Contractor will provide access roads as he deems necessary for the execution of work. The Contractor will also provide a report summarizing and interpreting field and laboratory results.

203.3 MEASUREMENT AND PAYMENT

The cost of laboratory tests is reimbursed after receiving test results by the contractor.

204. SITE CLEARANCE

204.1 BUSH CUTTING, GRASS CLEARING AND GRUBBING

204.1.1 Equipment

This activity requires hand tools, such as bush knives, slashers, wheel barrow and rakes.

204.2 FILL AND LEVEL BY SELECTED MATERIAL (HAULAGE WITHIN 50M)

204.2.1 Material

To be of good quality, the soil should have the following characteristics:

- Well graded from fine to coarse with a maximum particle size of 60 mm.
- The particles should be strong and not crumble under compaction equipment.
- The particles should be angular and not rounded.
- The soil should not contain organic soil, sticks, leaves, etc.
- If the soil is to be covered with another layer, it should have very low plasticity
- If the soil is to be used as a riding surface, it should have some plasticity.
- The Project Engineer must approve all soil before it is used.

204.2.2 Equipment

This item requires hand tools to excavate, spread and shape, light haulage equipment (wheel borrow) to carry, and compaction equipment (roller and water truck / water bowzer) to compact the soil.

204.3 FILL AND LEVEL BY SELECTED MATERIAL (HAULAGE DISTANCE - KM)

204.3.1 Material

To be of good quality, the soil should have the following characteristics:

- Well graded from fine to coarse with a maximum particle size of 60 mm.
- The particles should be strong and not crumble under compaction equipment.
- The particles should be angular and not rounded.
- The soil should not contain organic soil, sticks, leaves, etc.
- If the soil is to be covered with another layer, it should have very low plasticity.
- If the soil is to be used as a riding surface, it should have some plasticity.

LebRelief Project Engineer must approve all soil before it is used. All soil should be obtained with minimum environmental damage.

204.3.2 Equipment

This activity requires hand tools to excavate, haulage equipment (like truck) to carry, and compaction equipment (roller and water truck / water bowzer) to compact the soil.

204.4 FILL AND FORM CAMBER BY SELECTED MATERIAL

204.4.1 Description

This item is the excavation, haul (or transport), spreading to form a road camber and compaction of good quality soil from a selected source. In some cases, the formation of a camber can use soil which has been cut from the road surface, the alignment of an intended drain or a slope next to the road, and which is good quality.

204.4.2 Material

The soil for the camber should be of good quality (well graded, hard particles, clean of organic material, low plasticity) as characteristic mentioned in 205.6 above. The soil should be approved and instructed for use in the camber by LebRelief Project Engineer.

204.4.3 Equipment

This activity requires hand tools to excavate, spread and shape, light haulage equipment (wheel borrow) to carry, and compaction equipment (roller and water truck / water bowzer) to compact the soil.

204.5 FILL EMBANKMENT

204.5.1 Description

This item is the excavation, carrying/haul, spreading to level, sloping and compaction of good quality soil from a selected source. The soil to be filled and spread in layers no thicker than 15 cm and to the required level.

204.5.2 Material

The soil for the filling of the embankment layers should be of good quality (well graded, hard particles, clean of organic material, low plasticity) as characteristic mentioned in item (Fill and form camber by selected material) above.

204.5.3 Equipment

This activity requires hand tools to excavate, spread and shape, haulage equipment (wheel borrow or truck) to carry, and compaction equipment (roller and water truck / water bowzer) to compact the soil.

204.6 ROAD BASE (WHERE THE NATURAL GRAVEL IS NOT AVAILABLE THIS MATERIAL WILL BE USED AS ROAD SURFACE FOR THE AGRICULTURAL ROAD)

204.6.1 Description

The item is the supply of suitable base materials on site, spreading on a compacted sub base layer (or cambering layer) and compaction. Materials selected for use as road base should be crushed aggregate with proper proportion of gradation and fine material that meet the requirements in the specification and shall be free of lumps of organic, or other deleterious materials.

204.6.2 Materials

The base material should have the following characteristics:

- Well graded from fine to coarse with a maximum particle size of 50 mm
- The particles should be strong and not crush under compaction equipment
- The particles should be angular and not rounded
- The material should not contain organic soil, sticks, leaves, etc.
- The material should have very low plasticity
- The material should be obtained from an approved crusher
- Detail characteristic of the material is shown in table below.

