Code of Practice

on

Working near Electricity Supply Lines

2005 Edition

Electrical and Mechanical Services Department
The Government of the Hong Kong Special Administrative Region
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Foreword

This Code of Practice (“Code”) is approved by Director of Electrical and Mechanical Services and issued in accordance with the provisions of Section 15 of the Electricity Supply Lines (Protection) Regulation (“ESLPR”) made under the Electricity Ordinance (Cap.406) (“EO”). Its purpose is to provide practical guidance in respect of the requirements of the ESLPR to ensure that activities carried out in the vicinity of underground electricity cables and overhead electricity lines do not prejudice safety or the continuity of the electricity supply. These requirements are more specifically defined in Section 10(1) and (2) of ESLPR as follows -

“10. Requirements relating to works in the vicinity of electricity supply lines

(1) A person shall not -

   (a) carry out or cause or permit another to carry out in the vicinity of an underground electricity cable any works which are below ground level; or

   (b) carry out or cause or permit another to carry out in the vicinity of an overhead electricity line works of any kind,

unless before the works are begun all reasonable steps have been taken to ascertain the existence within the proposed works site and its vicinity of any such underground electricity cable and its alignment and depth or of any such overhead electricity line and its alignment, distance from the ground and voltage, as the case may be.

(2) A person who -

   (a) carries out or causes or permits another to carry out in the vicinity of an underground electricity cable any works which are below ground level; or
(b) carries out or causes or permits another to carry out in the vicinity of an overhead electricity line works of any kind,

shall ensure that all reasonable measures are taken to prevent the occurrence of an electrical accident or an interruption to the supply of electricity arising from those works.”

Section 10(3) of ESLPR stipulates what can be regarded as reasonable steps having been taken to ascertain the existence of the underground electricity cable and its alignment and depth for the purpose of complying with Section 10(1)(a) of ESLPR.

Section 10(4) of ESLPR provides that, subject to the provisions in the section, compliance with the Code shall be deemed to constitute the taking of all reasonable steps and reasonable measures for the requirements of paragraph (a) or (b) of subsection (1) and (2) of Section 10 of ESLPR. Although failure to observe any guidance contained in the Code is not in itself an offence, Section 16 allows that any provision of the Code relevant to a requirement under the ESLPR alleged to have been contravened is admissible in evidence in criminal proceedings and a failure to observe the requirement of such provision in the Code may be relied upon by the prosecution to establish contravention of the requirement under the ESLPR.

However, for a charge of contravening any requirement of Section 10(2)(a) or (b) of ESLPR, Section 18 of ESLPR provides for a defence to the charge if the person charged can show that the failure in question is due to reliance on the information provided by a competent person or an electricity supplier, who is the owner of the electricity supply line concerned.
1 Introduction

Incidents involving damage to electricity supply lines can have serious consequences for workers and adversely impact on the community. Various types of works have the potential to cause such damage but adequate precautions can dramatically reduce the risk of an incident. This Code outlines the dangers and provides advice on how to reduce risk.

1.1 Background

1.1.1 Damage to electricity supply lines can cause electrical accidents and electricity supply interruptions. Fatal accidents and serious injuries have occurred during excavation close to underground electricity cables and during lifting operations by cranes or hoists near overhead electricity lines. In addition, damage may also cause an electricity supply interruption that could potentially affect thousands of homes and businesses.

1.1.2 This Code outlines the dangers that can arise from works near underground electricity cables (“U/G cables”) or overhead electricity lines (“O/H lines”) and gives guidance on how to reduce the risk. It deals specifically with risks to persons carrying out works and the necessary precautions needed to reduce the risk of accidents due to damage and unsafe practices.

1.1.3 During the preparation of this Code, the Director of Electrical and Mechanical Services (“the Director”) consulted the electricity suppliers, the construction industry, the other utility companies and relevant Government Departments. The views and advice given by these organizations have been taken into account in this Code wherever possible.

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1 Electrical accident means an incident involving electricity that causes a fire or explosion or that causes death or injury to a person (Section 2 of Electricity Ordinance).
1.2 Scope

1.2.1 This Code applies to all works carried out in the works site or in its vicinity where U/G cables or O/H lines may be found. In addition to a safe system of work, it provides practical safety precautions to avoid damage to electricity supply lines in different situations, including works that involve excavation, ground penetration, lifting operations by cranes or hoists, and earth moving operations by heavy machinery.

1.2.2 The term “works” is defined in the ESLPR and this definition is also included under Section 1.3.1.7 of this Code. However, the following works need not follow the safe system of work set out in this Code unless probable damage to U/G cables is seen:

(a) the milling of paved surface up to 120mm below ground level in carriageways for the purpose of road resurfacing; and

(b) the replacement of existing paving block up to 120mm below ground level.

Moreover, this Code does not apply to dredging works and extraction of material from the seabed.

1.2.3 This Code is intended to be used by all those who have responsibilities under relevant legislation, including employers, employees, contractors, competent persons, electricity suppliers and those concerned with planning, designing, organizing and supervising works near U/G cables or O/H lines. Those who wish to carry out their works in some other ways than that provided in this Code must ensure that they achieve an equal or higher standard of safety.

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2 Contractor, in relation to works, means any person or site personnel engaged in carrying out works by way of trade or business, either on his own account or pursuant to a contract or arrangement entered into with another person including the Government or any public body.
1.3 Definitions

1.3.1 This Code adopts the following definitions from the Electricity Ordinance ("EO") or ESLPR:

1.3.1.1 “competent person” means a person approved as a competent person\(^3\) under Section 3 (of ESLPR).

1.3.1.2 “electricity supplier” means a person who generates, supplies and sells electricity at low or high voltage for use in an electrical installation.

1.3.1.3 “electricity supply line” means an electric line or any cable used in conjunction with such a line for the purpose of transmitting control signals, which is owned by an electricity supplier.

1.3.1.4 “overhead electricity line” (O/H line) means an electricity supply line located at or above ground level.

1.3.1.5 “site contractor” means a person who carries out or is engaged to carry out any works on a particular works site.

1.3.1.6 “underground electricity cable” (U/G cable) means an electricity supply line located below ground level.

1.3.1.7 “works” means -

(a) any kind of works involving or in connection with –

(i) building works\(^4\) within the meaning assigned to that term in Section 2(1) of the Buildings Ordinance (Cap.123), and

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\(^3\) Under Section 6 of ESLPR, a person’s approval as a competent person may be suspended or revoked by the Director in accordance with subsection (1) or (2) respectively.

\(^4\) It should be noted that “building works” includes any kind of building construction, site formation works, ground investigation in the scheduled areas as defined in the Building Ordinance (Cap.123), foundation works, repairs, demolition, alteration, addition and every kind of building operation, and includes drainage works.
for the purposes of this subparagraph reference in that Section to “ground investigation in the scheduled areas” shall be read as a reference to “ground investigation”;

(ii) the laying out, construction, alteration or repair of any road (whether or not at ground level), footpath, cycle track, pedestrian subway, footbridge, tunnel, airport runway, canal, reservoir, pipeline, railway or tramway;

(iii) trench works, including -
   (A) water mains, storm water drains and sewers; and
   (B) such works when carried out by or for any public utility;

(iv) the extraction of material from land or the seabed;

(v) landfill works, river training works, slope works or reclamation works; or

(vi) levelling, piling, ramming, dredging, boring, tunnelling or blasting works;

(b) the use of any crane or hoist (within the meaning assigned to those terms in Regulation 2(1) of the Construction Sites (Safety) Regulations (Cap.59 sub.leg.)) or other equipment for the purpose of lifting objects;

(c) the use of any heavy machinery or other equipment for the purpose of earth moving.

but does not include works necessary to ascertain the alignment and depth of an underground electricity cable, nor any electrical work carried out by a registered electrical worker or registered electrical contractor.

1.3.1.8 “works site” means any area in which works are being carried out.

1.3.2 The following terminologies are used in this Code:

1.3.2.1 “hand tool” means a non-mechanized tool designed for operation by hand including, but is not limited to spades, shovels, picks or forks.
1.3.2.2 “hand-held power tool” means a hand-held mechanized tool designed for operation that utilizes electrical or pneumatic power.

1.3.2.3 “minor shallow excavation” means an excavation limited to 2 sq. m x 450mm in depth and dug using hand tools with the exception that hand-held power tools can be used to break the paved surface up to a depth of 150mm in a footpath or 450mm in a carriageway and, in both cases, with at least 250mm clearance from any cable alignment.

