Project Profile

BASIC INFORMATION

Project Title

132kV Overhead Line from Tsuen Wan to Sham Tseng

Purpose and nature of the Project

Owing to new developments and land reclamation project for residential development along Castle Peak Road from Tsuen Wan to Tuen Mun, it is expected that there will be a substantial increase in electricity demand in these areas.

At present, the current electricity supply for Sham Tseng and Tsing Lung Tau area is mainly derived from a 33kV primary substation at Tsing Lung Tau and it is forecasted that this capacity will be exceeded by early 2002's. As a result, it is necessary to establish a new 132kV primary substation in Sham Tseng area.

This project profile is confined to the proposed 132kV overhead transmission pole lines to deliver electrical power from existing substations in Tsuen Wan to the new 132kV substation in Sham Tseng in order to maintain a secure supply to the existing and future developments in Sham Tseng and Tsing Lung Tau areas.

Name of Project proponent

China Light & Power Co. Ltd

Location and scale of project and history of site

The proposed routes commence from western side of Tsuen Wan, run along ridges to Ting Kau.

The total length of each route will be about 6 km and each end of route is to be linked by underground cables to the substations. Details of the proposed route are shown on the 1:5,000 scale map (Drg.No. 18290/RF1150-01 in Attachment 1).

The lines will consist of bare aluminium conductors supported on tubular steel poles at average spans of 150 metres, and will have approximately 30% single pole supports and 70% H-pole supports similar to those as shown in the Drgs. Nos. T GEN 51520 D E33 3000 01 AI, T GEN 51520 D E33 3001 01 AI & T GEN 51520 D E33 3002 01 AI in Attachment 2.

In the past, more than 1,000 poles (single and H-poles) of design similar to the captioned project were installed for supplying electricity to Kowloon, New Territories and Lantau Island. It is proved that this is one of the most secure method for electricity transmission as there is no incident of failure.

Project Profile

Number and types of designated projects to be covered by the project profile

This application is confined to overhead line project only.

Name and telephone number of contact person(s)

OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME

How will the project be planned and implemented?

The proposed routes are selected with consideration of land usage constraints, technical, safety & health and environmental aspects. Prior to the submission of this project profile, a preliminary route has been circulated to relevant government departments and other concerned parties for comments. Then the original route proposal has been modified to cope with the comments. In addition, light-type pole structure instead of lattice pylon will be used so as to minimise land occupation area and reduce visual impact.

Alternative options for transmission link had been considered and reviewed. The reasons of selecting this option are described in Attachment 3.

What is the project time-table ? (e.g. for appointment of consultants, finalising of design, commencement of construction, commissioning and operation)

Outline programme for the proposed 132kV overhead lines is as follows :-

1. Route investigation and government approval	July 1997 - June 1999
2. Site route survey (control, alignment profile & site pegging)	March 1998 - July 2000
3. Tender and issue purchase order for overseas material	May 1999 - September 1999
4. Manufacturing & delivery of material	October 1999 - April 2000
5. Pole erection and conductor stringing	May 2000 - January 2002
6. Commissioning test	January 2002 - February 2002
7. Circuit completion and start operation	February 2002

Are there any interactions with broader programme requirements or other projects which shall be considered?

The above programme is scheduled in line with the electricity demand forecast in Sham Tseng and Tsing Lung Tau areas.

POSSIBLE IMPACT ON THE ENVIRONMENT

Major activities and related environmental aspects

- Clearance of vegetation for pole sites.
- Excavation of footings (1.2m x 1.2m x 2.95m deep) by hand-dig method for overhead line poles. No blasting will be applied.
- Delivery of construction material to site by helicopter or by labour. No access tracks will be required for the use of vehicles or the movement of power machines.
- Construction of single & H-poles and overhanging of conductors, at a minimum of 6.7 metres above ground, between poles.
- The pole sites will be restored to their original condition by planting.
- Where the powerline passes over scrub, there will be a limited amount of pruning / felling of trees beneath and adjacent to the conductor to keep a minimum distance of 2.8 metres between tree canopy and the conductors for safety reasons.
- Low level of noise or dust could be caused by the construction operations but they are of temporary nature and localised around the pole.

Possible environmental impacts identified at this stage include :

- Noise;
- Ecological; &
- Unsightly visual appearance

Noise Impact

Since helicopter may be used for transportation of construction materials, there may have noise nuisance to the surrounding residential areas.

However, the nearest noise sensitive receivers, Yau Kam Tau Village, is 150 m (horizontal distance) away from the noise source and the frequency of material delivery by helicopter will not be high. As such noise impact should not be significant.

Ecological Impact

About two-third of the Overhead Cable will cross through Tai Lam Country Park which is an area of ecological importance. However, the actual impact and its significance cannot be identified and evaluated at this stage unless an ecological assessment is carried out.

Unsightly visual appearance

The erection of pole lines may affect visual compatibility with the surrounding area.

Shape of pole lines from 33kV to 400kV are shown in the attached photos for reference. The total height of each pole is 21 m height in which 18 m above ground and 3 m buried below ground as foundation (refer to Attachment 2).