Tables below show required grading and characteristic of base material

Grading Requirements for Base Course Material

Sieve Size		Percent by Weight Passing
ASTM	(mm)	

2"	50	
1 ½"	37,5	100
1"	25,0	79 - 85
¾"	9,50	44 - 58
No.4	4,75	29 - 44
No.10	2,0	17 - 30
No.40	0,425	7 - 17
No.200	0,075	2 - 8

Material Properties required for base course material

<i>Property</i>	<i>Gravel</i>
Plasticity Index PI (%)	0 - 6
Liquid Limit LL (%)	0 - 25
CBR of 98% MDD	min.80 %

LebRelief Project Engineer must approve all granular crushed aggregate base material before it is used. All base material must be obtained with minimum environmental damage.

204.6.3 Equipment

This activity requires hand tools and haulage equipment (trucks) to carry the base material and compaction equipment (roller and water truck/water bowser).

205. STRUCTURE WORKS

205.1 CONCRETE (LEAN CONCRETE) OF MIX PROPORTION 1:3:6

205.1.1 Description

This item is the supply and construct of an element of a concrete structure using lean concrete or mass concrete. This concrete is normally used in situations where high strength is not required, such as a foundation on which a water crossing structure will be constructed. Steel reinforcement is not fixed in this type of concrete.

205.1.2 Materials

- Material required for the concrete proportion in volume 1:3:6.
- The lean concrete should be made from fresh cement, clean angular sand and clean hard aggregate (stones 20 mm down) mixed by volume in the ratio 1:3:6
- Ideally the aggregate should be angular, but this may not be possible if the aggregate is taken from a river. (Details required size of aggregate is shown in table (**Gradations of Aggregate for the concrete work**))
- Fresh clean water should be added to give a workable mix.
- The strength of the concrete after 28 days, if it can be measured, should be 10 N/mm².
- The table in section (**Gradations of Aggregate for the concrete work**) below show gradations specification of aggregate for the concrete work (proportions: 1:3:6, 1:2:4 and 1:1.5:3)

LebRelief Project Engineer must approve all cement, sand and aggregate before it is used. All sand and aggregate must be obtained with minimum environmental damage.

205.1.3 Equipment

This activity requires hand tools and mechanical or manual concrete mixer and concrete vibrating equipment.

205.2 CONCRETE OF MIX PROPORTION 1:2:4

205.2.1 Description

This item is the supply and construct of an element of a concrete structure using structural concrete. This concrete is used in situations where medium strength is required, such as the infill between culvert barrels, slab of small culvert or low level elements of a water crossing structure. Steel reinforcement is normally fixed in structural concrete.

205.2.2 Materials

Material for the concrete should:

- Be made from fresh cement, clean angular sand and clean hard aggregate (stones 20 mm down) mixed by volume in the ratio 1:2:4.
- Ideally the aggregate should be angular, but this may not be possible if the aggregate is taken from a river. (Details required size of aggregate is shown in table ((**Gradations of Aggregate for the concrete work**))
- Have clean fresh water added to give a workable mix
- The strength of the concrete after 28 days, if it can be measured, should be 20 N/mm².

The table in section (Gradations of Aggregate for the concrete work) below show gradations specification of aggregate for the concrete work (proportions: 1:3:6, 1:2:4 and 1:1.5:3)

The concrete 1:2:4 normally includes reinforcement steel. All details relating to reinforcement steel are given in the specification for activity (**Reinforcement steel bar**).

LebRelief Project Engineer must approve all cement, sand and aggregate before it is used. All sand and aggregate must be obtained with minimum environmental damage.

205.2.3 Equipment

This activity requires hand tools and mechanical or manual concrete mixing equipment.

205.3 CONCRETE OF MIX PROPORTION 1:1.5:3

205.3.1 Description

This item is the supply and construct a concrete structure using structural concrete. Structural concrete is used in situations where high strength is required, such as high walls or the deck slabs of a water crossing structure. Steel reinforcement is normally fixed in structural concrete.

205.3.2 Materials

This activity requires structural concrete. The structural concrete should:

- Be made from fresh cement, clean angular sand and clean hard aggregate (stones 20 mm down) mixed by volume in the ratio 1:1.5:3.
- Ideally the aggregate should be angular, but this may not be possible if the aggregate is taken from a river.
- Have clean fresh water added to give a workable mix.
- The strength of the concrete after 28 days, if it can be measured, should be 25 N/mm².

