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Code of Practice

on

**Working near
Electricity Supply Lines**

Electrical and Mechanical Services Department

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Foreword

This code of practice has been prepared by the Electrical and Mechanical Services Department and approved and brought into effect in accordance with the provisions of section 15 of the Electricity Supply Lines (Protection) Regulation (hereinafter referred to as ESLPR) under the Electricity Ordinance (Cap 406). 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 the 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 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 or 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) 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,

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.

In addition, section 18 of ESLPR provides that where a code of practice is in effect in relation to section 10 (1) or (2) of ESLPR then a person who shows that he has complied with that code has a defence against charge alleging a contravention of section 10 of ESLPR. (The defence provisions in section 18 of ESLPR are shown in Appendix 1). This code of practice has been brought into effect in relation to the requirements of section 10 (1) or (2) of ESLPR and may therefore be used to demonstrate compliance with the ESLPR.

PART I: INTRODUCTION

A. Background.

1. Many electrical accidents and electricity supply interruptions occur when underground electricity cables (U/G cables) are damaged during excavation and other works involving ground penetration. Not all accidents or electricity supply interruptions occur immediately; some happen years after works have been carried out, perhaps when an U/G cable is damaged and it develops into a fault over a long period of time. Similarly, contact with or approaching near overhead electricity lines (O/H lines) very often results in serious accidents and electricity supply interruption. Statistics have shown that fatal accidents occurred during lifting operations by cranes or hoists in the vicinity of O/H lines.

2. In addition to the risk of fatal accident and personal injury, damage can be very costly and can have serious knock-on effects. Incidents involving damage to an U/G cable or O/H line in Hong Kong could result in widespread electricity supply interruptions affecting thousands of consumers.

3. This code of practice (COP) outlines the dangers which can arise from works near U/G cables or O/H lines and gives advice on how to reduce the risk. It deals specifically with risks to persons carrying out works and the precautions needed to reduce the risk of accidents that will generally result from damage and unsafe practices.

4. There are three main parts and three appendices in this COP. Part I of this COP is introductory in which the scope, definition of terms, dangers associated with U/G cables and O/H lines and electricity supply in Hong Kong are described. Specific guidance on the precautions to be taken when working in the vicinity of U/G cables and O/H lines are provided in Part II and Part III respectively, but many of the precautions against damage apply equally to all utility services. The appendices deal with legislation, guidance for workers, and information relating to the U/G cables and O/H lines to be supplied by electricity suppliers.

B. Scope.

5. This COP 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, with particular emphasis on situations where works are undertaken which involve excavation or any other means of penetrating the ground below ground level, lifting operations by cranes or hoists and earth moving operations by heavy machinery. The term “works” is defined in the Electricity Supply Lines (Protection) Regulation (ESLPR) and this definition is also included under “Definitions” in section 12 of this COP. U/G cables and O/H lines in Hong Kong are used to transmit and distribute the electricity generated in power stations to individual consumers.

6. All works in roads are covered by this COP, together with works in areas other than built-up roads, including works in footways, cycle tracks, on slopes, in Government and private land. Other matters relating to works near U/G cables and

O/H lines, such as the need to support excavations, handling of lifting or earth moving machinery, are also covered.

7. Works on or within buildings may also affect U/G cables and O/H lines located in their vicinity and therefore such works are also covered by this COP.

8. This COP is intended to be used by all those who have responsibilities under relevant legislation, including employers, employees, contractors¹, electricity suppliers and those concerned with planning, designing, organising and supervising works near U/G cables or O/H lines. This includes works by or for the utilities and also roadworks, construction (including the refurbishment of buildings) and demolition works, lifting operations by cranes or hoists and earth moving operations by heavy machinery. A summary of guidance for site personnel involved in works near U/G cables or O/H lines is given in Appendix 2 to provide a quick reference for site contractors and workers.

9. During the preparation of this COP the Director of Electrical and Mechanical Services (DEMS) has consulted the electricity suppliers, the construction industry, the haulage industry, the other utility companies and relevant Government Departments, and the views and advice given by these organisations have been taken into account in this COP wherever possible. This COP serves to give general guidelines on how the statutory requirements of the ESLPR can be met. Persons involved in works in the vicinity of U/G cables or O/H lines who wish to carry out their works in some other way than that provided in this COP must ensure that they achieve an equal or higher standard of safety. Attention is drawn to section 16 of ESLPR which specifies the use of approved codes of practice in criminal proceedings.

C. Definitions.

10. There are a few new terms introduced as a result of the new ESLPR. Section 2 of the Electricity Ordinance (EO) defines “electricity supply line” (see Appendix 1). Section 2 of the ESLPR also defines “underground electricity cable” as meaning an “electricity supply line” owned by an “electricity supplier” and located below ground level; and “overhead electricity line” as meaning an “electricity supply line” owned by an “electricity supplier” and located at or above ground level.

11. For specific definitions of the terms used, reference should be made to section 2 of EO and section 2 of ESLPR.

12. This COP adopts the following definitions from the ESLPR-

12.1 “works” means-

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

¹ Contractor, in relation to works, means any person or site contractor 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.

- (i) building works within the meaning assigned to that term in section 2(1) of the Buildings Ordinance (Cap.123) and 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 at grade or elevated, footpath, cycle track, subway, footbridge, tunnel, airport runway, canal, reservoir, pipeline, railway or tramway;
 - (iii) trench works, including such works when carried out by or for any public utility including water mains, storm water drains and sewers;
 - (iv) the extraction of material from land or the seabed;
 - (v) landfill works, river training works, reclamation works or slope works; or
 - (vi) levelling, piling, ramming, dredging, boring, tunnelling or blasting works;
- (b) the use of any crane (within the meaning assigned to those terms in regulation 3(1) of the Lifting Appliances and Lifting Gears Regulations (Cap. 59 sub. leg.)) 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 or depth of an underground electricity cable, nor any electrical work carried out by a registered electrical worker or registered electrical contractor. It should be noted that building works includes “any kind of building construction, site formation works, ground investigation, foundation works, repairs, demolition, alteration, addition and every kind of building operation, and includes drainage works”.

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

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

12.4 “competent person” means a person approved as competent person under section 3 of ESLPR.

13. All U/G cables and O/H lines in Hong Kong are owned and operated by CLP Power Hong Kong Limited (CLP) or The Hongkong Electric Company Limited (HEC) because these are the only two electricity suppliers in Hong Kong. For the purposes of this COP, the term “electricity supplier” is used to refer to either CLP or HEC or both.

D. The dangers associated with U/G cables & O/H lines.

14. Working in the vicinity of U/G cables or O/H lines may lead to an “electrical accident”² (as defined in section 2 of EO) and electricity supply interruption especially if the works concerned are carried out in an unsafe manner. Working near O/H lines is a potential safety hazard. Contact with or approaching near O/H lines is highly dangerous and may result in fatalities, severe injuries/shocks or burns to any person in the vicinity due to electrical explosion or arcing from the O/H line. For U/G cables, there are two common types of damage-

- (a) Damage which immediately causes an electrical accident and short-circuit fault on the U/G cable. Such damage often results in injuries to any persons nearby.
- (b) Damage which causes an electrical fault to develop some time later resulting in electricity supply interruption. The damage may occur at the time the work is carried out (for example damage to a cable sheath may eventually lead to an insulation breakdown) or later, for instance subsidence may occur as a result of works near an U/G cable and ground movement induces stress in the U/G cable causing it to fail at some time later. If the U/G cable involved is used for signalling purposes to control and protect electricity transmission and distribution circuits, it could result in tripping out of major cable circuits causing widespread electricity supply interruptions.

E. Electricity supply in Hong Kong.

15. Electricity supply lines used for transmission and distribution of electricity are scattered throughout the whole of Hong Kong Island, Outlying Islands, Kowloon and the New Territories. Both CLP and HEC own and operate their extensive electricity supply systems at various voltage levels. Consumers in Hong Kong Island, Lamma Island and Apleichau Island are supplied by HEC while CLP supplies electricity to the consumers in the rest of Hong Kong. The electricity supply systems operated by CLP and HEC are outlined in Appendix 3. Prior to commencement of the works, the electricity supplier should always be consulted.

² “electrical accident” means an incident involving electricity that causes a fire or explosion or that causes death or injury to a person.

PART II: GUIDANCE FOR WORKING NEAR UNDERGROUND ELECTRICITY CABLES

A. Safe system of work.

16. Damaging U/G cables is dangerous and can often cause flashover, explosion or fire. The damage is mostly resulted from excavation or penetration of the ground. This part of the COP aims to minimise the risk of fatal accidents and personal injuries and the possibility of damaging U/G cables resulting in electricity supply interruptions. It sets out a safe system of work which should be followed before commencement of works below ground level and when carrying out such works in the vicinity of the U/G cables.

17. The safe system of work comprises two key elements, namely, taking reasonable steps before commencement of works and taking reasonable measures in the course of works. Reasonable steps include obtaining plans for the U/G cables, locating the U/G cables and using trial holes to confirm their positions while reasonable measures mean the adoption of safe excavation, backfilling and working practices in the course of works. Brief descriptions of the two key elements of the safe system of work are given below -

17.1 Reasonable steps -

(a) Plans

Wherever possible persons undertaking works shall obtain plans or other suitable information about all U/G cables in the vicinity of their proposed works before any excavation starts. In return the electricity suppliers are committed to taking all reasonably practicable measures to ensure that such information is made available to those persons requesting this information. However, it is not a mandatory requirement to acquire U/G cable information if the works only involve shallow excavation of less than 450 mm from ground level because U/G cables are generally not allowed to be laid above this depth. Although the acquisition of plan is not required in this case, all other elements of the safe system of work must be followed unless otherwise specified in the COP and extra care must be taken to look out for any U/G cables with shallow cover. Also, when emergency or other unforeseen work has to be undertaken and it is not possible to obtain plans of U/G cables in advance, telephone contact must be made with the electricity supplier to seek oral advice and request their attendance on site. If such assistance cannot be made available immediately and it is essential for work to continue, then workers must assume that there are U/G cables in the vicinity and any excavation works undertaken must proceed with extreme caution. More detailed descriptions of this step are given between section 23 and 34 below.

(b) Locating U/G cable alignment

A “competent person”³ must be engaged by the site contractor to carry out U/G cable locating work, in conjunction with any available plans, to determine as accurately as possible the alignment of U/G cables in the proposed works site or its vicinity. The competent person engaged is required to discharge his duties in good faith and with all due diligence using suitable non-destructive cable locating devices in accordance with the certificate of approval issued to him by DEMS. The site contractor should ensure that the U/G cable alignment identified by the competent person is properly recorded in a written form prescribed by DEMS for inspection upon request by DEMS. More detailed descriptions of this step are given between section 35 and 39 below.

(c) Trial Holes

Trial holes are for the purpose of confirming and ascertaining the alignment and depth of U/G cables. Based on the rationale given in section 17.1(a) above, the indications of the alignment of U/G cables provided in plans and by competent persons must be confirmed using hand dug trial holes for an excavation depth of 450 mm or more from ground level. In many situations it will be necessary to use hand held power tools to break out paved surfaces to facilitate excavation of trial holes. In these cases great care must be exercised and use of such tools shall be limited to a depth of 150 mm in footpaths and 600 mm in carriageways, and at least 250 mm in horizontal distance away from the identified cable alignment. Where necessary electricity suppliers will assist site contractors in the identification of U/G cables exposed in trial holes. The site contractor must then engage a competent person to ascertain further the depth profile of the U/G cable along the alignment already identified in section 17.1(b) above. Similarly, the site contractor should ensure that the U/G cable depth profile ascertained by the competent person is properly recorded in a written form for inspection upon request by DEMS. More detailed descriptions of this step are given between section 40 and 43 below.

17.2 Reasonable measures -

(a) Safe excavation and backfilling practices

U/G cables which may be found in roads, footpaths and on works sites must be treated as LIVE and their presence should

³ “competent person” means a person approved as a competent person under section 3 of the Electricity Supply Lines (Protection) Regulation under the Electricity Ordinance (Cap. 406).

always been assumed if there is no other information. All excavation and backfilling works must be carried out carefully following recognised safe excavation and backfilling practices as outlined between section 44 and 51 below and taking into account any advice given by DEMS and the electricity supplier. Great caution shall be exercised in the use of excavators and other mechanical plant close to U/G cables.