Electromagnetic Fields (EMF)

With regard to EMF concerns, studies on CLP's 132kV overhead lines in relation to electric and magnetic fields revealed that both calculated and measured values are well within the guideline limits adopted by the International Radiation Protection Association (IRPA) and stipulated in Hong Kong Planning Standards and Guidelines (HKPSG). A statement on "Electric and Magnetic Fields Associated with CLP Overhead Lines" together with a paper on "Electric and Magnetic Measurements", reflecting CLP's attitude towards the EMF issue and the current status of EMF values measurements on CLP transmission system respectively, are included in Attachment 4.

MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT

The only area with conservation value in the surrounding environment is the Tai Lam Country Parks.

ENVIRONMENTAL PROTECTION MEASURES TO BE INCORPORATED IN THE DESIGN AND ANY FURTHER ENVIRONMENTAL IMPLICATIONS

The following measures will be incorporated in the design stage to minimise environmental impacts :

- Poles will be painted in antique colour on original hot dip galvanized dull grey surface if required by EIA study.
- The proposed alignment will be adjusted to miminise ecological impact where required in accordance with EIA Report and land use constraints.
- The **existing 33kV overhead lines** close to and along Tuen Mun Highway and Castle Peak Road **will be removed** upon commissioning of the proposed 132kV overhead lines. As a result there will have beneficial effects on visual appearance along these areas.

USE OF PREVIOUSLY APPROVED EIA REPORTS

Not applicable.

Attachment 1

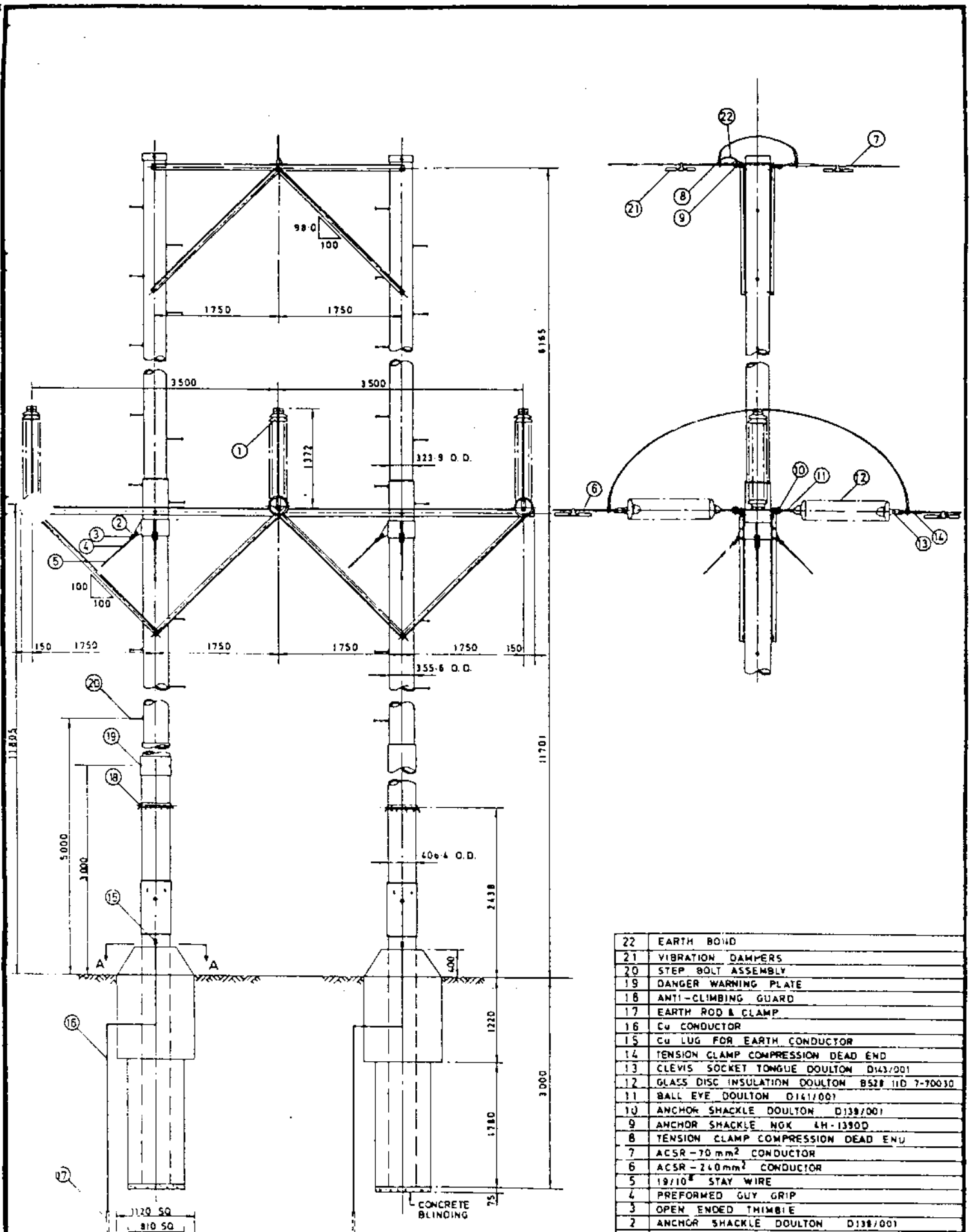
1 : 5,000 scale route map Drg. No. 18290/RF1150-01 Showing details of the proposed 132kV overhead lines from Tsuen Wan to Sham Tseng.

