ANNEX M: MCA-NEPAL AND ETP PROJECT GUIDELINES

Where there are no regulations or gazetted standards, the guidelines in this Annex provide guidance for Contractors that must be followed in compliance with this ESHSMP.

M.5.4 Constructing and Maintaining Earth Access Trails

Earth trails shall be aligned to follow the best possible route. Wherever feasible, they shall avoid steep slopes and streams. The amount of cut and fill shall be minimised.

Soil conservation measures shall be provided as necessary, including grassed and vegetated cut and fill slopes, grassed longitudinal drains, and check dams in drains for steep gradients.

Silt traps shall be used where required on drainage outfalls.

When carrying out maintenance, it must be ensured that vegetated slopes and drains are left intact, and silt is removed from the drains by hand.

Waste material must not be pushed down slopes or on to surrounding land. This material shall be recycled on to the trail or disposed of at a suitable waste dump.

Appropriate bio-engineering techniques shall be implemented to prevent soil erosion and landslides in areas where substantial access trails will be developed.

Routine environmental monitoring shall be undertaken of the water quality downstream of heavily used earth trails.

M.5.6 Guidance Rules for the Use of Sulphur Hexafluoride

Strict procedures for the transport, storage, handling and use of transformers filled with sulphur hexafluoride (SF_6) must be prepared by the substation Contractors, approved by the Engineer and MCA-Nepal, and followed at all times.

Guidance rules for the use of transformers filled with SF_6 are as follows.

- Do not drop or roll SF_6 cylinders.
- Do not apply direct heat to cylinders.
- Do not allow cylinder temperature to exceed 50°C.
- Do not store cylinders in direct sunlight.
- Store cylinders with the valve cap firmly in place
- Use a blanket heater or submerse in warm water to facilitate the transfer of SF_6 gas.
- Do not use an open fire for this purpose.
- Do not invert cylinders while removing SF_6.
- Use an appropriate fill hose with a proper regulator or relief device when filling from a cylinder.
- Weigh and document SF_6 gas usage every time it is added or removed from equipment, regardless of amount.
- Use a mass flow controller or weigh scale for this purpose.
- Do not rely on pressure differential calculations
- Locate and repair all leaks on equipment: leak detection tools are readily available, such as halogen leak detectors and camera detectors, which do not require an outage; and soap solutions, which may require an outage, depending on location.
- Keep hoses and equipment sealed and capped.
- Use care when connecting hoses to a SF_6 source so as to not let air into the system.
- After the handling procedure is completed, test for moisture and purity to verify the integrity of the SF_6 gas.
- A vacuum of <1 torr must be held for 1 hour. Check with specific manufacturer for their equipment specification.
- Do not fill an asset with SF_6 that has not been evacuated.
- SF_6 must be filtered for decomposition products.
- Use a multi-gas SF_6 decomposition analyser that tests for purity, moisture and acids to address safety

concerns.

- Do not intentionally "sniff" SF_6 to check for a faulted condition.
- SF_6 must be reclaimed – do not vent it to the atmosphere.
- Moisture in SF_6, combined with switching, could produce harmful acids. Perform routine moisture measurements.

M.5.9 Vegetation Clearance

The clearance of vegetation is permitted in certain areas in preparation of earthworks or for access to facilities, only as stated in the EIA and approved by MOFE. The swathe that may be cut is limited to the minimum required for the purpose in hand. In the case of the transmission line right of way (ROW), the swathe is to cover only the width of the legally defined ROW.

No vegetation may be cleared unless it is explicitly covered in the conditions of the relevant Environmental Permit. This may be allowed for in the EIA or the ESHSMP.

Vegetation shall be cleared only by cutting. The use of fire, herbicides or other poisons is not permitted. The use of earth-moving equipment is permitted only at tower sites if the works require the grubbing out of plant roots. Otherwise all roots and stumps shall be left in the ground.

Vegetation may be cut using either hand or machine tools. In all cases, appropriate personal protective equipment shall be used by the workers involved.

The vegetative debris shall be laid down to rot, thereby acting as mulch and helping to mitigate damage to the soil. Where clearance is for construction, then the debris may be removed to a suitable approved dump site. If a bare sloping area is created by vegetation clearance, then appropriate erosion control measures shall be implemented. Separate guidelines are provided to cover this.

M.5.12 Management and Use of Explosives at Tower Sites or in Quarries

General principle

It is expected that any use of explosives by the ETP will be undertaken by or in close collaboration with the Nepal Army. In that case, the Nepal Army's guidance shall be followed. If a Contractor is officially permitted to use explosives, then this guideline shall be followed.

Meanings of terms

In this guideline, the following meanings shall apply.

(a) "Operator" in relation to a site where blasting is taking place means the person in overall control of the working of the quarry.
(b) "Shot" means a single shot or a series of shots fired as part of one blast.
(c) "Shotfirer" means a person appointed to be responsible for shotfiring operations.
(d) "Shotfiring operations" include:
    (i) checking to ensure that the blasting specification is still appropriate for the site conditions at the time the blasting is to take place;
    (ii) mixing explosives;
    (iii) priming a cartridge;
    (iv) charging and stemming a shothole;
    (v) linking or connecting a round of shots;
    (vi) withdrawal and sheltering of persons;
    (vii) inspecting and testing a shotfiring circuit;
    (viii) firing a shot; and
    (ix) checking for misfires.

Transport and storage of explosives

Explosives shall be transported in escorted convoys, in accordance with all prevailing transport and safety rules.

Explosives shall be stored in locked shipping containers in a secure compound sealed from the rest of the quarry site, and with permanent guards to ensure no unauthorised access. Separate containers shall be used for different components (detonators, fuses, charges etc.) and shall be placed at least 10 metres apart with earthen bunds in between, with strict guidance and supervision by the Nepal Army.

Clearance of the site and safety zone

1. The contractor shall not permit any blasting to take place without a 500-metre safety zone cleared around the site. This zone shall be cleared of people, structures and all other infrastructure.
2. Warning notices shall be posted around the site, giving at least 24 hours warning of a blast.
3. The Operator shall notify the CLO in good time to allow deployment of its staff at least one week before a blast or series of blasts, to prepare communities for the blasting and to notify them of the times of blast(s). The signalling system shall also be explained.
4. A siren shall be sounded 30 minutes, 10 minutes, 5 minutes and 1 minute before a blast takes place. The siren shall be loud enough to be heard clearly throughout the site and safety zone. This shall include persons operating machines or required to use ear protection.
5. Where farms occur within the 500-metre safety zone, patrols shall be sent out to ensure they are cleared of people in good time. The warning signal sequence for the blast shall not be started until the patrols have reported that the farms are clear to the best of their knowledge and that they themselves are in places of safety.
6. Where a footpath runs into the safety zone, guards shall be posted at least one hour before the blast to prevent people from entering the safety zone.
7. The site is to be cleared of personnel as soon as the first warning siren is sounded.

Operator's duties

In general, the handling and use of explosives will be done by the Nepal Army and under its guidance. In such circumstances, the Nepal Army's procedures should be followed where they diverge from these.

(a) The operator shall:
  (i) ensure, so far as is reasonably practicable, that all explosives are stored, transported and used safely and securely;
  (ii) appoint one or more competent individuals to organise and supervise all work involving the use of explosives ("the Explosives Supervisor");
  (iii) ensure that at no time is there more than one person acting as the Explosives Supervisor at the site; and
  (iv) keep a copy of the written statement of duties of the person or persons appointed under paragraph (a) (ii) for at least twelve months after the date on which the appointment ceased to have effect.

(b) It shall be the duty of the operator to ensure that:
  (i) there are suitable and sufficient written rules and procedures for:
    - shotfiring operations;
    - appointing shotfirers and storekeepers;
    - authorising other persons who will be involved with the storage, transport or use of explosives;
    - dealing with misfires; and
    - ensuring, so far as is reasonably practicable, that such rules and procedures are complied with;
  (ii) an adequate written specification (whether produced by or for the operator) is prepared for each shotfiring operation to ensure, so far as is reasonably practicable, that when such firing occurs it will not give rise to danger; and
  (iii) a copy of the specification referred to in sub-paragraph (b) is given to any person upon whom it imposes duties.

(c) The operator shall ensure that operations involving the storage, transport or use of explosives are carried out by
  (i) a duly authorised and competent person; or
  (ii) a trainee under the close supervision of a duly authorised and competent person.

(d) The operator shall ensure that:
  (i) such facilities and equipment as are necessary to enable shotfiring operations to be carried out safely are provided;
  (ii) any vehicle which is provided for use in relation to shotfiring operations is so marked as to be readily identifiable from a distance;
  (iii) detonators are stored in separate containers from other explosives; and
  (iv) explosives are kept at all times either in a locked explosives store or under the constant supervision of a suitable person.

(e) The operator shall ensure, so far as is reasonably practicable, that each shotfiring operation is carried out safely and in accordance with the rules required to be made in pursuance of paragraph (b)(i) and any specification required to be prepared in pursuance of paragraph (b)(ii).

Supervision of shotfiring and records of appointment

(a) The operator shall take all reasonable steps to ensure that:
  (i) a trainee shotfirer does not fire shots and is not required to fire shots, except when he is under the close personal supervision of a shotfirer, until the operator is satisfied that he has completed a suitable period of training and has appropriate practical experience; and
  (ii) all shotfiring operations are carried out under the close personal supervision of the shotfirer.

(b) The operator shall ensure that a record of the appointment of any shotfirer or trainee shotfirer is kept at a suitable place until three years after that shotfirer's employment or trainee shotfirer's employment ends.

Shotfirer's duties

Before a shot is fired, a shotfirer shall:

(a) check that the procedure has been followed for clearing the site and the 500-metre safety zone;
(b) check the shotfiring system or circuit to ensure that it has been connected correctly;
(c) where electrical detonators are used, ensure that they have been correctly connected to the shotfiring system or circuit and that the shotfiring system or circuit is tested with an instrument suitable for the purpose from a position of safety;
(d) where appropriate, ensure that the electrical integrity of the shotfiring system or circuit is such as to make a misfire unlikely; and
(e) ensure that the shot is fired from a safe place.

Misfires

In the event of a misfire the operator shall ensure, so far as is reasonably practicable, that:

(a) apart from himself, no person other than the Explosives Supervisor, shotfirer, trainee shotfirer or any other person authorised by him enters the danger area until a period of five minutes has elapsed since the misfire and any shotfiring apparatus has been disconnected from the shot;
(b) appropriate steps are taken to determine the cause of and to deal with the misfire;
(c) a suitable record is kept of the misfire for at least three years; and
(d) appropriate steps are taken to prevent theft of the explosives and detonators or their initiation by an unauthorised person.

Use of ANFO

Where an ANFO (ammonium nitrate / fuel oil) mixture is used, special precautions shall be taken to ensure that there is no pollution. Both of the ingredients can be extremely damaging if they are leached into water courses. For this reason, the following precautions shall be taken when ANFO is used as an explosive.

(a) Ammonium nitrate shall be stored in sealed bags in a dry location.
(b) Fuel oil shall be stored and transported as per the fuel guidelines.
(c) Mixing of ANFO shall be done in such a way that there is no spillage or contamination of the ground. Should any spillage occur, then the spilt material shall be cleaned immediately and all contaminated soil shall be removed for remediation.
(d) The filling and blasting of holes shall be done in the same day to avoid the leaching of ANFO into the water table and polluting of groundwater.

Prohibited activities

(a) A person other than a person appointed by the Nepal Army of the Ministry of Forests and Environment as an Explosives Inspector, a person engaged in the transport of explosives to or from the work site, a shotfirer, a trainee shotfirer, a person authorised to handle explosives at a work site or a person appointed to be in charge of the explosives store shall not handle explosives.
(b) A person shall not bring any substance or article (other than explosives) likely to cause an unintended explosion or fire within ten metres of any explosives or take any naked flame within ten metres of any explosives.
(c) A person shall not forcibly remove any detonator lead or other system for initiating shots from a shothole after the shothole has been charged and primed.

(d) A person shall not charge or fire a shot:
  (i) unless there is sufficient visibility to ensure that work preparatory to shotfiring, the shotfiring operation and any site inspection after the shot is fired can be carried out safely;
  (ii) in a shothole which has previously been fired, unless he is dealing with a misfire; or
  (iii) in any tunnel or other excavation (not being merely a shothole) in the face or side of the quarry wall for the purpose of extracting rock.

(e) A person shall not fire a shot:
  (i) unless he is a shotfirer or trainee shotfirer; and
  (ii) other than by means of a suitable exploder, and the purpose of these guidelines, a safety fuse shall not be deemed to be a suitable exploder.

(f) No person shall be in possession of a mobile telephone when:
  (i) within 50 metres of a charged blast hole;
  (ii) inside an explosive storage compound; or
  (iii) on a vehicle transporting detonators.

Warning of Blasting

Blasting causes considerable concerns locally and can damage the structures of poorly-built houses nearby. The obligatory procedure given below is to be followed for this activity.

Obligatory Procedure for Blasting

1. Never blast on Saturdays, national public holidays, nor at night (6 pm to 7 am).
2. Blasting shall be announced at least 60 hours in advance and the timing agreed with MCA-Nepal's ESP on-site Community Assistant.
3. The blasting warning news shall be broadcast on local radio for a minimum of two days in advance: this shall be done in all local languages as well as English and on at least two radio stations.
4. Communities shall be fully informed of the blast at least 48 hours in advance. To achieve this, workers shall be sent out to carry the blasting notices to all the villages and farms within 2 km from the quarry, to inform the precise time of the blasting operation. The workers shall post the notices on specially appointed notice boards at prominent locations at the nearby villages, the quarry access road and other approaches to the area. The notices shall explain the siren signals (1 hour, 15 minutes and 5 minutes before, and all-clear afterwards) and the grievance redress mechanism.
5. The workers shall also discuss the significance of the blast with the Ward Chair or other community representative.
6. The day before any blasting, the Quarry Manager and the Community Assistant shall visit all households judged to be close enough to the 500-metre fly rock exclusion zone as to require warning of evacuation.
7. On the day of any blasting, additional security shall be deployed around the quarry, and patrols made to enforce the exclusion of people from the 500-metre safety zone.
8. The Blast Operator will sound a loud double siren (15 seconds each with a 15-second gap) 1 hour, 15 minutes and 5 minutes before the blasting shots are fired.
9. Workers equipped with radios for communication shall be sent in all directions from the blasting area to enforce the clearance within the 500-metre fly rock danger zone 1 hour in advance, and keep watching every path leading to the blasting area until the blasting has finished.
10. The Blast Operator shall separately ensure that all workers and security guards are removed to an approved safe location before the blast.
11. At the last minute, the Blast Operator shall confirm the safety one more time through the radios, and then does the blasting.
12. After the blast, the Blast Operator shall check that all shots have fired and that the site is now safe. The all-clear shall then be sounded (a single siren of 30 seconds).
13. After the all-clear has sounded, the community liaison team is sent to the villages to do the investigation for any possible damage.
14. A grievance process including a guidance form for all complaints shall be established, and a reporting mechanism to reach resolution.