(b) Safe working practices for trenchless methods

The use of trenchless methods for laying underground utility services is an alternative to the traditional trench digging especially when there are constraints at the works site. All works in relation to the use of trenchless methods must be carried out carefully following the safe working practices for trenchless methods as outlined in sections 52 and 53 and taking into account any advice given by DEMS and the electricity supplier.

(c) Safe working practices for other works

The uses of supporting structures, ground penetration equipment, explosives, apparatus for hot work etc. are common practice in works sites which could easily damage any U/G cables nearby if the works are not safely carried out. All these works must be carried out carefully following the safe working practices as outlined between section 54 and 57 and taking into account any advice given by DEMS and the electricity supplier.

18. When working near U/G cables each item of these two key elements - reasonable steps (plans, locating alignment and depth, trial holes) and reasonable measures (safe excavation and backfilling practices or safe working practices referred to in sections 17.2(b) & (c) above) must be employed unless otherwise specified in this COP. Using only one may not be enough: for example, an U/G cable may be shown on a plan as a straight line, with measurements taken from fixed objects at the time of installation, whereas in practice the cable may snake or may have been moved out of position. This is not an uncommon situation because U/G cables are flexible and prone to be moved by contractors of other utility undertakings. Reliance on the plan alone may result in a false indication of the position of the cable, but this could be alleviated by the engagement of a competent person to carry out the U/G cable locating work. Conversely, if several U/G cables are close together a competent person may identify them as a single cable, whereas the plan would help to give a more accurate picture. Once the general situation has been established, hand dug trial holes provide physical confirmation of the position of the U/G cable and access to the exposed cable allowing the cable depth profile to be ascertained accurately. However, there will be no need for work involving the milling of paved surface up to 100 mm below ground level in carriageways for the purpose of road resurfacing and dredging at sea to follow such safe system of work practice.

19. Anyone responsible for excavation works where, as revealed from record plans and/or cable detection results at site, U/G cables may be present must liaise with the appropriate electricity supplier when planning to carry out the works. HEC should be approached for works to be carried out in Hong Kong Island, Lamma Island or Apleichau Island while CLP should be contacted for the rest of the Hong Kong Special Administrative Region (HKSAR). Electricity suppliers accept the need for close co-operation with those who have to carry out works in the vicinity of their U/G cables. If a competent person encounters genuine difficulty in locating the alignment of U/G cables due to conflicting and inaccurate information on the electricity supplier's drawing, he shall clarify with and/or seek necessary assistance from the electricity supplier who shall send technical staff to site to assist with the locating of that U/G cable as necessary without charge. In this case, the electricity supplier shall indicate to the competent person the approximate alignment of the U/G cable to expose physically the U/G cable. The person carrying out the works in the vicinity of the U/G cable shall then excavate any trial holes at his expense.

20. Both CLP and HEC maintain a 24 hour emergency service and any person can obtain information about U/G cables from and report any emergency incidents to the respective emergency centres of CLP and HEC at any time without charge. (Information about the two electricity suppliers, how to contact them and the services they provide can be found in Appendix 3)

21. The organisation and arrangements necessary for avoiding danger to U/G cables shall be written into, or form part of, employers' and contractors' safety plans and this information must be effectively communicated to all persons likely to be engaged in works in the vicinity of U/G cables. Guidelines on what to do in case of accidents or emergencies like fire or electric shock should be included in the safety plans.

22. All U/G cable locating work must be carried out by a "competent person" prior to commencement and in the course of works. Any person wishing to become such a person is required to submit the application to DEMS. Where, on application for the approval of a person as a competent person, DEMS is satisfied that the person has the relevant training and/or experience on U/G cable locating work, DEMS shall approve that person as a competent person. In the interest of regulating the quality of work performed by competent persons, DEMS is empowered to suspend or revoke the certificate of approval granted to a competent person. Details on the approval process and sanction provisions for competent persons are given in the ESLPR.

B. Detailed descriptions of reasonable steps and measures.

B1. Reasonable steps.

B1.1 Plans.

23. Electricity suppliers should be approached for information and plans indicating the alignment of their U/G cables before any works begin, except for those works which only involve shallow excavation of less than 450 mm from ground level as mentioned in section 17.1(a) above. Early contact at the planning stage will allow full discussion about the proposals and identification of any cable diversions or other

protective measures necessary to ensure the safety of construction workers, the general public and U/G cables and other equipment affected. Consideration should be given by anyone responsible for the proposed works at the design stage, including feasibility study, to amending the proposals to avoid existing U/G cable or areas particularly congested with utility services. For major projects an approach to the electricity suppliers by those responsible for the works at the earliest possible moment is recommended to ensure that sufficient time is available to plan and carry out any essential diversion of the U/G cables in the vicinity of the proposed works site. It should be noted that where a major diversion of an electricity supply system becomes necessary it can take many months to plan and complete the diversion in some cases.

24. To ensure that all available records of U/G cables in the vicinity of the proposed works are made available, the scope and, where appropriate, the nature of the proposed works must be fully defined when the request for information is made to the electricity supplier. The extent to which U/G cables may be affected by the works will depend on several factors, particularly the type of works being proposed. For example the effects of deep excavations, piling, percussion moling, high impact road breaking, etc. would extend for greater distances outside the immediate area of the proposed works than conventional trench excavation at relatively shallow depth. The request for information about U/G cables should therefore include such essential information in order that the electricity supplier can identify the area over which they consider their U/G cables may be affected, and indicate the alignments of their U/G cables in that area which are located within the proposed works site or its vicinity.

25. Table 1 defines what is to be considered to be “in the vicinity of the U/G cables” for various types of works below ground level. The distances given are a guide to the extent to which U/G cables may be affected by a range of typical works. When there is any doubt whether U/G cables are in the works site or its vicinity the electricity supplier must be consulted.

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

Type of works below ground level	Distance⁴
Trench or other excavation works in stable ground conditions up to 1.5 metres in depth	3 metres
Trench or other excavation works in stable ground conditions over 1.5 metres and up to 5 metres in depth	5 metres
Trench or other excavation works in stable ground conditions over 5 metres in depth	10 metres
Excavations under U/G cables (including any form of tunnelling, boring, construction of caverns, driving headings, cable jacking, etc.)	always consult regardless of depth under U/G cable
Welding or other hot works near exposed U/G cables	10 metres
Piling, percussion moling or pipe jacking	15 metres
Ground investigation and any kind of drilling or core sampling or ramming	3 metres
Use of explosives	60 metres

26. Where any person gives written notice to the electricity supplier that he proposes to carry out works in any works site or its vicinity where there is reason to believe that U/G cables may be found, the electricity supplier shall without charge provide details of the alignment of any U/G cable in the proposed works site or its vicinity within 14 working days or such period as is mutually agreed between the concerned parties.

27. Upon receipt of the notice, the electricity supplier shall immediately date stamp the notice and shall thereafter retain the notice for a minimum of 5 years. That date shall then be deemed to be the date of commencement of the time periods stipulated in section 26 of this COP. Where required in the notice, the electricity supplier shall acknowledge receipt of the notice, stating the date upon which it was received.

28. Electricity suppliers will normally respond to requests for information about the alignment of their U/G cables by providing inquirers with copies of their record plans. The times by which the electricity suppliers must respond to requests for information, advice or assistance shall be as follows -

- (a) Electricity related emergency - immediate despatch of emergency personnel on receiving information about the emergency situation,
- (b) Advice on alignment of U/G cables, etc. during working hours where plans have already been provided and work is in progress - by prior arrangement with the electricity supplier, which will normally be provided within the next working day but not more than 3 working

⁴ Distance considered to be in the vicinity of U/G cables which are located within the proposed works site or near the works site is measured from the centre line of the U/G cable.

days. In cases of genuine urgency/unforeseen circumstances staff to be sent as soon as they become available.

- (c) Requests for provision of plans/details of alignment of U/G cables, etc. - Plans showing the alignment of U/G cables (and associated equipment) will be provided within the time frame stated in section 26.

29. After obtaining information about U/G cables, contractors or any other persons responsible for the works must ensure that this information is provided to those who are actually involved in excavation and ground works. Particular care must be taken in the preparation of combined utility drawings for major construction projects to ensure that information is transferred accurately.

30. It is the responsibility of the site contractors and any other persons actually carrying out the works to ensure that any U/G cables in the proposed works site or its vicinity are located and then protected from damage. Where information about U/G cables in the proposed works site or its vicinity will have been provided, say three months before work is due to commence, it may be necessary to consult the electricity supplier again, one week before work is due to commence, to ensure that the up-to-date information with regard to the alignment of U/G cables is known.

31. It is essential that the electricity suppliers -

- (a) accurately record the as-built alignments of their U/G cables;
- (b) maintain the accuracy of such records throughout the life of the U/G cable; and
- (c) co-operate with persons wishing to carrying out works in the vicinity of U/G cables by providing them with information about the alignment of U/G cables.

32. An example of a record plan of U/G cables prepared in accordance with the standard set out in this COP is shown in Figure A3-1 of Appendix 3. With the best of the electricity supplier's knowledge, record plans will indicate the size, voltage rating and the recorded alignment and depth⁵ of all their U/G cables in the proposed works site or its vicinity. The typical colours, sizes and buried depths of CLP's and HEC's U/G cables are given in Table A3-1 of Appendix 3.

33. However carefully plans are prepared at the time of construction, their continued accuracy cannot be relied upon absolutely as the references used to indicate their alignment may have changed. They can, however, give a good indication of the alignment, sizes and number of U/G cables at a particular site, and will help subsequent tracing by competent persons. Those in charge of the works, and the

⁵ Information on depth of U/G cable is not generally available in the electricity supplier's record plan. When such information is required but not provided in the plan, Table A3-1 of Appendix 3 can be used as a supplement to the plan for identifying the minimum buried depth of the cable concerned.

competent persons responsible for the U/G cable locating work, should be aware that the accuracy of plans is limited because -

- (a) the position of reference points (e.g. the kerb or building line) may have changed since the plans were drawn;
- (b) regrading or resurfacing of the road may mean that the depths shown, if provided, are now incorrect;
- (c) U/G cables may have been moved without the authorisation or knowledge of the electricity supplier;
- (d) U/G cables, marked as straight lines may, in practice, vary in alignment from a straight line; and
- (e) the level and alignment of U/G cables may change rapidly over a short distance due to the presence of underground obstructions.

34. Even when work is to start without plans, as may be the case for shallow excavation of less than 450 mm from ground level, every effort shall be made to locate U/G cables including the use of a competent person. For emergency and unforeseen works, electricity suppliers must be consulted. Telephone requests for general information such as enquiry on locations of U/G cables should be made. In the meantime, it should be assumed that U/G cables are present and digging must proceed with extreme caution, and only after the engagement of a competent person to carry out U/G cable locating work to determine as accurately as possible the alignment of U/G cables. It is particularly important that anyone carrying out excavations in such circumstances must be adequately trained and supervised based on the guidelines given in Part II-B2 and Appendix 2 of this COP to avoid electrical accident or damage to U/G cables.

B1.2 Locating U/G cable alignment.

35. Site contractors are required to, or to cause to, engage a competent person, who is a holder of a valid certificate of approval issued by DEMS pursuant to section 3 of ESLPR for conducting U/G cable locating work, to pinpoint as accurately as possible any U/G cables in or near the proposed works site or its vicinity before excavation takes place by using suitable non-destructive cable locating devices. The competent person should carry out his work in conjunction with the record plans provided, except for circumstances given in section 23 for shallow excavation works, as these will help him to interpret the signal generated by the cable locating device, and so give the maximum information to those involved with the works before digging starts.

36. Non-destructive cable locating devices used by competent persons should be capable of operating in the following detection modes -

(a) **Passive detection**

Only a receiving instrument which responds to power and radio frequency signals is required for passive detection. These passive signals are naturally present in many conductors. The 50 Hz power frequency signal generated by electricity carrying U/G cables which may be picked up provide a reliable means of detecting the alignment of the U/G cable. For de-energised U/G cables or energised U/G cables with no load, the detection will rely on radio frequency signals. Detection which relies on the radio frequency signals to be picked up is less definite than the power frequency signal detection because other metallic objects may re-emit the radio frequency signal and results may vary appreciably according to locality, length of the U/G cable and distance from the termination, and geographical orientation. It should be noted that this detection mode enables the alignment of U/G cables to be located but should not be relied upon for depth measurement.