(Note: The above A-0 size drawing is not included here. Please contact the EIA Ordinance Register Office at Tel 2835 1835 for further information.)

Attachment 2

Elevation plan of pole supports

Pole Description	Drawing No.
D60 Angle/Terminal "H" Pole	T GEN 51520 D E33 3000 01 A I
D30 Angle "H" Pole	T GEN 51520 D E33 3001 01 A I
Intermediate Single Pole	T GEN 51520 D E33 3002 01 A I



22	EARTH BOND
21	VIBRATION DAMPERS
20	STEP BOLT ASSEMBLY
19	DANGER WARNING PLATE
18	ANTI-CLIMBING GUARD
17	EARTH ROD & CLAMP
16	Cu CONDUCTOR
15	Cu LUG FOR EARTH CONDUCTOR
14	TENSION CLAMP COMPRESSION DEAD END
13	CLEVIS SOCKET TONGUE DOULTON D143/001
12	GLASS DISC INSULATION DOULTON B52B 11D 7-70030
11	BALL EYE DOULTON D141/001
10	ANCHOR SHACKLE DOULTON D139/001
9	ANCHOR SHACKLE NGK 4H-1390D
8	TENSION CLAMP COMPRESSION DEAD END
7	ACSR – 70 mm² CONDUCTOR
6	ACSR – 240 mm² CONDUCTOR
5	19/10⁰ STAY WIRE
4	PREFORMED GUY GRIP
3	OPEN ENDED THIMBLE
2	ANCHOR SHACKLE DOULTON D138/001
1	POST INSULATOR NGK DA95855A

REVISIONS											

CHINA LIGHT & POWER CO., LTD.

CONTRACTOR :