15. In the event of a postponement for any reason, the all-clear shall be sounded. The Quarry Manager shall arrange a new time of blasting, which shall be not less than 48 hours ahead. The affected communities shall be informed of the reasons for postponement and updates provided every 24 hours until the blast takes place.

M.5.14a Guideline on Surface Restoration

Before a surface can be stabilised and protective treatments applied, the site must be properly prepared. The surface should be clean and firm, with no loose debris. It must be trimmed to a smooth profile, with no vertical or overhanging areas. The object of trimming is to create a semi-stable slope with an even surface, as a suitable foundation for subsequent works.

Trim slopes to a straight profile, with a slope angle of less than 45°, and as gentle as the terrain allows. Never produce a pronounced convex or concave profile; these are prone to failure starting at a steep point. Trim off steep sections of slope, whether at the top or bottom. In particular, avoid convex profiles with an over-steep lower section, since a small failure at the toe can destabilise the whole slope above. Remove all small protrusions and unstable large rocks. Eradicate indentations that make the surrounding material unstable by trimming back the whole slope around them. If removing indentations would cause an unacceptably large amount of work, excavate them carefully and build a prop wall.

In plan, a trimmed slope does not need to be straight. An irregular plan view is acceptable and, in most cases, reduces costs because protrusions do not need to be removed.

Remove all debris and loose material from the slope surface and toe to an approved tipping site with appropriate bio-engineering to prevent gully erosion. If there is no toe wall, the entire finished slope must consist of undisturbed material.

Where toe walls form the lower extreme of the slopes to be trimmed, you can use the debris for backfilling. Where backfilling is practised, compact the material in layers, 100 to 150 mm thick and sloping back at about 5°, by ramming it thoroughly with tamping irons. This must be done while the material is moist.

Dispose of excess spoil carefully, in an approved tipping site. Just throwing it over the nearest valley side slope is not acceptable. Much slope instability and erosion is caused in this way. Always include adequate provision in your estimates for haulage to an approved safe tipping area.

नेपाल सरकार
वन तथा वातावरण मन्त्रालय
सिंहदरबार, काठमाडौं

M.5.14b Topsoil Restoration

Replacement of Topsoil (and Subsoil)

Before spreading soil back on to a site, erosion and sedimentation control practices such as run-off water diversions, berms, and sediment basins shall be put in place. The slopes and elevations should be graded smooth for the receipt of soil. Slopes steeper than 1v:3h should not normally be considered for re-soiling, but instead should be protected by direct planting with suitable pioneer species.

Topsoil shall be spread evenly over freshly laid subsoil in a layer of 150 to 200 mm depth (or as otherwise approved by the appropriate Engineer representative). When the soil is dry, light compaction shall be provided, such as by one pass by a tracked excavator or small bulldozer. When the soil is moist or wet, then it should be harrowed using standard agricultural implements, or raked by hand, to form a fine tilth. No topsoil operations shall be undertaken while it is muddy or when the subgrade is saturated. The running of vehicles over newly spread topsoil shall be minimised to avoid excessive compaction.

Where embankments are being constructed (such as part of a permanent drainage system), the slope, ground and climatic conditions may reduce the ability of the topsoil layer to bind well with the subsoil layer. In these situations, offsetting lifts of material to create an uneven surface prior to topsoil placement should be considered.

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Where subsoil is available, its use should be considered as part of the rehabilitation process. Where the substrate has the characteristics of subsoil, particularly in terms of allowing root penetration and plant growth (i.e. similar physical and chemical properties to natural subsoil in a similar site), then it may be appropriate only to add topsoil and not to expend energy and resources in re-laying subsoil unnecessarily. Available subsoil may be better retained for the rehabilitation of sites with very poor substrate.

Immediately prior to spreading any available subsoil, the subgrade should be loosened by disking or scarifying to a depth of at least 150 mm to ensure bonding between the layers.

Subsoil shall be distributed uniformly to a minimum compact depth of 500 mm and compaction achieved using a few passes by a tracked machine. No soil shall be spread while it is muddy or when the subgrade is saturated. Any irregularities in the surface shall be corrected that result from stockpiling or other operations, to prevent the formation of depressions or water pockets.

Placement of Topsoil on Engineered Structures

The placement of topsoil on engineered structures shall be at the discretion of the appropriate Engineer representative. In some cases, especially on embankment slopes, it is better to plant vegetation straight on to the earthfill structure rather than to attempt to stabilise a veneer of topsoil. This is because unconsolidated topsoil can become saturated in heavy rain due to the discontinuity below it to a compacted and impermeable substrate; in extreme conditions this can lead to a small mud flow of the topsoil. In some cases topsoil may be specified in porous bags, especially at the toe of a slope, to allow vegetation to grow, while the bags provide temporary stability and protection from scour erosion.

Rehabilitation of Topsoil

Simply replacing topsoil back on top of an altered surface does not constitute rehabilitation. In the best cases, following topsoil placement, the only rehabilitation required is revegetation using planted grasses, as described in the next sub-section, and tending for a period of a few years to allow the processes of nature to aid the rehabilitation process. But in certain cases other work may be needed to ensure that the topsoil returns to a good condition. After stockpiling for periods of more than about six months, the topsoil characteristics will have altered so that only the surface 300 mm or so retains real topsoil characteristics, and the lower 700 mm or so starts to have characteristics more like subsoil.

In many site rehabilitation cases it is difficult to establish the right drainage regime for the soil. Sometimes it may be necessary to alter the compaction or the drainage system to achieve this. Compaction can be reduced by ripping or ploughing the soil, or increased by running machines over it. Frequently the problem lies in the discontinuity between a relatively loose replaced topsoil and the hard substrate below, which does not have the same physical characteristics of naturally occurring subsoil, or the same physical continuity with the topsoil. Therefore, the surface conditions and drainage network in a re-engineered site may need to be quite different from what was there before disturbance.

Compost or manufactured organic soil amendments can be added to topsoil to increase its organic content and assist in rebuilding soil micro-organism populations. Undecomposed organic materials such as wood bark or fibre, grass hay or grain straw should not be mixed into topsoil unless nitrogen fertiliser is included (organic material uses nitrogen to break down and decompose the fibres). Compost derived from livestock or green urban waste (cut brush) is far superior to non-composted manure or wood fibre.

Some borrow areas may be utilised to introduce improved agricultural methods with members of the local communities. If this is done, an agreement may be made to take the area under the control of the livelihoods restoration component of the Resettlement Action Plan before rehabilitation is complete.

Revegetation of Topsoil

All topsoil surfaces must be revegetated as soon as there is enough moisture at the start of the rainy season to allow plant growth. In many cases, the seeds and residual plant parts in the topsoil will grow, giving the initiation of natural revegetation. However, some areas of topsoil require special treatment. These include but may not be limited to, the following.

- Alongside drains.
- Alongside roads.

- On slopes above water courses.
- On steep slopes.
- Around the crest of cut slopes.

In these locations, intensive revegetation measures are essential. The appropriate Engineer representative will make a specific instruction as to the extent of revegetation on site, but as a general rule, at least four lines of planted grasses are required on all peripheries of topsoil stockpiles and rehabilitated borrow areas.

The use of hydro-seeding or other mechanical applications of seeds or plants is not permitted. This is because abundant native species of grass are available locally, and their planting by hand is an excellent way to increase local employment opportunities. The main revegetation technique is therefore the use of planted grass slips (see appropriate guideline). Other revegetation techniques that may be required are as follows.

- Brush layers, made of hardwood cuttings of certain shrubs or small trees. These can be used to create stronger, more substantial barriers to erosion where run-off tends to be concentrated. This technique is described in a separate guideline below.
- Tree or shrub seedling planting. Plants raised from seed in a nursery are planted on to a site to start the process of restoration of the forest vegetation community. This technique is described in a separate guideline below.

M.5.14c Selection of Revegetation Techniques for Erosion Prevention

Selection of Technique

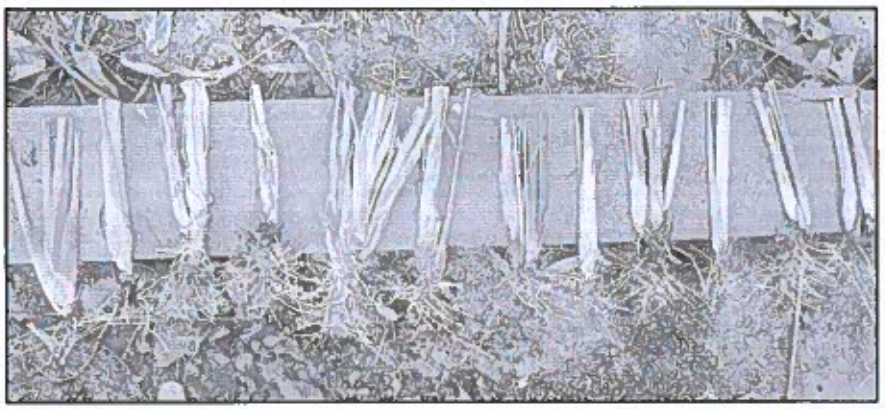
Revegetation techniques should normally be used to cover bare soil slopes, to begin the process of restoring the natural habitat, to control soil erosion or to stabilise or prevent shallow landslips (i.e. where the depth to the sliding surface is shallow, up to 0.5 m).

The table below summarises the best available techniques for different situations.

Location	Technique	Advantages	Disadvantages
Cut slope in soil	Grass planting in lines, using rooted slips.	Rapid and complete surface cover.	Requires a soil slope without too many stones. Slow to establish on hard cut slopes.
Track, terrace or platform edge or shoulder in soil			
Fill slopes, embankments and backfill above walls	Brush layers using hardwood cuttings from trees or shrubs.	Instant physical barrier that interrupts runoff. Stronger than grass. Often successful on stony debris.	Can only be installed on slopes of 1V:1.25H or less, on unconsolidated materials.
Small erosion gullies or small seasonal stream channels			
Other bare areas	Tree planting using potted seedlings from a nursery.	Allows a long term forest mix of trees to be restored.	Takes a long time to establish a complete cover. Seedlings are vulnerable to grazing for a few years.

Materials for Revegetation

Grass slips are small sections of a grass plant, made by splitting up a large clump. The stems are cut down to a height of 100 to 200 mm and the roots cut back to 40 to 80 mm. There should be 2 or 3 stems per slip



Hardwood cuttings are taken from the branches of certain types of small trees. They are cut to be between 450 and 600 mm long, and the diameter should be between 20 and 40 mm in diameter. Shoots and leaves are trimmed off.

It is very important that plant materials for revegetation works are kept cool and damp when they are being moved and prepared.

M.5.14d Revegetation using Planted Grasses

Function. Grass slips (rooted cuttings), rooted stem cuttings or clumps grown from seed are planted in lines on the slope. This form of revegetation uses large clump grasses.

Grasses planted in contour or horizontal lines protect the slope with their roots and, by providing a surface cover, reduce the speed of runoff and catch debris, thereby armouring it.

Grasses planted in diagonal lines protect the slope with their roots and by providing a surface cover, while at the same time helping to drain surface water. They have limited functions of catching debris and draining surface water. The main engineering functions are to armour and reinforce the soil surface, with secondary functions to catch debris and drain moisture. This technique offers the best compromise of the grass line planting systems in many situations.

Sites. Almost any slope less than 50°.

Contour or horizontal lines are used on all slopes less than 35°. Also on steep (35° to 50°) dry sites, where moisture needs to be conserved. They are most widely used on well-drained materials where increased infiltration is unlikely to cause problems. On cultivated slopes, horizontal lines of grass planted at intervals across a field can be used to avoid loss of soil and to help conserve moisture, as a standard soil conservation measure.

Diagonal lines are used on poorly drained materials on steep slopes (35° to 50°) where an increase in infiltration can lead to liquefaction of the soil. It is also useful on damp sites, where moisture needs to be shed.

Timing. Planting work should only be done in the wet season. The slope should be moist when the planting is done. If it does not rain within 24 hours of the work being done, water the plants every day until it does rain. On small sites this may be done by hand but on large sites it will require a water truck and spray cannon.

Spacing of plants. Line spacing depends largely on the steepness of the slope.

- Within rows: plants at 100-mm centres.
- Row spacings: rows at 500-mm centres for diagonal lines;
  for contour lines:
  - slope < 30°: 1000 mm;
  - slope 30-45°: 500 mm;
  - slope > 45°: 300 mm.

Materials. Grass slips are small sections of a grass plant, made by splitting up a large clump. The stems are cut down to a height of 100 to 200 mm and the roots cut back to 40 to 80 mm. There should be 2 or 3 stems per slip. The clumps must be obtained locally (i.e. from similar terrain within 15 km of the planting site) where their loss will not cause soil erosion to start. The source location should have similar environmental characteristics (altitude and soil particularly) to the destination site. The material must be between 6 and 18 months old. Grass clumps must be dug up and brought to site on the same day that the slips are made and planted, and kept cool and moist.

Construction. Prepare the site well in advance of planting. Slopes should be trimmed to an even grade. Trimming should achieve a slope that meets the appropriate design for the material. If there is no design, it should be cut or finished with a straight profile, without undulations that give over-steep portions that are steeper than the grade appropriate for the material.

After slope trimming, remove all debris and either remove or fill in surface irregularities so that there is nowhere for erosion to start. If the site is on backfill material, it should be thoroughly compacted, preferably when moist.

Always start grass planting at the top of the slope and work downwards.

Mark out the lines with string, using a tape measure and spirit level. Make sure the lines run exactly as required by the specification.

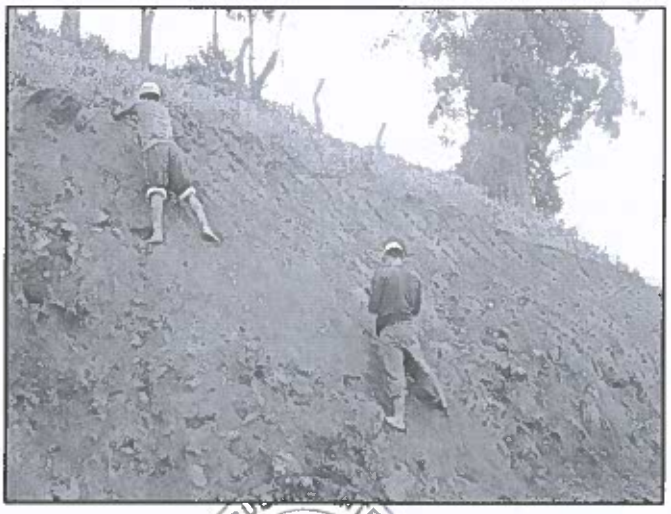
Split the grass plants out to give the maximum planting material. Trim off long roots and cut the shoots off at about 100-mm above ground level. Wrap the plants in damp hessian to keep them moist until they are planted.

With a planting bar (typically a 500-mm section of re-bar with a flattened end), make a hole just big enough for the roots. Place the grass into the hole, taking care not to tangle the roots or have them curved back to the surface. Fill the soil in around them, firming it gently with your fingers. Take care to avoid leaving an air pocket by the roots.
If it looks dry and there is no prospect of rain for a day or two, consider watering the plants by hand.