(b) **Active detection**

This detection mode requires the use of a signal generator (the transmitter) and a separate receiver. The signal may not only be of a known and closely controlled frequency, it can also be given a distinctive signature for the detection of electricity carrying or de-energised U/G cables. The means of supplying the signal generated by the transmitter to the target U/G cable are as follows :-

- (i) Induction - The signal is applied by electromagnetic induction by placing the transmitter close to the target U/G cable. There is no need to have any physical or electrical contact with the U/G cable and the method applies equally well for energised or de-energised cables. However some part of the U/G cable usually needs to be already known so that the transmitter can be properly positioned. This is the most commonly used active detection method because most target U/G cables have no exposed parts and this approach can provide useful information in difficult situations where the techniques in section 36(a) above have not been successful.
- (ii) Toroidal injection with a signal clamp - The signal is applied by electromagnetic induction by properly placing a signal clamp around the target U/G cable. This method needs no electrical contact with the U/G cable but part of the cable must be exposed for gaining access for the signal clamp. Although this approach is not as commonly used as the techniques in section 36(b)(i) above, it provides a more reliable means of locating the alignment of U/G cables in practice.

The active detection method is a more effective means of U/G cable locating technique when compared with the passive detection method because it also allows more precise work such as depth measurement and signal strength comparison to be taken. However, detection results obtained by these cable locating devices should not be relied upon totally for reasons stated in section 37 below.

37. The degree of confidence with which U/G cables can be detected depends on a number of factors such as the characteristics of the device being used, the state and depth of the cable, magnitude of current being carried by the cable and effects of other cables or metal pipes close by. In particular, a competent person may not be able to distinguish de-energised cables or pipes running close together and may represent them as a single signal. If two are sited one above the other it may not detect the lower one. Having dug and found one cable does not mean that there is not another close by. Frequent and repeated use shall be made of cable locating devices by the competent person during the course of the works.

38. 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 in a form prescribed by DEMS. The site contractor should ensure that the written record of the cable alignment is available for inspection before and during the course of the works upon request by DEMS. The cable locating device used by the competent person should be calibrated as per the manufacturer's requirement. Information to be provided in the written record shall include -

- (a) name and certificate number of competent person;
- (b) name of 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 based on common reference points (e.g. the kerb or building line); and
- (e) brand name, model number, serial number, calibration record and the mode of operation of the U/G cable locating device used for the detection.

39. Also, the competent person is responsible for marking the alignment with waterproof crayon, paint or self-adhesive temporary road marking tapes on paved surfaces or with wooden pegs in grasses or unsurfaced areas. Steel pins, spikes or long pegs, which could damage U/G cables laid at shallow depth, shall not be used. The site contractor should ensure that the cable alignment identified by the competent person is clearly marked and erase any residual markings on paved surfaces after completion of the works and not deface any traffic marking signs.

B1.3 Trial holes.

40. After establishing the alignment of any U/G cable at the works site or its vicinity, the position of any U/G cables must be confirmed with trial holes dug using hand tools for excavation of 450 mm or more from the ground level. If it is necessary to use road breaking power tools to break out a paved area, they are limited to hand-held power tools which should be kept at a horizontal distance of 250 mm away from the identified cable alignment and shall be used with care. For all other excavation, it is essential that only hand tools are used and that these are used cautiously. Further guidelines on excavating in the proximity of U/G cables can be obtained from the electricity suppliers, if required. However, advice must be sought from the electricity supplier for works to be carried out in the vicinity of U/G cables of 66 kV or above.

41. Having confirmed the position of any U/G cables, the site contractor should ensure that a small part of the target cable, in which its alignment has been located, is exposed to allow the competent person to gain physical access such that the depth of the unexposed part of the target U/G cable can be determined by active detection techniques as described in section 36(b) above. Great caution has to be exercised, for energised U/G cables in particular, when exposing the target U/G cable. Should there be any doubt about working in close proximity to U/G cables, the relevant electricity supplier must be consulted in advance. When gaining access to the target U/G cable, the most practical and reliable approach for identifying the depth of the unexposed part of the target U/G cable is to inject a signal by properly placing a signal clamp around the target U/G cable as described in section 36(b)(ii) above.

42. Similar to the requirements in section 38 above, the competent person is required to note in writing the depth profile of any identified U/G cable alignment in a form prescribed by DEMS and the site contractor should ensure that the written record of the cable depth profile is available for inspection before and during the course of the works upon request by DEMS. The cable locating device used by the competent person should be calibrated as per the manufacturer's requirement. These information, which should be provided in conjunction with the cable alignment record, shall include -

- (a) name and certificate number of competent person;
- (b) name of site contractor;
- (c) location, date and time for which the work on identifying the depth of the U/G cable was carried out;
- (d) depth profile of the unexposed part of the U/G cable; and
- (e) brand name, model number, serial number, calibration record and the mode of operation of the U/G cable locating device used for the detection.

43. Also, the competent person is responsible for marking the depth with waterproof crayon, paint or self-adhesive temporary road marking tapes on paved surfaces or with wooden pegs in grasses or unsurfaced areas. Steel pins, spikes or

long pegs, which could damage U/G cables laid at shallow depth, shall not be used. Any section of the U/G cable with a sudden reduction of buried depth must be clearly marked along the alignment. The site contractor should ensure that the cable depth profile identified by the competent person is clearly marked and erase any residual markings on paved surfaces after completion of the works and not deface any traffic marking signs.

B2. Reasonable measures.

B2.1 Safe excavation and backfilling practices.

44. Once the alignment and depth of the U/G cable have been established by the competent person as may be required in the case, excavation or other works involving ground penetration may begin. In the case of excavation of less than 450 mm from ground level where U/G cable information has not been obtained and no trial hole has been dug, only hand tools shall be used for the digging but hand-held power tools may be used for the purpose of breaking out paved concrete surfaces. Moreover, the electricity supplier should be informed before commencing excavation in the vicinity of U/G cables of 66 kV or above. Generally, special care must be taken when digging above or close to the assumed alignment of the U/G cable to avoid damaging the cable. Whenever possible, excavation near U/G cables should be carried out by hand digging. Also, it is safer to hand dig by spades and shovels than picks or forks. As work progresses, workers should be vigilant for signs and position of U/G cables.

45. Mechanical excavators and hand held power tools are the main causes of danger and they shall not be used too close to U/G cables. As the position of excavation by mechanical excavators and hand held power tools cannot be precisely controlled in practice, adequate clearance shall be maintained between any U/G cable and the point where a mechanical excavator is used - 1 m for U/G cables of below 66 kV and 3 m for 66 kV or above. The electricity supplier must be consulted before the works start if the clearance from the U/G cable will be less than such clearances. For hand held power tools used for the purpose of breaking out paved concrete surface, a horizontal clearance of 250 mm from any U/G cable must be maintained. Otherwise, a clearance of 500 mm from any direction of any U/G cable nearby must be maintained. Greater safety clearance may be required by the electricity supplier or DEMS, depending on operating voltage of the U/G cable and its strategic importance to electricity supplies in the HKSAR.

46. Hand tools are also a common source of accidents but when used carefully usually provide a satisfactory way of exposing U/G cables, once the approximate positions have been determined. 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.

47. All backfilling of excavations shall be done carefully and warning tapes, tiles, protection plates or other protection shall be put back in their original position by the party who removed them. The electricity supplier should be approached for make-up cable protection materials if they are found damaged or missing before the backfilling. The same backfilling materials should be used unless otherwise agreed with the electricity supplier. In general, cement bonded⁶ sand or sieved soil⁷ of suitable fineness shall be used as covering materials for the backfilling as the case may be. 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, stone, timber, rubbish and other materials of high thermal resistivity) must not be used. If in doubt, the site contractor should seek advice from HEC or CLP on the specific requirements for backfilling of excavation including the thickness of the bedding layer, type of materials to be used and method of compaction etc.

48. Where an excavation uncovers an U/G cable, the backfill shall be adequately compacted, particularly beneath the cable, to prevent any settlement which would subsequently damage the cable. Backfill material adjacent to U/G cables shall be selected fine material or sieved soil, containing no stones, bricks, lumps of concrete, timbers, or materials which are perishables or self-combustible etc. and shall be suitably compacted to give comparable support and protection to that provided before excavation. No power compaction should take place until 300 mm cover of selected fine fill has been suitably compacted.

49. If the road construction is close to the top of an U/G cable, the electricity supplier shall be asked about the necessary precautions. The buried depth of the U/G cable as depicted in section 51 below must not be reduced without permission from the Highways Department.

50. No concrete or other hard material shall be placed or left under or adjacent to any U/G cable as this can cause damage to cable sheaths at a later date. Concrete backfill must not be used within 300 mm of an U/G cable.

51. For new U/G cables of below 33 kV, the depth of cover for those laid in a carriageway is nominally 900 mm and for those laid in a footway 450 mm. The minimum cover for U/G cables of 33 kV or above is 1 m for both footway and carriageway. These depths are only a guide and U/G cables may be found at shallower or deeper depths. For U/G cables installed in the past, the depth of cover

⁶ 1:14:2 cement bonded sand is defined as a machine mixed material consisting of 1 part of cement and 14 parts of sieved sand and 2 parts of water by weight. Sieved sand is defined as washed sand passing through a 5 mm x 5 mm mesh screen

⁷ sieved soil is defined as soil of suitably low thermal resistivity passing through a 12 mm x 12 mm mesh screen

may have been altered, perhaps because other works (such as road alterations) have been carried out in the area. Cables passing over underground obstructions or in the vicinity of bridge structures may also be laid at shallower depths.

B2.2 Safe working practices for trenchless methods.

52. 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. Care must be taken when using trenchless methods to avoid colliding with and thereby damaging U/G cables. With moling and pipe jacking it is also important not to come too close to adjacent U/G cables, as displaced soil may also cause damage.

53. Plans, competent persons for locating U/G cables and trial excavations must be used to locate existing U/G cables in the same way as for traditional excavation methods. The path of the device being used shall then be planned accordingly. As a general guide, the minimum clearance from adjacent U/G cables shall be of at least 1 m. Depending on the operational tolerances and errors of the device being used, this clearance may need to be varied taking into account the electricity supplier's advice such factors as the construction of adjacent plant, ground conditions, bore diameter, the accuracy and reliability of the technique/equipment being used, and whether the other plant is parallel or crossing the proposed line to ensure that the minimum clearance will be encroached. Moles are prone to deflection from their original course and if there are existing U/G cables in the vicinity a mole tracking device must be used.

B2.3 Safe working practices for other works.

54. U/G cables uncovered in an excavation will almost certainly need to be supported. The advice of the electricity supplier shall be sought and agreement reached on the measures necessary to achieve this. Safeguarding the stability of the excavation is equally important for the protection of U/G cable from damage due to ground settlement or collapse of excavation and adequate support shall be provided to avoid such incidents from occurring.

55. Where U/G cables cross or are parallel and close to excavations, changes in backfill etc. may cause differential ground settlement and increased stress in the cable. For cables parallel and close to excavation, the degree of risk depends upon the depth of the excavation, the distance of the cable from the excavation, and the type of soil. Wherever an excavation may affect support for an U/G cable, the electricity supplier shall be consulted. In some cases it may be necessary to divert permanently the U/G cable before work begins. In others it may be necessary to provide permanent support for the walls of an excavation to ensure the long term stability of the works after backfilling and restoration have been completed.

56. Where explosives are to be used within 60 m of an U/G cable, or piling, vertical boring, etc. are to be carried out within 15 m of an U/G cable, then prior consultation with the electricity supplier should be made to reach an agreement on the protective measures to be taken before any work takes place.

57. If welding or other hot work is to be carried out within 10 m of exposed U/G cables, the electricity supplier should be consulted on any special protective measures required. Even if agreement has been reached with the electricity supplier to carry out such hot work, particular care shall be taken to avoid damage by heat, sparks or naked flames to the protective coatings and sheaths of the U/G cable.

C. Good working practices.

58. In addition to the practices of reasonable steps and measures as depicted between section 23 and 57 above which should be followed for compliance with the requirements of the ESLPR, the adoption of other good working practices when carrying out site activities in the vicinity of U/G cables is highly recommended.

C1. Damaged U/G cables.

59. If an U/G cable suffers damage, however slight, the electricity supplier shall be informed immediately and arrangements made to keep people well clear of the area and to provide access to the works site until it has been repaired or otherwise made safe. Equally, where an excavation uncovers an U/G cable with damaged sheath, the electricity supplier shall be told, so that repairs can be made to prevent it from developing into a fault over a long period of time. Under no circumstances shall any unauthorised repairs be made to an U/G cable.