CONTR DRG NO

DRAWN S. C. T | DATE 2-12-87

CHECKED P.Y.L/Y.H.S | APPROVED

SCALE 1:50 | SHEET 1 IN SET 1

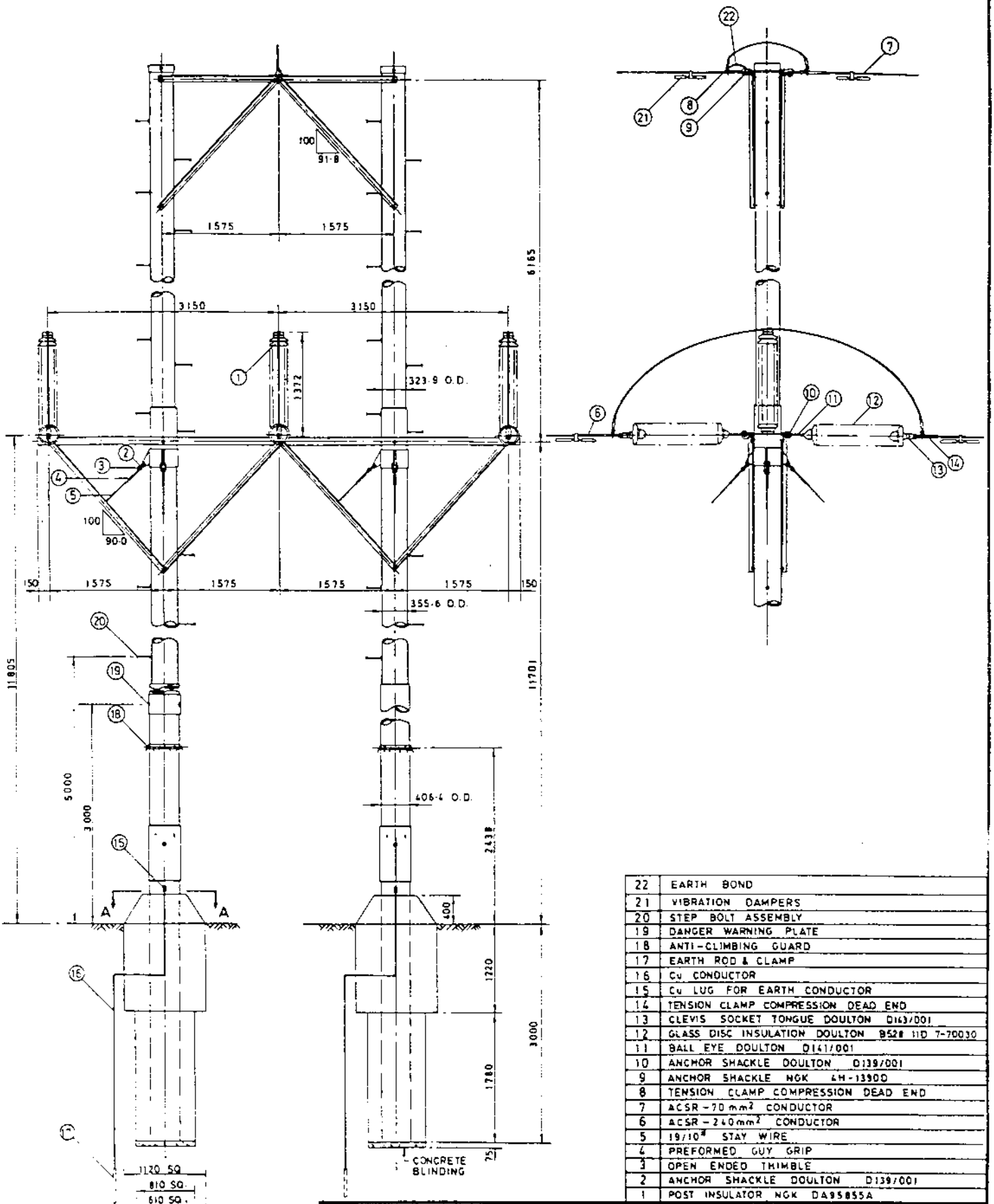
TRANSMISSION PROJECTS | OH

TITLE :

D60 ANGLE / TERMINAL 'H' POLE

PROJECT NO. | CONTRACT NO.

DRG. NO. T G E N 5 1 5 2 0 D E 3 3 2 0 0 0 0 1 A



PLAN A—A

22	EARTH BOND
21	VIBRATION DAMPERS
20	STEP BOLT ASSEMBLY
19	DANGER WARNING PLATE
18	ANTI-CLIMBING GUARD
17	EARTH ROD & CLAMP
16	Cu CONDUCTOR
15	Cu LUG FOR EARTH CONDUCTOR
14	TENSION CLAMP COMPRESSION DEAD END
13	CLEVIS SOCKET TONGUE DOULTON D163/001
12	GLASS DISC INSULATION DOULTON B52# 11D 7-70030
11	BALL EYE DOULTON D141/001
10	ANCHOR SHACKLE DOULTON D139/001
9	ANCHOR SHACKLE NGK AH-1390D
8	TENSION CLAMP COMPRESSION DEAD END
7	ACSR – 70 mm² CONDUCTOR
6	ACSR – 240 mm² CONDUCTOR
5	19/10# STAY WIRE
4	PREFORMED GUY GRIP
3	OPEN ENDED THIMBLE
2	ANCHOR SHACKLE DOULTON D139/001
1	POST INSULATOR NGK DA95855A

CHINA LIGHT & POWER CO., LTD.

RES 11-11-87 A

INITIALS K.S.

CONTRACTOR

CONTR. DRG. NO.