Structural concrete normally includes reinforcement steel. All details relating to reinforcement steel are given in the specification for activity (Reinforcement steel bar).

LebRelief Project Engineer must approve all cement, sand and aggregate before it is used. All sand and aggregate must be obtained with minimum environmental damage.

Table below show Gradations of Aggregate for the concrete work (proportion: 1:3:6, 1:2:4 and 1:1.5:3)

Sieve Size		Weight per cent of which passes aggregate					
Inch (in)	Standard (mm)	Fine	Coarse				
			Size max. 37.5 mm	Size max. 25 mm	Size max. 19 mm	Size max. 12.5 mm	Size max. 10 mm
2	50.8	-	100	-	-	-	-
1.5	38.1	-	95-100	100	-	-	-
1	25.4	-	-	95-100	100	-	-
0.75	19	-	35-70	-	90-100	100	-
0.5	12.7	-	-	25-60	-	90-100	100
3/8	9.5	100	10-30	-	20-55	40-70	95-100
#4	4.75	95-100	0-5	0-10	0-10	0-15	30-65
#8	(RE	80-100	-	0-5	0-5	0-5	20-50
#16	MO	50-85	-	-	-	-	15-40
#50	VAL	10-30	-	-	-	-	5-15
#100	OF TOP	2-10	-	-	-	-	0-8

205.3.3 Equipment

This activity requires hand tools and mechanical or manual concrete mixing equipment.

205.4 REINFORCEMENT STEEL BAR

205.4.1 Description

This item is the supplying, cutting, bending and fixing of reinforcement steel bars within a space into which concrete will be poured, typically to form part of a structure.

205.4.2 Materials

All reinforcement steel bars are shown on the contract drawings, either high tensile or mild steel. All reinforcement steel should be bought from a known and good quality source. Reinforcement steel normally rusts slightly when in storage so it should be cleaned before use with a wire brush. It should be stored in as dry a place as possible.

Good quality fixing wire is required.

It is also necessary to make spacer blocks in advance, normally from cement/sand mortar with a length of fixing wire embedded in the block. These blocks will be fixed to the outer surface of the steel mesh so that it does not move close to formwork when the concrete is being poured.

205.4.3 Equipment

This activity requires hand tools to clean, cut and bend the reinforcement steel and fix it securely in place.

205.5 BACK FILLING FOR STRUCTURES

205.5.1 Description

Backfilling is required for structures, foundation walls, abutment walls, retaining walls, culvert, gabion works and shall be done in accordance with the Drawings. This item includes supply selected material, backfilling, levelling, shaping and compacting the approaches of constructed structures to a required length as directed by LebRelief Project Engineer.

205.5.2 Material

To be of good quality, the soil should have the following characteristics:

- Well graded from fine to coarse with a maximum particle size of 50 mm
- The particles should be strong and not crush under compaction equipment
- The particles should be angular and not rounded
- The soil should not contain organic soil, sticks, leaves, etc
- If the soil is to be covered with another layer, it should have very low plasticity
- If the soil is to be used as a riding surface, it should have some plasticity

LebRelief Project Engineer must approve all soil before it is used. All soil should be obtained with minimum environmental damage.

205.5.3 Equipment

The activity requires hand tools, truck and compaction equipment (roller, mechanical tamper and water truck).

205.6 FORMWORK AND SUPPORT

205.6.1 Description

Formwork shall include all temporary forms required for forming the concrete slab of bridges, culverts or building together with all temporary construction required for their support. This item include supply, cut and fix timber for the formworks, place timber or wooden supports for the formworks and fix necessary wooden / bamboo bracing for the supports

205.6.2 Materials

All timbers for the formwork must be approved by the Project Engineer before fixing. Timber plank should be of quality medium to good timber and thickness should not be less than 20 mm. Size of timber for poles should be 50 mm x 50 mm. Size of timber for beam should be 100mm x 50 mm. The supports can be timber of size of 50 mm x 50 mm or wooden poles of 70 - 100 mm diameter.

205.6.3 Equipment

This activity requires carpentry tools.