Example illustration. Grass slips are planted in lines across the slope. The best results usually come from lines that are at 45° to the maximum slope. Start from the top and work downwards.

Mark out the lines on the slope and then plant the grass slips to the original depth and gently firm the soil back around them.

Note that this is an old picture, taken before the days of personal protective equipment usage.



M.5.14e Revegetation using Hardwood Cuttings (Brush Layers)

Function. Woody (or hardwood) cuttings are laid in lines across the slope, usually following the contour. Brush layers protect and reinforce a slope in weak soil. They catch debris and provide a strong and low-cost barrier to erosion, especially on debris slopes, however loose.

Sites. This technique can be used on a wide range of sites up to about 45°. It is particularly effective on debris sites, fill slopes and high embankments.

Timing. Planting work should only be done in the wet season. The slope should be moist when the planting is done. If it does not rain within 24 hours of the work being done, water the plants by hand every day until it does rain.

Spacing. Spacing between brush layers depends on the steepness of the slope. The following spaces should be used.

- Slope less than 30° 2-m interval;
- Slope 30 to 45° 1-m interval.

Within the brush layers, cuttings should be at 50 mm centres, in the double layer described below.

Materials. Cuttings made from woody material of shrubs or trees that coppice well. They must be obtained locally (i.e. within 3 km of the planting site). The material must be between 6 and 18 months old. Cuttings shall be 20 to 40 mm in diameter and 450 to 600 mm long. When taking the cuttings, cut the top at right angles to the stem and the bottom at 45° to make it clear as to which way they should be inserted. Cuttings must be taken the same day that they are to be planted, and kept cool and moist.

Construction. Prepare the site well in advance of planting. Slopes should be trimmed to an even grade. Trimming should achieve a slope that meets the appropriate design for the material. If there is no design, it should be cut or finished with a straight profile, without undulations that give over-steep portions that are steeper than the grade appropriate for the material.

After slope trimming, remove all debris and either remove or fill in surface irregularities so that there is nowhere for erosion to start. If the site is on backfill material, it should be thoroughly compacted, preferably when moist. Using string, mark the lines to be planted, starting 500 mm from the base of the slope.

Always install brush layers from the bottom of the slope, and work upwards. Form a small terrace, with a 20% fall back into the slope. The terrace should be 400 mm wide. If you are brush layering a gravel-filled road embankment you should lay a 50-mm thick layer of soil along this terrace to improve rooting conditions.

Lay the first layer of cuttings along the terrace, with a 50-mm interval between the cuttings. Leave at least one bud and up to 1/3 of the cuttings sticking beyond the terrace edge and the rest inside. The branch growing tips should point towards the outside of the terrace.

Lay a 20 mm-thick layer of soil in between the cuttings to provide a loose cushion.

Lay a second layer of cuttings on top of this, staggered with the first layer. On a gravel-filled embankment slope lay an 80-mm layer of soil over the cuttings before you do any backfilling.

Partly backfill the terrace with the excavated materials. This should not be more than 50 mm thick.

Mark a line 1 metre above the first brush layer and set the string for the next layer.

Repeat the process. As the next terrace is cut, always fill the lower bench with the material excavated from above and compact it reasonably well by gentle foot pressure.

Good site supervision is essential to ensure that lines run along the contours and do not concentrate runoff; also to make sure that cuttings are not allowed to dry in the sun. Well buried cuttings have a higher survival rate.

Example illustration. Mark out horizontal lines every 2 metres down the slope. Start from the bottom and work upwards. Dig shallow trenches along the lines, 350 to 450 mm wide.

Lay the cuttings across the trenches with the bottom inwards and 80 to 100 mm of the top protruding from the slope. The cuttings should be 50 mm apart. Place a small amount of soil over the cuttings and then lay another line of cuttings. Replace all the soil and firm it down gently.

M.5.14f Revegetation using Shrub and Tree Seedlings

Function. Shrubs or trees are planted at regular intervals on a bare area of soil. As they grow, they create a dense network of roots in the soil, helping to reinforce it against erosion or mass failure. It helps to re-establish a vegetation cover on disturbed areas.

Sites. This method can be used without adverse effects on almost any slope up to 30°. With care, it can be used on slopes between 30° and 45°. It can be used on any material and site other than bare rock.

Timing. Planting work should only be done in the wet season. The slope should be moist when the planting is done. If it does not rain within 24 hours of the work being done, water the plants by hand every day until it does rain.

Spacing. The spacing of plants is important. The main considerations are cost and the speed with which a full cover is required. In typical forestry sites, a spacing of 2 × 1 metres is normal, requiring 2,500 plants per hectare. However, in revegetation sites a spacing of 1 × 1 metre is usually necessary, requiring 10,000 plants per hectare. Plants should be planted in off-set rows unless a different pattern is needed for specific erosion control or landscaping effects.

Construction. Prepare the site well in advance of planting. Remove all debris and remove or fill surface irregularities. If the site is on backfill material, thoroughly compact it, preferably when it is moist. Cut all weeds.

If possible, dig pits for the shrubs or trees in advance of the planting programme, but refill them the same day. Pits should be 300-mm deep and 300-mm in diameter if this is possible without causing excessive damage to the slope.

When the ground is wet enough to support reasonable growth, plant out good quality seedlings from a nursery. The bigger the hole made, the better it is for the plant; but there must be a compromise between helping the plant and avoiding excessive disturbance to the slope.

Carefully remove the pot. If it is a polythene bag, do this by slicing it down the side with a razor blade. Take care not to cut the roots.

Plant the seedling in the pit, filling the soil carefully around the cylinder of roots and soil from the pot. Ensure there are no cavities. Firm the soil all around the seedling with gentle foot pressure.

If available, mix a few handfuls of well-rotted compost with the soil around the roots when you are backfilling the hole. Remove any weeds around the plant. Add mulch around the seedling, but with a slight gap so that it does not touch the stem.

Main advantages. Planting shrubs and trees reinforces and restores a slope by establishing a community of larger plants.

Main limitations. Seedlings take about 5 years (or more) to provide a canopy, produce useful materials or contribute significantly to slope strengthening. Care and protection are required in the first three years.

M.6.2 Personal Protective Equipment Provision to Site Staff and Workers

The Contractor shall supply high quality personal protective equipment (PPE) meeting international standards, as appropriate to the needs for each work site and worker's task. The necessary equipment is to be provided to all staff and workers entering the site, irrespective of rank and level of seniority. The equipment is to be comfortable for prolonged use, and is to be replaced as soon as it loses its effectiveness.

The site in-charge is responsible for ensuring that all staff and workers use appropriate safety gear during all hours of work on each site.

Fluorescent jackets shall be worn when on any construction or operational site, or in the proximity of other workers operating machines or tools, or engaged in potentially dangerous activities such as erecting structures. Helmets shall be worn when on any construction or operational site, or whenever there is a danger of head injury from falling or moving items, such as loose formwork, unsecured overhead structures and the tools of other workers.

Goggles shall be worn whenever there is a risk of flying debris, from the use of hammers, drills or other fast-moving or impact-creating tools and machines, welding and other UV/high solar illumination areas.

Gloves shall be worn whenever there is a risk of hand injury from hard or sharp materials such as wood or metal, or sparks; they shall also be worn when handling caustic materials such as cement.

Boots with steel toe and side protection shall be worn when on any construction or operational site, or whenever there is a risk of foot injury from fast-moving or impact-creating tools and machines, such as drills, sledge hammers and pick axes.

Ear protection shall be worn whenever a person is within 20 metres of any machine making a loud noise, including generators, drills, compressors, power saws, grinders, or earth-moving and compacting machines. No individual shall be exposed to noise levels in excess of 85 dB without wearing ear protection. Environmental Department staff can measure site noise on request.

Face Masks shall be worn in areas where there is dust or light smoke blowing due to movement of vehicles, operation of machines, wind blows or open fires.

M.6.4 Guidance for Traffic Management Plans

MCA-Nepal, the Engineer, all Contractors and all Subcontractors must develop a Traffic Management Plan (TMP). The Engineer's TMP will be reviewed by MCA-Nepal prior to commencement; Contractors and Subcontractors' TMP will be reviewed by the Engineer.

Every TMP shall take into consideration applicable national laws and regulations pertaining to traffic movement, road use, vehicle ownership, and maintenance and driving permits (including heavy vehicles for goods transport, driving on hilly roads etc.); construction material transport permits and labour laws; and the project's ESHS provisions.

As part of a TMP, there must be prepared route maps for the duration of activities. These must cover all origin-destination points. Stakeholder engagement must be used in the vicinity of construction sites to identify suitable routes, and to highlight areas and issues of community concern. In addition to these aspects, route planning (for route selection, use and maintenance) will include consideration of the following:

- Are vehicle routes clearly separated from pedestrian routes by fencing or a kerb, or other suitable means?
- Are routes wide enough to accommodate safely the number of vehicles likely to use them at peak times?
- Do routes allow easy access to construction areas?
- Are routes kept free of obstruction?
- Do selected routes have clear and suitable signage?
- Can pedestrians safely cross the selected vehicle routes, especially where routes go through settlement

areas?

- Do pedestrians have a clear view of traffic movements at crossings and at gates which lead on to traffic routes?
- Do selected routes minimise the nuisance to local residents from noise, dust and traffic?
- Do routes eliminate or reduce the need for reversing?
- At the point of exit from construction sites, can the driver see pedestrians on the road?
- Are temporary structures protected from vehicle impact?
- Are parking areas available at suitable locations and have they been approved by the ESHS staff for project use?

Each TMP will include driver training and safety measures, including:

- Ensuring details are checked at the time of hiring a driver and maintenance workers, including valid driving licenses, proof of identification, age and reliability, etc.; and
- Providing training and awareness regarding driving safety, road signage and speed rules, use of seat belts, and other safe practices, to drivers and helpers.

Each TMP will address the following traffic management measures (including on the access roads to substation construction sites):

- Make adequate arrangements to manage traffic, particularly at the entry and exit points, and at locations identified by communities for specific management;
- Plan traffic movements to have flexible timings to avoid congestion and minimise disturbances to local communities;
- Include traffic calming and management measures at stretches on routes with narrow roads or bridges, which are prone to congestion;
- Manage vehicular entry into the site to avoid queuing on the road outside;
- Plan for and provide drop-off zones for workers coming by buses, clearly identified for easy access;
- Plan and provide adequate parking of vehicles to avoid using public or private land, unless prior arrangements have been made;
- Install adequate signage that is easily understood by both drivers and local communities;
- Undertake periodic stakeholder engagement activities to introduce corrective measures as necessary to improve traffic movements and minimise disturbances to local communities; and
- Ensure regular and ongoing reporting of incidents and accidents with actions taken to understand the causes and take remedial action.

Each Traffic Management Plan will include dust suppression measures on public roads used for project-related traffic movements, such as:

- The use of hard surface roads, rather than gravel roads, to the extent possible;
- The provision of easily cleaned hard surface areas for vehicle parking, and loading and unloading; and
- Sheeting of all project vehicles carrying potentially dusty material (such as construction aggregate and excavated spoil) or likely to deposit loose materials on roads.

M.6.5 Guideline on the Scope of Emergency Preparedness and Response Plans

Every Contractor must submit an Emergency Preparedness and Response Plan for approval by MCA-Nepal at least three months before mobilising to any site.

The Emergency Preparedness and Response Plan shall stand alone, and shall include the following measures as a minimum:

- Identify the required preventative measures;
- Identify the roles and responsibilities of personnel in the event of an emergency;
- Detail the required emergency control materials to be stored at the work sites;
- Clearly document emergency control procedures (see below), and
- Describe notification requirements.

The plan will clearly outline the control procedures listed below.

Fire control and fire emergency method statement, describing:

- The reasonable steps to be taken by the Contractor to avoid increasing the risk of fire through activities

on site;

- The fire-fighting equipment that the Contractor will keep available and well-maintained at all camp areas and facilities;
- The identity of the Contractor's Fire Officer who shall be responsible for ensuring immediate and appropriate action is implemented in the event of a fire;
- The procedures to be followed by the workers in the event of fire;
- The method for ensuring that all site personnel are aware of the procedure to be followed in the event of a fire; and
- The details of mock fire drills that shall be conducted to prepare workers in case of an emergency (records of which will be maintained by the Contractor).

Earthquake response procedure, including:

- The actions to be taken by personnel in responding to earthquakes; and
- Collaboration and integration with any Disaster Management Plans or Procedures of the surrounding community administrations during an emergency situation.

Triggered landslide event, covering:

- The Contractor's diligence approach to the assessment and monitoring of ground stability in the vicinity of its work sites;
- Slope stabilisation procedures to be implemented during construction;
- Routine monitoring and inspection processes to aid in the rapid identification of insufficient control measures, and identify areas with potential for landslides;
- Guidelines for personnel to notify management and implement remedial action as required to limit slope instability; and
- Mechanisms to ensure that work will be scheduled or suspended to avoid periods of heavy precipitation or prolonged periods of saturated ground conditions.

Traffic accidents, including:

- A detailed statement on the management of traffic to maximise the safety of both personnel, members of roadside communities and other road users;
- A system to ensure that all project drivers will observe all local and national traffic rules and laws;
- A system to ensure that all project drivers are appropriately trained and licensed;
- The designated light vehicle and truck routes, and the speed limits and weight restrictions to be observed on all roads near the work sites;
- Actions to be taken by personnel in the event of a traffic accident; and
- Notification arrangements for local communities about proposed changes to local traffic access due to construction activities, and the clear signage of changed traffic conditions that would be provided in this event.

Accidental spills of hazardous materials, including:

- A detailed spill prevention and response statement, which will identify all potentially hazardous substances (including fuels and lubricants) to be used by the Contractor, the required leakage and spillage preventative measures, the required spill control materials to be located at all work sites and on transfer vehicles, the roles and responsibilities in the event of a spill, and the spill control documentation and notification procedures;
- The appropriate containment for any fuel or hazardous materials, including secondary containment (e.g., bunding) around any diesel storage tanks, that will be provided at all work sites and camps;
- The prohibited activities near all fuel and other hazardous material handling and storage areas;
- The schedules of manufacturer-recommended maintenance for all equipment and vehicles; and
- The regular check protocols of storage tanks and vehicles for leaks.

M.7.1 Guidelines on Labour and Employment Conditions

For labour and employment conditions, MCA-Nepal requires its contractors to follow the guidance of the International Finance Corporation, as provided in the latest version of Performance Standard 2.

Performance Standard 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. The requirements

set out in this Performance Standard have been in part guided by a number of international conventions and instruments, including those of the International Labour Organization (ILO) and the United Nations (UN). Project Implementation under IFC Performance Standards require that the PS 2 is fully complied with as laid out in the Standard and accompanying guidelines.

The standards define trafficking in persons as the recruitment, transportation, transfer, harbouring, or receipt of persons, by means of the threat or use of force or other forms of coercion, abduction, fraud, deception, abuse of power, or of a position of vulnerability, or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purpose of exploitation. Women and children are particularly vulnerable to trafficking practices.