DRAWN S.C.T. DATE 3-12-87

CHECKED P.Y.L./Y.N.S. APPROVED

SCALE 1:50 SHEET 1 IN SET 1

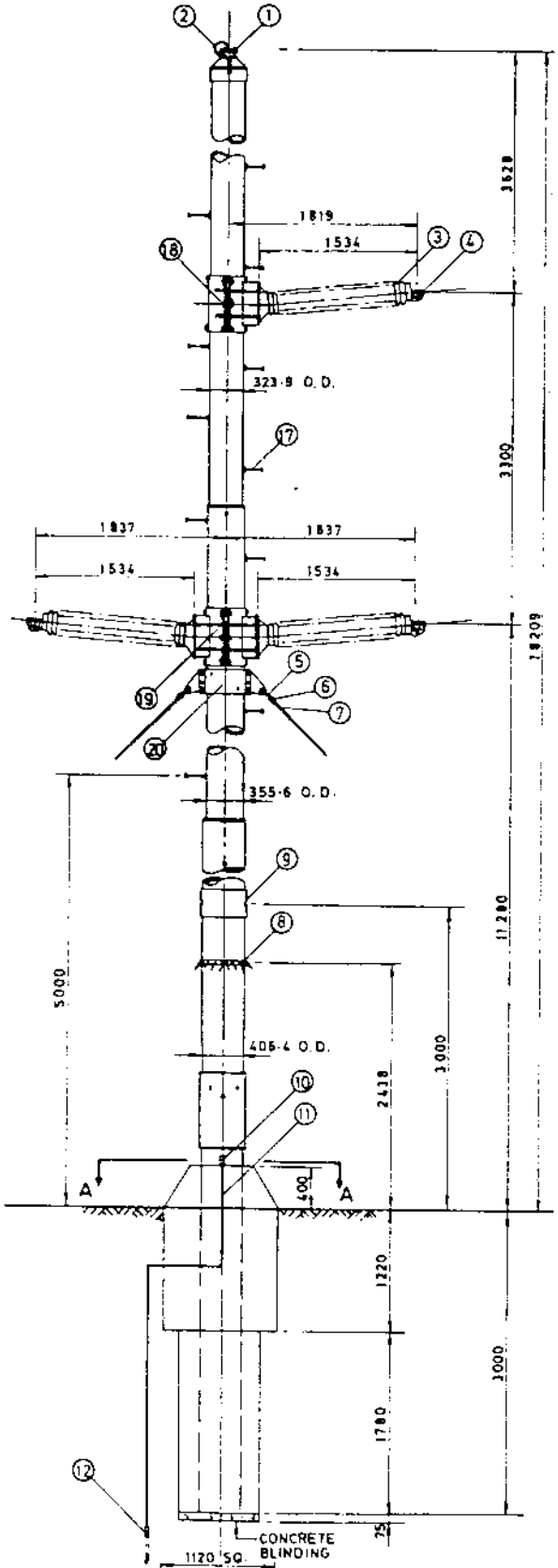
TRANSMISSION PROJECTS DH

TITLE:

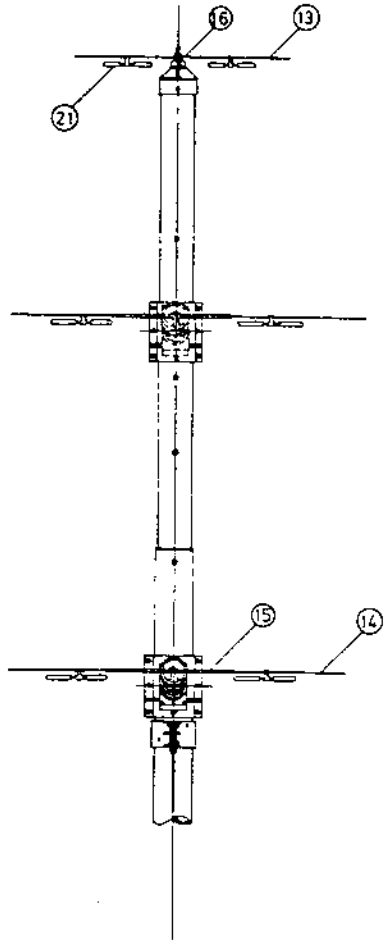
D30 ANGLE 'H' POLE

PROJECT NO. CONTRACT NO.

DRG NO. TGEN5152 0 DE33 0 0 1 0 1 7 A



PLAN A—A



21	VIBRATION DAMPERS
20	STAY CLAMP ASSEMBLY
19	LINE POST INSULATOR SUPPORT (DOUBLE)
18	LINE POST INSULATOR SUPPORT (SINGLE)
17	STEP BOLT ASSEMBLY
16	AL. LINE TAP
15	PREFORMED LINE GUARD
14	ACSR-240mm² CONDUCTOR
13	ACSR-70mm² CONDUCTOR
12	EARTH ROD & CLAMP
11	Cu CONDUCTOR
10	Cu LUG FOR EARTH CONDUCTOR
9	DANGER WARNING PLATE
8	ANTI-CLIMBING GUARD
7	PREFORMED GUY GRIP
6	OPEN ENDED THIMBLE
5	ANCHOR SHACKLE DOULTON D139/001
4	TOP CLAMP TH-1170AU
3	LINE POST INSULATOR NGK DAB5705G
2	EARTH BOND
1	EARTH WIRE HOLDER

CHINA LIGHT & POWER CO., LTD.

REVISIONS: C 11.93 A | B | C | D | E | F | G | H | J | K

CONTRACTOR		
CONTR DRG NO		
DRAWN S C T	DATE 4-12-87	
CHECKED P Y L / Y N S	APPROVED	
SCALE 1:50	SHEET 1 IN SET 1	
TRANSMISSION PROJECTS		OH

TITLE:

INTERMEDIATE SINGLE POLE

PROJECT NO. | CONTRACT NO.

DRG NO A G E N 5 1 5 2 0 D E 3 3 3 0 0 2 0 1 A 1

Attachment 3

Justification of alternative route options for transmission link between Tsuen Wan and Sham Tseng.

Option 1 : By a combination of undergroung cables and submarine cables.

Option 2 : By underground cables.

Option 3 : By a combination of underground cables and overhead lines.

Justification of Alternative Route Options for Transmission Link between Tsuen Wan and Sham Tseng

Option 1 : By a combination of underground cables and submarine cables

Route description

The proposed routes starting from Shing Mun Road Substation and Lei Muk Shue Substation in the form of underground cables. The cable routes run along existing roads before approaching the sea-wall in Tsuen Wan. From that point, a submarine cable corridor, approximate 5 km long x 400m width, will be required in the sea-bed of channel between Tsuen Wan and Tsing Yi Island for submarine cables laying.

For submarine cables route option, please refer to Drg. No. MP/EP/18290/P98-03 in Attachment 5.

Justification

Advantages :

1. Minimum disturbance to traffic;
2. No permanent unsightly visual appearance;
3. No tree cutting

Disadvantages :

1. In accordance with Tuen Mun - Chap Lap Kok spacing arrangement design, 400 metres under-water corridor is required which will preclude future development at the channel between Tsing Yi Island and Tsuen Wan.