1.3.2.4 “trial hole” means an excavation for exposing part of the target cable, carried out under the supervision of a competent person at the point of works where the working personnel use hand tools for digging with the exception that hand-held power tools can be used to break the paved surface up to a depth of 150mm in a footpath or 600mm in a carriageway and, in both cases, with at least 250mm clearance from any cable alignment.

1.3.2.5 “works in the vicinity of U/G cables” are defined in Table 1.

Table 1 - Works below ground level in the vicinity of U/G cables

<table>
<thead>
<tr>
<th>Type of works below ground level</th>
<th>Distance$^5$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trench or other excavation works in stable ground conditions up to 1.5 metres in depth</td>
<td>3 metres</td>
</tr>
<tr>
<td>Trench or other excavation works in stable ground conditions over 1.5 metres and up to 5 metres in depth</td>
<td>5 metres</td>
</tr>
<tr>
<td>Trench or other excavation works in stable ground conditions over 5 metres in depth</td>
<td>10 metres</td>
</tr>
<tr>
<td>Vertical penetration including sheet piling, ground investigation and any kind of drilling or core sampling or ramming</td>
<td>3 metres</td>
</tr>
<tr>
<td>Welding or other hot works near exposed U/G cables</td>
<td>10 metres</td>
</tr>
</tbody>
</table>

$^5$ Measurement is taken from the centre line of the U/G cable to determine whether works will be considered to be in its vicinity.
<table>
<thead>
<tr>
<th>Type of works below ground level</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-Piling, percussion moling or pipe jacking</td>
<td>15 metres</td>
</tr>
<tr>
<td>Any form of tunnelling, boring, construction of caverns, driving headings, cable jacking</td>
<td>always consult electricity supplier</td>
</tr>
<tr>
<td>Use of explosives</td>
<td>60 metres</td>
</tr>
</tbody>
</table>

1.3.2.6 “works in the vicinity of overhead lines” means any works, except for blasting works, found within a horizontal distance of 9m from the outermost conductor of an O/H line (Fig 1). For blasting works, they are considered as works in the vicinity of O/H lines if any blasting point is within a horizontal distance of 25m from the nearest O/H conductor or radial distance of 50m from the centre of any O/H line footing.

Fig 1 – Works in the vicinity of overhead lines (except blasting works)

1.3.2.7 “working party” means any person, including contractor, site contractor and site personnel, concerned with planning, designing, organizing and supervising works near U/G cables or O/H lines.
1.4 The dangers associated with damage to U/G cables and O/H lines

1.4.1 Damage to U/G cables can cause fatalities or severe injuries and electricity supply interruptions. There are three common types of damage to U/G cables:

(a) Damage due to penetration by a sharp object up to the cable conductor. This will immediately cause an explosive arcing current and a short-circuit fault on the U/G cable.

(b) Damage due to penetration by a sharp object up to the cable insulation. While this may not cause immediate danger, it constitutes a potential hazard and could result in an electrical fault later as the damaged insulation deteriorates.

(c) Damage due to mechanical stress in the U/G cable. Mechanical stress often occurs when a long section of U/G cable is overhanging without proper support or when the earthworks fall onto an exposed U/G cable. This stress is transmitted to the nearest cable joint, where an electrical fault may subsequently develop.

1.4.2 Damage to the control cables associated with U/G cables could trip major cable circuits and cause electricity supply interruptions.

1.4.3 Other services, such as plastic gas pipes, may also be at risk if they are near to damaged live U/G cables. If the gas main leaks at the same time, the damage could cause a gas explosion which imposes a higher risk to the persons in the surrounding.

1.4.4 Getting close to O/H lines, or coming into contact with them, is highly dangerous and may result in fatalities, severe injuries, shocks or burns to any persons in the vicinity due to an electrical explosion or arcing from the O/H lines. The instantaneous short circuiting of high voltage O/H lines to the ground, following damage or interference by an overhead crane, can cause a voltage surge on the ground potential. Any persons on the ground in the
vicinity may suffer electric shock, and any electrical products in nearby houses may burn out.

1.5 Electricity supply in Hong Kong

1.5.1 Electricity supply lines used for the transmission and distribution of electricity are scattered throughout Hong Kong Island, the Outlying Islands, Kowloon and the New Territories. Currently there are two electricity suppliers in Hong Kong, namely, CLP Power Hong Kong Ltd. (CLP) and The Hongkong Electric Co. Ltd. (HEC). Both CLP and HEC own and operate extensive electricity supply systems at various voltage levels. Consumers in Hong Kong Island, Lamma Island and Apleichau are supplied by HEC while CLP supplies electricity to consumers in the rest of Hong Kong Special Administrative Region (“HKSAR”). The electricity supply systems operated by CLP and HEC are outlined in Appendix 3. The typical colours, sizes and buried depths of CLP’s and HEC’s U/G cables are given in Table 2 of Appendix 3.
2 Safe System of Work

A safe system of work protects those working in the vicinity of electricity supply lines. The working party who requires to work in the vicinity of electricity supply lines is responsible for executing the safe system of work.

2.1 The working party’s safe system of work

2.1.1 The working party\(^6\) is responsible for ensuring that those working in the vicinity of electricity supply lines adhere to a safe system of work. This safe system of work has two key elements: reasonable steps and reasonable measures.

2.1.2 Before commencement of works in the vicinity of U/G cables, the working party shall take all reasonable steps to ensure safety, which include obtaining cable plan from electricity supplier, appointing a competent person for cable detection work and ensuring that personnel at the works site are fully aware of the details of the U/G cables.

2.1.3 Before commencement of works in the vicinity of O/H lines, the working party shall take all reasonable steps to ensure safety, which include planning the works, consulting the electricity supplier and ensuring that personnel at the works site and the appointed signaller fully understand all necessary safety precautions to be taken.

2.1.4 In the course of works in the vicinity of electricity supply lines, the working party shall adopt the reasonable measures appropriate to the nature of the works.

2.1.5 The safe system of work, together with the safety guidelines on handling accidents or emergencies, shall be effectively communicated to all persons likely to be engaged in the works in the vicinity of electricity supply lines.

\(^6\) See Definition in Section 1.3.2.7
2.2  Electricity supplier’s responsibility

2.2.1  The electricity supplier\(^7\) shall:

(a) accurately record the as-built alignments of its electricity supply lines and maintain the accuracy of such records as long as the supply lines remain underground or overhead; and

(b) provide the working party with the most updated U/G cable plan or O/H line drawing upon request within the agreed time frame.

2.2.2  The electricity supplier accepts the need for close co-operation with those who carry out works in the vicinity of electricity supply lines. According to the nature of the works, the electricity supplier shall attend site meetings and provide safety advice to the working party as necessary. Additional site patrol will be essential when the electricity supplier believes that the electricity supply lines may be susceptible to damage.

2.3  Competent person’s responsibility

2.3.1  A competent person\(^8\) shall:

(a) coordinate with the working party to undertake an investigation to ascertain the existence of any U/G cable within the proposed works site and its vicinity, and to determine its alignment and depth; and

(b) provide the working party with a Competent Person Written Report and give a briefing on it as required by the working party.

2.3.2  The competent person shall not delegate the function and duty of the investigation to another person.

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\(^7\) See Definition in Section 1.3.1.2

\(^8\) See Definition in Section 1.3.1.1
2.3.3 The competent person shall seek assistance from the electricity supplier if he encounters genuine difficulty in locating the U/G cables.

2.4 Emergency situation

2.4.1 In an emergency involving works in the vicinity of electricity supply lines, the working party shall contact the 24-hour emergency service of the electricity supplier by telephone. The electricity supplier shall provide immediate advice as far as practicable by telephone or facsimile. In addition, if the electricity supplier is aware of an imminent danger arising from the electricity supply lines, emergency personnel shall be immediately despatched to the site. The contact information of the two electricity suppliers can be found in Appendix 3 of this Code.

2.4.2 The electricity supplier shall provide cable plans/alignment drawings and safety advice to the working party at site. In case of works in the vicinity of U/G cables, the working party shall arrange for a competent person to ascertain the positions of the U/G cables whenever possible. In an emergency situation, the electricity supplier shall offer assistance to the working party.