The scope of application of this Performance Standard depends on the type of employment relationship between the client and the worker. It applies to workers directly engaged by the client (direct workers), workers engaged through third parties to perform work related to core business processes of the project for a substantial duration (contracted workers), as well as workers engaged by the client's primary suppliers (supply chain workers).

Following IFC PS 2 requires organisations to adopt and implement human resources policies and procedures appropriate to its size and workforce that set out its approach to managing workers consistent with the requirements of the Performance Standard and Nepalese law. As far as the ETP is concerned, these have the following requirements.

- The Contractor will provide workers with documented information that is clear and understandable, regarding their rights under national labour and employment law and any applicable collective agreements, including their rights related to hours of work, wages, overtime, compensation, and benefits upon beginning the working relationship and when any material changes occur.
- The Contractor will provide reasonable working conditions and terms of employment.
- The Contractor will identify migrant workers and ensure that they are engaged on substantially equivalent terms and conditions to non-migrant workers carrying out similar work.
- Accommodation services (work camps) will be provided in a manner consistent with the principles of non-discrimination and equal opportunity. Workers' accommodation arrangements should not restrict workers' freedom of movement or of association.
- The Contractor will base the employment relationship on the principle of equal opportunity and fair treatment, and will not discriminate with respect to any aspects of the employment relationship, such as recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, and disciplinary practices. The Contractor will take measures to prevent and address harassment, intimidation, and/or exploitation, especially in regard to women. The principles of non-discrimination apply to migrant workers.
- The Contractor will provide a grievance mechanism for workers (and their organizations, where they exist) to raise workplace concerns. The Contractor will inform the workers of the grievance mechanism at the time of recruitment and make it easily accessible to them. The mechanism should involve an appropriate level of management and address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned, without any retribution. The mechanism should also allow for anonymous complaints to be raised and addressed. The mechanism should not impede access to other judicial or administrative remedies that might be available under the law or through existing arbitration procedures, or substitute for grievance mechanisms provided through collective agreements.
- The Contractor will not employ children under the age of 18 in any manner that is economically exploitative, or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development.
- The Contractor will not employ forced labour, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labour, such as indentured labour, bonded labour, or similar labour-contracting arrangements. The Contractor will not employ trafficked persons.

Provisions to ensure compliance with these requirements must form part of the Contracts for the project.

M.7.2 Code of Practice for Staff, Worker and Visitor Behaviour

All contractors' managers must ensure that their staff uphold this Code of Practice at all times.

Project contractors are guests of the communities in which they are living and working. They must fit with local customs and laws. Many staff are from other parts of Nepal and from other countries, and some will be in the project area for only short periods. Cultural differences and poor behaviour of workers can lead to tension between local communities and workers housed in camps. This Code of Practice demands moderate and tolerant behaviour of all people associated with the project.

All project staff, the employees of contractors and visitors to camps and work sites, must abide by the following rules to ensure harmonious co-existence.

- Adhere to Nepal laws and regulations.
- Respect local communities, religions and customs.
- Respect all groups within the towns and camps.
- Behave in a moderate, modest and tolerant manner.
- Avoid causing disturbance or undertaking any unruly or anti-social behaviour at any time.
- Do not hunt, fish, keep animals or gather forest products, except in line with the law and the rules of local communities.
- Bring no firearms, ammunition, dangerous weapons or fireworks in the towns, camps or work sites.
- Use vehicles safely at all times.
- Use security passes as required for different areas.

All employers shall maintain a zero tolerance policy towards the following.

- Infringement of any Nepalese law.
- Bribery, fraud or attempts at these.
- Racist or anti-religious behaviour.
- Involvement in prostitution on project sites or in project vehicles.
- Any form of sexual exploitation or abuse.
- Any involvement in the trafficking of persons.
- Any theft or dealings of any sort in stolen property.
- Involvement in violence of any sort.
- Repeated excessive consumption of alcohol.
- Intoxication on any work site.
- The use of any non-prescribed or illegal narcotic substance.

The MCA-Nepal and the Engineer have the right to require intoxication or controlled substance testing at any time.

M.7.3 Countering Trafficking in Persons

The Millennium Challenge Corporation ("MCC") is committed to working with partner countries to ensure appropriate steps are taken to prevent, mitigate and monitor trafficking in persons ("TIP") risks in the projects it funds. MCC's core mission, reducing poverty through economic growth, does not directly address human trafficking. This policy applies to all MCC-funded projects.

The Policy defines "severe forms of trafficking in persons" as:

- Sex trafficking: A commercial sex act is induced by force, fraud, or coercion, or in which the person induced to perform such act has not attained 18 years of age; in the location or movement to another area for exploitation; or
- Labour Conditions: The recruitment, harbouring, transportation, provision, or obtaining of a person for labour or services, through the use of force, fraud, or coercion for the purpose of subjection to involuntary servitude, peonage, debt bondage, or slavery.

Both forms of trafficking occur in Nepal and there are risks that projects will enable trafficking to occur. MCC considers the taking of measures to address TIP concerns is important in project design and implementation.

Sex Trafficking. A clear potential TIP risk is associated with the actions of contractors and workers through increased demand for sex services/sex workers, particularly where the project involves an influx of predominantly male workers. Depending on context, this increased demand for sex services is commonly met by a combination of harmful sexual activity with women in surrounding communities, and commercial sex with those in prostitution, each of which carries its own set of risks. In this context, it is considered TIP when adults engage in sexual activities through force, fraud or coercion. It is also considered sex trafficking when the person induced to perform such act has not attained 18 years of age.

Risk is also present in the practice of project workers offering transport to community members as this opens the possibility that project vehicles could be used in the transporting of trafficking victims (as well as the possibility of direct exploitation of passengers by drivers). MCC's policy in this regard is to prohibit the practice on all projects unless there are compelling reasons to not do so. It may also be possible that workers themselves may contribute to TIP by, for example, bringing in child domestic workers, or luring unsuspecting community members into a trafficking situation through techniques ranging from false promises of a better job or life elsewhere.

Labour Conditions. The most direct way in which TIP can impact projects funded by MCC is through exploitative recruitment practices and/or labour conditions for workers, particularly construction workers. The importation of labour to projects from other areas of Nepal or from India offers the risk of abusive employment practices. Exploitative practices include but are not limited to:

- Abuses in the migrant labour recruitment chain, such as charging workers large recruitment fees that place them in debt and effectively bind them to the workplace;
- Denying workers access to their travel documents;
- Penalizing workers for leaving the workplace;
- Violence or threats of violence against workers;
- Restriction of movement of workers; non-payment or delayed payment of wages of workers;
- Mandatory overtime for workers; and the use of child labour.

TIP risk assessment will be conducted in all MCC-funded projects. To the extent possible, TIP risks should be assessed as part of existing processes, notably due diligence by MCC's Social and Gender Counter-Trafficking in Persons Policy 8 Assessment unit ("SGA") and Environmental and Social Performance unit ("ESP").

A project will be categorized as high-risk when it is determined that the project could contribute to an increase in TIP either during project development and/or implementation phases. In addition, a high-risk project may also contribute to an increase in TIP once the project implementation phase is completed and/or may present high-risk if the project is implemented in an area with a strong TIP problem.
When a project is categorized as high-risk for TIP, in addition to the Counter-TIP Minimum Compliance Requirements, MCA staff or contractor/consultants must develop a specific TIP Risk Management Plan to be approved by MCC prior to issuing the solicitation for procurement, and implemented by the contractor (under direct supervision from MCA).
All projects that use contract mechanisms for works (both large and small works), non-consulting, and consulting services are required to incorporate Counter-TIP Minimum Compliance Requirements in their solicitations and contracts. In addition, for works and consulting services contracts for projects that are categorized as high-risk, MCAs are also required to develop and require the contractor/consultants to implement a TIP Risk Management Plan.

Counter-TIP Minimum Compliance Requirements and adherence with and implementation of the TIP Risk Management Plan will be included in the technical specifications as a task in the Statement of Work and Terms of Reference for contractor/consultants, and in the bill of quantities/specifications works, and non-consulting solicitation documents. These requirements will be discussed during negotiations with the selected contractor/consultants, and be included as deliverables in the contracts that will be monitored by MCAs and MCC.

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M.8.1 Topsoil Stripping and Stockpiling

Overview

This guideline provides guidance on the management of topsoil and subsoil in engineering operations. Topsoil is an important resource, both ecologically and economically, since it is the source of all terrestrial life. Topsoil is therefore classed as an asset and must be treated as a living entity. Under no circumstances is topsoil a waste material. Subsoil is an essential foundation to topsoil and where possible should also be saved to aid later rehabilitation.

The recommended sequence for stripping, stockpiling and restoring of topsoil from a borrow area or other site, is as follows. The paragraphs below give details on how each step should be undertaken.

1. Delineate excavation area.
2. Delineate topsoil storage area.
3. Complete land access procedure.
4. Construct access tracks.
5. Clear vegetation and dispose.
6. Install drainage and silt traps.
7. Grub roots and stumps.
8. Strip topsoil from borrow area.
9. Place topsoil on designated storage.
10. Stockpile unusable subsoil if present.
11. Remove approved earth fill to construction site.
12. Replace subsoil if available.
13. Replace topsoil and rehabilitate.
14. Undertake revegetation works to restore habitat.

Field Identification of Topsoil

Topsoil is the darker coloured surface layer that varies in depth depending on location, but in general is 100 to 150 mm in depth. It is the soil layer with the greatest proportion of organic matter (in the form of fine roots, decomposing plant material and microbial animals). In the Nepal forests, the organic carbon component in the surface horizon ranges from 4 to 10 percent, usually with higher levels under better-developed forest. Where there is any leaf litter on the soil surface, this should be considered part of the topsoil. Topsoil depth and quality generally increases from a hilltop to the toe of a slope.

With depth in the soil profile, the material becomes increasingly less weathered and thus of decreasing value as plant-growing material. This is the subsoil. The downward change is often gradual and thus it is a matter of judgement as to where to make the cut-off. However, the subsoil horizon from 150 to 500 or 600 mm contains soil that is of value in restoration, as it contains some organic material and raised nutrient levels, and is weathered to a consistency that will help facilitate later regrowth when it is re-laid as a foundation below the topsoil. Note, however, that lack of cleared land for storage space means that the contractor will not normally need to take subsoil for storage unless it is found between the topsoil and the approved borrow material.

Storage of Topsoil

The location for a soil stockpile shall be in a place where it will not erode, block drainage, or interfere with work on the site. The stockpile location must be selected to avoid steep slopes (gentler than 1:4 to avoid slippage), flood plains and natural channels. It shall be at least 30 metres from a water course, pond or swamp to prevent sedimentation and damage to riparian habitat.

Topsoil should not be stored on another topsoil or subsoil of highly contrasting texture. Sandy topsoil over clay subsoil is a particularly poor combination, especially on slopes: water may creep along the junction between the soil layers and cause the topsoil layer to slip or slough.

Subsoil should not be stored on top of topsoil. If necessary, the topsoil at a stockpile location must be stripped off and the subsoil laid down, before the topsoil is replaced on top of it.

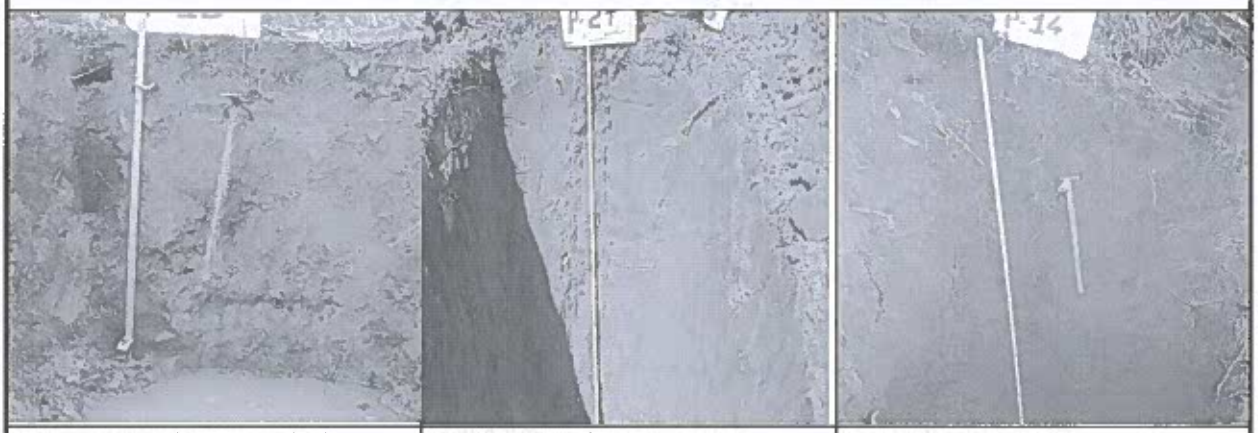
Before any topsoil is stored in a designated area, vegetation must be cut and a full drainage and sediment control system installed.

Identification of topsoil and subsoil

Topsoil is the darker surface layer of soil. It is usually from the surface to a depth of 150 mm (6 in) or slightly more. It may include decaying plant material on the surface (dead leaves and sticks).

Subsoil is the weathered layer below the topsoil. This almost always extends to 500 mm (20 in) below the surface and sometimes much more. In most of the borrow areas, subsoil will be classed as approved engineering earth fill material and removed to the construction sites.

The illustrations below show typical soil profiles. In all of them, the topsoil layer is visible.



Distinct topsoil 200 mm thick Subsoil to 600 mm depth Seasonally waterlogged swamp soil	Distinct topsoil 230 mm thick Subsoil to 800 mm depth Well-developed forest soil	Indistinct topsoil 120 mm deep Subsoil to 1000 mm depth Iron-rich steep mountain soil

As far as the terrain allows, storage areas should be gently convex in design so that run-off is managed and does not lead to erosion and instability. The slopes used should be at a maximum angle of 18 to 20° to enable working, and subject to final assessment and sign-off by the authorised engineer to ensure that the slopes are stable in the short and long term.

Where stockpiles are on slopes, the downward slope shall be adapted to retard run-off water and prevent erosion. Erosion control berms and appropriate drainage channels may be used to achieve this. An alternative is to create "moonscape" indentations to retard run-off, placed in a staggered manner to ensure they do not form continuous lines

Management of Topsoil (and Subsoil) Stores

The management of topsoil storage areas shall be determined on an area-by-area basis and an appropriate plan agreed. All storage areas will be in approved locations, with sites prepared as described above. The main management options are as follows.

- Temporary storage of topsoil, with it replaced to site within the same dry season.
- Longer term storage requiring management interventions, including revegetation, periodic aeration, erosion controls and other work.
- Initial stabilisation followed by handover for approved use by the landowner under an agreement in line with the Resettlement Action Plan.

Topsoil stockpile height shall not exceed 1 metre. If space permits, where topsoil is being stockpiled on areas where agriculture will remain active as part of the management plan, then it should be limited in height to 0.5 m to retain topsoil characteristics (significant biological activity really continues only to a depth of 300 mm). Gentle compaction is necessary, but should be as light as possible, such as one pass by a tracked excavator or small bulldozer; but never by a roller or vibrating compactor.