205.7 SUPPLY AND INSTALL REINFORCED CULVERT PIPE INTERNAL DIAMETER: 60 CM, 80 CM, 100 CM

205.7.1 Description

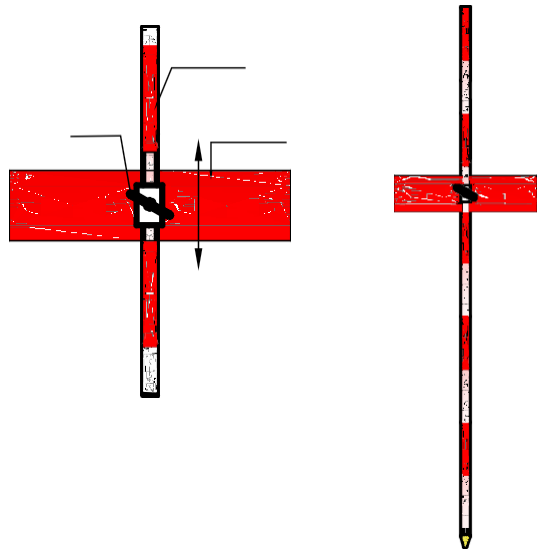
This Item consists of supplying the concrete pipe rings, laying and joining the rings. Excavation and back filling, culvert head and wing walls and aprons are not included in this Item.

205.7.2 Material

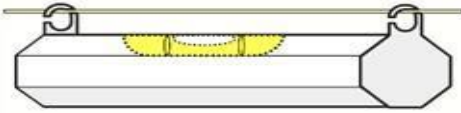

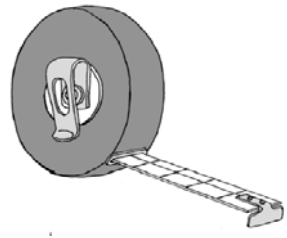
- The pipe rings shall be of reinforced concrete with ogee (male and female) joints, of concrete Class 20, at least 28 days cured, and where possible, manufactured on site.
- If the pipe rings are not manufactured on site, the supplier must be approved by LebRelief Project Engineers. The ring shall in standard length of 1 m.
- The culvert gradient including the outlet shall be minimum 2%.
- Culvert joints shall be sealed with mortar of 1:3.

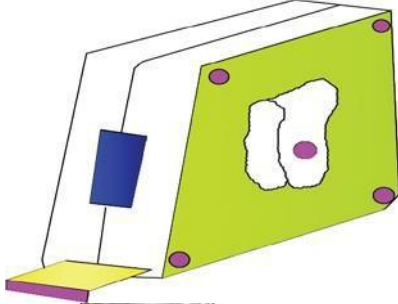
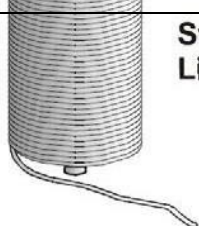



205.7.3 Equipment

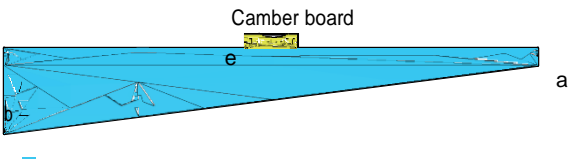
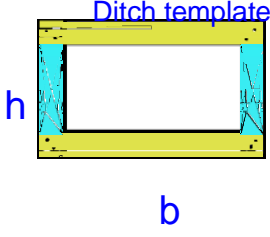
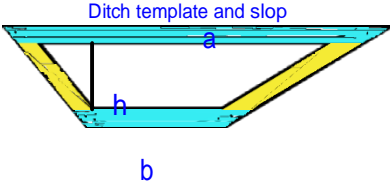
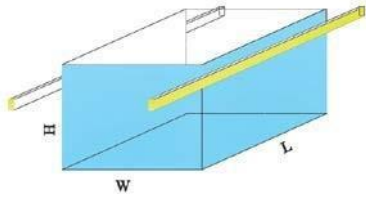
- The activity requires hand tools, truck, mechanical tamper