2.4.3 If the electricity supplier cannot immediately provide this assistance and yet it is essential that excavation work continue, the excavation shall be under the direct supervision of a competent person and extreme caution must be taken with the assumption that there are U/G cables in the vicinity. In case of an emergency involving O/H line (e.g. O/H line or tower is damaged, etc.), no works are allowed in the vicinity without the consent of the electricity supplier.
3 Reasonable Steps for Working near Underground Electricity Cables

The reasonable steps to a safe system of work for works near U/G cables begin at the design stage and involve the early participation of the electricity supplier. Once cable plans have been received from the supplier, a competent person is appointed to detect the alignment of the U/G cables and propose trial hole locations. Working closely with site personnel, the competent person helps to open trial holes and expose cables to allow their alignment and depth to be accurately ascertained. He then prepares the “Competent Person Written Report” and clearly marks up cable alignment and depth on site.

3.1 Plans from electricity supplier

3.1.1 The working party shall approach electricity supplier for information and cable plans before any works begin, except for works which involve only minor shallow excavation\(^9\).

3.1.2 An early approach to the electricity supplier is particularly recommended for a major project involving large scale construction or horizontal drilling or tunnelling. Consideration should be given at the design stage, as early as the feasibility study, to planning works away from the vicinity of existing U/G cables. If a major diversion of U/G cables is necessary, the electricity supplier may require a long lead time to plan and complete the diversion.

3.1.3 The request for information made to the electricity supplier should include a full description of the scope and, where appropriate, the nature of the proposed works. The electricity supplier can then identify the area over which it considers its U/G cables may be affected and provide all available records of U/G cables in the vicinity.

3.1.4 Upon receiving written notice of proposed works from a working party, the electricity supplier shall without charge provide the cable plans of

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\(^9\) See Definition in Section 1.3.2.3
the proposed works site or its vicinity within 14 working days or such period as is mutually agreed between the concerned parties.

3.1.5 The date of commencement of the time period stipulated above (in 3.1.4) is the date upon which the electricity supplier received and date-stamped the notice. Notices shall be immediately date-stamped when they are received by the electricity supplier and retained for a minimum of five years. The working party may request, in the notice, an acknowledgment of its receipt, stating the date upon which it was received.

3.1.6 The working party shall consult or request new cable plans from the electricity supplier 14 working days before commencement of works, if the plans in hand have been provided for more than three months. After commencement of works, if the working party has overall control of the works site until completion of the works, the requisition of new cable plans is not necessary unless the working party has given access to the electricity supplier for laying new cables.
3.1.7 The cable plans\(^{10}\) provided by the electricity supplier shall be of suitable scale sufficient for the working party to identify the following cable information:

(a) number of cables including abandoned cables;
(b) their respective voltage rating and size;
(c) their alignment, with dimensions making reference to appropriate reference points; and
(d) any shallow cover locations (i.e. cables with buried depth less than 900 mm in a carriageway or 450 mm in other areas), to the best of the electricity supplier’s knowledge.

3.1.8 Cable plans provided by the electricity supplier provide a good indication of the presence and alignment of U/G cables at a particular site, and will help subsequent cable detection. However, it should be noted that the accuracy of plans cannot be relied upon fully because:

(a) the position of reference points (e.g. the kerb or building line) may have been moved since the plans were drawn;
(b) regrading or resurfacing of the road may mean that the depth shown, if provided, are now incorrect;
(c) U/G cables may have been moved without the authorization or knowledge of the electricity supplier;
(d) U/G cables, marked as straight lines may not, in practice, run in a straight alignment; and
(e) the level and alignment of U/G cables may change sharply over a short distance due to the presence of underground obstructions.

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\(^{10}\) Information on depth of U/G cable is not generally available in the electricity supplier’s cable plans. Normally the electricity suppliers install new cables according to the buried depth shown in Table 2 of Appendix 3.
3.2 Locating U/G cable alignment (passive detection)

3.2.1 The working party shall decide whether the works site is within the vicinity of U/G cables in accordance with the distance specified in Table 1 (i.e. Section 1.3.2.5). If the cable plans supplied by the electricity supplier indicate that there are U/G cables within the works site and/or the area of the specified distance from the works site, the working party shall appoint a competent person to carry out the cable detection work.

3.2.2 Before the cable detection takes place, the competent person shall be provided with electricity supplier’s cable plans and works site drawings. The cable detection device to be used by the competent person shall be non-destructive and calibrated as per the manufacturer’s requirements. In the course of cable detection, the competent person shall repeatedly refer to the cable plans to pinpoint as accurately as possible the alignment of any U/G cables.

3.2.3 Under normal conditions, the competent person should select the 50Hz passive detection mode of the cable detection device for alignment detection. The larger the 50Hz unbalanced current (i.e. the vector sum of the currents in phase conductors is not zero) flowing in the cable gives a stronger signal, allowing the competent person to locate the most probable alignment of each U/G cable. However, depth measurement from this detection mode is not accurate and should not be relied upon.
3.2.4 It should be noted that 50Hz passive detection cannot detect the existence of de-energized U/G cables, energized U/G cables with no load and current-balanced U/G cables. If the cable alignment cannot be detected by means of 50Hz passive detection, the competent person can switch to the following alternative detections:

(a) **Radio frequency passive detection** – Another passive mode selected at the cable detection device, this method provides less definite alignment detection than 50Hz passive detection because other utilities with metallic objects may also re-emit the radio frequency signal.

(b) **Inductive detection** – This detection mode requires the use of a signal generator (the transmitter) and a separate receiver. This method can only be used when certain part of the U/G cable alignment is accurately known so that the transmitter can be properly positioned right above it. It should be noted that the accuracy of this method is very much affected by other utilities with metallic objects close to the target cable.
3.2.5 The competent person should be able to detect the most probable alignment of the U/G cables identified on the cable plans if the current-carrying cables are properly laid out with an adequate horizontal clearance. However, if the U/G cables are very close to each other or crossing each other or laid in different layers (e.g. cables in the same alignment but at different depths), the competent person will not be able to detect the most probable alignment for each U/G cable. Instead, he can locate a peak signal for the group of U/G cables and record its alignment and note the number and voltage level of the cables that it may represent.

3.2.6 The competent person is required to note in writing the existence of any U/G cable at the works site or its vicinity and any identified U/G cable alignment. This written record shall bear the heading “Cable Alignment Record” and include the following details:

(a) name and approval number of competent person;
(b) name of the working party or site contractor;
(c) location, date and time for which the work on locating the U/G cable alignment was carried out;
(d) U/G cable alignment (for each U/G cable or for each group of cables) based on common reference points (e.g. lamp pole, traffic light post or hydrant, etc.)
(e) brand name, model number, serial number, calibration record and mode of operation of the U/G cable detection device used for the detection;
(f) proposed trial hole locations; and
(g) photos showing site markings for cable alignment.
3.2.7 The competent person shall propose trial hole locations according to the detected alignment or, in case the alignment cannot be located due to de-energized or current-balanced cables, by referring to the electricity supplier’s cable plans. The proposed locations at appropriate intervals shall be, as far as practicable, convenient for the working party to expose as many U/G cables as possible for the purpose of toroidal active detection as described in Section 3.3.1 (b).

3.2.8 The competent person is responsible for marking the alignment at the location and its vicinity where the trial hole is to be opened. This marking should be done with waterproof crayon, paint or self-adhesive temporary road marking tapes on paved surfaces, or with wooden pegs in grass or unpaved areas.

3.2.9 The competent person should brief the working party on the content of the cable alignment record, with particular reference to the locations of the proposed trial hole opening and the number of target U/G cables to be exposed.

3.2.10 In case of a minor shallow excavation, the competent person shall mark the cable alignment, if any, within and in the vicinity of the works site and submit the Cable Alignment Record as a Competent Person Written Report to the working party appointing him.

3.3 Trial holes (exposing cable and active detection)

3.3.1 The working party shall proceed with the following reasonable steps except for works which involve only minor shallow excavation:

(a) Trial hole Excavation – Great caution has to be exercised when exposing the target U/G cable. The excavation of the trial hole shall be supervised by the competent person who should repeatedly use a cable detection device and frequently update the working personnel as to the most accurate cable location until the target cable is exposed.
(b) **Toroidal active detection** - The target cable inside the trial hole is adequately exposed so as to permit the competent person to place a signal clamp around it. A known high frequency signal is injected into the cable by electromagnetic induction through the signal clamp. As only the target cable carries this high frequency signal, the competent person can use a receiver selected to this signal frequency to detect at appropriate interval (say, 1-3m) the alignment and depth of the unexposed part of the target U/G cable, starting from the trial hole.
3.3.2 Trial hole excavation shall be carried out when:

(a) the alignment of any U/G cable is ascertained to be within the works site and/or within the area 500mm away from the boundary of the works site, or;

(b) the alignment of any peak signals for a group of U/G cables is located within the works site and/or within the area 3m away from the boundary of the works site.
3.3.3 As to 3.3.2 (b), if the alignment of the peak signals is located between the area 500mm and 3m away from the works site and it is not practicable to open trial hole within that area (e.g. the works site is at a footpath whereas the alignment is located at a carriageway), the competent person should propose the following:

(a) open a number of trial holes along the boundary of the works site opposite the alignment of the peak signals. The competent person shall determine the number of trial holes based on the alignment and the number of cables within the group. In principle, the closer the alignment and/or the greater the number of cables within the group, the more trial holes will be required.