Soil stockpiles shall be protected against erosion and soil loss by temporarily planting or seeding with a locally collected species of grass. This must be done as soon as possible, but only when there is enough moisture in the

soil for germination and growth. In the wet season, no stockpile shall be unprotected for more than 30 days after its formation. While vegetation is becoming established, the stockpile may need additional protection by a silt fence or other sediment barrier on the down-gradient sides.

If stockpiles will not be removed within the same dry season as they were created, they should be stabilised with permanent vegetation to control erosion and weed growth. This will involve the planting of fast-growing pioneer shrubs or trees.

No seeds or plants from sources outside Nepal may be used on any revegetation sites. Invasive plants also must not be used. This is on account of the need to protect the local biodiversity to the greatest extent possible.

Fine-textured topsoil may need aeration periodically if there is a risk of waterlogging and the generation of anaerobic conditions. This can be achieved by turning down the stockpiles once a year. Revegetation may be required after the aeration operations.

M.8.2 Control of Water Pollution

No person shall discharge or apply any poisonous, toxic, noxious or obstructing matter, radioactive waste or other pollutants unless the discharge of such material is treated to permissible standards as defined in the project's environmental permit.

No person shall:

- Generate and discharge any form of effluent on to land or into any water resource without compliance with an approved Environmental Management Plan and a valid Environmental Certificate;
- Discharge wastewater or effluent off an operational site, which does not meet the water quality requirements stipulated in the appropriate licence for effluent discharge; or
- Discharge into any water resource effluent from a sewage treatment plant, trade or industrial facility without both treatment and a valid effluent discharge license.

It is a safe rule that, in rural Nepal, all surface water courses are used for drinking water supplies at some point during the year.

Prevention of water pollution

Surface run-off from earthworks, waste dumps and other areas shall be properly controlled, collected and treated before discharging into natural water courses. Silt traps and check dams of appropriate sizes shall be constructed at all strategic points to control surface run-off. All run-off water shall be diverted through a series of sedimentation basins to remove suspended particles and chemicals as necessary.

Entrained sediment shall be collected as close to the source as possible. In particular, coarse sediment (sand- and coarse silt-sized particles) should be removed from water courses at the point where they leave the source of supply. Coarse sediment can destroy riverine biotic systems that can otherwise thrive close to earthworks sites. Sedimentation ponds and check dams shall be de-silted at regular intervals, as required to maintain effectiveness.

Re-vegetation of exposed surfaces shall be done as far as possible in the earthworks and other operational sites, and around all ancillary infrastructure and access tracks. A separate series of guidelines covers these works.

All efforts shall be made to re-use and re-cycle treated effluents to the maximum possible extent in order to achieve zero effluent discharge.

Domestic effluents shall be treated in properly designed oxidation ponds or by any other suitable sewage treatment method. Outfalls should be allowed to discharge into the environment only where the quality standards are met. The Engineer shall be responsible for monitoring this, but may require a contractor to undertake monitoring on its behalf. Where camps are operated by contractors, then the operator is responsible for monitoring outfalls.

Workshops, fuelling stations and other areas handling fuels, lubricants and other hazardous substances shall be subject to special provisions. These are covered in detail by separate guidelines.

Protection and conservation of riparian areas

Riparian land is the area along the banks of rivers and creeks, and edges of swamps, where there is a dynamic complex of plant, animal and micro-organism communities and their non-living environment adjacent to and associated with a watercourse. Although this zone varies, a practical guideline is to take it as occupying 50 metres on each side of a watercourse. In specific conditions, where there is a strong case for a narrower width, this may be reduced to a minimum of 15 metres.

The following activities shall not be permitted on riparian land except as provided in the following two paragraphs:

- Tillage or cultivation;
- Clearing of trees or other vegetation;
- Building of permanent or temporary structures;
- Disposal of any form of waste;
- Excavation of soil or development of borrow pits or quarries; or
- Any other activity that may degrade the water resource.

Where it is essential that tracks or roads must cross the riparian zone, they shall be aligned to cross at right angles, thereby minimising disruption to this valuable habitat. The area cleared for them shall be kept as narrow as possible and special provision shall be made for soil erosion control measures. Culverts shall be installed so that vehicles do not drive through the water.

If any of the above activities must take place within the 50-metre riparian zone, a full environmental management plan must be prepared that demonstrates how any impacts will be mitigated, with control measures put in place before any other site works start.

Riparian zones should be considered as key areas in all work site environmental monitoring. Water quality assessment or the health and diversity of indicator insect species such as dragonflies shall be used to judge the effectiveness of mitigation measures.

Spillage

No person shall wilfully and deliberately allow any substance to spill out into any water resource or on to land where such spillage may contaminate either soil or a body of surface or groundwater.

In the event of accidental spillage where such spillage may contaminate either soil or a body of surface or groundwater, the following actions shall be taken.

- The person responsible for or causing or finding the spilt substance shall immediately inform the Engineer of the accident.
- The Engineer shall take immediate and adequate measures to prevent spread of the spillage and its likely adverse effects to soil and water resources.
- The Engineer shall take measures to notify the public of the spillage and also to cause action to be taken to deal with the spillage.

In this context the Engineer is represented by the Manager responsible for that overall site.

M.8.4 Guidelines on Tree Felling and Use of Chainsaws

General

These guidelines provide methods for the safe felling of trees using chainsaws. It is assumed that all larger plants – anything greater than about five metres in height – will normally be cleared using chainsaws, and detailed guidance is given on this aspect.

The felling of trees using bulldozers and excavators is not allowed in the Electricity Transmission Project.

Pre-felling safeguards

Before any tree felling starts on a worksite:

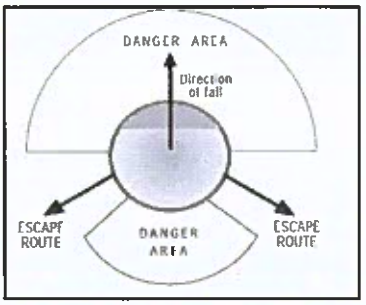
- contact the owners of any overhead power lines within a distance equal to twice the height of any tree to be felled to discuss whether the lines need to be lowered or made dead;
- check whether there are underground services such as power cables or water pipes which could be damaged when the tree strikes the ground;
- if there are roads or public rights of way within a distance equal to twice the height of the tree to be felled, ensure that road users and members of the public do not enter the danger zone – you may need to arrange warning notices, diversions or traffic control;
- do not start work until agreement has been reached and all necessary precautions have been taken.

Safe tree felling procedure using chainsaws

Timing. Only start to fell a tree when there is adequate time to do so safely. Tree felling is inherently dangerous and should not be rushed. Once cutting is started, the tree must not be left alone until it has been safely felled and the branches trimmed out.

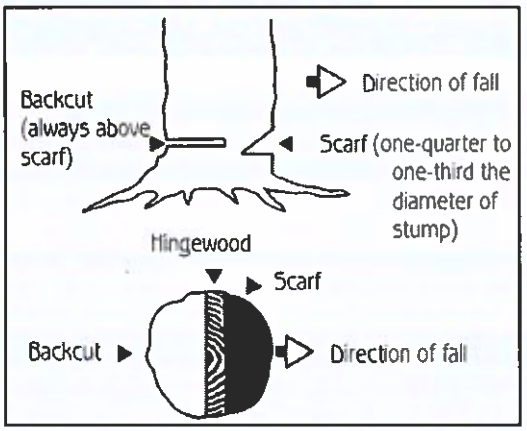
Condition of the tree. Check if the butt of the tree is affected by rot. In addition, be especially careful to check for dead or broken crowns and branches which might fall during the operation. Check both the tree to be felled and those nearby which might be hit by the tree being felled.

Line of fall. Assess what could affect the direction of fall, such as wind conditions and whether the tree is leaning, has uneven growth or branches which could foul other trees. A tree should always be felled along its natural line of fall. Attempts to fell it in another direction should be aided by equipment such as wedges for small trees and winches for larger trees (see below).



Clearing the area. The area around the base of a tree should be cleared of vegetation for a minimum of two to three metres. An escape route should be made clear on the side of the tree where the operator will be when making the final cut. The escape route should be in the 45-degree quadrant between 90 and 135 degrees from the line of expected fall. Any tripping hazards should be removed.

Where to cut. Trees should always be cut as low to the ground as possible. No tree should be cut more than 500 mm above the level of the surrounding ground. This might require the removal of buttresses and trimming of a splayed tree trunk to form a regular cylinder.



Dip, scarf or wedge cut. As low as possible, make a horizontal cut one third of the way through the tree on the side where it is expected to fall. Then make another cut, cutting down at 15 to 30 degrees from the horizontal, to remove a wedge of wood from above the first cut. Clean out the dip to ensure that an even, open wedge is formed, facing exactly the direction of felling.

Final cut or back cut. Do a final check that the area all around is clear and that there is no danger of anyone entering the felling zone. Make the final cut 50 to 75 mm above the base of the dip cut, starting on the opposite side of the tree and working towards the dip. Keep it horizontal and keep the cut face parallel to the thin end of the dip cut. As the cut is approaching the dip, look closely for signs of movement in the trunk of the tree. Once it starts to fall, remove the saw from the cut and move away from the tree without rushing. You should normally move at right angles to the direction of fall in case the butt jumps backwards off the stump. Keep watching the tree in case it twists or starts to fall in an unexpected direction.

Trimming out. Once the tree is down, the branches should be trimmed out to ensure that the trunk is lying along the ground and that it cannot roll over. Especial care is needed in cutting the branched on the underneath of the lying trunk, as these will be under tension.

Additional tools and equipment. Operators may need to use aid tools such as alloy or plastic wedges, a breaking bar, a cant hook, a winch, or high-lift wedges and a sledgehammer. They should understand when it is important to use additional equipment, and it is the manager's responsibility to make sure operators have the right equipment available and the skills to use it correctly. This is in any situation where there is any doubt as to whether a tree can be felled safely using only a saw. Additional equipment introduces different forces, however, and always complicates the process of felling.

Hung-up trees. If a tree is likely to become hung-up on another during felling, operators will need to have the knowledge and the equipment to bring the hung-up tree down safely. Dealing with leaning trees or wind-blown trees also requires special skills.

Use of chainsaws

The following part of this standard provides guidelines on using portable, hand-held, petrol-engine chainsaws for clearing bush and felling trees. It is aimed at both operators and those who control the use of work equipment, and includes basic information on safe working practices which operators should follow.

Fitness to operate a chainsaw

To use a chainsaw safely, the operator needs to be reasonably fit, both physically and mentally. People with disabilities need not necessarily be excluded from work with chainsaws, but medical advice may restrict the tasks they can do and require increased supervision. It is recommended that workers undertake pre-employment screening when selecting chainsaw operators. Seek further medical advice if prospective operators have any condition affecting:

- mobility (e.g. arthritis, stroke);
- alertness (e.g. diabetes or alcohol/drug dependency);
- physical strength (e.g. heart conditions);
- vision (which cannot be corrected by glasses or contact lenses);
- manual dexterity/grip strength (e.g. vibration white finger);
- balance (e.g. vertigo or giddiness).

Operators should inform their supervisor when they are taking prescribed medication. Check with the operator's medical practitioner if the medication can affect a person's ability to operate a chainsaw safely.

Health risks

Chainsaws expose operators to high levels of noise and hand-arm vibration which can lead to hearing loss and conditions such as vibration white finger. These risks can be controlled by good management practice including:

- purchasing policies for low-noise/low-vibration chainsaws (e.g. with anti-vibration mounts and heated handles);
- providing suitable hearing protection;
- proper maintenance schedules for chainsaws and protective equipment;
- giving information and training to operators on the health risks associated with chainsaws and use of personal protective equipment (PPE) etc.

Encourage existing chainsaw operators to report any signs or symptoms which may affect their ability to use a chainsaw safely or may indicate adverse health effects from noise and/or vibration.

Training and competence: all chainsaw use

Chainsaws are potentially dangerous machines which can cause major injury if used by untrained people. Anyone who uses a chainsaw at work should have received adequate training and be competent in using a chainsaw for that type of work. The training should include:

- dangers arising from the chainsaw itself;
- dangers arising from the task for which the chainsaw is to be used; and
- the precautions to control these dangers, including relevant legal requirements.

Training for use of chainsaws in tree work

All workers who use a chainsaw should be competent to do so. Before using a chainsaw to carry out work on or in a tree, a worker should have received appropriate training and obtained a relevant certificate of competence, unless they are undergoing such training and are adequately supervised.

This means everyone working with chainsaws on or in trees should hold such a certificate or award.

Training provision

Training should be carried out by specialist instructors at organised training courses. Where training is being consolidated through workplace-based experience, the trainee should be supervised by a person competent in the use of a chainsaw for the work being done by the trainee and who holds the relevant competence certificate or award.

It is recommended that all chainsaw operators have regular refresher training to ensure they work to industry best practice and maintain their levels of competence. The suggested intervals for such training are:

- occasional users – every two to three years;
- full-time users – every five years.

Supervision of trainees at training courses and training at work

Instructors need to organise training to maintain a suitable ratio of trainees to instructors. Factors to be considered include:

- the level of experience of trainees;
- the content of the training;
- the location and terrain where the training is being carried out.

Selecting a chainsaw

There are two basic designs of chainsaw – 'rear-handled' and 'top-handled'.

Rear-handled chainsaws. These have the rear handle projecting from the back of the saw. They are designed always to be gripped with both hands, with the right hand on the rear handle. Select chainsaws which will be suitable for the intended work. It may be necessary to have a range of saws with different guide bar lengths available. As a general rule, choose a chainsaw with the shortest guide bar suitable for the work. Training in how to use chainsaws will identify the type and size of saw most suited to a range of operations.

Top-handled chainsaws. These saws have the rear handle over the top of the engine. They are only suitable for use off the ground by trained competent arboriculturists. They are not designed for use on the ground or as a substitute for small, rear-handled chainsaws.