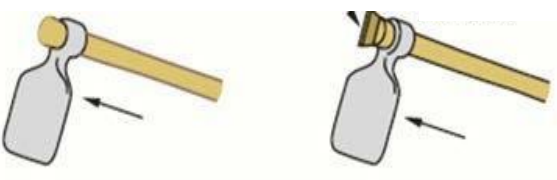
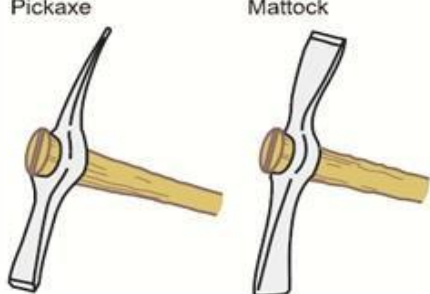
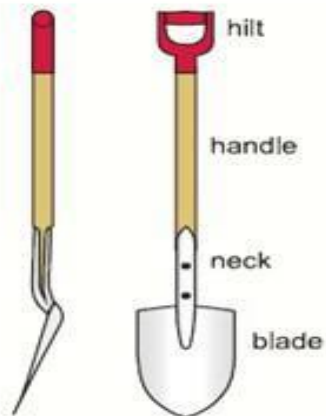


206. TECHNICAL SPECIFICATIONS FOR HAND TOOLS

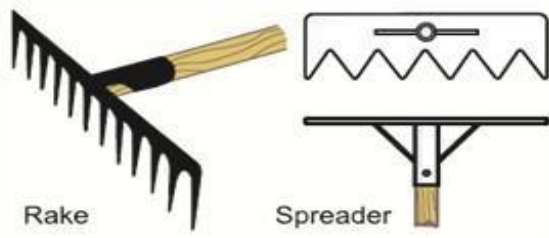
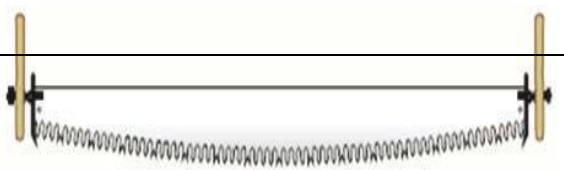

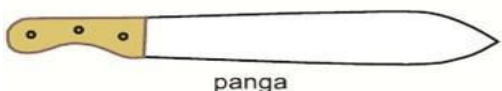
Description	1. Setting out tools	
<p>Line level is used with a clear nylon string to transfer the exact level of one location to another point. The line level is a short spirit level (about 100mm long) with a hook at each end to hang it from a smooth nylon string. This instrument needs two persons to operate – one at the end of the line, and the second to watch the spirit level.</p>		
<p>Ranging rod and profile board: Ranging rods are used to set out the straight and curve lines and to support profile boards on both straight and curved sections of the road.</p> <p>Ranging rods are made of hollow metal tube, often 20-25mm diameter galvanized pipes, with a pointed end of sharpened reinforcement steel and have 2m long. They are painted alternately red and white to make them easy to see during setting out. The length of red/white sections is 250mm.</p> <p>Profile boards are used to set out the road profile in straight grade, sage or crest sections. A profile board is used to attach to a ranging rod. It has a screw mechanism that enables the profile board to slide up and down on the ranging rod and be fixed at any desired point simply by tightening the screw.</p>	<p>Ranging rod</p> <p>Metal clam Adjusted profile board 40 cm x 10 cm</p>	
<p>Measuring tape: The most common length of tape measures used for setting out are: Long tape 30-50m and short tape 5-7.5m.</p> <p>The measuring tapes are made of steel or linen. The long tape is used for measuring long distance especially for measuring longitudinal alignment while short tape is used for measuring short distance and cross section of a road.</p> <p>The numbers/marking on the tape becomes unreadable after a period of use. Important is to keep tape clean</p>		