2. The buoy corridor will be seriously affected. A series of buoys are found locating between Tsuen Wan and Tsing Yi Island, the integrity of the anchors of buoys will be affected during the installation of the submarine cable.

3. The pipeline between Po Fung Terrace, Tsuen Wan and Ching Tai Court, Tsing Yi will be in conflict with the proposed submarine cable.

4. The marine traffic in the channel between Tsuen Wan and Tsing Yi Island will be impeded during the submarine cable installation.

5. Due to the relatively rapid water flow rate outside Sham Tseng, sand cover would not be adequate to protect our submarine cable against anchoring by ships in particular near Sham Tseng area. In this respect, cables installed in the water channel are subject to damages.

   Our previous experience of loosing 3 x submarine cables in one single typhoon with several days of blackout at Lantau indicated that submarine cable installation in this area is not preferable. The case is even worse when our submarine cables are laid within anchorage area as anchors may eventually damage our submarine cable in the long run.

6. Possible Impacts on the Environment

   Possible impacts on the environment are mainly due to the disruption of marine sediment. In addition, 6 bathing beaches are within 500m of dredging operation from Tsuen Wan. They are Approach, Ting Kau, Lido, Casam, Hoi Mei & Gemini and their water quality may be affected if dredging is too close to the beaches.

7. The highest project budget.

Conclusion :

This proposal results in occupation of tremendous sea-bed area and cannot provide a secure power supply wayleave. As a result this option is not recommended.

Option 2 : By underground cable only

Route description

The proposed underground cables commence from the respective Substations and pass through Hoi On Road before arriving Castle Peak Road. The routes are laid in the same route along the Castle Peak Road to Sham Tseng Substation.

Justification

Advantages :

1. No permanent visual impact.
2. No conflict with vessel flow.
3. No tree cutting is required.

Disadvantages :

1. Due to the narrow footpath and the high cable rating required, the circuits can only be installed in open trenches of Castle Peak Road. As such two sections of Castle Peak Road, about 400m, will be limited to one lane two-way traffic for a duration of about two years.

   It is foreseeable that the traffic impact to Castle Peak Road will be very significant and off peak hour work is the only solution for installation which will further extend the duration of the project.

   If cable ducts are installed along the carriageway instead of open trenches, the duration of disturbance will be even further extended. However, the length of trench for each section with one lane two-way traffic can be reduced.

2. If there are any accidents at Tuen Mun Road, Castle Peak Road cannot be used as an alternative or emergency route because of one lane two-way traffic at the two locations with cable trenches.

3. Since cable installation duration is quite close to the Castle Peak Road widening project by Highways Department, therefore, the chance of cable damage also increases. Besides, it will also hinder the progress of the roadwork project which will be beneficial to the business and residents in all N.T. west area.

4. Possible Impacts on the Environment

   During construction period, noise generated will affect the nearby residents along Castle Peak Road. The impact would be particularly significant if the work has to be planned at off-peak hour such as night-time. Moreover, the dust generated will also cause nuisance to the nearby residents even control measures are taken,

5. Relatively high project budget

Conclusion :

Under such circumstances, the public will be disturbed significantly. Since the disadvantages override advantages, this option is not preferable.

Option 3 : By a combination of underground cables and overhead pole lines

Route description

The proposed routes starts from the respective Substations by underground cable similar to option 1 & 2 above and leading to the hillside near the Allway Gardens where existing 11kV and 33kV overhead pole lines will be undergrounded to give way for the proposed 132kV overhead pole lines.

The means of transmission will then be changed from underground cables to overhead lines. The proposed 2 x 132kV overhead pole lines will run almost in parallel to the existing 33kV overhead pole lines in the northern side along the water catchment road to Ting Kau.

Afterwards, it will turn north-west to avoid the conflict with roads and bridges of the Route 3 project. After running along the water catchment road and skirting around the portal of the tunnel of Route 3, it will oversail the Tuen Mun Road near Gemini Beach and approach to the proposed Sham Tseng Substation by underground cables.

Some LV, 11kV and 33kV overhead pole lines near Sham Tseng Tung village will be undergrounded / diverted to maintain adequate clearance for these 2 x 132kV overhead pole lines.

Justification

Advantages :

1. The traffic impact is relatively low. For the two underground cable sections at the two substation ends, the cables will be laid in pavement in general and only two major crossings will be required across Castle Peak Road.

2. The proposed overhead poles lines will be located on government land and there is no conflict with any private lot. The risk of cable damage by third party is minimal and the power supply is more reliable.

3. The section of the proposed overhead pole lines between Allway Gardens and Ting Kau will run almost in parallel with the existing 33kV overhead pole lines, therefore, the visual impact is apparently low. For the remaining proposed overhead pole lines between Ting Kau and Sham Tseng, the majority of the routing is diverted into the

hills to avoid the Route 3 contract area and is not visible from Castle Peak Road or Tuen Mun Road.

4. There is no conflict with vessel flow.

5. Relatively low project budget

Disadvantages :

1. In order to avoid the Route 3 Contract area as well as to plan the route further away from Tsuen Mun Highway, the proposed route has to affect Tai Lam Country Park.