C2. Identifying different utilities and protecting U/G cables from damage.

60. Once U/G cables and underground pipes have been uncovered, failure to identify them correctly is another common cause of accidents. A wide variety of materials and colours have been used by the utilities in Hong Kong over the years and there is no standard colour coding system identifying all services.

61. Certain high voltage U/G cables may look like water pipes and some U/G cables are yellow which could be mistaken for polyethylene gas pipes. Occasionally U/G cables may be run in ducts, making them difficult to identify. The typical colours, sizes and buried depth of CLP's and HEC's U/G cables are given in Table A3-1 of Appendix 3. An exposed U/G cable should not be handled or has its position altered. Where there is any doubt about the identity of an exposed service (electricity, gas or water) it must be treated as being LIVE and potentially hazardous until proved otherwise. All U/G cables must be assumed to be LIVE until de-energised by the electricity supplier and proved to be safe at the point of work. As such, an exposed U/G cable must never be used as a convenient step or hand-hold nor be worked on (e.g. drilling or cutting) even the cable may seem to be disconnected and abandoned. Confirmation and approval should be obtained from the electricity supplier at site before attempting to remove any apparently dead U/G cable.

62. If U/G cables have been found to be too shallow, or if the plans or other information have proved to be inaccurate, the site contractor shall ensure that the electricity supplier is informed, preferably before the excavation is backfilled. Where the cable is considered to be too shallow or otherwise at risk, the electricity supplier shall take whatever steps are necessary to ensure the safety of the U/G cable. Where plans are inaccurate they shall amend their records accordingly.

C3. Avoiding long term damage to U/G cables.

63. Installation of plant 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 and no work shall be carried out which results in a reduction of cover or protection over a cable.

64. Anyone who carries out works near U/G cables must observe any reasonable requirements made by the electricity supplier for the present and long term protection of U/G cables, and ensure that access to the U/G cables is available at all times. 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, DEMS shall be informed forthwith and shall decide whether the electricity supplier's requirements are reasonable and/or enforcement action is required.

C4. Construction and demolition sites, new and existing housing developments.

65. Special problems can arise in the case of works being carried out on construction and demolition sites, new and existing housing developments. Anyone concerned with construction works 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. Consideration should be given to disconnecting electricity supplies within the works site in advance of the works commencing where practicable. Particular attention should be given to the protection of U/G cables where construction traffic will access the works site. Work should not start until all appropriate safeguarding action has been taken.

66. U/G cables within the confines of partly completed housing developments are especially prone to damage from the numerous site operations that have to be carried out. A common trench may help to control the position and separation distances between all underground utilities. Where U/G cables are laid on partly developed sites, special arrangements may be necessary for their temporary protection at vehicle and mobile plant crossing points.

67. Close liaison shall be maintained between the developers, their designers and contractors, and the utilities. A marked-up plan of the estate showing the up-to-date position of U/G cables (including any variations from planned routes) shall be kept on site by builder/developer for the information of those involved in excavation and ground works.

C5. Installation of new utility pipes and cables near existing U/G cables.

68. New underground utilities, which do not include re-construction of existing utilities, often have to be laid in ground which contains existing U/G cables. Where it is reasonably practicable to do so, the utility undertaking planning the new installation shall aim to site it so that it is separated from all existing U/G cables by the distances

agreed with the electricity supplier. Names of the electricity supplier's staff and other general information in relation to the agreement should be kept as a record. In general, the clearance shall be 300 mm for U/G cables of below 66 kV and 1 m for 66 kV and above to allow for future maintenance or emergency operations.

69. Where this standard cannot be attained because of congestion of utility plant in a particular location there shall be as great a separation distance as is reasonably practicable.

70. Where the utility undertaking which is laying the new buried service has to reduce the separation, it must inform the relevant electricity supplier and agree what special measures are necessary to protect the U/G cable from damage.

PART III: GUIDANCE FOR WORKING NEAR OVERHEAD ELECTRICITY LINES

A. Safe system of work.

71. Working too close or causing damage to O/H lines is dangerous and can lead to flashover, explosion or fire and often results in casualties. Risk of casualties will increase if details of the O/H lines (e.g. voltage level, distance to ground etc.) are not ascertained before commencement of works. This part of the COP aims to minimise the possibility of damaging O/H lines or causing an electrical hazard (e.g. due to electrical explosion, arcing) before commencement of works in the vicinity of the O/H lines and when carrying out such activities. The meaning of “vicinity of the O/H lines” in this part of the COP is described in section 80 below.

72. The safe system of work comprises two key elements, namely taking reasonable steps before commencement of works and taking reasonable measures in the course of works. Reasonable steps include ascertaining the alignment, ground clearance and voltage of the O/H lines through prior planning and consultation with the electricity supplier while reasonable measures mean the adoption of safe working practices in the course of works. Brief descriptions of the two key elements of the safe system work are given as follow -

72.1 Reasonable steps -

(a) Planning

Since O/H lines are clearly visible, acquisition of O/H line alignment drawings and other suitable information from electricity suppliers is not mandatory but such information should still be requested from the electricity suppliers, if and when necessary, for preventing damage to O/H lines and avoiding danger. When there is a request for O/H line information, the electricity suppliers are committed to taking all reasonably practicable measures to ensure that such information is made available to those persons requesting this information. If it is not possible to obtain the O/H line information in advance because emergency or other unforeseen works have to be undertaken, telephone contact can be made with the electricity supplier to seek oral advice and request their attendance on site. More detailed descriptions of this step are given between section 78 and 88 below.

(b) Consultation

If there are any O/H lines over the works site, near its site boundaries, or over access roads to the site, the site contractor shall consult the electricity supplier so that the proposed plan of work can be discussed. Site meetings with the electricity supplier to work out mutually acceptable arrangements should be arranged before commencement of works. The electricity

suppliers are committed to taking all reasonably practicable measures to ensure that the relevant advice is provided and that they attend site meetings arranged by the site contractor. More detailed descriptions of this step are given between section 89 and 95 below.

72.2 Reasonable measures -

(a) Safe working practices

O/H lines which are mostly found in uninhabited or rural areas must be treated as LIVE and the distance to ground of overhead conductors should not be ascertained by relying on visual judgement only. All works, particularly when the use of lifting and earth moving equipment is involved, must be carried out following recognised practices in the trade as outlined between section 96 and 107 below and taking into account any advice given by DEMS and the electricity supplier. Great caution shall be exercised in the use of such equipment and other mechanical plant close to the O/H lines.

(b) Safe working practices for blasting works

The use of explosives at works sites could easily damage any O/H lines nearby if the works are not safely carried out. Such works must be carried out carefully following the safe working practices as outlined in section 108 and taking into account any advice given by DEMS and the electricity supplier.

73. It is essential that each element of these safe system of work must be followed when working in the vicinity of the O/H lines. The first step in avoiding danger is to find out whether there is any O/H line within or in the vicinity of the works site, or across any route to it and obtain the necessary information on the O/H line from the electricity supplier. Based on the information provided by the electricity supplier, the minimum clearance between the O/H line and any object which may be operating within or near the works site (i.e. the safe working distance) shall be assessed and a site meeting shall be conducted with the electricity supplier as necessary.

74. Anyone responsible for works where O/H lines are present must liaise with the appropriate electricity supplier when planning to carry out the works. HEC should be approached for works to be carried out in Hong Kong Island, Lamma Island or Apleichau Island, whilst CLP should be contacted for the rest of the HKSAR. Electricity suppliers accept the need for close co-operation with those who have to carry out works in the vicinity of their O/H lines, including but not limited to the provision of advice on site before and during the works.

75. Both CLP and HEC maintain a 24 hour emergency service and any person can obtain information about O/H lines from and report emergency incidents to the respective emergency centres of CLP and HEC at any time without charge.

(Information about the two electricity suppliers, how to contact them and the services they provide can be found in Appendix 3.)

76. The organisation and arrangements necessary for avoiding danger to O/H lines shall be written into, or form part of, employers' and contractors' safety plans and such information must be effectively communicated to all persons likely to be engaged in works in the vicinity of O/H lines. Guidelines on what to do in case of accidents or emergencies like fire or electric shock should be included in the safety plans.

77. All workers, especially those operate lifting and earth moving equipment, must receive relevant training in the above steps and measures. The guidance shown in Appendix 2.3 provides a summary on the scope of training required Organisations such as the Construction Industry Training Authority can give advice on available training.

B. Detailed descriptions of reasonable steps and measures.

B1. Reasonable steps.

B1.1 Planning.

78. Works near O/H lines should be well planned before their commencement. Any O/H lines found in the vicinity of the proposed works must be assumed to be LIVE unless until the O/H lines concerned have been proved or made dead by the electricity supplier.

79. It is essential to identify whether any nearby O/H lines will fall within the vicinity of the proposed works. No works shall be carried out in this vicinity without ascertaining the alignment, distance from the ground and voltage of the O/H line such that a safe working distance can be kept by the person carrying out the works to prevent the occurrence of an electrical accident or an electricity supply interruption. Although it is not mandatory, the acquisition of O/H line alignment drawings and other suitable information, especially for major works, will help to identify O/H lines in the vicinity which should greatly facilitate the planning of works. To ensure that all available records of O/H lines are made available, the scope and, where appropriate, the nature of the proposed works must be fully defined when the request for information is made to the electricity supplier.

80. Any works, except for blasting work, found within a horizontal distance of 9 m from the outermost conductor of an O/H line will be considered as "O/H line in the vicinity of the works". For blasting work, a horizontal distance within 50 m of any O/H line footing or 25 m from the nearest conductor will be considered as "O/H line in the vicinity". A diagram showing the setting of this horizontal distance is given in Figure A3-2 of Appendix 3. This distance is a guide to the extent to which O/H lines may be affected by a range of typical works. When there is any doubt whether O/H lines are in the vicinity of the works the electricity supplier must be consulted.

81. Where any person gives written notice to the electricity supplier, that he proposes to carry out works in any place where there are O/H lines nearby, the

electricity supplier shall without charge provide details of the alignment and voltage of any O/H lines in the vicinity of the proposed works within 14 working days or such period as is mutually agreed between the concerned parties.

82. Upon receipt of the notice, the electricity supplier shall immediately date stamp the notice and shall thereafter retain the notice for a minimum of 5 years. That date shall then be deemed to be the date of commencement of the time periods stipulated in section 81 of this COP. Where required in the notice, the electricity supplier shall acknowledge receipt of this notice, stating the date on which it was received.

83. Electricity suppliers will normally respond to requests for information about the alignment of their O/H lines without charge by providing inquirers with copies of their record plans. The times by which the electricity suppliers must respond to requests for information, advice or assistance shall be as follows -

- (a) Electricity related emergency - immediate despatch of emergency personnel on receiving information about the emergency situation,
- (b) Advice on alignment and other relevant information of O/H lines during working hours where plans have already been provided and work is in progress - by prior arrangement with the electricity supplier, which will normally be provided within the next working day but no more than 3 working days. In cases of genuine urgency/unforeseen circumstances staff to be sent as soon as they become available.
- (c) Requests for provision of plans/information of O/H lines, etc. - Plans showing the alignment of O/H lines (and relevant information) will be provided within the time frame shown in section 81.

84. Contractors or any other persons responsible for the works must ensure that the information about O/H lines obtained from the electricity supplier is made available to those who are actually involved in operating the heavy machinery (e.g. mobile cranes, container loaders etc.).

85. It is the responsibility of the site contractor to identify the required distance from the O/H line as stated in section 80 above and to carry out any works safely in the vicinity of the O/H line in accordance with this part of the COP.

86. It is essential that the electricity suppliers -

- (a) accurately record the as-built alignments of their O/H lines
- (b) maintain the accuracy of such records throughout the life of the O/H lines, and
- (c) co-operate with persons wishing to carry out works in the vicinity of O/H lines by providing them with relevant information about the lines.

87. An example of a record plan of O/H lines in accordance with the standard set out in this COP is shown in Figure A3-3 of Appendix 3. With the best of the electricity supplier's knowledge, records plans will indicate the voltage rating, recorded alignment of all O/H lines in the vicinity of the proposed works.

88. However carefully plans are prepared at the time of construction, their continued accuracy cannot be relied upon absolutely as the references used to indicate their alignment may be different from actual site installations due to changes in landscape, construction of roads etc. Whenever possible, site inspection should therefore be conducted before commencement of works.