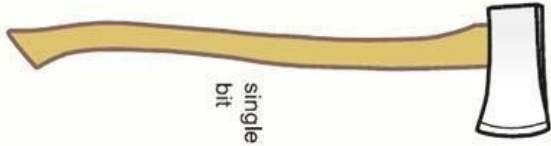

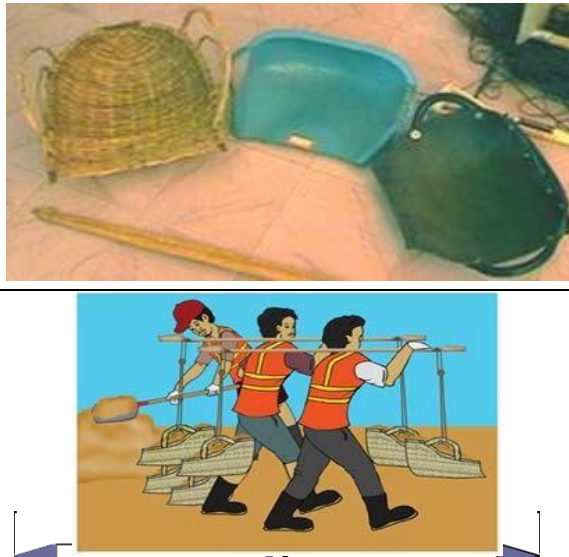
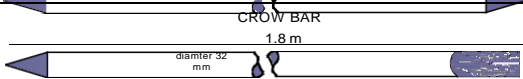
<p>and avoid dirt from entering the dust.</p> <p>Note: The zero point is not always located at the same place on different tape measures.</p>	
<p>String line is used with pegs for setting out activity and quality control for road work and drainage structure works. The string line is commonly made of nylon string of diameter 3-4 mm.</p>	 <p>String Line</p>
<p>Hammer: There are difference size and weight of hammers that are used for difference purposes. Big hammer is made of solid steel with wooden handle. Weight of the hammer between 3-5 kgs fixed with wooden handle of length between 50-70cm depends on weight of the hammer. This big hammer is commonly used for breaking stone. Small hammer is also made of solid steel with wooden handle. Weight of the hammer between 1-3 kgs. Length of the wooden handle between 30-40 depends on weight of the hammer. This small is commonly use for hammering pegs, metal spike for setting out activity. It is also used for carpentry work for structure works.</p>	 <p>Club Hammer</p>
<p>Peg: is a locally made material for setting out. The peg is made from bamboo / wood stick. The length is required to be within 30 cm to 50 cm. The stick can be diameter between 3-5 cm and bamboo strip of 3-5 cm and has one shape pointed end. When setting out on a hard soil metal peg should be used. The metal peg can be a deformed bar of 12-14 mm diameter.</p>	
<p>Metal spike/pointed chisel: The metal spike / pointed chisel is usually manufactured either as round or octagonal section rods. For the setting out the diameter should be minimum 20mm. The length is required to be within 30 cm to 40 cm. The spike is made of carbon steel and should have one pointed end.</p> <p>This instruments is used with hammer to make a hole before placing the ranging rods or pegs in the ground,</p>	 <p>Metal Spike</p>

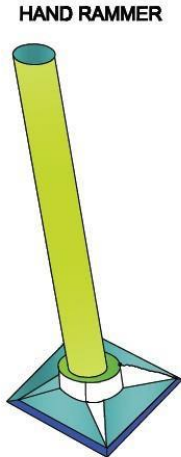
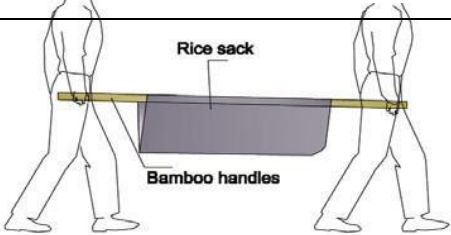
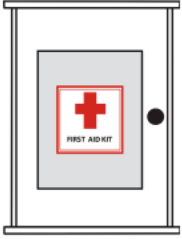
<p>when the setting out is carried out in hard and compact soils.</p>	
<p>Camber board is used for setting out of a road camber or checking camber of a road. The chamber board consists of timber plank of trapezium shape. The longer side of the plank is designed of half width road carriage way. Thickness of the plank between 2-3 cm. Dimensions of <i>a</i>, <i>b</i> and <i>e</i> as shown in the right hand side figure depend on designed width of the road and cross slop of the camber:</p> <p><i>Example width of road is 4 m and camber 10%, a=5 cm so e= 200cm and b=5+200/10=25cm.</i></p> <p>A spirit level is placed at middle of the plank as shown in the figure right hand side to ensure the plank is horizontally placed during checking or setting out for camber.</p>	
<p>Ditch template is used for checking ditch of a road side drain before allowing to cut slop of the side drain.</p> <p>The ditch template is made of timber frame of rectangular shape. Width of the timber frame between 5-7 cm and thickness 2-3 cm.</p> <p>Size of the template depends on side drain design. Commonly size of the ditch template is <i>b=50-60 cm</i> and <i>h= 30-50 cm</i></p>	
<p>Side drain template is used for checking earth side drain of a road. The side drain template is made of timber frame of trapezium shape. Width of the timber frame between 5-7 cm and thickness 2-3 cm.</p> <p>Size of the template is commonly: <i>b=50-60 cm</i> and <i>h= 30-50 cm</i> and <i>a=140-150 cm</i></p>	
<p>Gauge boxes are used to batch, or measure volumes of the material, to control the mix proportions of concrete. The gauge box should be prepared based on quantity of 1 bag of cement</p> <p>The gauge box must be filled level with the top so that the volume of the sand and stone measured out is equal to the volume of a bag of cement. The sand and stone in the gauge box must not be compacted when filled up.</p>	