(b) The trial holes should be proposed at the locations where the peak signals are closest to the works site.

(c) The trial hole should be excavated at a right angle to the alignment and extended 500mm away from the works site.

(d) The alignment and depth of any cables found in the trial holes shall be ascertained by means of toroidal active detection.
3.3.4 Before beginning trial hole excavation, the working party shall inform the electricity supplier of the nature of the intended works if:

(a) the target cables are of 132kV or above; or

(b) the works involve trenchless excavation or horizontal drilling such as tunnelling, percussion moling, pipe jacking and soil nailing, etc.

The electricity supplier may deem the excavation of a trial hole unnecessary if the works involved are below ground level, where U/G cables would not be affected or where U/G cables do not exist. Any agreement between the electricity supplier and the working party shall be properly signed and recorded for inspection upon request by EMSD.

3.3.5 If the works site is not large but heavily congested with many U/G cables and/or other utilities (e.g. in a rear lane), the competent person may consider supervising the excavation until all U/G cables are exposed within the works site.

3.3.6 If the competent person encounters genuine difficulty in locating the U/G cables shown in the electricity supplier’s plans, he shall seek necessary assistance from the electricity supplier. The electricity supplier shall send technical staff to the site, not more than three working days after receipt of the request, to assist with locating U/G cables as necessary without charge.

3.3.7 Should there be any doubt regarding discrepancies between the cable detection results and the electricity supplier’s cable plans, the competent person shall repeat the cable detection and/or contact electricity supplier for clarification on site.

3.4 Competent person written report

3.4.1 Upon completion of active cable detection, the competent person is required to prepare a proper record form for submission to the working
party appointing him. The form shall bear the heading “Competent Person Written Report” and include the following details:

(a) name and approval number of competent person;

(b) name of the working party or site contractor;

(c) location, date and time for which the active detection was carried out;

(d) the cable layout plan detailing the alignment of each U/G cable based on common reference points (e.g. lamp pole, traffic light post, or hydrant, etc.) and any cable sections in shallow depth;

(Note: a cable alignment band can be used to represent a group of U/G cables of which the ascertained alignment are very close to each other. The alignment and size of the band shall be dimensioned and the number of U/G cables that the band represents shall be specified.)
(e) depth profile of each U/G cable (i.e. cable depth corresponding to each measurement point along the cable alignment);

(f) voltage level of each U/G cable;

(g) electricity supplier’s advice, if any;

(h) photos showing the toroidal active detection and site markings for cable alignment and depth; and

(i) brand name, model number, serial number, calibration record and the adopted frequency of the U/G cable detection device used for the detection.

3.4.2 The working party shall provide the site personnel with a copy of the Competent Person Written Report. In addition, the working party should arrange a site briefing given by the competent person to ensure that the site personnel are conversant with the contents of the Report and aware of the required safety precautions.

3.4.3 The working party should ensure that the Competent Person Written Report is available for inspection, upon request by the Director until the works are completed without occurrence of any cable damage.

3.4.4 The competent person is responsible for marking the alignment and depth of all U/G cables with waterproof crayon, paint or self-adhesive temporary road marking tapes on paved surfaces or with wooden pegs in grass or unpaved areas. Steel pins, spikes or long pegs, which could damage U/G cables laid at shallow depth, must not be used. Any section of the U/G cable with a sudden reduction of buried depth shall be clearly marked along the alignment.

3.4.5 The working party shall ensure that the markings (both alignment and depth) identified by the competent person are available at site before the commencement of works. After completion of the works, the working party should erase any residual markings on paved surfaces and not deface any traffic marking signs. To avoid confusion to drivers, markings in
carriageways should only be laid after the area is fenced off from traffic. Such markings should be completely removed before the area is re-opened to traffic.
4 Reasonable Measures for Working near Underground Electricity Cables

The reasonable measures to a safe system of work for excavation works near U/G cables encompass the safe use of tools, protections of exposed U/G cable and safe backfilling practices and include safe working practices for different excavation methods (hand-held power tool, mechanical excavators, trenchless methods, horizontal drilling, vertical penetration, use of explosives, H-piling) or where welding is to be carried out.

4.1 Safe working practices for different types of excavation

4.1.1 The following general requirements shall be followed:

(a) Other than minor shallow excavation, the electricity supplier shall be informed before commencing any excavation in the vicinity of U/G cables of 132kV or above; and

(b) The site personnel should always refer to the Competent Person Written Report in the course of excavation, and be vigilant for signs and position of U/G cables.

4.1.2 As the position of excavation by mechanical excavators and hand-held power tools cannot be precisely controlled in practice, adequate minimum clearance shall be maintained between any U/G cable and the point where the equipment is used:

(a) Hand-held power tools – 500mm in any direction from any U/G cable, except when breaking out paved concrete surface where a horizontal clearance of 250mm is required;

(b) Mechanical excavators and others – 1m in any direction, for U/G cables of below 132 kV and 3m for 132 kV or above.
4.1.3 The working party shall consult the electricity supplier before commencement of works if the required clearance in Section 4.1.2 from the U/G cable cannot be achieved and keep records. Greater safety clearance may be required by the electricity supplier or the Director, depending on operating voltage of the U/G cable and its strategic importance to electricity supplies in the HKSAR.

4.1.4 Hand tools are commonly used for exposing U/G cables. Every effort shall be made to excavate alongside the service rather than directly above it. Final exposure of the service by horizontal digging is recommended as the force applied to hand tools can be controlled more effectively. In particular:

(a) spades and shovels shall be used rather than other tools. They should not be thrown or spiked into the ground but eased in with gentle foot pressure;

(b) picks or forks may be used with care to free lumps of stone, etc. and to break up hard layers of earth; and

(c) picks should not be used in soft clay or other soft soils near to U/G cables.
4.1.5 Whenever the excavation involves the removal of hard materials (e.g. concrete, bitumen and the like) in which the U/G cable is covered or embedded, the electricity supplier should be consulted before commencement of works.

4.2 Safe working practices for exposing U/G cables

4.2.1 U/G cables uncovered in an excavation need to be supported. The electricity supplier should be consulted in advance wherever an excavation may cause any U/G cable overhanging within the works site.

4.2.2 Collapse of excavation may result in damage to exposed U/G cables within a trench of depth greater than 1.2m. To protect the U/G cables and working personnel, it is essential to provide temporary support for the excavation (e.g. shoring, or timbering or sheet piling, as the case may be) to ensure the stability of the excavation during works.

4.3 Safe backfilling practices

4.3.1 All warning tapes, tiles, protection plates or other protection materials shall be reinstated in their original position by the working party. The electricity supplier should be approached to make up cable protection materials if they are found to be damaged or missing before the backfilling.

4.3.2 The same backfilling materials should be used unless otherwise agreed with the electricity supplier. In general, cement bonded sand\textsuperscript{11} or sieved soil\textsuperscript{12} of suitable fineness shall be used as covering material for the backfilling, as the case may be.

4.3.3 Unsuitable filling materials which are likely to cause damage or reduce the rating of the U/G cables (e.g. rock, rubble, bituminous material, brick, brick, concrete, crushed stone, cinders, fireclay, sandstone, shale, clay, etc.) should not be used in the backfilling materials.

\begin{itemize}
\item \textsuperscript{11} 1:14:2 cement bonded sand is defined as a machine mixed material consisting of 1 part cement and 14 parts sieved sand and 2 parts water by weight. Sieved sand is defined as washed sand passing through a 5mm x 5mm mesh screen.
\item \textsuperscript{12} Sieved soil is defined as soil of suitably low thermal resistivity passing through a 12mm x 12mm mesh screen.
\end{itemize}
stone, timber, rubbish and other materials of high thermal resistivity) must not be used. If in doubt, the working party should seek advice from the electricity supplier on the specific backfilling requirements (thickness of the bedding layer, type of materials to be used and method of compaction, etc.).