B1.2 Consultation.

89. The proposed plan of work, even for works of a short duration, should be discussed with the relevant electricity supplier if O/H lines are found in the vicinity of the works to be carried out or the passageway of plant or equipment to the works site. Prior consultation with the electricity supplier should be made before commencement of the works in the vicinity of O/H lines. In particular, it is the responsibility of the site contractor to ascertain the alignment, distance from the ground and voltage of any O/H line which may fall within the vicinity of their proposed works. If there is any doubt, advice from the relevant electricity supplier must be sought.

90. Where any person gives written notice to the electricity supplier, that he proposes to effect works in the vicinity of their O/H lines, the electricity supplier shall without charge attend the site meeting to discuss the work plan within 14 working days or such period as is mutually agreed between the concerned parties.

91. Upon receipt of the notice, the electricity supplier shall immediately date stamp the notice and shall thereafter retain the notice for a minimum of 5 years. The date shall then be deemed to be the date of the commencement periods stipulated in section 90 of this COP. When required in the notice, the electricity supplier shall acknowledge receipt of this notice without charge, stating the date on which it was received.

92. Electricity suppliers will normally respond to requests for site meeting relating to the plan of work by sending a member of their staff with suitable experience to attend the meeting. Under an electricity related emergency, the electricity supplier must respond to the request by an immediate despatch of emergency personnel on receiving information about the emergency situation.

93. Both the site contractor and the electricity supplier should keep a record of all site meetings held which shall include -

- (a) names of site contractor and electricity supplier's staff;
- (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 plan of work.

94. The site contractor should retain for inspection upon request by DEMS any site meeting records as described in section 93 of this COP until the related works have been 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 5 years.

95. Contractors or any other persons responsible for the works must ensure that the advice and information obtained from the electricity supplier (e.g. alignment, distance from ground, voltage of the O/H line and the safe working distance) is made available to those who are actually involved in operating the heavy machinery (e.g. mobile cranes, container loaders etc.).

B2. Reasonable measures.

B2.1 Safe working practices.

96. Once the O/H line information required for the works in its vicinity is known and the relevant electricity supplier has been consulted regarding the proposed work plan, works including the use of various heavy machinery may begin by following the safe working practices as described below. Broadly, the nature of works can be categorised as follows -

(a) **Where no works are carried out underneath the O/H lines nor plant or equipment passing underneath the O/H lines**

There will be no planned works or movement of plant or equipment under the O/H lines. Barriers should be erected along the O/H lines to prevent works or movement within the works site becoming too close to the lines. Further details are provided between section 97 and 101 below.

(b) **Where there will be plant or equipment passing underneath the O/H lines in the course of works**

There will be no planned works under the O/H lines but movement of plant or equipment underneath the lines is expected. Specially designed passageways should be made to allow for movements of plant or equipment under the O/H lines. Further details are provided between section 102 and 104 below.

(c) **Where works are carried out underneath the O/H lines**

There will be works directly under the O/H lines. In addition to the erection of barriers and provision of passageways for plant or equipment, further precautions which are provided between section 105 and 107 below, must be taken to prevent any occurrence of an electrical accident and/or electricity supply interruption. In all circumstances, a safe working distance from the O/H lines must be maintained at all time.

B2.1.1. Where no works are carried out underneath the O/H lines.

97. Ground level barriers parallel to the O/H line to prevent any part of the plant or equipment approaching too close to the line should be erected to reduce danger. It is recommended that the barriers should be erected at a horizontal distance of at least 6 m away from the outermost conductor of the O/H line. In the interest of maintaining a safe distance from the barriers to the O/H line at all times, the electricity supplier or DEMS 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.

98. The position of barriers should be clearly marked for the benefit of the plant equipment operators where the minimum horizontal distance could be encroached upon by parts of their equipment. This could be done by putting up a non-metallic string of coloured plastic or cloth flags (i.e. bunting) suspended vertically above ground between 3 to 5 m on top of the barrier. Care must be exercised when erecting the bunting to avoid contact or becoming too near to the conductors of the O/H line. Also, warning notices of O/H line nearby should be attached to or displayed on the barriers at intervals of not less than 2 m.

99. Barriers are intended to maintain a safe working distance between any works and O/H lines. As such, 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. Also, the barriers should be set up to prevent access by person as well as plant or equipment if site workers carrying steel bars, ladders or other conducting objects are likely to go pass through the barriers.

100. Ground level barriers should be set up such that they are not easily moved by wind or any mechanical force. Typically, these barriers could be -

- (a) a rail fence; or
- (b) a plastic/nylon rope fence with planted stout posts in between; or
- (c) an electrically earthed wire fence under tension to be set up in consultation with the relevant electricity supplier; or
- (d) an earth bank boundary of at least 1 m high 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 bunks or concrete blocks.

Visibility of these barriers should be enhanced by attaching coloured plastic or cloth flags on or above fence lines; or applying paint stripes with distinctive colours on drums etc.

101. No materials to be used in relation to the works should be stored, even for a short duration, in the area between the O/H line and the ground level barrier without first consulting the electricity supplier.

B2.1.2. Where there will be plant or equipment passing underneath the O/H lines in the course of works.

102. Allowing the passage of plant or equipment under the O/H line increases the danger and the passage should only be undertaken if reasonable alternative routes are not available. In order to minimise the danger areas, the number and width of the passageways for plant or equipment should be minimised. For the safest crossing, the passageway, if provided, should be at right angles to the alignment of the O/H line wherever possible. 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 in the barriers running along the O/H line alignment and fixing a cross-bar securely on top of the two goal posts for entrance height restriction. Similar to the barriers, the route of the passageway should be clearly fenced.
- (b) The goal posts and cross-bars should be rigid and of non-electrically conductive materials and be marked with distinctive colour stripes. If metallic goal posts or cross-bars 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 equipment shall exceed this ground clearance when the equipment is inside 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 underneath the O/H line above.
- (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, say 30 m away.

103. Due consideration should be given to the speed, stopping distance, size and manoeuvrability of any vehicle or mobile plant equipment when deciding the location of the goal posts and form of warning notices to be used. The gateway should be erected far away enough from the O/H line such that the vehicle/plant does not come to a rest underneath the line should it hit the goal post or cross-bar.

104. In the case where it is not possible to place a rigid cross-bar on top of the goal posts due to the width of the passageway (e.g. the construction of carriageways underneath the O/H line), a string of strong non-metallic rope under tension could be used as a flexible height limiter. Similar to the bunting for the barriers, the flexible height limiter should be made easily visible by attaching to it plastic or cloth flags with distinctive colour. The distance between a flexible height limiter used in a gateway and the closest O/H line conductor nearby should be at least 12 m. This increased horizontal clearance is to allow for maintaining adequate safety clearance from the O/H line in case that the flexible height limiter is struck and stretched by any vehicles/plant moving towards the line.

B2.1.3. Where works are carried out underneath the O/H lines.

105. Ground level barriers, gateways and warning notices can help to reduce the danger arising from works being carried out not directly underneath the O/H line or the horizontal movement of vehicles and plant or equipment across the line. Additional precautions need to be taken to prevent danger resulting from upward movements of plant or equipment (e.g. cranes, loader arms, excavator buckets) if works are to be carried out underneath the O/H line and to prevent the workers from encroaching beyond the safety clearance limit where buildings or structures are being erected beneath the lines.

106. The following additional precautions should be exercised when the works underneath the O/H line only involve ground level work (e.g. pipe laying, road construction/maintenance etc.) -

- (a) The minimum vertical distance to ground of the O/H line span concerned and the safe working distance between the line conductor and any object which may be present under the O/H line must be ascertained from the relevant electricity supplier.
- (b) No tools, equipment or apparatus which could encroach beyond the safe working distance should be used under the O/H line.
- (c) Suitable physical restraining devices should be fitted to plant equipment to inhibit any of its moving part (e.g. derricks, cranes, jibs, hoists etc.) from reaching beyond the safe working distance.
- (d) The site contractor responsible for the works must make certain that the safety precautions are observed by all workers concerned.
- (e) Site workers should avoid working unnecessarily directly underneath the O/H lines, 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 ground which are normally buried underground.
- (f) The electricity supplier must be informed immediately of any damage, however slight, or interference to an O/H line. Arrangements shall be made to keep people well clear of the area and to provide access to the works site until it has been repaired or otherwise made safe; but do not

attempt to remove any objects, retract mobile crane or contact the injured person which are in contact with the O/H line conductor because the line may still be LIVE. Under no circumstances shall any unauthorised repairs be made to an O/H line. Also, the electricity supplier shall be advised of any reduction of vertical distance from ground of the O/H line span concerned

107. Stacking of goods, containers, erection of buildings and structures etc. underneath an O/H line may substantially increase the risk of causing danger because the chance of any object encroaching beyond the safe working distance is higher due to the reduction of distance between the line conductor and the top of the object. As such, these activities should not be carried out unnecessarily. The O/H line should be de-energised by the electricity supplier or diverted, if feasible, should there be a need to carry out the works directly under the line. In case that the O/H line cannot be de-energised or diverted, the following precautionary measures must be taken -

- (a) The working methods agreed with the relevant electricity supplier at the consultation stage must be strictly followed and any subsequent change to the agreed working methods must be confirmed by the electricity supplier before the change is effected.
- (b) The insulation cover of any overhead electricity conductors should not be relied as a means of protection from electric shock and should always be treated as LIVE.
- (c) The precautions as described in section 106(b), (c), (d), (e) and (f) of this COP also apply.

B2.2 Safe working practices for blasting works.

108. Any blasting work shall be kept well away from O/H lines in order to prevent damage to the line and its supporting structure from the flying debris. The following precautions should be taken if blasting work needs to be carried out in the vicinity of O/H lines (as defined in section 80 of this COP) -

- (a) The maximum particle velocity caused by the blasting shall also 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 involved, the suppliers of explosives and detonating system should be consulted about the suitability of the system chosen. In general, electric detonators should be used at least 60 m away from the nearest conductor of the line.
- (c) Erection of damping mats to reduce the effect of flying debris.
- (d) Requirements of the Buildings Department and Civil Engineering Department in relation to blasting works should be followed.

C. Other aspects relating to works.

109. Although proximity warning devices and conductor insulating covers have some applications in electrical engineering work, they must not be used as substitutes for any of the precautionary measures prescribed in this part of the COP.

110. Where aircrafts, including helicopters, are to be used in relation to the works, advice must be sought from the Director of Civil Aviation and the relevant electricity supplier.

Appendices

Appendices 1 and 3 give advice on matters which relate to the application of relevant legislation to this COP and various aspects concerning electricity supply lines and the electricity suppliers that own and operate them. These appendices provide additional information and should be read and used in conjunction with the advice contained in the main text.

Appendix 2 provides the step-by-step guidance for site personnel involved in works near U/G cables or O/H lines. The guidance is summarised from the corresponding parts of the main text which serve to provide a quick reference for the site personnel concerned.

Appendix 1 : Legislation

Relevant legislation enforced by DEMS

1.1 The Electricity Supply Lines (Protection) Regulation (ESLPR), made under the Electricity Ordinance, Cap. 406 (the Ordinance), apply to any works in the vicinity of “electricity supply lines”⁸, in particular section 10 of ESLPR requires that :

“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 or 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) 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,

⁸ “electricity supply 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;
- (c) any cable used in conjunction with such conductor mentioned in paragraph (a) or apparatus mentioned in paragraph (b) for the purpose of transmitting control signals,

and in paragraph (a), reference to a conductor used for the purpose of conveying, transmitting or distributing electricity includes reference to a wire or wires or other means used for that purpose.

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 18 of ESLPR sets out the defence provisions to a prosecution brought against any person under section 10 of ESLPR as follows-

“18 Defence

- (1) Where a code of practice is approved for the requirements of section 10(1) (a) or (b), it shall be a defence to a charge under section 17(3) alleging a contravention of that paragraph for the person charged to show that he has complied with the provisions of that code.
- (2) 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 were taken for the purposes of section 10(1); and
 - (b) having regard to information so obtained, all reasonable measures were taken for the purposes of section 10(2),

and where a code of practice is approved for the requirements of section 10(1) or (2) as that subsection applies to the particular case, compliance with the provisions of that code shall be deemed to constitute the taking of all reasonable steps for the purposes of paragraph (a) or the taking of all reasonable measures for the purposes of paragraph (b), as the case may be.