2. Tree trimming cannot be fully avoided.

3. Permanent low visual impact.

Conclusion :

This is the optimal option regarding traffic flow, marine traffic flow, reliability of power supply, disturbance to public and minimal visual impact.

(Further information on this option is provided in the Project Profile)

Attachment 4

(1) A statement on "Electric and Magnetic Fields Associated with CLP Overhead Lines" reflecting CLP's attitude towards EMF issue.

(2) A paper on "Electric and Magnetic Measurements" reflecting current status of EMF values on CLP transmission systems.

Attachment 4 - (1)

Electric and Magnetic Fields Associated with CLP Overhead Lines

1. In a modern society that depends on electricity, electromagnetic fields (EMF) are a fact of life.

   When electricity is used, electric fields are produced by the voltage in a conductor. Magnetic fields are produced by the current or flow of electricity in a conductor.

   Electric and magnetic fields are produced by virtually all consumer appliances, computer terminals, wiring in homes and offices and power lines.

2. China Light & Power (CLP) are committed to providing electricity in a way that protects the health and safety of customers and employees. The existence of EMF associated with the overhead lines does not compromise this commitment.

   Over the past few decades, the issue of possible health effects of EMF has generated a number of studies and reports. The weight of the evidence from those studies indicates that no changes to CLP's present power delivery methods are warranted.

   Studies of CLP's overhead lines in relation to EMF revealed that both the calculated and measured values are well within the guideline limits (5kV/m for electric field exposure and 1000 milligauss for magnetic field exposure) issued by the International Radiation Protection Association, as part of the World Health Organisation Environmental Health Criteria Programme and recommended for adoption by the Hong Kong Government. CLP have agreed to adopt the guideline limits in total for both existing and future circuits, in recognition of some concern by certain members of the public, although independent and authoritative review panels and government inquires have found no concrete scientific evidence that there is a health hazard from power lines.

3. At this stage of development there are over 150 studies underway world-wide covering the effects of electric and magnetic fields. CLP will continue to monitor the situation and ensure that any concerns raised are fully considered in the light of the data available from qualified scientific research parties and the subsequent reviews and overall assessments as compiled by recognised research bodies, government and state authorities.

ELECTRIC AND MAGNETIC FIELD MEASUREMENTS

W.A. el Arculli[1], D.K.Y. Leung[2], Dr. T.C. Cheng[3]
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[2]B.Sc(Eng.), M.Sc., MBA, C.Eng., M.I.E.E.
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[2]Electronics & Electrical Services Engineer
[3]Lloyd Hunt Professor & Director of Electric Power Program
[1,2]China Light & Power Company, Limited
[3]University of Southern California

ABSTRACT

Over the past few decades the issue of possible health effects from electric and magnetic fields has generated a large number of studies and reports world-wide. In 1990, the International Radiation Protection Association (IRPA) produced interim guidelines covering limits of exposure to power frequency electric and magnetic fields, as part of the World Health Organization Health Criteria Programme. These guidelines were recommended for adoption by the Hong Kong Government and the two local power companies have accepted the recommendation. This paper summarizes the measurements carried out on the transmission and distribution systems of China Light & Power Co., Ltd. with respect to such fields and compares them with the IRPA interim guidelines and also results obtained from other studies. The measurements are also compared against theoretical predications which enable the electric and magnetic fields to be calculated with reasonable accuracy before the circuits and plant are installed.

INTRODUCTION

In an attempt to allay public concerns regarding the possible effects of electric and magnetic fields on human health, China Light & Power carried out numerous measurements in the system during the past four years for comparison against the IRPA guidelines which are summarized in Table 1. The measurements were carried out with portable instruments which responded only to the alternating current electric and magnetic fields, e.g. ZMDEX II LINDA System of Enertech Consultants (USA) and HI-3604 system of Holaday Industries, Inc. (USA). The corresponding voltage and current measurements were taken at the respective substations.

The strength of an electric field, measured in kV/metre, increases as the voltage is increased but decreases rapidly with increasing distance from the source. The magnetic field strength, measured in millitesla, increases as the current is increased but also decreases rapidly with increasing distance.

MEASUREMENTS AND FINDINGS

The test results are summarized in Tables 2, 3 and 4 for overhead lines, underground cables and switchboards respectively.

Overhead Lines

The strengths of the electric and magnetic fields in the vicinity of overhead lines depend on the complex geometry of the line configuration, height of the conductors above ground level, voltage and current. The electric field strengths can be distorted by nearby earthed objects, such as tall trees and structures, which effectively establish a screening effect thereby reducing the electric field strength near ground level.

The measurements shown in Table 2 were carried out with the instruments held under the overhead line conductors at a "standard" height of one metre above ground level.

Among the four overhead lines measured, the 400kV line was found to have the strongest electric field strength of 1.35kV/metre where the ground clearance was 27.5 metres. The maximum magnetic field strength or magnetic flux density measured was 0.004 millitesla under the 400kV line. Stronger electric and magnetic field strengths will be measured if the ground clearance is reduced. However, ground clearances of the lines are designed with due attention paid to ensure they stay above the statutory height limits.