4.3.4 The backfill shall be **adequately compacted**, particularly beneath the cable, to prevent any settlement which would subsequently damage the cable. No power compaction should take place until a 150mm cover of selected fine fill or sieved soil has been suitably compacted above the U/G cable. Concrete backfill shall not be used within 300mm of an U/G cable in any direction.

4.3.5 Before backfilling, the electricity supplier shall be notified to allow it to take appropriate **precautionary measures** if:

(a) the exposed U/G cable, in particular U/G cable of 132kV or above, need to be relocated to other position (either depth or alignment); or

(b) the U/G cable is found at a depth less than the minimum cover required by the Highways Department.

4.4 Safe working practices for trenchless methods/ horizontal drilling

4.4.1 Trenchless methods are increasingly being used for laying and renovating cables and pipes, particularly where there is a need to avoid surface disruption. The most widely used techniques are percussion moling, pipe jacking and auger boring. Horizontal drilling is also commonly adopted in landslip prevention works for slope stabilization. The **electricity supplier shall be informed before commencement of works** in addition to the necessary consultations at the planning or design stage.

4.4.2 The reasonable steps shall be followed to ascertain both the alignment and depth of the existing U/G cables, unless advised otherwise by the electricity supplier. As a general guide, the **minimum clearance** between the path of the drilling/boring device and the adjacent U/G cables shall be of
at least 1m in any direction. This clearance may need to be varied, taking into account the electricity supplier’s advice and other factors such as the construction of adjacent plant, ground conditions, bore diameter, the accuracy and reliability of the device being used.

4.4.3 When the path of moling or pipe jacking comes too close to adjacent U/G cables, extreme care must be taken to avoid cable damage by soil displacement. A mole tracking device shall be used if the working party finds that the moles are prone to deflection from their original course.

4.5 Safe working practices for vertical penetration

4.5.1 Vertical penetration works such as sheet piling or geotechnical investigation are common causes of U/G cable damage at construction sites. The reasonable steps shall be followed to ascertain the alignment of the existing U/G cables by toroidal active detection. If there is genuine difficulty in locating the U/G cables in the vicinity of the works site, assistance should be sought from the electricity supplier.

4.5.2 A 500mm minimum safe working distance shall be maintained between the point of vertical penetration and the ascertained alignment of any U/G cable.
4.6 Safe working practices for other works

4.6.1 Where explosives are to be used within 60m of an U/G cable, or where H-piling, vertical boring for building structure, etc. are to be carried out within 15m of an U/G cable, protective measures should be agreed with the electricity supplier before any works take place.

4.6.2 If welding or other hot works are to be carried out within 10m of exposed U/G cables, the working party shall take necessary safety precautions to avoid damage by heat, sparks or naked flames to the protective coatings and sheaths of the U/G cables. If the welding or hot works are in the close proximity of the exposed U/G cables, the working party shall consult the electricity supplier on any special protective measures required.
Large construction or demolition projects place particular demands on the working party with respect to protecting U/G cables. Similarly, special safety precautions apply when U/G cables are found to be damaged or at risk, when plant or other utilities are to be installed near U/G cables, or when there is any doubt about cable identification between the different utilities. The involvement of the electricity supplier is crucial in all of these circumstances.

5.1 Large construction works

5.1.1 In large construction projects, the safe system of work for working near electricity supply lines can be integrated into the site contractor’s Permit-to-Dig system. This helps working personnel to check that all reasonable steps have been completed prior to excavation and aids compliance with all reasonable measures, as specified in the Permit, in the course of the works.

5.1.2 The working party has a duty to give sufficient notice to the relevant electricity supplier so that adequate precautions can be taken to ensure the safety of U/G cables within and adjacent to the works site.

5.1.3 For large development construction or site demolition, the working party should:

   (a) identify all U/G cables that need to be diverted. These U/G cables are treated as live unless they have been confirmed by the electricity supplier otherwise, or unless the diversions have been completed by the electricity supplier;

   (b) protect all in-service U/G cables by appropriate means, in particular those subjected to pressure by construction traffic; and
(c) designate a cable reserve to help control the separation distances from other underground utilities. A marked-up cable reserve plan should be posted on site by the builder/developer for the information of all those involved in excavation and ground works.

5.2 U/G cable found damaged

5.2.1 If an U/G cable is damaged, the electricity supplier shall be notified immediately, regardless of how slight the damage and even if it is only on the cable sheath. The working party shall keep people well clear of the area until the electricity supplier has attended the site and given further safety advice. Under no circumstances shall any unauthorized repairs be made to the U/G cable.

5.3 Doubt about identification of cables amongst different utilities

5.3.1 The typical colours, sizes and buried depth of CLP’s and HEC’s U/G cables are given in Table 2 of Appendix 3. The working party and the competent person should be aware that there is NO standard colour coding system identifying all U/G utilities services. Certain high voltage U/G cables may look like water pipes; some U/G cables are yellow andmistakable for polyethylene gas pipes. The electricity supplier should be consulted if there is any doubt about the identification of cables amongst different utilities.

5.3.2 Unless the underground service is proved to be of another utility, this service shall be treated as a LIVE cable whenever works are carried out in its vicinity.

5.4 U/G cable found in shallow cover

5.4.1 If an U/G cable is found to be in shallow depth, the working party shall ensure that the electricity supplier is notified before the excavation is
backfilled. The electricity supplier shall take remedial action to safeguard electricity safety as far as reasonably practicable. Where the cable plan is proved inaccurate, the electricity supplier shall amend its records accordingly.

5.5 Installation of plant or other utilities close to U/G cables

5.5.1 Installation of plant or other utilities should be kept away from the U/G cable as far as practicable. It is essential that the electricity supplier should be consulted prior to the construction of any manhole, chamber or other structure over, around or under an U/G cable.

5.5.2 As far as practicable, new utilities installations should be separated from existing U/G cables by the distances agreed with the electricity supplier. In general, the minimum clearance shall be 300mm for U/G cables of below 132kV and 1m for 132kV and above to allow for future maintenance or emergency operations.

5.5.3 Any working party which carries out works near U/G cables shall observe any reasonable requirements made by the electricity supplier for protection of U/G cables. Where there is any doubt about the reasonableness or adequacy of the electricity supplier’s requirements, or where the measures called for are not adequately implemented, the Director, upon request, shall decide whether the electricity supplier’s requirements are reasonable and/or whether enforcement action is required according to the ESLPR.
6 Reasonable Steps for Working near Overhead Electricity Lines

The reasonable steps to a safe system of work for works near O/H lines involve planning and consultation. During planning of the proposed works, the working party is required to ascertain the actual alignment and ground clearance of any O/H lines found within and close to the works site. In consultation with electricity supplier, the working party shall obtain all necessary safety advice including the minimum safe working distance.

6.1 Planning

6.1.1 Works near O/H lines should be well planned before their commencement. For a large project (e.g. housing development) where a major diversion of O/H lines is necessary, the working party should propose their diversion requirements to the electricity supplier at the design stage or during the feasibility study. It should be noted that a long lead time is required by the electricity supplier to plan and complete an O/H line diversion of 132kV or above.

6.1.2 Since O/H lines are clearly visible, the acquisition of O/H line alignment drawings from the electricity supplier is not mandatory. However, the information contained in these drawings is useful to setting out safety precautions against damage to O/H lines. When the request for information is made to the electricity supplier, the scope and, where appropriate, the nature of the proposed works should be fully described.

6.1.3 Based on the described works in the vicinity of O/H lines, the electricity supplier shall, without charge, provide O/H line alignment drawings and any related information within 14 working days or such period as is mutually agreed between the concerned parties.

6.1.4 The date of commencement of the time period stipulated above (in 6.1.3) is the date upon which the electricity supplier received and date-stamped the notice. Notices shall be immediately date-stamped when they are received by the electricity supplier and retained for a minimum of five years. The working party may request, in the notice, an acknowledgement of its receipt, stating the date upon which it was received.
6.1.5 The O/H line alignment drawings provided by the electricity supplier shall be of suitable scale sufficient for the working party to identify the following O/H line information:

(a) the alignment in respect of the O/H lines, poles or towers corresponding to appropriate reference points or mapping grid; and

(b) their respective voltage levels.