1.2 This code of practice has been prepared by the Electrical & Mechanical Services Department and approved and brought into effect in accordance with the provisions of section 15 of ESLPR. Its purposes is to provide practical guidance in respect of the requirements of the ESLPR, particularly concerning the avoidance of danger from working in the vicinity of electricity supply lines. Although failure to comply with any provision of this code may not in itself be an offence, that failure shall be admissible in evidence in the proceedings and may be relied upon by the prosecution as tending to establish that matter. In such case it will be open to that person to satisfy the Court that he has complied with the ESLPR in some other way.

Appendix 2 : Guidance for site personnel

A. Introduction

2.1 Anyone who works near electricity supply lines should be properly trained to follow the necessary safe precautions and working procedures in order to prevent the occurrence of electrical accidents or cause electricity supply interruption to consumers. Information issued to employees can usefully supplement this training and act as a reminder of the main points. A summary of guidance for working in the vicinity of underground electricity cables (U/G cables) and overhead electricity lines (O/H lines) compiled based on Part II and Part III of this COP respectively are given below. These could be usefully adapted to meet the needs of individual organisations by adding supervisors' names, contact points, etc. which may be produced as a packet card or leaflet, or in some other appropriate form.

B. Advice to site personnel when working near U/G cables.

2.2 The following advice should be clearly conveyed to all who are involved in works near U/G cables especially those who are actually carrying out the excavation -

- (a) Damaging U/G cables is dangerous and can often cause flashover, explosion or fire.
- (b) Damage can result from excavation or penetration of the ground.
- (c) U/G cables may be found in roads, footpaths and on sites. Always assume that they are present. Treat any cables found anywhere as LIVE.

Before starting work

2.2.1 Before starting work, the site contractor or person responsible for the proposed works should go through a checklist as follows -

- (a) Make sure you have plans of the U/G cables in the area before carrying out any works except for shallow excavation of less than 450 mm from ground level. Contact the electricity suppliers if this is not possible as in the case of emergency or unforeseen works. Remember that the plans are used for reference only and cable locator must be used to identify the existence and alignment of the U/G cables in the works site or its vicinity in any event.
- (b) Engage a competent person approved by DEMS for locating the alignment of all U/G cables in the area, irrespective of the excavation depth.
- (c) Ensure that any U/G cable alignments as identified by the competent person in the area are clearly marked on the ground.

- (d) Confirm the location of U/G cable by exposing the cable using hand dug trial holes in the case of excavation of 450 mm or more from ground level. Hand-held power tools shall only be used for breaking out paved concrete surfaces.
- (e) Engage a competent person approved by DEMS for locating the depth profile of all U/G cables in the area in the case of excavation of 450 mm or more from ground level.
- (f) Ensure that any U/G cable depth profiles as identified by the competent person in the area are clearly marked on the ground.
- (g) Ensure that the written report provided by the competent person in a form prescribed by DEMS which contains information on the U/G cable's alignment and depth as identified is obtained and kept.

In the course of works

2.2.2 During the course of the excavation, the following precautions should be exercised by the site worker -

- (a) Whenever possible, hand dig near underground services. Spades and shovels are safer than picks or forks.
- (b) Watch out for signs and position of cables as work continues.
- (c) Keep a clear distance of 500 mm from the side of any U/G cable when using hand-held power tools.
- (d) Do not use hand-held power tools directly over the marked alignment of an U/G cable identified by the competent person. Only use such tools if the work cannot feasibly be carried out by hand tools and a horizontal clearance of 250 mm from any cable as identified by the competent person could be maintained.
- (e) Keep a clear distance of 1 m between the side of any distribution cable (i.e. voltage below 66 kV) and the bucket of a mechanical excavator whereas such distance is extended to 3 m for transmission cables (i.e. voltage 66 kV and above).
- (f) Do not install plant, such as compressors, generators, close to an existing U/G cable. Ask the supervisor about the required separation distance.
- (g) Do not build existing U/G cables into a manhole or other structure or encase them in concrete.

- (h) Always provide adequate support and anchoring of exposed U/G cables according to the electricity supplier's recommendations.
- (i) Report to the relevant parties, including the electricity supplier, any electrical accident or damage to an U/G cable or its sheath. Even if there is no immediate danger, damage could lead to danger at a later date. Evacuate everyone from the immediate area of the damage but do not attempt to remove any objects or contact the injured persons which are in contact with the damaged cable because the cable may still be LIVE. Cooperate with the electricity supplier by providing access to the works site for carrying out repair to the cable as requested.
- (j) Even if the U/G cable seems to be disconnected and abandoned, do not attempt to drill or cut into it, or to dismantle it until the electricity supplier's approval has been given.
- (k) All backfilling of excavations shall be done carefully and warning tapes, tiles, protection plates or other protection shall be put back in their original position. The electricity supplier should be approached for make-up cable protection materials if they are found damaged or missing before the backfilling. The same backfilling materials should be used unless otherwise agreed with the electricity supplier. If in doubt, the site contractor shall seek advice from HEC or CLP on the specific requirements for backfilling of excavation including the thickness of the bedding layer, type of materials to be used and method of compaction etc.

C. Advice to site personnel when working near O/H lines.

2.3 The following advice should be clearly conveyed to all who are involved in works near O/H lines especially to the operators of lifting and earth moving equipment -

- (a) Working too close or causing damage to O/H lines is dangerous and can lead to flashover, explosion or fire and often results in casualties.
- (b) Risk of casualties will increase if details of the O/H line (e.g. voltage level, distance to ground etc.) are not ascertained before commencement of works.
- (c) O/H lines are mostly found in uninhabited or rural areas which are clearly visible but the distance to ground of the overhead conductors should not be ascertained by relying on visual judgement only. Treat any O/H lines found anywhere as LIVE.

Before starting works

- 2.3.1 Before starting work, the site contractor or person responsible for the proposed works should go through a checklist as follows -
- (a) Identify whether any of the proposed works are within the vicinity of any O/H lines (i.e. a horizontal distance of 9 m from the nearest conductor for all works except blasting work which requires a horizontal distance of 25 m).
 - (b) Obtain plans of the O/H lines in the area to ascertain the alignment if necessary.
 - (c) Ascertain the voltage rating, distance to ground of the O/H lines and consult the electricity supplier of the lines to agree on a mutually acceptable work plan if any of the proposed works fall within the vicinity of the O/H lines.
 - (d) Ensure that notes of all discussions held with the electricity supplier on the work plan are kept until all the proposed works are completed.

In the course of works

- 2.3.2 During the course of the works, the following precautions should be exercised by the site worker -
- (a) Avoid working unnecessarily directly underneath the O/H lines.
 - (b) Observe any warning notices erected in the vicinity of the O/H lines.
 - (c) To make certain that the height of any object, including any tools, equipment, apparatus or vehicles, used is known and suitable physical restraining devices are used to maintain a safe working distance from the O/H line as advised by the relevant electricity supplier.
 - (d) To make certain that the working methods as agreed with the relevant electricity supplier are strictly followed.
 - (e) Never handle or attempt to handle any O/H line conductor even though it may appear as damaged.
 - (f) Do not erect structures (e.g. scaffolding) unnecessarily in the vicinity of any O/H lines.
 - (g) Do not disturb any earthing conductors connecting the O/H line poles/towers to ground. Earthing conductors are normally

buried underground and connected to the O/H line from the bottom of poles/towers.

- (h) Never rely on the insulating cover of any overhead electricity conductors as means of protection from electric shock. Always treat the insulated conductors as LIVE.
- (i) Report to the relevant parties, including the electricity suppliers, any electrical accident or damage or interference to an O/H line. Remove everyone from the immediate area of the damage/interference but do not attempt to remove any objects, retract mobile crane or contact the injured person which are in contact with the O/H line conductor because the line may still be LIVE. Cooperate with the electricity supplier by providing access to the works site for carrying out repair to the line as requested.

D. Consultation and assistance by electricity supplier.

2.4 Where further help is required, the following advice and assistance should be sought from the relevant electricity supplier -

- (a) Contact the electricity supplier to seek their advice and assistance if there is genuine difficulties by the competent person to locate the U/G cables.
- (b) Always maintain contact and co-ordination with the electricity suppliers to obtain further guidelines as necessary for works in the vicinity of U/G cables but their advice must be sought if the cables concerned are of 66 kV and above.
- (c) In the case of works in the vicinity of O/H lines and if there is any doubt on its ground clearance, voltage, safe working distance or working procedures, contact the electricity supplier to arrange a site meeting before starting the works.

Appendix 3 : Electricity suppliers

A. Introduction

3.1 At present, there are two companies, namely CLP Power Hong Kong Limited and The Hongkong Electric Company Limited supplying electricity to all consumers in the HKSAR. Either one of the companies is classified as an “electricity supplier” which is defined under the Electricity Ordinance, Cap. 406 as to mean “a person who generates, supplies and sells electricity at low or high voltage for use in an electrical installation”. Electricity suppliers are required to comply with the relevant requirements stipulated under Cap. 406.

3.2 The electricity supply business of each of the electricity suppliers is briefly described below, together with information on how to contact them, and the services they provide to any persons proposing to carry out or carrying out works in relation to information about their underground electricity cables (U/G cables) or overhead electricity lines (O/H lines).

B. CLP Power Hong Kong Limited (CLP).

3.3 Apart from the U/G cables and O/H lines in Hong Kong Island, Lamma Island and Apleichau Island, all U/G cables and O/H lines in the rest of 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 400 kV, 132 kV, 66 kV, 33 kV, 11 kV and 380 V. 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 the consumers where the situation permits. 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.

3.4 Details of U/G cables or O/H lines in the vicinity of works to be undertaken may be obtained from the company at their offices in Mongkok. The address is -

CLP Power Hong Kong Limited
147 Argyle Street
Kowloon

General enquiries and incident reporting about U/G cables or O/H lines can also be made by calling the following telephone numbers -

Office hours	2678 2678
After office hours	2728 8333

C. The Hongkong Electric Company Limited (HEC)

3.5 All U/G cables and O/H lines in the Hong Kong Island, Lamma Island and Apleichau Island are owned and operated by HEC. Unlike CLP, HEC mainly depends on U/G cables and submarine cables to supply its electricity generated at Lamma Island to consumers due to geographical reasons. Similar but not identical to

that of CLP's, the voltage levels of HEC's systems are 275 kV, 132 kV, 66 kV, 11 kV and 380 V. Apart from a few 132 kV O/H lines still being operated by HEC, electricity is mainly supplied by U/G cables in their supply areas.

3.6 Details of U/G cables or O/H lines in the vicinity of works to be undertaken may be obtained from the company at their offices in North Point. The address is -

The Hongkong Electric Company Limited
Electric Centre
28 City Garden Road
North Point
Hong Kong

General enquiries and incident reporting about U/G cables or O/H lines can also be made by calling the following telephone numbers -