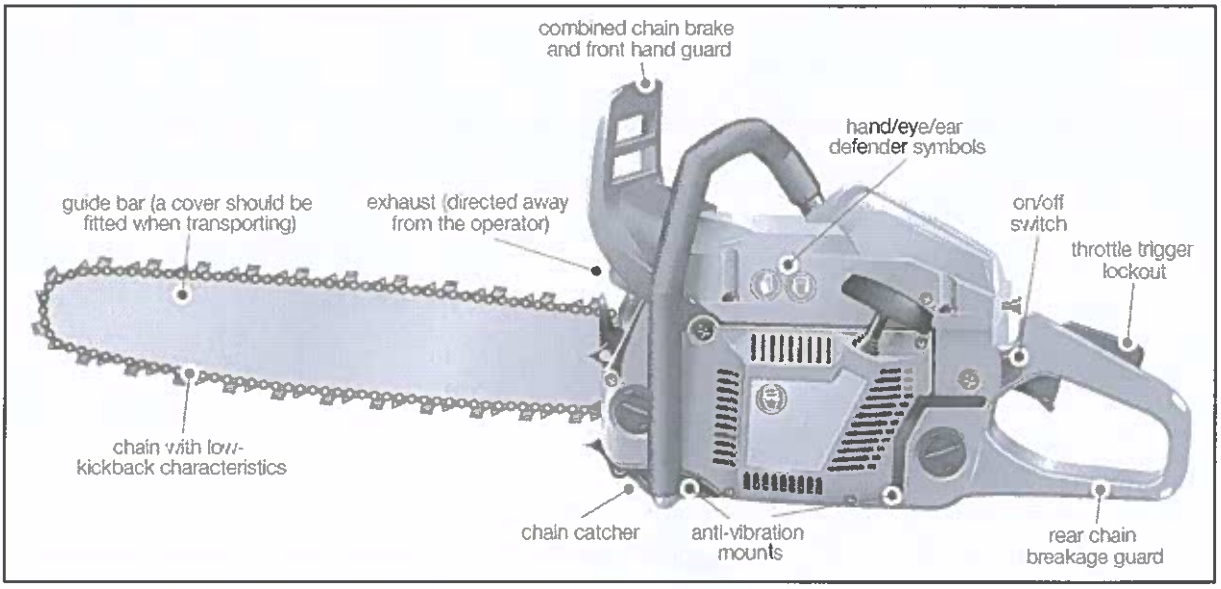
Maintaining a chainsaw

Proper maintenance is essential for safe use and protection against ill health from excessive noise and vibration. The saw must be maintained in its manufactured condition with all the safety devices in efficient working order and all guards in place. It should be regularly serviced by someone who is competent to do the job.

Operators need to be trained in the correct chain-sharpening techniques and chain and guide bar maintenance to keep the saw in safe working condition. Operators should report any damage or excessive wear from daily checks on the following:

- on/off switch;
- chain brake;
- chain catcher;
- silencer;
- guide bar, drive sprocket and chain links;
- side plate, front and rear hand guards;
- anti-vibration mounts;
- starting cord for correct tension.

Features of a good chainsaw



Personal protective equipment

Suitable personal protective equipment (PPE) should always be worn, no matter how small the job.

Protective clothing must comply with high international standards to provide a consistent level of resistance to chainsaw cut-through. Other clothing worn with the PPE should be close fitting and non-snagging. However, note that no protective equipment can ensure 100% protection against cutting by a hand-held chainsaw.

The following PPE are obligatory:

- Safety helmet
- Hearing protection;
- Eye protection – mesh visors or safety glasses;
- Gloves;
- Leg protection;
- Chainsaw boots – knee-length safety boots with steel shin guards and toe caps.

In addition, upper body protection (i.e. a cut-proof chainsaw jacket) is recommended.

Lone working

Avoid working alone with a chainsaw. Where this is not possible, establish procedures to raise the alarm if something goes wrong. These may include:

- regular contact with others using either a radio or telephone;
- someone regularly visiting the worksite;
- carrying a whistle to raise the alarm;
- checks to ensure operators return to base or home at an agreed time.

First aid

Anyone working with chainsaws needs to understand how to control major bleeding and to deal with crush injuries, so it is recommended that operators hold an emergency first-aid certificate. Make sure operators always carry a personal first-aid kit (incorporating a large wound dressing) with them and have reasonable access to a more comprehensive kit.

Working with chainsaws: fuelling and lubrication

Make sure petrol containers are in good condition and clearly labelled, with securely fitting caps. Use containers which are specially designed for chainsaw fuelling and lubrication. Fit an auto-filler spout to the outlet of a petrol container to reduce the risk of spillage from over-filling. Operators should:

- avoid getting dirt in the fuel system (this may cause the chainsaw to be unreliable);
- securely replace all filler caps immediately after fuelling/oiling;
- wipe up any spilt petrol/oil;
- during starting and use, keep fuel containers well away from fires and other sources of ignition, including the saw itself (at least 4 m is recommended).

Do not allow operators to use discarded engine oil as a chain lubricant – it is a very poor lubricant and may cause cancer if it is in regular contact with an operator's skin.

Pre-use checks and starting a chainsaw

When preparing to use a chainsaw, operators should check:

- all nuts, screws etc are tight;
- the saw chain is correctly tensioned;
- the throttle cannot be squeezed unless the throttle lock-out is pressed; and
- they are wearing the correct PPE.

When starting the saw, operators should maintain a safe working distance from other people and ensure the saw chain is clear of obstructions.

When starting a chainsaw with a cold engine, operators should:

- place the saw on level ground;
- secure the saw firmly, e.g. put a foot on the rear-handle base plate and a hand on the front handle;
- set the controls as recommended by the manufacturer;
- pull the starter cord firmly.

Once the saw has started, operators should rev the throttle to warm up the engine and check:

- the saw chain stops moving when the engine revs return to idle;
- the chain brake is effective when applied at maximum revs or according to the manufacturer's specification;
- the engine continues to run when the saw is turned through 90° in any direction;
- the stop switch works correctly;
- lubrication to the guide bar and chain is working properly.

These checks should be repeated at regular intervals throughout the day.

When starting a chainsaw with a hot engine, operators may use the same method as above. Alternatively, they can grip the rear handle firmly between the knees and the front handle with their left hand, pulling the starter with their right hand.

Once the saw is running, operators should apply the chain brake before moving off with the saw. Most modern chainsaws will allow hot starting with the chain brake applied.

Kickback

Kickback is the sudden uncontrolled upward and backward movement of the chain and guide bar towards the operator. This can happen when the saw chain at the nose of the guide bar hits an object. Kickback is responsible for a significant proportion of chainsaw accidents, many of which are to the face and parts of the upper body where it is difficult to provide protection. A properly maintained chain brake and use of low-kickback chains (safety chains) reduces the effect, but cannot entirely prevent it.

Make sure operators use the saw in a way which avoids kickback by:

- not allowing the nose of the guide bar to accidentally come into contact with any obstruction, e.g. branches, logs, stumps;

- not over-reaching;
- keeping the saw below chest height;
- keeping the thumb of the left hand around the back of the front handle;
- using the appropriate chain speed for the material being cut.

Using the chainsaw

Whatever the job, check the worksite thoroughly to identify any potential hazards. This is particularly important when carrying out felling or demolition work. Wherever possible maintain a clear working area on the site. For any work with a chainsaw ensure:

- the risks from the work have been assessed and controlled;
- the operator is competent to do the job;
- the operator wears the appropriate PPE;
- the operator either stops the engine or applies the chain brake when not cutting with the saw.

The risks from manual handling must be considered: operators can suffer serious back injuries from handling timber incorrectly. Training in good manual handling techniques and using handling aids and appropriate tools should reduce the risk of these injuries.

Working with chainsaws off the ground

Chainsaws should not be used off the ground unless the operator has been adequately trained in safe working techniques. Always use a purpose-built platform. Ensure operators have received adequate training in the safe operation of the platform and safe use of a chainsaw from a work platform.

Avoid using a chainsaw from a ladder. Chainsaws require both hands to be operated safely: work on a ladder requires one hand to hold the ladder to maintain a steady working position. Work from a ladder should only be done by an arboriculturist trained in and equipped for tree climbing. When operating from a ladder, the climber must establish an independent anchor to the tree using a rope and harness and obtain a stable and secure work position.

Using a chainsaw from a rope and harness requires special skills. This should only be done by people who have obtained the relevant competence certificate for arboricultural work.

M.9.1 Cleaning-up of Pollution by Hazardous Materials

This guideline covers the action to be taken in the event of the leakage or spillage of any environmentally hazardous material, such as fuel, oil, chemicals of any kind, or drilling slurry, into either a water course or standing water body, or into soil. It contains the minimum details that must be included in spill clean-up plans of all contractors to the Engineer, and any sub-contractors that may be engaged by the contractors. Before bringing any hazardous materials to the site, the contractor must prepare a spill clean-up plan in accordance with this guideline and gain the approval of the Engineer.

The purpose of a spill clean-up plan is to provide guidelines to prevent environmental contamination, and the procedures to be followed should hazardous materials enter the environment. It applies to all working areas of the project.

The contractor must prepare on-site spill clean-up plans for all hazardous materials to be used on the site. This is a regulatory requirement of the Government of Nepal, and the minimum details that must be in the plan are as follows: (a) how incidents will be contained and controlled so as to minimise the effects and to limit danger to persons, the environment and property; (b) how the necessary measures will be implemented to protect people and the environment; (c) a description of the actions that will be taken to control the conditions and to limit their consequences, including a description of the safety equipment and resources available; and (d) arrangements for training staff in the duties they will be expected to perform. The emergency plan shall be simple and straightforward.

The following principles must apply in the plan: (a) the source of the leak or spill must be stopped immediately it is discovered; (b) the alarm must be raised throughout the site; (c) work on the site must be stopped and all available resources directed into resolving the problem; (d) emergency measures must be taken to contain all

remaining material; (e) where appropriate, measures must be taken to neutralise hazardous substances; (e) the Engineer representative shall be informed immediately; and (f) site-specific and material-specific details will be given for the disposal of contaminated soil and water, and mitigation of the damage caused.

The contractor shall ensure that all site supervision staff are aware of the plan and capable of implementing it. In the event of a leak or spillage, the contractor shall bear all liability whether the plan is implemented or not. Spill response procedure: Every spill clean-up plan must contain, as a minimum, details of the following emergency procedures:

- The person who discovers any spill must notify fellow workers and inform the supervisor that a spill has occurred. If anyone is injured or in danger, they must be rescued if it is safe to do so, and appropriate rescue and medical assistance called if required. All site staff must be informed if there is a risk of fire or explosion, or of a collapse of infrastructure, and in these cases all unnecessary personnel must be evacuated to a safe location.
- All staff will react promptly to all spills, no matter how insignificant they may appear. Whatever resources are available will be diverted immediately to assist in resolving the spill.

The Engineer's representative will both be notified immediately if any spill or release occurs, however small. As much information as possible should be provided about the spill location, type of material, approximate quantity, and extent of damage.

The area surrounding the spill will be secured and contained to minimise additional contamination, for example by building an earth bund or the deployment of floating bunds. Emergency containment should be started as soon as possible. This will give time for a full pollution-control strategy to be designed, agreed and implemented.

M.9.2a Storage, Dispensing and Disposal of Hazardous Materials

The Contractor shall take full responsibility for the use and effects of any hazardous materials that are required for operations that are part of the project. The Contractor is further responsible for complying with the Engineer's policies and procedures as may from time to time be communicated, and will ensure that all aspects of the spill clean-up plan are followed in the event of a spill (see appropriate guideline).

All materials that are potentially hazardous to the environment must be stored or disposed of in accordance with this guideline. Hazardous materials include, but are not limited to, substances such as fuels, lubricants, paints, preservatives, pesticides, explosives, cement, lime, slurry clays, bentonite, catalysts or other chemicals, in solid or liquid form, or sewage and foul waste water.

Approval by the Engineer for the use, storage and disposal of hazardous materials shall not reduce the contractor's responsibility to prevent all leaks and spillages, nor his liability to remedy the damages which may be caused should such incidents occur.

Prevention. Every effort will be made to prevent spills and leaks of any kind. All hazardous materials will be stored in appropriate ways, in line with international safety practices. All operators and supervisors will be trained in appropriate inspection procedures and checks. All problems detected during inspection must be passed on to the relevant superior officer. Appropriate repairs will be made immediately.

Storage. Hazardous materials shall be stored at least 400 metres from the sea, a water course, spring, swamp, drain or well, and at least 400 metres from a dwelling. Storage areas shall have barriers and impervious surfaces preventing leakages of spilt material outside the storage area or into the underlying soils. They shall be protected from rainfall and secure against intrusion by people other than the Contractor's personnel.

Fuelling operations. Fuel tanks will be bunded: i.e. there must be secondary containment for the full capacity of the tank in the event of a leak from the tank. A trained attendant will always be in control of fuelling nozzles during refuelling operations. Designated fuelling areas will be bunded (diked) and lined to capture any unexpected releases of fuel. Oil and lubricant dispensing drums will have spill containment trays and liners, or both, to catch and contain material.

Disposal. All used oils, lubricants, solvents, and filters will be recycled whenever possible. Where excess quantities of a hazardous material need to be disposed of, then the contractor shall prepare a disposal plan and

seek the approval of the Engineer before implementing it. In general, hazardous solids that need to be disposed shall be buried in a location proposed by the Contractor and approved by the Engineer. Disposal sites must be situated at least 400 metres from any dwelling and at least 400 metres from a water body or water course. They should not be on cultivated land. Wherever possible, they should be on a permeable but not sandy soil. Holes shall be a minimum of 2 metres deep when first excavated and all materials must be buried under at least 1 metre of soil.

Sewage disposal. Sewage and foul waste water shall be disposed into a covered underground septic tank. If this is a permanent feature, then it shall have an underground soakaway so that water does not seep on to the surface. All parts of the system shall be at least 100 metres from a water body or water course. The contractor shall present his plans for such facilities to the Engineer for approval prior to their implementation.

Fuel contamination of water: Where there is a significant risk of water becoming contaminated with any form of fuel, such as in port areas, then appropriate containment equipment (e.g. floating bunds or barriers, absorbent pads etc) will be kept in readiness at fuel dispensing areas to assist in cleaning up any spills that may occur.

Cleaning up spills. In the event of a spill or release of any material, the spill will be stopped and the incident reported to the nearest representative of the Engineer. The substance will then be cleaned up immediately, disposed of in an approved manner and the contaminated environment cleaned to the satisfaction of the Engineer. A separate guideline covers this in detail.

M.9.2b Prevention of Pollution from Refuelling Facilities

General

Oil is the most common water pollutant, with the potential to harm watercourses and groundwater. In addition, certain fuels, such as petrol, are highly flammable and are tightly regulated for safety reasons. This guidance is applicable to all refuelling facilities and should be consulted regardless of the type of facility.

Types of drainage system

Clean water. All clean, uncontaminated rainwater should be channelled to:

- a surface water drainage system;
- a combined drainage system downstream of the oil separator;
- directly to a local watercourse or soak-away.

This includes roof water and uncontaminated drainage from those areas of the site where vehicles are not stored, repaired, refuelled or washed. Such discharges may require prior permission from the MOFE or the local sewer provider.

Contaminated water. The entire area where fuel is delivered, stored and dispensed should be isolated from the surface water drainage system, open ground or other porous surfaces. This can be achieved using drainage grids, gullies or kerbs in conjunction with surfaces impermeable to the products used. Potentially contaminated water and spills should be directed through an oil separator and prevented from seeping into the soil and groundwater below the site. The separator should be of an adequate size to serve the surface area catchment of the site.

Sustainable drainage systems. The use of sustainable drainage systems (SUDS) should be considered. SUDS such as constructed wetlands or reed beds may offer an environmentally sound alternative to traditional methods of treating drainage effluent. Wetland or equivalent technology can be used for a variety of wastewater treatment purposes at refuelling facilities. It may also be suitable as a replacement for on-site separators for oily water run-off, provided the system is compatible with local groundwater conditions. Wetlands systems can offer an acceptable level of environmental protection provided they are properly designed, installed and maintained. In some situations, they may provide better environmental protection than conventional drainage systems.