6.1.6 As the alignment shown in the drawings may be different from actual site installations due to changes in landscape, construction of roads, etc, the working party shall conduct site inspection and surveying to ascertain the actual alignment, distance from the ground and voltage of any O/H lines found within or close to the works site. Should there be any queries about the alignment or other matters relevant to the O/H lines, the working party shall contact the electricity supplier, which shall provide a response within three working days.

6.1.7 It is the working party’s responsibility to decide whether the works site is in the vicinity of the O/H lines (as defined in Section 1.3.2.6). If there are works to be carried out in the vicinity of O/H lines, the working party shall take all reasonable steps and reasonable measures to prevent damage to the O/H lines.

6.1.8 All site personnel, especially those who operate lifting and earth moving equipment, should receive adequate training on working in the vicinity of O/H lines. Organizations such as the Construction Industry Training Authority can give advice on available training.

6.2 Consultation

6.2.1 For the proposed plan of works in the vicinity of O/H lines, even of a short duration, the working party shall discuss with the relevant electricity supplier before commencement of the works. During the consultation, the
working party shall obtain all necessary safety advice from the electricity supplier including the minimum safe working distance.

6.2.2 Where the working party gives written notice to the electricity supplier to request a site discussion on the proposed works, the electricity supplier shall without charge attend the site meeting within 14 working days or such period as is mutually agreed between the concerned parties.

6.2.3 The date of commencement of the time period stipulated above (in 6.2.2) is the date upon which the electricity supplier received and date-stamped the notice, as outlined in Section 6.1.4 of this Code.

6.2.4 Both the working party and the electricity supplier should keep a record of all site meetings held, which shall include:

(a) names of all attendees;

(b) location, date and time for which the meeting was conducted; and

(c) a brief description, with the aid of diagrams if necessary, of the advice provided by the electricity supplier in relation to the proposed works plan.

6.2.5 The working party should retain for inspection upon request by the Director any site meeting records described in Section 6.2.4 of this Code until the related works have been safely completed. Similar to the notice for requesting the provision of O/H line information, the electricity supplier shall retain the meeting records for a minimum of five years.

6.2.6 The working party responsible for the works shall ensure that information about the O/H lines (e.g. alignment, distance from ground, voltage of the O/H line) and the safety advice obtained from the electricity supplier (e.g. minimum safe working distance) are made available to the site personnel including supervisors, signallers, plant operators and workers.
7 Reasonable Measures for Working near Overhead Electricity Lines

The reasonable measures to ensure a safe system of work for works near O/H lines involve implementing safety precautions on site to ensure that works are always carried out at a safe working distance. These precautions include erecting suitable ground level barriers, creating safe passageways (with goal posts, gateways and warning signs), assigning a signaller and fitting physical restraining devices to equipment.

7.1 General safety practices

7.1.1 Any O/H lines found in the vicinity of the proposed works must be assumed to be LIVE unless the O/H lines concerned are confirmed dead by the electricity supplier.

7.1.2 The working party shall ensure that all necessary safety precautions have been taken and all site personnel are fully conversant with safety precautions implemented on site.

7.1.3 No works shall be carried out in the vicinity of O/H lines unless a safe working distance is always maintained in such a way that damage to O/H lines can be prevented and personal safety can be safeguarded.

7.2 Where no works are carried out underneath the O/H lines

7.2.1 Ground level barriers parallel to the O/H lines should be erected at a horizontal distance of at least 6m from the outermost conductor of the O/H lines to prevent any part of the plant or equipment approaching too close to the lines.

7.2.2 If lifting and earth moving equipment (e.g. lorry crane, mobile crane or tower crane) are to be used or site personnel may carry steel bars, ladders or other conducting objects, the barriers shall be erected further from the O/H lines so that a minimum 6m horizontal distance is always maintained.
between any part of the crane (including loaded material) or hand-carried material and the outermost conductor of the O/H lines.

7.2.3 If an O/H line crosses a works site in which works are to be conducted on either side of the line, barriers on both sides of the line are required.

7.2.4 The electricity supplier or the Director may vary the minimum clearance required based on the type of works and plant or equipment used, voltage and spans of the O/H line, etc. If barriers cannot be erected to meet the clearance requirement due to the constraints of the site, the electricity supplier shall be consulted before commencement of works.

7.2.5 Ground level barriers should be set up such that they are stable when subject to strong wind or any human force. Typically, these barriers could be:

(a) a rail fence;
(b) a plastic/nylon rope fence with stout posts planted in between;

(c) an electrically earthed wire fence under tension to be set up in consultation with the relevant electricity supplier;

(d) an earth bank boundary of at least 1m in height, marked by sign posts to stop vehicles from entering; or

(e) a properly spaced array of large steel or plastic drums filled with rubble, timber balks or concrete blocks.

7.2.6 The **barriers should be clearly visible** for the benefit of the plant equipment operators. This could be achieved by putting up cloth flags (i.e. bunting) suspended vertically above ground between 3m and 5m on top of the barriers, or by applying paint stripes with distinctive colours on drums. To warn personnel of the nearby O/H lines, **warning notices** should be attached to or displayed on the barriers at intervals of not less than 2m. Care must be exercised when erecting the bunting to avoid becoming too near to the conductors of the O/H lines.

7.2.7 No materials whether or not to be used in relation to the works should be **stored**, even for a short duration, in the area between the O/H lines and the ground level barrier without first consulting the electricity supplier.

7.3 Where there will be plant or equipment passing underneath the O/H lines in the course of works

7.3.1 Allowing the passage of plant or equipment under the O/H lines increases the danger and should only be considered if reasonable alternative routes are not available. In order to minimize the danger areas, the number of the passageways for plant or equipment should be minimized. For safest crossing, the passageway, if provided, should be at right angle to the alignment of the O/H lines wherever possible.
7.3.2 In general, the precautions to be taken when making provisions for the passageway are as follows:

(a) Gateways to the passageway should be set up at both sides of the entrance by erecting goal posts. Similar to the barriers, the route of the passageway should be clearly fenced.

(b) The goal posts and crossbars should be rigid and of non-electrically conductive materials and be marked with distinctive colour stripes. If metallic goal posts or crossbars are used, they must be adequately earthed.

(c) Clearly marked warning notices should be placed at both gateways of the passageway indicating the potential electrical danger and ground clearance of the cross bar and advising that no part of the plant or equipment shall exceed this ground clearance when passing the fenced passageway.

(d) The passageway shall be sited, as far as practicable, on level ground and its surface must be adequately compacted, flattened and maintained to prevent the plant equipment and the loads being carried from undue tilting or bouncing when moving.

(e) Adequate lighting for the notices, signs, passageway and its gateways should be provided if movement of plant or equipment is to take place after dark. Light fittings for illumination of the O/H line conductors immediately above the passageway should be sited at ground level projecting light upwards towards the conductors.

(f) Warning notices should be erected on all approaches to the crossing.

(g) A signaller who is able to assess the clearance between the plant or equipment and the goal post shall be assigned to guide the movement of plant or equipment underneath the O/H
lines. The signaller shall agree with the operator on suitable hand signals or flag signals to be adopted during moving.

7.3.3 Due consideration should be given to the speed, stopping distance, size and manoeuvrability of any plant or equipment when deciding the location of the goal posts and form of warning notices to be used. The gateway should be erected far enough away from the O/H lines such that the plant/equipment does not stop underneath the lines if it hits the goal post or crossbar.

7.3.4 If it is not possible to place a rigid crossbar on top of the goal posts due to the width of the passageway (e.g. the construction of carriageways underneath the O/H lines), a string of strong non-metallic rope under tension or an electronic detection beam could be used as a height limiter. The distance between the height limiter used in a gateway and the outermost O/H line conductor should be at least 12m.

7.4 Where works are carried out underneath the O/H lines

7.4.1 In addition to the use of ground level barriers, gateways and warning notices mentioned in Section 7.2 and 7.3, additional precautions are required
for works carried out within a 6m horizontal distance from the O/H lines, particularly where upward movements of plant or equipment (e.g. cranes, loader arms, excavator buckets), or construction works could encroach on the safe working distance, resulting in damage to O/H lines and/or personal injury.

7.4.2 The following *additional precautions* shall be exercised when ground level works underneath an O/H line are undertaken (e.g. pipe laying, road construction/maintenance, etc.):

(a) Based on the minimum safe working distance advised by the electricity supplier, the working party shall assess its works underneath the O/H line to determine whether any tools, equipment and part of plant or equipment could encroach on the minimum safe working distance.

(b) No tools, plant or equipment shall be used if they could encroach beyond the minimum safe working distance when operated underneath the O/H line.