<p>For 1 bag of cement (40 kg) <i>W= 30 cm, H= 30 cm, L= 32 cm</i> <i>Volume= 0.029 m³</i></p>	
<p style="text-align: center;">Description</p>	<p style="text-align: center;">2. Hand tools</p>
<p>Hoe is used for excavation of soil, spread gravel, mix concrete or mortar. It consists of a blade and a handle.</p> <p>The blade of the common hoe has a straight cutting edge. The eye can be round or oval, although for road works the oval eye is recommended. The round eye makes it easier to replace the handle but the blade tends to turn while working. The hoe should have a suitable length handle (1.2-1.5m) so that the laborer can work standing upright.</p>	
<p>Pickaxes and mattocks are used for excavating stony, hard soils which are difficult to penetrate with hoes. These tools have an oval eye so that the handle cannot turn in the eye. Weights of the pickaxe is between 2.7 and 3.6kg and the mattock between 1.8 and 2.7kg. They have double edge striking tools and have straight handle with an elliptical rather than circular cross-section. The handle should be provided with a raised safety grip which prevents the handle slipping out of worker's hands.</p>	
<p>Shovel is used for scooping up material and throwing it on to a truck, wheelbarrow or directly to where the material is needed and use for mixing concrete and mortar. The shovel has a rounded or pointed blade.</p> <p>The handle for the shovel should be long enough to allow the worker to throw the soil with little effort. Shovels should not have sharp joints which damage the hands of user.</p>	

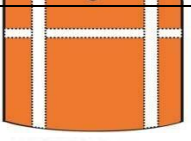
shovel

<p><u>Spreader and rake</u></p> <p>Rake is used in road works for collecting vegetation from loose soil when grubbing, but can also be used for spreading if the soil is not stony. Rakes have 10 to 16 teeth, each about 75-100mm long, with an overall width of about 400-450mm. They require straight handles made of hard wood or metal tubes.</p> <p>Spreader is used for spreading out the soil on fills. A spreader can be a heavy-duty rake. The spreader is very useful when forming the camber and for spreading gravel. It is made of sheet metal (3-4mm thick) and have a ridge for crushing lumps of soil. Spreader can be pointed or flat, depending upon the nature of the gravel to be spread.</p>	 <p>Rake</p> <p>Spreader</p>
<p><u>Saws</u> are used to cut trees, branch of tree, bush and wood. There are difference type of saws are used for cutting difference size of tree, bush or wood.</p> <p>Big saw is used to cut big tree or wood operate with two persons while small saw (steel frame bow saw)can be sue single person.</p> <p>Big saw is made from steel blade of 1.5-2 m long with wooden handles fixed at both end of the blade.</p> <p>Small saw (steel framed bow saws) is used for cutting small trees, tree branches and bush. A narrow blade is held in tension by the frame. A quick release lever applies tension to the blade. The lever, combined with an oval sectioned frame, provides a comfortable handgrip. Blades are 20-25mm wide and are produced in a standard length. The frame is made of mild steel and the blade is made of high carbon alloy steel.</p>	 <p>frame</p> <p>release lever</p> <p>blade</p>  <p>machete</p>
<p>Bush knives: Bush knife is used for clearing the bush and cutting tree branches along the road alignment. It is also used for cutting and sharpening peg. The bush knife is made of steel shape blade and wooden round handle.</p>	 <p>panga</p>