Washing activities. All washing and cleaning operations, including the washing of all vehicles or plant, should be carried out in a designated area clearly marked on the ground and in any plans. The cleaning area should be isolated from both the surface water drainage system and unmade ground or porous surfaces (e.g. using drainage

grids, gullies or kerbs). Wash water should be re-circulated whenever possible. Otherwise it should drain to, or be disposed of, via the foul sewer (where available).

Cleaning agents such as detergents (including biodegradable ones) should never be allowed to enter the surface water system or to soak into groundwater unless specifically permitted after appropriate treatment. They should not enter oil separators because they reduce their effectiveness (the oil will be dispersed and washed through).

Training in dealing with emergencies. Staff should be trained to deal with an environmental incident. Set up a system of written training records and make these available for inspection. Training should include a background to environmental sensitivities around the site and a formal emergency procedure that details actions to be taken in the event of:

- a spillage;
- a fire;
- a collision with equipment;
- odours being detected off-site;
- a suspected leak being identified.

Make this procedure available on-site in case an emergency arises.
Waste management. To avoid pollution, all waste (including separator waste and oil spill adsorbent materials) must be handled, stored and disposed of correctly. Waste producers and holders must ensure that waste:

- does not escape from their control;
- is passed only to a registered waste carrier for recycling or disposal at a suitably licensed facility;
- is accompanied by a transfer note with a full written description of the waste.

Fuel tank bund rain water discharge procedure

Diesel fuel is a hazardous substance which can cause extensive pollution to soil and water. Fuel tanks must be bunded to ensure that if a tank leaks, the fuel does not escape into the environment. However, if the bunded area is not roofed, rain water will accumulate in the bund. This needs to be drained out under controlled conditions.

The supervisor is responsible for ensuring that no leaked fuel within the bund is allowed to get out of the bund. Should there be an accidental spill or leakage, then the supervisor is responsible for ensuring that it is cleaned up immediately and the matter reported to his manager. In any event, the fuel must be cleaned before any water is drained from the bund.

The following procedure shall be followed.

1. The supervisor shall be present throughout the process of draining the bund.
2. The valve on the bund outlet must be kept closed at all times except when it is being drained.
3. At a designated time on each working day, the supervisor must inspect the bund and assess: (a) whether there has been any spillage or leakage of water from any tank; and (b) whether any rain water has accumulated and needs to be drained off.
4. If any fuel has leaked, then the cause of the leak must be investigated immediately and the leak stopped if possible. This might be done using a tank repair compound such as "Plug Pattie", which is contained in the re-fuelling station's fuel and oil spill kit. After this it must be reported to the manager. The leaked fuel must then be mopped up using appropriate pads from the spill kit. Once used, these must be placed in the polythene bags provided in the spill kit and disposed of correctly.
5. If there is water in the bund that appears uncontaminated with fuel, it may be drained off. This is done by opening the valve at the outlet, and allowing the water to flow out through the filter or water-oil separator. The supervisor must watch this process carefully, and must ensure that the flow from the valve is adjusted so that it does not flood the filter. Normally the filter will not cope with the full flow from a valve opened completely.
6. Once the bund has been drained, the valve must be screwed shut again.
7. All other staff, including security guards, are to be instructed that it is forbidden for them to drain water from the bund except when the supervisor is present.

Re-fuelling spill prevention procedure
Diesel fuel is a hazardous substance which can cause extensive pollution to soil and water. It is also a valuable asset.

The supervisor is responsible for ensuring that no fuel is spilt. Should there be an accidental spill, then the supervisor is responsible for ensuring that it is cleaned up immediately and the matter reported to his manager.

Only a trained pump operator may use a fuel pump. Drivers are not permitted to do this.

The following procedure shall be followed.

1. The hard standing in front of the fuel pump must be kept clean at all times. It must be swept at least once per working day.
2. Vehicles must be positioned on the hard standing, with the fuel filling location between 1 and 2 metres from the pump.
3. The fuel filler cap must be removed from the vehicle before the hose is taken from the pump.
4. When moving the hose from the pump, the nozzle must be kept upright at all times.
5. The nozzle is to be inserted carefully into the vehicle filler pipe, and pushed in as far as it will go.
6. Only when the nozzle is fully inserted may the pump be started.
7. While filling the vehicle, the pump operator must watch the nozzle and reduce the pump speed if there is any splashing from the filler pipe.
8. If the nozzle does not have an automatic shut-off valve, the filling must be done slowly and the filler pipe watched carefully to ensure that the pump is stopped well before the tank overflows.
9. Once filling is complete, the pump must be switched off before the nozzle is moved.
10. The nozzle must be removed slowly and carefully, and held in an upright position as it is moved back to its cradle on the pump. The hose must then be stowed neatly beside the pump.
11. The filler cap is then to be replaced on the vehicle, and screwed down firmly.
12. If any fuel has been spilt, it must be mopped up immediately using appropriate pads from the re-fuelling station's fuel and oil spill kit. Once used, these must be placed in the polythene bags provided in the spill kit and disposed of correctly.

M.9.2c Pollution Prevention in Vehicle and Plant Workshops

Introduction

Workshops and service centres carry out a number of operations and processes that have the potential to damage the environment. These include the cleaning of vehicles, the storage, use and disposal of polluting liquids such as oils, paints, solvents, coolant additives, brake fluids and solid waste such as oil filters, exhaust systems, batteries and tyres. Unless the site drainage is correct, waste is properly managed and spillage control procedures are in place, environmental harm could occur.

Vehicle and plant maintenance areas

Internal gullies or grids must not drain to the surface water system. If the workshop pit is subject to water infiltration, and is served by a gully and pump, then this should be directed to the foul sewer. Areas where maintenance or dismantling activities are carried out must have an impermeable surface and a raised edge with drainage to a sealed sump or via an oil separator to the foul sewer.

Disposal of waste liquids. Used liquids, such as lubricating oil, hydraulic fluid, coolant and solvents from degreasing activities, must not be disposed of into surface water systems. They should be collected in a suitably bunded tank. This oil can be taken for use in the furnaces of rubber factories until such time as Nepal has recycling facilities.

Batteries. Batteries containing acid should be stored intact and upright in an acid resistant bunded compound or purpose built bin. Both the lead and the plastic cases can be recycled, so they should be collected for sale to an authorised contractor. Storage can be minimised by the use of one-for-one exchange schemes, whereby old batteries are collected when new ones are delivered.

Tyres and other discarded dry parts. Tyres must never be burnt on site. They can be treated as a dry material for storage, but if burnt, release compounds that are extremely polluting. Tyres should be disposed of by a suitably licensed tyre incinerating or recycling company.

Oil filters and other oil contaminated components. There are certified contractors for used oil filters, and so these should be stored. Alternatively, discarded oil filters can be crushed on-site and the oil and metal

recovered. Intact or crushed filters and other oil contaminated parts such as engines, gearboxes and axles should be stored either in a sealed container or within an impermeable bunded area, preferably roofed to prevent the entry of rain.
Other wastes. Skips should have a designated use and be clearly marked to indicate what materials they may be used for. Material stored in skips should be drained or dry and the skips covered to prevent the entry of rainwater and kept watertight to prevent leakage. If any contaminated liquid does accumulate, it should be removed and suitably disposed of. Note that scrap metal is a potential asset.

Oil, fuel and chemical storage

Above ground storage tanks. All oil storage tanks and drums, including waste oil, must be sited on an impermeable base within an oil-tight bund wall. Any fill and draw pipes, valves and sight gauges should be enclosed within its curtilage and tank vent pipes should be directed downwards into the bund, so that in the event of overfilling the discharge is contained. Bunds should be examined on a regular basis and any rainfall that accumulates removed by bailing or by pumping under a manually controlled system. This water may be contaminated and should be disposed of with care.

Internal storage tanks should also be bunded as above and, if served by a remote fill point, the drainage from the area should pass through a suitably sized oil separator. A high level alarm, which provides an additional safeguard against overfilling, is recommended for all storage tanks.

Underground storage tanks. Underground tanks and pipelines are susceptible to damage and corrosion, and above ground facilities are preferred. In areas of high groundwater vulnerability, the MOFE may object to the installation of underground storage tanks. Where underground storage is necessary, a number of protective measures, such as double skinned tanks and piping, and leak detection, may be required. Regular inspection, stock reconciliation and pressure testing are essential, especially where groundwater pollution could occur. The location of underground piping should be identified and clearly marked in order to avoid damage through excessive surface loading.

Chemical storage. Chemicals such as detergents, degreasers, solvents and hydraulic fluids should be securely stored with storage vessels labelled to show their contents and should be kept as close to the point of use and as far from surface water drains as possible.

Refuelling facilities. These are covered by a separate guideline. The risk of pollution from refuelling areas is especially high. Such areas should be isolated from general yard drainage, (for example by using a raised kerb or roll-over bund). Particular care should be taken in the cleaning of such areas.

Degreasing and cleaning

The cleaning and degreasing of vehicles and components must be carried out in a designated wash-bay and not on unmade ground or in areas which discharge to surface water drains, watercourses or soak-away. A wash water recycling system will reduce water use and associated costs. The wash-bay should be impermeable and isolated from the surrounding area by a raised kerb or roll-over bund, with the effluent directed to foul sewer. Particular care should be taken when using hydrocarbons such as paraffin and white spirit as degreasers, as these substances are toxic to river life. In no circumstances should these substances be discharged to surface water drains.

M.9.2d Sewage Disposal

Pit Latrines

Where temporary toilets are required on site, earth pit latrines are the preferred option. These shall consist of a simple pit with a well-ventilated shelter over the top.
Pit latrines shall be sited in locations that meet the following criteria:

- Within the right of way of the road.
- At least 50 metres from a water course or water body of any description.
- At least 100 metres from a drinking water source. This shall be determined by asking members of local communities to show their sources of drinking water before siting a latrine.
- At least 50 metres from a house.

- Where neither surface nor ground water is likely to collect in the pit.

Holes should be around 1.5 metres deep, and certainly not less than 1 metre, and approximately 1 metre in diameter. They shall be completely enclosed by a sound wooden platform over the top, apart from:

- A small hinged cover that allows use of the latrine but can be closed when not in use; and
- A vertical vent pipe at least 2 metres long, with mosquito mesh over the top, made of bamboo or plastic.

A short burst (10 seconds) of disinfectant or insecticide should be sprayed, or a small amount of lime thrown into the latrine every 2 to 3 days, to stop mosquitoes from breeding in water collected in the pit.

The latrine shall be moved to a new location if it becomes unpleasant to use due to excessive smell, becomes full, or a month of use time elapses. When this is done, the pit must be carefully backfilled and the soil compacted. The ground surface over and around the pit shall be regraded and made good, and if necessary revegetated.

Septic tanks

Outlying housing areas and camps should use appropriately-sized septic tank systems, with the liquids drawn off into an underground soakaway (see below). For temporary purposes, liquids from septic tanks may be drawn off by tanker and discharged in a place designated by the appropriate Government of Nepal authority.

The following guidelines are to be followed to provide for the underground soaking away of liquids emanating from septic tanks.

- Select an area for the soakaway that is at least 50 metres down gradient, at least 250 metres laterally and at least 500 metres up gradient of any boreholes or water supplies.
- Excavate a trench for the underground soakaway (2 metres deep by 1.5 metres wide by 50 metres long).
- Line the large trench for the soakaway with permeable geotextile.
- Place a layer of clean stone of 50 to 100 mm size to 100 mm that is 600 mm thick throughout the trench.
- Lay a UPVC pipe of 150 mm diameter perforated with at least 100 holes of 8 mm diameter per metre of pipe. The upper end shall be connected to the outlet from the septic tank and the lower end shall be covered over with permeable geotextile.
- Fill the trench with clean stone of 50 to 100 mm size to 1 metre below ground level.
- Place a sheet of permeable geotextile over the stone and then backfill the trench to ground level with 1 metre thickness of soil. This shall be lightly compacted by running an excavator track over the backfilled trench.

Other designs and sizes are permitted if supported by appropriate civil engineering calculations and design.

Soakaway for "grey" water only

"Grey" water is used water derived from kitchens, showers, laundries and other washing areas, but not from toilets. It should normally be sent to a sewage treatment plant or septic tank. If no sewerage system is available or the soil has low permeability (making it difficult to dispose of large volumes of water in a soakaway), then a reed bed system may be used.

A reed bed system uses a minimum of three and preferably five separate ponds in series, for the biological treatment of water. Water should be resident in the system for at least 7 days. This usually requires 3 m^2 of reed bed surface area per person using the system, with an outlet pipe height of 0.5 metre.

When the pond series is constructed, local swamp reeds should be transplanted into the ponds. During use, it must be ensured that the reeds are healthy and growing vigorously. If the reeds are dead, the system must be stopped until new reeds have been established.

Discharge from the final pond may go into an open water course. Samples should be tested regularly for bacterial quality if there is a water supply known to exist downstream.

Chemical toilets

The use of chemical toilets is strongly discouraged. They may only be used at project sites where it is proven that neither a standard water closet and septic tank system, nor a pit latrine, are practical. There are two main risks involved in chemical toilets: (a) damage to soils, plants, animals and water from the chemicals used in the toilets; and (b) health dangers to people in the vicinity from the sewage being disposed.

Waste from chemical toilets shall not be poured into a foul drain leading into a sewage treatment plant that relies on biological aerobic digestion, since the bacteria would be killed by the discharge from chemical toilets; and this would ruin the treatment process. Chemical toilets should also not be discharged into septic tanks, since the chemical used in toilets can have an adverse effect on the sewage digestion process in this situation as well.

A disposal hole must be excavated to receive waste from chemical toilets. A suitable hole must be situated at least 100 metres from any dwelling and at least 100 metres from a water course, spring or well. Wherever possible, it should be on a permeable but not sandy soil. Holes shall be two metres deep when first excavated.

When full or nearly full, chemical toilets shall be transported to the approved emptying point for careful disposal under proper supervision. Once emptied, the toilet shall be sluiced down with plenty of water. The toilet receptacle shall also be well washed out with water and disinfectant, all of which shall also be discharged into the disposal hole.

Each time a toilet is emptied into the hole, the waste shall be covered with 100 mm of soil. When the hole has only 0.5 metre of depth remaining, it shall be completely filled and a new hole started.

M.9.3a Management of Waste

Waste management in general

The principles of pollution prevention include the following key messages.

- Everyone should minimise waste production to save money and resources.
- A review of the options for minimising waste will usually help to find ways to save money on raw materials and waste disposal costs.
- Reuse your waste or buy in products that can be reused many times – it will save money in the long term.
- Recycle as much waste as possible.

A waste management strategy is to be organised on the principles of reduction, recovery, recycle and reuse. Recycling and waste reduction campaigns shall be conducted whenever there is evidence of unnecessary waste generation.

A distinction will be made between waste materials that have a potential commercial value – which shall be classed as assets – and those with no value – which shall be considered non-assets.

Waste materials shall be collected and segregated at the source. Care shall be taken to avoid spills during storage and handling. Workers must use appropriate personal protective equipment when handling all forms of waste.