(c) Suitable physical restraining devices should be fitted to plant or equipment to inhibit any of its moving parts (e.g. derricks, cranes, jibs, hoists, etc.) from reaching beyond the safe working distance.
(d) A signaller shall be assigned to direct the operator in maintaining sufficient safe working distance when plant or equipment is operated underneath O/H lines. Depending on the site situation, the signaller should be provided with red and green flags or suitable communication equipment to maintain dialogue with the operator.

7.4.3 Site personnel should observe any warning notices in the vicinity of the O/H lines and never disturb any earthing conductors connecting the O/H line poles/towers to the ground. These conductors are normally buried.

7.4.4 The electricity supplier must be informed immediately of any damage, however slight, or interference to an O/H line. The working party shall keep people well clear of the area until the electricity supplier attends the site and gives further safety advice. No attempt should be made to remove any objects or retract any mobile crane which is in contact with the O/H line conductor unless the line is confirmed dead by the electricity supplier. This also applies in the case of an injured person who is still in contact with the O/H line conductor.

7.4.5 Stacking of goods and containers, erection of buildings and structures, etc. underneath an O/H line should be avoided as the distance between the line conductor and the top of the object is reduced and the chance of an object encroaching on the safe working distance is higher.

7.4.6 If there is genuine need to work directly underneath an O/H line but the safe working distance cannot be maintained at all times by all appropriate means, the working party should request that the electricity supplier de-energizes the O/H line for a certain period at a suitable time agreed between them.

7.5 Safe working practices for blasting works

7.5.1 Blasting works should be kept well away from an O/H line in order to prevent damage to the line and its supporting structure from flying debris.
The following precautions should be taken if blasting works need to be carried out in the vicinity of an O/H line:

(a) The maximum particle velocity caused by the blasting shall be restricted to 25 mm/sec at the O/H line footing;

(b) Mechanical detonators should be used whenever possible. If an electric detonator is used, the suppliers of the explosives and detonating system should be consulted about their suitability. In general, electric detonators should only be used at least 60m from the nearest conductor of the line;

(c) Damping mats should be erected to reduce the effect of flying debris; and

(d) The requirements of the Buildings Department and Civil Engineering and Development Department in relation to blasting works should be followed.
8 Other Aspects relating to Works near Overhead Electricity Lines

8.1.1 Although general warning devices are erected by the electricity supplier near O/H lines, they must not be used as substitutes for any of the precautionary measures prescribed in this Code.

8.1.2 Where aircraft, including helicopters, are to be used in the vicinity of O/H lines (e.g. O/H line insulator cleaning, delivery of materials, etc.), advice must be sought from the Director of Civil Aviation and the relevant electricity supplier.
Appendices

Appendix 1 contains the following legislation in connection with the legal requirements of working near electricity supply lines:

A.1.1 Section 10 of ESLPR – Requirements relating to works in the vicinity of electricity supply lines
A.1.2 Section 11 of ESLPR – Remedial Notices
A.1.3 Section 18 of ESLPR – Defence
A.1.4 Section 6A & 6B of the Factories and Industrial Undertakings Ordinance – General duties of a proprietor and persons employed
A.1.5 Other legislation

Appendix 2 lists the provisions of Section 3 of ESLPR concerning the requirements for approval of a competent person.

Appendix 3 provides the following information in respect of the two electricity suppliers:

A.3.1 Brief of CLP’s electricity supply system
A.3.2 CLP’s contact information (address, telephone and fax)
A.3.3 Brief of HEC’s electricity supply system
A.3.4 HEC’s contact information (address, telephone and fax)
A.3.5 Typical U/G cable plan and O/H line alignment drawing
A.3.6 Typical colours/sizes/buried depths of U/G cables
Appendix 1: Legislation

Relevant legislation enforced by the Director of Electrical and Mechanical Services (“the Director”)

A.1.1 The Electricity Supply Lines (Protection) Regulation (“ESLPR”), made under the Electricity Ordinance, (Cap.406) (“EO”), applies to any works in the vicinity of “electricity supply lines". In particular, Section 10 of ESLPR requires that:

“10. Requirements relating to works in vicinity of electricity supply lines

(1) A person shall not -

(a) carry out or cause or permit another to carry out in the vicinity of an underground electricity cable any works which are below ground level; or

(b) carry out or cause or permit another to carry out in the vicinity of an overhead electricity line works of any kind,

“Electricity supply line” means an electric line, or any cable used in conjunction with such a line for the purpose of transmitting control signals, which is owned by an electricity supplier.

“Electric line” means -

(a) a conductor used for the purpose of conveying, transmitting or distributing electricity and any casing, coating, covering, tube, pipe or insulator enclosing, surrounding or supporting such conductor, or any part of it;

(b) any apparatus connected with such conductor or other thing mentioned in paragraph (a) for the purpose of conveying, transmitting or distributing electricity,

and in paragraph (a), reference to a conductor used for the purpose of conveying, transmitting or distributing electricity includes reference to a wire or to any other means used for that purpose.
unless before the works are begun all reasonable steps have been taken to ascertain the existence within the proposed works site and its vicinity of any such underground electricity cable and its alignment and depth or of any such overhead electricity line and its alignment, distance from the ground and voltage, as the case may be.

(2) A person who -

(a) carries out or causes or permits another to carry out in the vicinity of an underground electricity cable any works which are below ground level; or

(b) carries out or causes or permits another to carry out in the vicinity of an overhead electricity line works of any kind,

shall ensure that all reasonable measures are taken to prevent the occurrence of an electrical accident or an interruption to the supply of electricity arising from those works.

(3) For the purposes of subsection (1) as it applies in relation to works in the vicinity of an underground electricity cable, and without affecting the generality of that subsection, reasonable steps shall not be regarded as having been taken unless a competent person has undertaken an investigation for the purpose of ascertaining the existence within the proposed works site and its vicinity of any such underground electricity cable and its alignment and depth and has provided a written report of his findings as to those matters.
(4) Subject to section 11(7), where the Director has approved a code of practice for any of the requirements of paragraph (a) or (b) of subsection (1) or (2), then, subject to subsection (3), compliance with the provisions of that code shall be deemed to constitute the taking of all reasonable steps, or the taking of all reasonable measures, as the case may be, for the purpose of that requirement.

(5) A competent person who undertakes an investigation to ascertain the existence, alignment and depth of an underground electricity cable -

(a) shall not delegate the function and duty of the investigation to another person;
(b) may carry out the investigation with the assistance of any other persons, but such persons shall be directly supervised by that competent person at the proposed works site in the course of the investigation;
(c) shall carry out the investigation in a manner that does not cause damage to, or impair the operation of, the underground electricity cable; and
(d) shall provide the person requesting the investigation with a written report of his findings as to that matter.”

A.1.2 Section 11 of ESLPR empowers the Director to serve on a person remedial notice for contravention of a requirement under the ESLPR stating his opinion and reason for such notice, direct the person as appropriate to remedy the contravention or the matter as follows -
“11. Remedial notices

(1) Where the Director is of the opinion that a person -

(a) is contravening a requirement under this Regulation; or

(b) has contravened such a requirement in circumstances that make it likely that the contravention will continue or be repeated,

he may serve on the person a notice ("remedial notice") stating that he is of that opinion, giving particulars as to why he is of that opinion, and directing the person to remedy the contravention or the matter occasioning it, as the case may be, within the period specified in the notice.

(2) Except as provided in subsection (3), the period to be specified in a remedial notice under subsection (1) shall be a period of not less than 14 days.

(3) If the Director is of the opinion that the circumstances of the contravention are such that there is an undue risk of an electrical accident or an interruption to the supply of electricity occurring, he may specify in the remedial notice such lesser period as he reasonably considers appropriate in the circumstances.

(4) A remedial notice may contain instructions as to the measures to be taken to remedy any contravention or matter to which the notice relates, and any such instructions may be framed -

(a) wholly or in part by reference to any approved code of practice; and
so as to afford the person on whom the notice is served a choice between different ways of remedying such contravention or matter.

(5) Subject to section 43(4) of the Ordinance, a direction specified in a remedial notice shall take effect at the time of the notice being served or at such later date, if any, as may be specified in the notice.

(6) In addition to service as provided under section 52 of the Ordinance, service of a remedial notice on a person who is a site contractor may also be effected by delivering the notice to a person at the works site who appears to be the person in charge of the site activities or who identifies himself as being the site contractor’s representative on the site.