Office hours 2814 3292

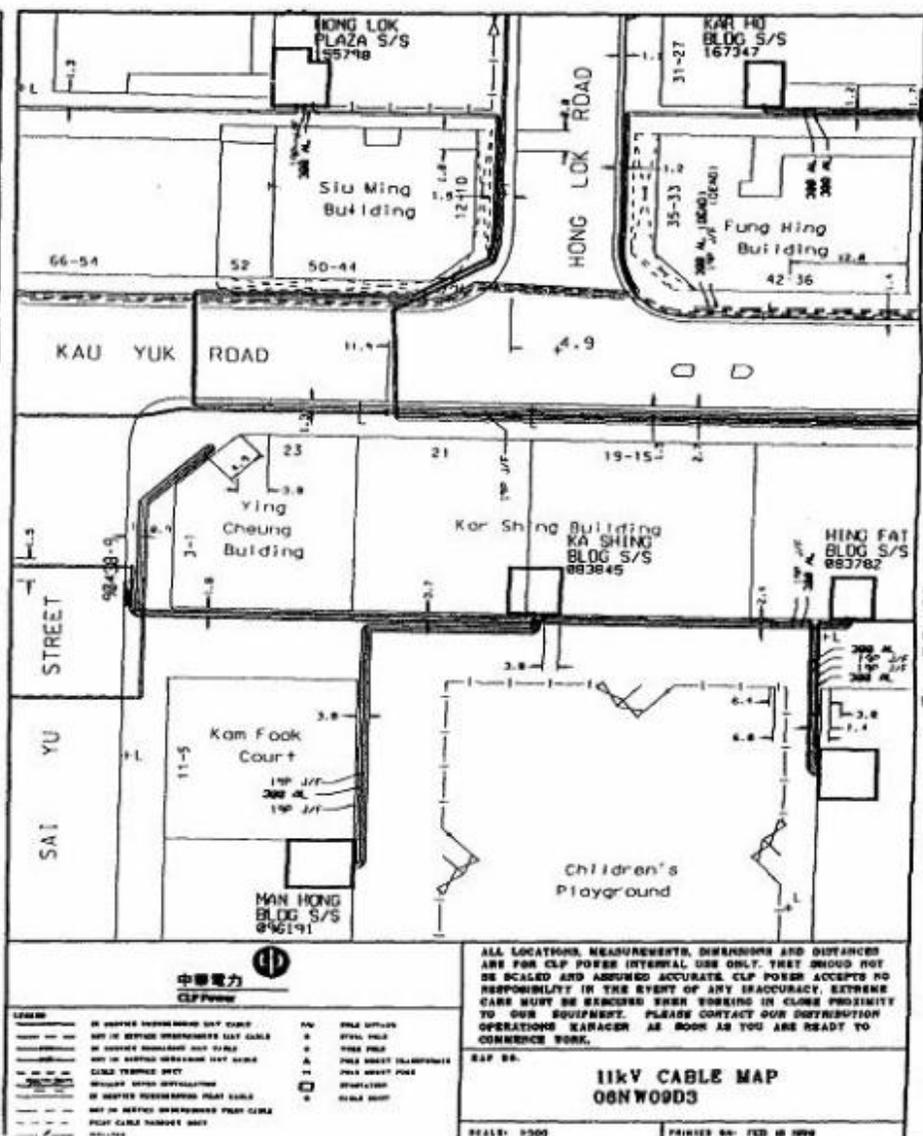
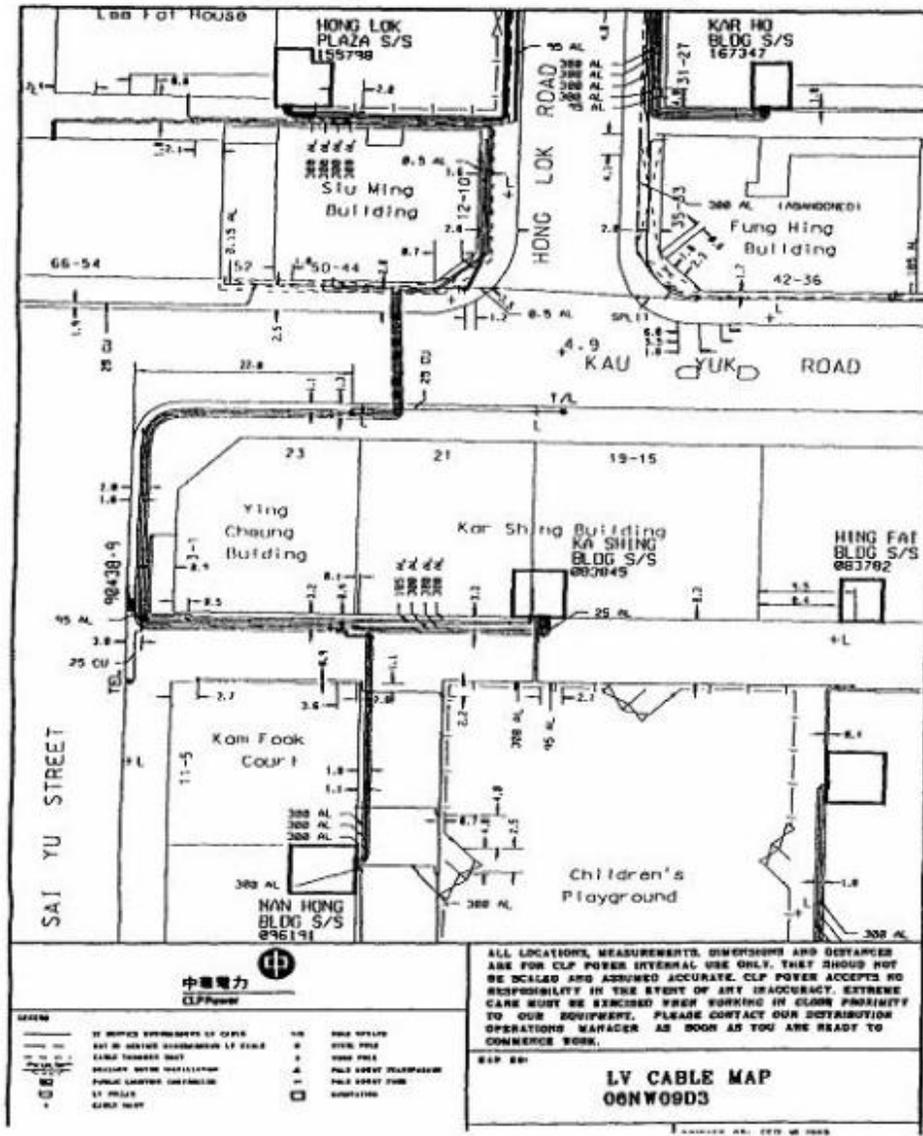
After office hours 2814 3443

D. Information and assistance provided by electricity suppliers.

3.7 Enquiries will be directed to the engineer responsible for the particular area in which the proposed works are to be undertaken and where necessary a site meeting will be arranged.

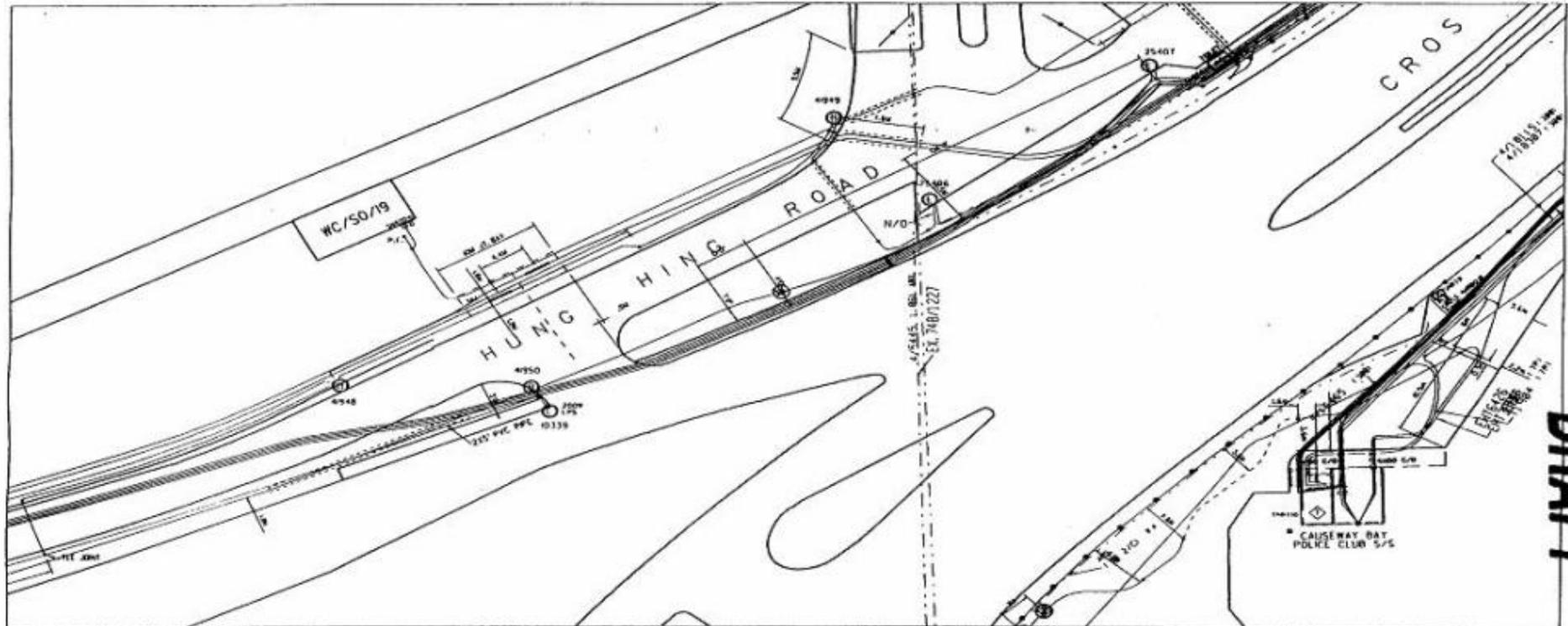
3.8 Requests for information about the U/G cables or O/H lines should be in line with the guidelines set out in sections 23 to 34 and sections 78 to 88 of the COP and should include plans and relevant details of the proposed works so that the relevant electricity supplier can decide the extent to which their lines may be affected. They can then provide sufficient information to ensure that the details in relation to the electricity supply lines in the vicinity are ascertained.

Figure A3-1 : (i) Typical CLP U/G cable record plan



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Figure A3-1 : (ii) Typical HEC U/G cable record plan



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Notes :

1. THE POSITION OF HEC CABLES AND O/W WIRES ON THE PLAN ARE APPROXIMATE ONLY AND THE HATCHED AREAS WITH REFERENCE "C" INDICATE AREAS WHERE PRONE TO SHALLOW COVER AS THESE CABLES ARE ENERGISED EXTREME CARE MUST BE EXERCISED WHEN EXCAVATION OR ANY KIND OF CONSTRUCTION WORKS ARE MADE IN PROXIMITY TO OUR CABLES.
2. HV JOINTS ARE MARKED WITH (95) ON THE PLAN FOR THE SAKE OF SAFETY. WHEN YOUR EXCAVATION OR ANY KIND OF CONSTRUCTION WORK IS UNDERTAKEN IN CLOSE PROXIMITY TO SUCH JOINTS, YOU MUST INFORM HEC AT TELEPHONE 2814343 TO ARRANGE INSPECTION AND NECESSARY ACTION BEFORE COMMENCING SUCH WORKS.
3. FOR EXCAVATION OR ANY KIND OF CONSTRUCTION WORK THAT IS UNDERTAKEN IN CLOSE PROXIMITY TO OUR 275/132/66KV CABLES HV JOINTS, YOU ARE REQUESTED TO CONTACT THE RESPONSIBLE ENGINEER BY OUR CONSTRUCTION & MAINTENANCE DEPARTMENT, T & D DIVISION BEFORE COMMENCING SUCH WORKS.
4. CONFIDENTIAL : EXCEPT FOR YOUR AUTHORIZED CONTRACTORS/EMPLOYERS THIS DRAWING MUST NOT BE RELEASED TO THIRD PARTY WITHOUT HEC'S WRITTEN APPROVAL.