Full records shall be maintained of the types and quantities of waste generation, storage, transfers and disposals.

Landfill sites should be selected with care and the location and details approved by the MOFE. They should be in areas that are not prone to slippage, cannot leach to surface water and groundwater, and are a suitable distance (at least 400 metres) from settlement. They should be located down gradient of any water supply boreholes. The base of a landfill site should be lined with an impermeable membrane and seepage water piped to a sewage treatment plant. As it is filled, the site should be progressively compacted and buried with soil. Always ensure that landfill sites are in secure compounds.

Waste materials that are assets

Topsoil. Waste topsoil generation should be minimised by disturbing the soil only where it is necessary to do so. Topsoil is to be removed carefully, by scraping it off in thin layers. It will be stored in shallow stockpiles, which must not be compacted. Stockpiles shall be planted with grass to prevent erosion and maintain soil quality. Once the work has been completed, the topsoil must be returned to rehabilitated areas.

Under no circumstances shall topsoil be sent to spoil tips, allowed to erode or be contaminated with other substances. Traffic must not be allowed to run on topsoil, causing it to become compacted, either in its natural state or in stockpiles. Topsoil is the source of almost all food, and its protection means the protection of life itself.

Scrap metals. Metallic objects and components should be re-used as far as it is practicable and safe to do so. Scrap items shall be segregated and kept in safe, dry locations, such as shipping containers. Aluminium items, especially used drink cans, shall be crushed to reduce storage volume. Once accumulated, batches of scrap metals shall be sold to an authorised dealer.

Used commercial and industrial machines (vehicles, trucks, generators etc). Wastage should be reduced by using machines for their full design life, and repairing rather than replacing them. Once defunct, they should be stripped of re-usable parts and stored securely, in a bunded and covered area. Machines shall be decommissioned thoroughly, all fuel and lubricants removed, moving parts degreased and components with valuable materials such as copper and lead removed for separate disposal as described above. Remaining usable scrap shall then be sold as an asset, as described above.

Under no circumstances shall machines be placed into landfill sites, allowed to be stolen by informal scrappers or sold to unauthorised companies, uncertified small enterprises or individuals who might re-use their components without proper disposal of unwanted parts.

Used oil drums. Used oil drums shall be stored securely, in a bunded and covered storage area. They shall be recycled for waste oil or other appropriate uses. They are not to be sold to unauthorised companies or uncertified small enterprises. If they need to be cleaned, they shall be washed in an area with a full oil separator drainage system.

Non-asset waste

Vegetation. The cutting of vegetation shall be minimised by only cutting plants or plant parts that are in the way of approved activities. This means plants that are in the direct area required for access tracks, quarry areas or other purposes. Vegetation shall be cut into small pieces and stacked beside the working area to decompose slowly. It shall not be burnt, either standing or cut.

Plantation trees and agricultural plants shall not be cut without following the procedures given in the Resettlement Action Plan.

Spoil (overburden). Damage to land and wasted energy shall be minimised by removing spoil only where it is essential to do so. Spoil shall be placed only in designated and approved spoil tip sites, which must be prepared in advance. Preparation shall include the installation of drainage blankets and slope toe retaining walls as necessary to ensure permanent stability. Spoil shall be placed in shallow layers, not more than 2 metres in thickness, compacted and shaped as they are developed. Erosion protection shall be provided as necessary to ensure that there is no sediment washed into water courses; this will usually be done using planted grasses. The water regime and stability of spoil tips shall be monitored and action taken as required to resolving any problems that are identified. Spoil tips will be kept away from watercourses and seasonal drainage channels unless adequate through-flow has been provided. The use of any spoil tip will be discontinued when the designated area has been used up.

Contaminated soils. The contamination of soil will be avoided by adhering to the hazardous materials storage and handling guidelines. Any soil that has become contaminated will be excavated and removed to a level and secure area, surrounded by an earth bund. The contaminated soil shall be treated fully using an approved bioremediation agent. The area affected will be fully rehabilitated, either using appropriate topsoil from a stockpile, or by replacing the remediated soil as soon as it has been decontaminated. This process will be used

in every case where there has been any spill of hydrocarbons or other chemicals. Under no circumstances will contaminated soils be dumped untreated.

Used lubricants. Waste from excessive used oils shall be reduced by using lubricants for their full design life. Used lubricants shall be stored securely, in strong, leak-proof drums in either a double-walled container or in a bunded and covered storage area. Spill kits will be maintained ready and serviceable in all storage and handling areas, and carried in transporting vehicles. Used oil may be sold to large rubber factories for use in the boilers, or to disposal companies with valid certification from the MOFE. Under no circumstances may any form of used lubricant be poured away, either into the soil or into water, or sold to chain saw operators.

Oily water from workshops and fuelling stations. Industrial oil-water separators shall be installed as part of the drainage system at every mechanical workshop and every fuelling station. Drainage shall be arranged such that all spillages and rainwater drain through the separator. All separators shall be maintained according to the manufacturer's instructions.

Used grease. Waste from excessive used grease shall be reduced by using it for its full design life. Used grease shall be stored securely, in strong, leak-proof drums in a bunded and covered storage area. Grease shall be incinerated at a high temperature in a proper industrial incinerator.

Used engine filters (fuel and oil filters). Waste from excessive used filters shall be reduced by using them for their full design life, and if possible ensuring this is reached by appropriate cleaning. Used filters shall be stored securely, in strong, leak-proof drums in a bunded and covered storage area. Used filters may be sold to disposal companies with valid certification from the MOFE. Alternatively, filters may be crushed to remove residual fuel or oil, and incinerated at a high temperature in a proper industrial incinerator.

Used hazardous containers (paint tins, pesticide containers, etc). Used containers shall be stored securely, in strong, leak-proof drums in a bunded and covered storage area. Used paint tins and pesticide containers shall be crushed as far as possible and sent to an approved landfill site. Under no circumstances shall containers or any parts of them be sold to unauthorised companies or uncertified small enterprises. Containers must not be washed in open water courses or areas that do not drain to a proper sewage treatment plant.

Used tyres. Wastage shall be reduced by using tyres for their full design life (usually until the tread is less than 1.2 mm for road vehicles). Used tyres shall be stored securely, in a recognised storage area. They may be sold to companies that will recycle them for non-road uses. Where there is doubt about the future use of tyres, they should be slashed before sale to make them useless for road vehicles. Tyres should also not be sold to people who will use them for quarrying, since this involves air pollution from low temperature burning. Tyres may also be chipped and sent to approved companies that can burn them in furnaces at high temperatures or sent to an approved landfill site.

Used batteries (12-volt lead-acid and gel-filled batteries). Where possible, batteries should be purchased under a buy-back policy from the suppliers to avoid the storage and handling of waste batteries. Wastage should be minimised by using batteries for their full design life, servicing and recharging them where feasible. Used batteries shall be stored securely, in strong, leak-proof containers in a bunded and covered storage area. Batteries containing lead shall be sold for recycling by companies with valid certification from the MOFE. Under no circumstances shall batteries be sold to unauthorised companies, uncertified small enterprises or individuals who might re-use their components without proper disposal of acid or other unwanted parts.

Used personal protective equipment (PPE). Wastage should be reduced by using PPE for its full design life. Used PPE should be stored securely, in strong, leak-proof containers in a bunded and covered storage area. PPE shall be sorted into chemically contaminated (e.g. overalls and gloves stained with creosote from handling rail ties) and non-contaminated items. Chemically contaminated PPE shall be incinerated at high temperature in an industrial incinerator or, if this is not possible, in a purpose-dug pit. Residues shall be placed into an approved landfill site. Non-contaminated PPE shall be placed into an approved landfill site.

Used workshop clothing and rags (i.e. oily waste). Wastage should be reduced by using clothing and rags for as long as it is safe to do so. Oily waste should be stored securely, in strong, leak-proof containers in a bunded and covered storage area. It shall be incinerated at high temperature in an industrial incinerator or, if this is not possible, in a purpose-dug pit. Residues shall be placed into an approved landfill site.

Household waste. Awareness programmes shall be undertaken to encourage waste minimisation. The use of throw-away plastic bags shall be discouraged inside the concession. Households shall be given the necessary waste bins to segregate their waste into aluminium (e.g. foil and drink cans), steel (e.g. food tins), glass, plastics, cardboard, compostable and other waste. The segregated waste shall be collected for disposal as follows.

- Aluminium, steel, glass, plastics and cardboard shall be sold for recycling by companies with valid certification from the MOFE.
- Compostable waste shall be composted and, once fully decomposed and sterile, spread to land as fertiliser or mulch.
- The remaining waste shall be sent to an approved landfill.
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Food waste. Wastage shall be minimised by ensuring that canteens do not over-cook. Canteen staff shall be encouraged to use uneaten food for themselves and their families if it is still safe. Arrangements shall be made for farmers of domesticated animals to collect food waste for feeding to their stock. Any unused vegetable material shall be composted and unused animal products sent to an approved landfill site. All food waste shall be stored and transported in containers that are proof against dogs, crows and rodents.

Clinical waste. All biomedical waste shall be stored in appropriate sealed containers. Wastes shall be segregated in the hospital or clinic into different categories, in the appropriate colour bins; it is important to ensure staff involved in the handling of waste are equipped with appropriate PPE. Biomedical waste shall be incinerated at a temperature of 800 to 1600°C in an approved specialist incinerator. Incinerator ash and residues shall be placed into an approved landfill site. Only appropriately trained staff shall handle hospital wastes and operate incinerators.

Used Domestic Machines (refrigerators, air conditioners, washing machines etc) and IT Equipment (computers, printers, UPS etc). Wastage shall be reduced by using machines for their full design life, and repairing rather than replacing them. Used machines shall be stored securely, in a bunded and covered storage area. Re-usable parts should be stripped out for repairing other equipment. Machines shall be sold for recycling by companies with valid certification from the MOFE. Under no circumstances shall machines be sold to unauthorised companies, uncertified small enterprises or individuals who might re-use their components without proper disposal of unwanted parts.

Recording hazardous waste management and disposal

Contractors are required to record the accumulation, storage and transfer of potentially hazardous waste (including materials that may be used for environmentally unsound purposes after transfer). This shall include, but not necessarily be limited to, the following:

- Used commercial and industrial machines (vehicles, trucks, generators etc);
- Used lubricants;
- Oily water of any kind;
- Used engine filters (fuel and oil filters);
- Used hazardous containers (paint tins, pesticide containers etc);
- Used tyres;
- Used batteries (12-volt lead-acid and gel-filled batteries); and
- Clinical waste (biomedical).

The unit generating the waste must keep a Waste Materials Record Book. This must contain as a minimum, full records of the following:

- Weekly or monthly estimate of the quantities of each type of hazardous waste;
- The location of storage and any special storage measures employed;
- Each disposal of waste, including the type, quantity, date and location of each transfer;
- The destination of all disposed waste, including the details of any waste management contractor, the method of transport and the point of transfer of responsibility;
- Where a waste contractor is involved, a copy or details of the contractor's Environmental Permit for waste handling and disposal; and
- Any accident or loss involving hazardous or potentially hazardous waste materials.

Waste Materials Record Books may be inspected at any time as part of environmental audits.

M.9.3b Burning or Burial of Rubbish at Temporary Camps at Tower Sites

This guideline shall apply only to domestic rubbish at temporary site camps and not to permanent establishments, which shall have formal, long term procedures for waste disposal. All industrial and hazardous waste shall be sent to an MOFE-approved waste management facility for proper disposal. This shall include batteries, waste oil, tyres, used vehicle parts, and any form of hazardous chemicals or their containers.

All rubbish that is combustible shall be burnt. This shall be done only in a designated area, one per camp, on the downwind side of the living and working areas.

Before starting a bonfire, all vegetation shall be cleared in a radius of 5 metres around the fire site. If possible, rocks shall be placed in a circle to mark the location of the fire.

Burning shall be for a limited and defined period each day (e.g. 8 to 10 am).

One individual shall be made responsible for burning, and for ensuring that the fire is completely dead before he leaves it. The individual shall be provided with the means to control the fire if it starts to spread (e.g. buckets of water ready at the burning site).

Residues of bonfires and non-combustible items (e.g. glass) shall be buried in a designated and approved landfill site. When finished, the buried material shall be underneath at least one metre of soil.

M.9.4 Guideline for Spoil disposal

However much care is taken to minimise quantities of spoil, it cannot be eliminated altogether. Controlling the disposal of spoil is very important, because it can give rise to a variety of problems, including:

- erosion of the spoil tip itself;
- the smothering or removal of natural vegetation – once stripped of plant and soil cover, slopes usually take three to five years to re-vegetate, and as many as 10 years on steeper and more sterile slopes;
- instability within the spoil material itself, especially when infiltrated by water;
- overloading and resultant failure of the slope;
- disruption of existing runoff patterns and siltation of water courses and drainage channels;
- disruption to agricultural practices.

Spoil problems can be minimised by taking two steps. The first is to identify those operations that will generate spoil, the places where it will be generated and the quantities involved, no matter how small. The second is to plan for its disposal by designating safe tipping sites.

The Contractor is responsible for designating suitable sites and obtaining the Engineer's approval for them. The criteria for their selection should aim to avoid the problems listed above. The Contractor must ensure that the construction workforce is aware of the restrictions on the disposal of spoil, the location of approved spoil disposal sites and specific requirements for the management of these sites. The Engineer must strictly enforce contract specifications regarding spoil disposal.

Spoil can be either discarded or turned into landfill. The following guidelines must be observed:

- when creating a landfill site for spoil, maximum use must be made of terraces, level ground and spurs;
- if spoil tipping has to be done on steep slopes, areas formed in resistant bedrock must be selected; tipping should result in no more than the removal of vegetation and shallow soil, with negligible slope incision thereafter;
- build many small spoil benches rather than a few large ones, to avoid slope overloading;
- provide a drainage blanket beneath a spoil bench where there is any indication of a spring seepage at or near the spoil site;
- compact spoil benches during construction: while benches cannot be compacted in the formal sense, they can be constructed in definite lifts normally not more than 0.5 m thick, with the top surface of each lift approximately horizontal, as this will allow machines involved in spreading the spoil to track the surface and provide some degree of compaction;
- where spoil benches are constructed on agricultural land, form the tip into a benched profile so that it can eventually be returned to agricultural production; in the meantime, the risers between levels must be

protected against erosion by applying vegetation or constructing dry stone walls;

- where the top surface of the bench is large, reduce runoff by providing regular shallow interceptor drains: the slope of these drains should be constant as far as is practicable and should not be so steep as to induce erosion;
- on completion, leave spoil benches in their required shape and plant them with grasses, shrubs and trees to encourage maximum stability and resistance to erosion.

The following is not permitted:

- tipping of spoil into stream and river channels, as the increased sediment load will lead to scour and siltation downstream;
- tipping of spoil on to slopes where road alignments, housing areas or farmland downslope might be affected;
- use of areas of past or active instability and erosion as tip sites;
- the discharge of runoff over the loose front edge of a tip bench during or after construction;
- tipping of spoil in front of engineering structures, where impeded drainage could soften the foundation.