(7) Where -

(a) the Director has approved a code of practice for any of the requirements of paragraph (a) or (b) of section 10(1) or (2); and

(b) the Director has served a remedial notice under subsection (1) in relation to a contravention of the same paragraph,

then, subject to section 10(3), compliance with the provisions of that code and the direction in that notice shall be deemed to constitute the taking of all reasonable steps, or the taking of all reasonable measures, as the case may be, for the purposes of that requirement.

(8) For the purposes of subsection (7), where there is any conflict or inconsistency between any provision in the code of practice and any direction in the remedial notice, then that direction shall, to the extent of that
conflict or inconsistency, as the case may be, prevail over that provision.”

A.1.3 Section 18 of ESLPR sets out the defence provision to a prosecution brought against any person under section 17(4) of ESLPR as follows -

“18. Defence

It shall be a defence to a charge under section 17(4) alleging a contravention of section 10(2) for the person charged to show that -

(a) before the works began, all reasonable steps had been taken for the purposes of section 10(1); and
(b) any failure in the taking of all reasonable measures for the purposes of section 10(2) was due to reliance on information contained in a report prepared by a competent person or on information provided by the electricity supplier who is the owner of the electricity supply line concerned.”

Relevant legislation enforced by Commissioner for Labour

A.1.4 The Factories and Industrial Undertakings Ordinance (Cap.59) places duties on both proprietors and their employees with regard to health and safety at work in industrial undertakings -

a) Section 6A places a duty on the proprietor of an industrial undertaking to ensure, among other things, so far as is reasonably practicable, the provision and maintenance of plant and systems of work that are safe and without risks to health, and the provision of such information, instruction, training and supervision as is necessary to ensure the health and safety at work of employees. A proprietor who contravenes this section commits an offence.
b) Section 6B imposes a duty on every employee to take reasonable care for the health and safety of himself and of others who may be affected by his acts or omissions. He must also co-operate with the proprietor to enable him to meet his obligations under Section 6A. A person who wilfully does anything while at work likely to endanger himself or others commits an offence.

Other legislation

A.1.5 Public utilities and others intending to carry out works in roads or Government land must obtain a permit from Highways Department or other government departments as appropriate and comply with the conditions contained in the permit. For emergency and excepted works, the agreed requirements and procedures between utilities and government departments prevailing at that time shall be observed.
Appendix 2: Approval of competent person

A.2.1 Section 3 of ESLPR –

“Approval, etc. of competent person

(1) The Director may, in accordance with this section, approve a person as a competent person for the purposes of this Regulation.

(2) An application for approval as a competent person shall be in such form as may be specified by the Director and shall be accompanied by the fee specified in the Schedule.

(3) Subject to subsection (4), the Director shall grant an application for approval as a competent person if-

(a) the Director is satisfied that-

(i) the person has attended and passed a course in the locating of underground electricity cables which has been approved by the Director for the purposes of this section; and

(ii) during the period of 3 years immediately preceding his application, the person has had not less than 6 months' practical experience in locating underground electricity cables, or has had such other practical experience as the Director may consider relevant and equivalent for the purposes of this Regulation; or

(b) in the opinion of the Director, the person is by reason of his knowledge and practical experience capable of carrying out the work of locating underground electricity cables in a competent manner,

and the Director may grant his approval subject to such conditions as he reasonably thinks fit.
(4) The Director may refuse an application for approval under this section if a previous approval granted to the person has been revoked on grounds other than the grounds specified in section 6(2)(d) or (e).

(5) An approval granted under this section shall be valid for a period of 3 years from the date of its grant.

(6) The Director shall publish in the Gazette notice of any approval, granted by him for the purposes of this section, of a course in the locating of underground electricity cables."
Appendix 3: Information on electricity suppliers

CLP Power Hong Kong Limited (CLP)

A.3.1 Apart from the U/G cables and O/H lines in Hong Kong Island, Lamma Island and Apleichau, all U/G cables and O/H lines in Hong Kong are owned and operated by CLP. The CLP electricity supply system consists of extensive networks of U/G cables and O/H lines operating at 400kV, 132kV, 33kV, 11kV and 380/220V. Since CLP’s major power stations are located far away from the load centres, O/H lines are widely used to carry the bulk of electricity to consumers. U/G cables are used to transmit and distribute electricity in urban and new town areas. Submarine cables are also used to deliver electricity to outlying islands.

A.3.2 Details of U/G cables or O/H lines in the vicinity of works to be undertaken may be obtained from CLP at the following address -

CLP Power Hong Kong Limited
147 Argyle Street
Kowloon

General enquiries and incident reporting regarding U/G cables or O/H lines can be made through the following contact numbers:

Office hours (08:30hrs – 17:00hrs Mon - Fri) Tel. 2678 6704
Fax. 2678 6757

After office hours Tel. 2678 7721
Fax. 2678 6368
The Hongkong Electric Company Limited (HEC)

A.3.3 All U/G cables and O/H lines in Hong Kong Island, Lamma Island and Apleichau are owned and operated by HEC. Due to geographical reasons, HEC depends primarily on U/G cables and submarine cables to carry electricity generated at Lamma Island to consumers. Its voltage levels are similar but not identical to those of CLP, namely 275kV, 132kV, 22kV, 11kV and 380/220V. Although relying mainly on U/G cables, HEC does operate a small number of 132kV and 380V/220V O/H lines.

A.3.4 Details of U/G cables or O/H lines in the vicinity of works to be undertaken may be obtained from HEC at the following address –

The Hongkong Electric Company Limited
Hongkong Electric Centre
44 Kennedy Road
Hong Kong

General enquiries and incident reporting regarding U/G cables or O/H lines can be made through the following contact numbers:

Office hours
08:45hrs - 17:15hrs on weekdays
08:45hrs - 12:00hrs on Saturdays

General enquiries
Tel. 2814 3443 (24-hr hotline)
Fax. 2871 0645

Emergency enquiries
Tel. 2814 3443 (24-hr hotline)
Fax. 2843 3110 (office hours)
Fax. 2510 7812 (after office hour)

Incident reporting
Tel. 2555 4000 (English 24-hr hotline)
Tel. 2555 4999 (Chinese 24-hr hotline)
Fax. 2555 6637
A.3.5 Figure 2 - Typical CLP U/G cable plan
A.3.5 Figure 3 - Typical HEC U/G cable plan
A.3.5 Figure 4 - Typical CLP O/H line alignment drawing
A.3.5 Figure 5 - Typical HEC O/H line alignment drawing
### A.3.6 Table 2: Typical colours/sizes/buried depths of CLP and HEC U/G cables

<table>
<thead>
<tr>
<th>System Voltage/Type</th>
<th>Colour</th>
<th>Outer Diameter (mm)</th>
<th>Buried Depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CLP</td>
<td>HEC</td>
<td>CLP</td>
</tr>
<tr>
<td>380/220V</td>
<td>Black</td>
<td>Green, Blue or Black</td>
<td>24 - 58</td>
</tr>
<tr>
<td>11kV</td>
<td>Red or Black</td>
<td>Red or Black or Turquoise</td>
<td>54 - 75</td>
</tr>
<tr>
<td>22kV</td>
<td>N/A</td>
<td>Turquoise</td>
<td>N/A</td>
</tr>
<tr>
<td>33kV</td>
<td>Red or Black</td>
<td>N/A</td>
<td>70 - 84</td>
</tr>
<tr>
<td>66kV*</td>
<td>Black</td>
<td>Black</td>
<td>40 - 110</td>
</tr>
<tr>
<td>132kV</td>
<td>Black</td>
<td>Black</td>
<td>50 - 130</td>
</tr>
<tr>
<td>275kV</td>
<td>N/A</td>
<td>Black</td>
<td>N/A</td>
</tr>
<tr>
<td>400kV</td>
<td>Black</td>
<td>N/A</td>
<td>110 - 140</td>
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<tr>
<td>Pilot</td>
<td>Yellow or Black</td>
<td>Yellow or Black or Turquoise</td>
<td>20 - 40</td>
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<td>Fibre Optic</td>
<td>Orange or Black or Purple</td>
<td>Pink</td>
<td>5 - 20</td>
</tr>
<tr>
<td>Bonding</td>
<td>Black</td>
<td>Green or Black</td>
<td>20 - 50</td>
</tr>
</tbody>
</table>

Note: The table indicates approximate information only, actual dimensions vary with brands, year of manufacture and site conditions.

* Both CLP and HEC have already decommissioned 66kV electricity supply lines. However, abandoned 66kV U/G cables still exist underground.