<p>Axe is used to cut bush, tree, branch and stripping branches of felled trees. The axe can be shaped as cutting edge (blade) while the head of the axe can be used instead of hammer.</p> <p>The eye of the axe is oval and is fixed to the handle with a wedge. Handles are normally 70 to 90cm long made from seasoned hardwood shaped in an ergonomically sound fashion.</p> <p>Smaller axes, also referred to as hatchets, are often used for cutting small trees and branches instead of a bush knife. They are also used for producing setting out pegs.</p>	 <p>single bit</p>
<p>Wheelbarrow: The wheelbarrow can be a useful piece of transportation equipment over short distance (up to 200 metres). Wheelbarrows are used at sites in earthworks and structure construction for transport the construction material such as soil, sand, aggregate, stone, concrete etc.</p> <p>Wheelbarrows are made in many different types and qualities. A good wheelbarrow should take a big load (struck capacity approximately 60 to 70 litres) and be easy to balance and tip. The common wheelbarrow is a single front rubber tyre.</p>	
<p>Basket is used for carrying soil or gravel for a short distance. A typical basket has a pay-load of 5 to 6 kilograms of soil. Basket can be made from local basket making materials (bamboo) or used tires or manufactured in plastic. Baskets are very suitable for dry soil, and although they are not as durable, they can be fixed with local materials and cost about half the price.</p> <p>Plastic and Rubber Tyre baskets are most suitable for wet soils. Baskets can be carried individually or two can be balanced on a shoulder pole, at the end of ropes, like a scale, depending upon the workers strength and preference.</p>	
<p>Crow bar is used mostly for digging stony, very hard soils or moving the boulders or heavy things when used in the right way as a lever. The crowbar looks like a simple tool, but it has to be of very</p>	

<p>strong material that does not bend easily and be well designed to function properly.</p> <p>Crowbar is manufactured either as round or octagonal section rods. For infrastructure work the diameter should be minimum 30mm. The length is required to be within 1.5 to 1.8 meters. The bar is made of carbon steel and should have one pointed and one chisel end</p>	
<p>Hand rammer is used for compacting soil and gravel and consists of a weight with a long handle. The weight can be made of various materials such as steel, concrete or solid wood. Ideally the weight should be as large as possible and the area as small as possible. A rammer which can be handed by a worker should therefore have a weight of some 6– 8kg and a bitumen surface size: 13 cm x13 cm or 15cm x 15 cm. The handle must be long enough between 1.5 to 2 m.</p> <p>Hand rammer is used to compact in small and confined areas such as around culverts, potholes and other places where it is impractical or difficult to access with rollers.</p>	 <p style="text-align: center;">HAND RAMMER</p>
<p>Sack Stretcher: A Sack Stretcher is a locally made for carrying soil and gravel. An empty rice sack is cut open. Two thick straight bamboo poles about 1.5 meters long are sewn along the length of either side of the cloth, to make a stretcher.</p> <p>The Soil to be carried is placed on the sack carry by two persons.</p>	 <p style="text-align: center;">Rice sack Bamboo handles</p>
<p><i>Description</i></p>	<p>3. Safety measures and safety gear</p>
<p>First aid kit must include items like plasters, bandages, disinfectant, antiseptic cream, clean fresh water for washing eyes, saline, irrigation syringe, sterile dressings, adhesive tape, scissors, disposable gloves.</p> <p>The First Aid Kit must be available on site, regularly checked and restocked</p>	

<p><u>Markings and detours</u> Place warning signs or cones at each end of the work area. The warning signs should be placed 50-100 m away from the working areas. The text on the warning signs should read: "KUIDADU" or " HALAI NENEIK"</p> <p>Deep excavations (more than 1.5 m) for foundations etc shall be clearly marked and fenced off in a way that people cannot drive or fall into the excavation.</p>	
<p><u>Safety Goggles</u> should be used when there is a risk for eye injury, eg when:</p> <ul style="list-style-type: none"> • breaking rocks • welding 	
<p><u>Boots</u> should be used when:</p> <ul style="list-style-type: none"> • mixing concrete and mortar • working in wet or muddy places • working with sharp tools <p><u>Closed shoes</u> should be worn at all other times</p>	
<p><u>Gloves</u> should be used when:</p> <ul style="list-style-type: none"> • carrying heavy load and when using hand tools • working with concrete and masonry work (rubber gloves) • bending and fixing steel bars • breaking rocks 	
<p><u>Safety hat or helmet</u> should be used when working in dangerous of falling objects like:</p> <ul style="list-style-type: none"> • in deep drain or foundation excavation • under bridge • under tall tree 	

<p>Bright vest should be used by site supervisors to easily identifying who is responsible on the worksite. If working on a road with frequent traffic then all workers must wear a safety vest.</p>	
<p>Masks are used when working in places that produce a lot of dust or bad smell.</p>	