備註 :

1. 此圖只顯示本公司電纜/架空電線之大概位置，圖中標有 "C" 標記之區域係指在電纜/電線附近之淺層覆蓋區域，當這些電纜/電線帶電時，在該等區域進行挖掘或建造工程時，必須極度小心。
2. 圖中標有 (95) 標記之區域係指高壓接頭，為了安全起見，在該等區域進行挖掘或建造工程時，請先與 2814 3443 本公司查詢有關安全進行有關之工程。
3. 在本公司 275/132/66 千伏電纜或架空電線附近進行挖掘或建造工程時，請先與本公司輸電材料工程處及維護部之負責工程師聯絡。
4. 保密 - 此圖僅供本公司有關人員使用，未經本公司之書面許可，不得向第三方披露。

Legend :

	P.E. ● CABLE POT-END 電纜終端
—————	275KV CABLE ROUTE (275 千伏電纜線路)
—————	132KV CABLE ROUTE (132 千伏電纜線路)
—————	66KV CABLE ROUTE (66 千伏電纜線路)
—————	O/W CABLE ROUTE (1 萬伏電纜線路)
—————	TEL./FIBRE OPT. CABLE ROUTE (電訊電纜線路)
—————	S/A CABLE ROUTE (供電電纜線路)
—————	O/W CABLE ROUTE (10 萬伏電纜線路)

THE PART PLAN SHOWING THE ABOVE MENTIONED CABLE ROUTE IS IN SCALE 1:500
以上電纜/架空電線地圖之比例尺 1:500

Ref. No. :	THE HONGKONG ELECTRIC CO., LTD. 香港電燈有限公司 DP & IT	
Date : 06/12/1990		

DRAFT

Figure A3-2 : Boundary of works in the vicinity of O/H lines

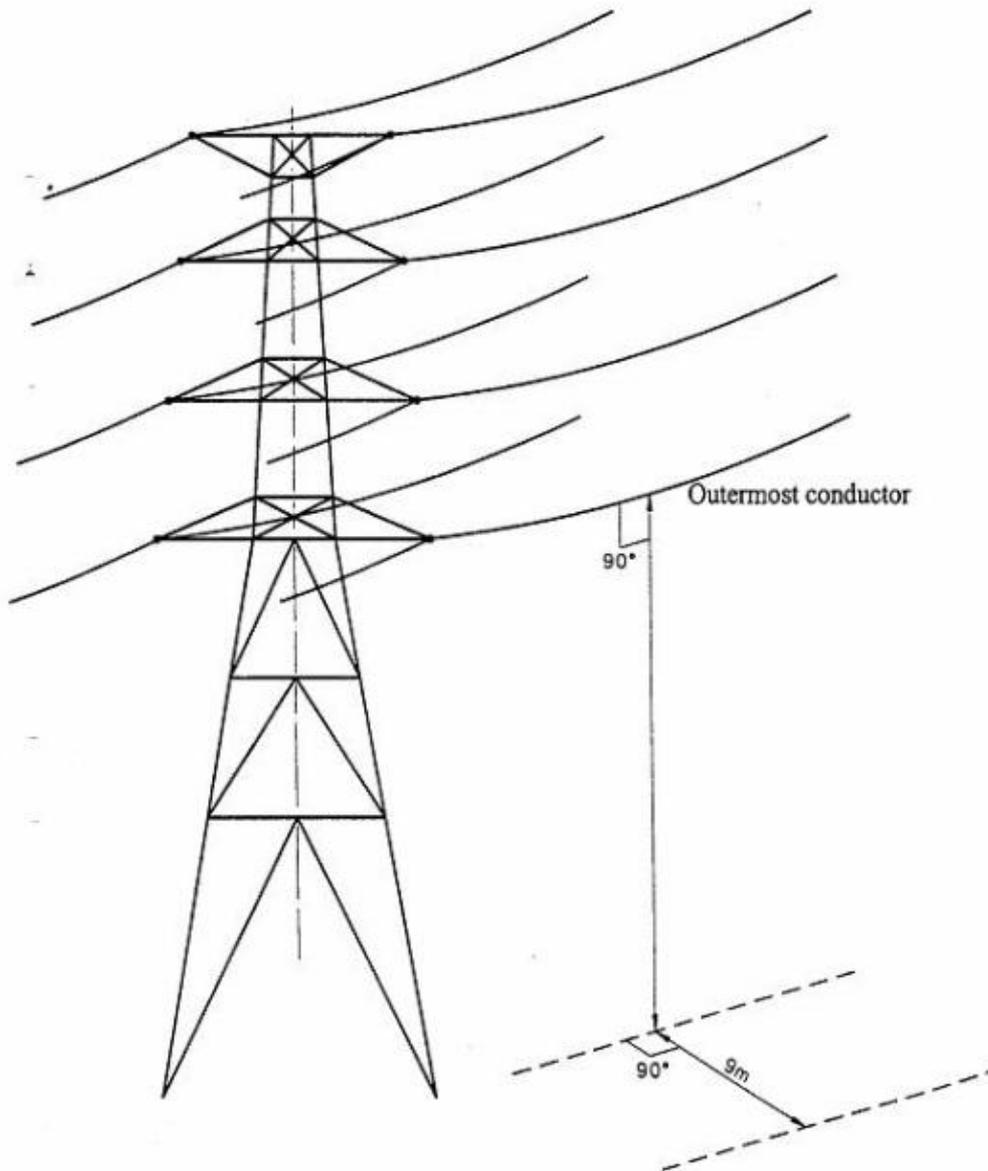


Figure A3-3 : (i) Typical CLP O/H line record plan

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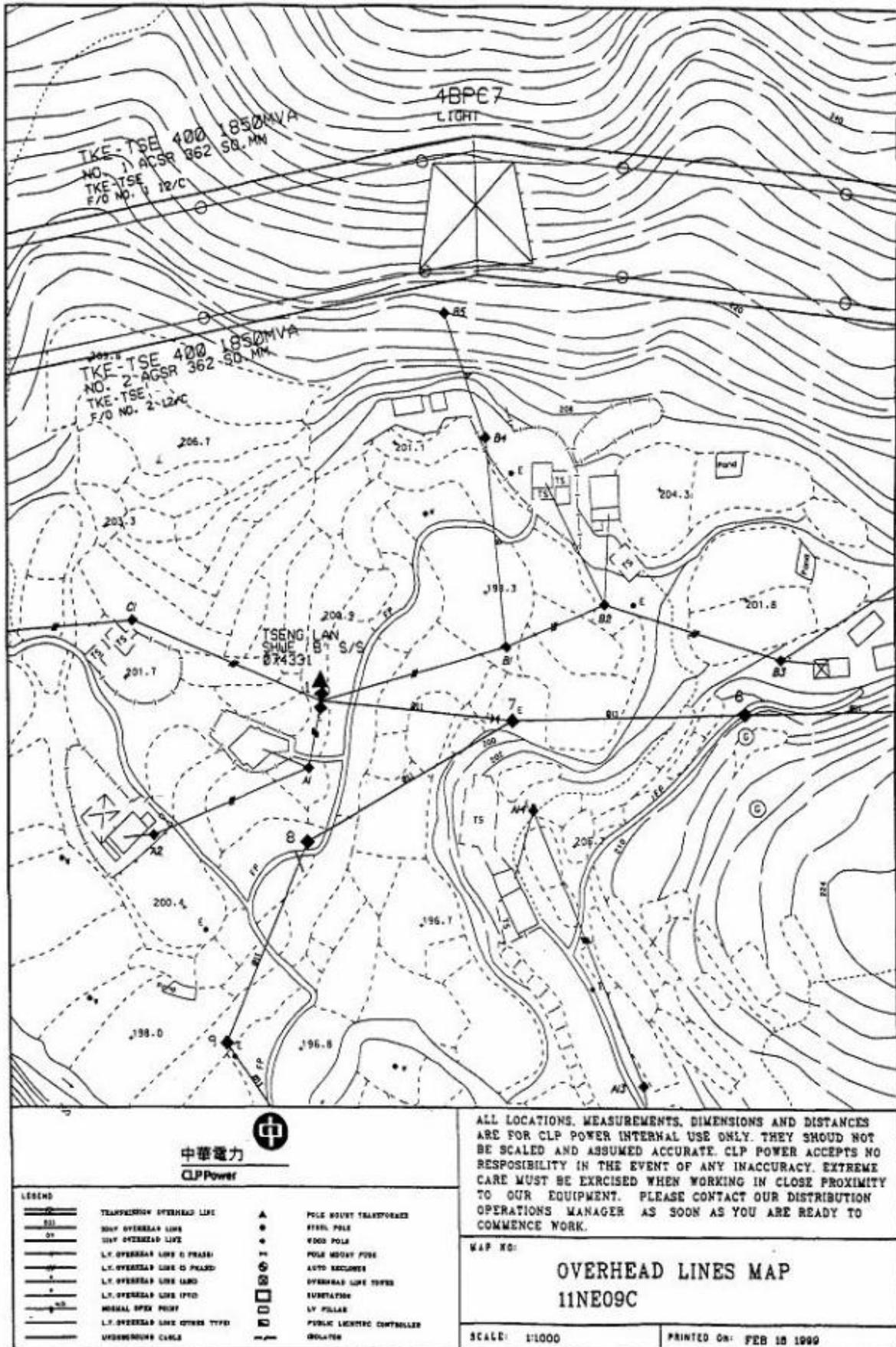


Figure A3-3 : (ii) Typical HEC O/H line record plan



Notes :

1. THE POSITION OF HEC CABLES AND O/H LINES ON THE PLAN ARE APPROXIMATE ONLY AND THE UNCOVERED AREAS WITH REFERENCE 'SC' INDICATE AREAS MORE PRONE TO SHALLOW COVER AS THESE CABLES ARE ENERGISED EXTREME CARE MUST BE EXERCISED WHEN EXCAVATION OR ANY KIND OF CONSTRUCTION WORKS ARE MADE IN PROXIMITY TO OUR CABLES.
2. HV JOINTS ARE MARKED WITH ⊕ OR ⊗ ON THE PLAN FOR THE SAKE OF SAFETY. WHEN YOUR EXCAVATION OR ANY KIND OF CONSTRUCTION WORK IS UNDERTAKEN IN CLOSE PROXIMITY TO SUCH JOINTS YOU MUST INFORM HEC AT TELEPHONE 28143443 TO ARRANGE INSPECTION AND NECESSARY ACTION BEFORE COMMENCING SUCH WORKS.
3. FOR EXCAVATION OR ANY KIND OF CONSTRUCTION WORK THAT IS UNDERTAKEN IN CLOSE PROXIMITY TO OUR 275/132/66KV CABLES OR JOINTS YOU ARE REQUIRED TO CONTACT THE RESPONSIBLE ENGINEER IN OUR CONSTRUCTION & MAINTENANCE DEPARTMENT, T & D DIVISION BEFORE COMMENCING SUCH WORKS.
4. CONFIDENTIAL : EXCEPT FOR YOUR AUTHORIZED CONTRACTORS/EMPLOYEES, THIS DRAWING MUST NOT BE RELEASED TO THIRD PARTY WITHOUT HEC'S WRITTEN APPROVAL.

備註 :

1. 此圖只顯示本公司電纜/架空電線之大概位置，圖中所有'SC'標記之部份範圍表示在該範圍內會比較容易遇到較少之厚層之土或石等情況，因此當電纜/架空電線，當在附近進行挖掘或建造工程時，必須極度小心。
2. 圖中所有⊕或⊗標記乃為高壓接頭，為了安全起見，在該等高壓接頭附近進行挖掘或建造工程時，請先與28143443 和會本公司安排檢查及進行有關之工程。
3. 在本公司275/132/66 千伏電纜或高壓附近進行挖掘或建造工程時，請先與本公司聯絡電氣工程建設及保養部之負責工程師聯絡。
4. 除圖中此圖在具有本公司印章及簽字外，只准與有關之人員/經理及建造商使用。

Legend :

●	CABLE POT-END 電纜終端
—	275KV CABLE ROUTE 1275 千伏電纜路線
—	132KV CABLE ROUTE 1132 千伏電纜路線
—	66KV CABLE ROUTE 106 千伏電纜路線
—	HV CABLE ROUTE (高壓電纜路線)
—	TEL./PILOT CABLE ROUTE (電滲電纜路線)
—	L/V CABLE ROUTE (低壓電纜路線)
—	S/A CABLE ROUTE (商務電纜路線)
—	O/H CABLE ROUTE (架空電纜路線)

THE PART PLAN SHOWING THE ABOVE MENTIONED CABLE ROUTE IS IN SCALE 1:200
以上電纜/架空電纜路線之比例尺 1:200

Ref. No. : _____
Date : 21/01/1999

THE HONGKONG ELECTRIC CO., LTD.
香港電氣有限公司
DP & IT



Table A3-1 : Typical colours/sizes/buried depths of CLP & HEC U/G cables

Rating/ Type	Colour		Outer Diameter (mm)		Buried Depth (mm)	
	CLP	HEC	CLP	HEC	CLP	HEC
220/380 V	Black	Green or Black	24 - 58	30 - 85	450	450 - 900
11 kV	Red or Black	Red or Black	54 - 75	50 - 95	750	450 - 900
33 kV	Red or Black	N/A	70 - 84	N/A	1000	N/A
66 kV	Black	Black	40 - 110	75 - 120	1000	1000 - 2000
132 kV	Black	Black	50 - 130	75 - 120	1000	1000 - 2000
275 kV	N/A	Black	N/A	75 - 120	N/A	1000 - 2000
400 kV	Black	N/A	110 – 140	N/A	1000	N/A
Pilot	Yellow or Black	Yellow or Black	20 – 40	25 - 63	600 - 750 or in depth with related U/G cable	450 - 900 or in depth with related U/G cable
Fibre Optic	Orange or Black or Purple	Pink	5 – 20	25 - 63	600 or in depth with related U/G cable	450 - 900 or in depth with related U/G cable
Bonding	Black	Black	20 – 50	10 - 60	600 or in depth with related U/G cable	450 - 900 or in depth with related U/G cable

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