Underground Cables

Of the four cable circuits measured, only the 400kV circuit comprised single-core cables laid horizontally with the remainder comprising three-core cables. All measurements were taken at a height of one metre above ground level.

The combination of the earthed cable sheaths and the soil above the cables reduced the electric field strength to below 0.01 kV/metre in all cases. The highest magnetic flux density was 0.0052 millitesla for the 400kV circuit as shown in Table 3. The very low magnetic flux density encountered for the remaining cables was mainly due to the cancelling effect of the three phases in close proximity inside each three-core cable.

Metalclad Switchboards

Table 4 shows the measurements taken around the switchboards at a height of one metre above floor level and 0.5 metre away from the panels.

The screening effect of the earthed metallic enclosures of the four switchboards reduced the electric field strength to below 0.01 kV/metre. The highest magnetic flux density around the switchboards was 0.068 millitesla, which was measured at the panel carrying the highest load current of 920A.

COMPARISON WITH THEORETICAL PREDICTIONS AND OTHER STUDIES

Figure 1 provides a comparison between the actual measurements and the theoretical predictions of the electric field strengths of the 400kV overhead line. The results are generally consistent with the differences mainly caused by the screening effect of the vegetation within the overhead line corridor.

Figure 2 compares the actual measurements of the magnetic flux density above the 33kV cable with the theoretical predictions. As indicated in the section for Underground Cables, the close proximity of the three phases in the three-core cable accounts for the low magnetic flux density.

The measurements summarized in Tables 2 to 4 inclusive and the theoretical predictions are comparable to the findings of other organizations such as the National Radiological Protection Board of the U.K., the Hongkong Electric Company and other utilities.

CONFIRMATION OF THE IRPA INTERIM GUIDELINES

In May 1993, the International Commission on Non-Ionising Radiation Protection, which is the successor to the former International Non-Ionising Radiation Committee of the International Radiation Protection Association (IRPA), confirmed the interim guidelines produced by the IRPA in 1990 and such guidelines are still applicable.

CONCLUSIONS

Owing to the screening effect, equipment with earthed metallic enclosures would limit the spread of electric fields. In the case of overhead lines the electric field strength is a function of the voltage and the height of conductors above ground level. The electric field strength diminishes rapidly over distance.

The magnetic flux density produced by a conductor is basically current dependent and, similar to electric fields, diminishes over distance. Ferrous material enveloping a current-carrying conductor would affect the field pattern and reduce the intensity of the magnetic field.

The electric and magnetic field strengths measured under the overhead lines, over the underground cables and around the metalclad switchboards were well within the IRPA guidelines for occupational exposure and the general public.

Table 1 : IRPA LIMITS OF EXPOSURE TO 50/60Hz ELECTRIC AND MAGNETIC FIELDS

Exposure Characteristics	Electric Field Strength kV/m (rms)	Magnetic Flux Density Millitesla (rms)
Occupational	10	0.5
Whole working day	30	5
Up to 2 hrs. per working day		
General Public	5	0.1
Up to 24 hrs. per day	10	1
Few hrs. per day		

Table 2 : ELECTRIC AND MAGNETIC FIELD MEASUREMENTS - OVERHEAD LINES

Circuit	System Voltage	Current	Height of Bottom Conductor	Electric Field Strength, kV/m(rms)	Magnetic Flux Density, Millitesla(rms)
Castle Peak - Yuen Long Double Circuit	400kV	1162A	27.5m	1.35	0.004
Fanling - Luohu	132kV	402A	9.7m	0.65	0.004
Hammer Hill - Pak Kong	33kV	80A	8.0m	0.28	0.003
Kowloon Peak S/S - Kowloon Peak	11kV	15A	7.0m	0.06	0.003

Table 3 : ELECTRIC AND MAGNETIC FIELD MEASUREMENTS - UNDERGROUND CABLES

Circuit	System Voltage	Current	Cable Depth Below Ground	Electric Field Strength, kV/m(rms)	Magnetic Flux Density, Millitesla(rms)
Tai Wan - Tsz Wan Shan No.1	400kV	390A	1m	<0.01	0.0052
Fanling - Chunfeng	132kV	380A	1m	<0.01	0.0003
Kwai Chung 'A' - Tsing Lung Tau No.2	33kV	160A	1m	<0.01	0.00038
Hoi Shing Road - Princess Alexandra Community Centre	11kV	160A	0.75m	<0.01	0.00016

Table 4 : ELECTRIC AND MAGNETIC FIELD MEASUREMENTS - METALCLAD SWITCHBOARDS

Substation	System Voltage	Current of panel where max.magnetic flux density was measured	Electric Field Strength kV/m (rms)	Magnetic Flux Density Millitesla(rms)
Tsz Wan Shan	400kV	700A	<0.01	0.059
Tuen Mun	132kV	500A	<0.01	0.047
Tuen Mun	33kV	500A	<0.01	0.052
Tuen Mun	11kV	920A	<0.01	0.068

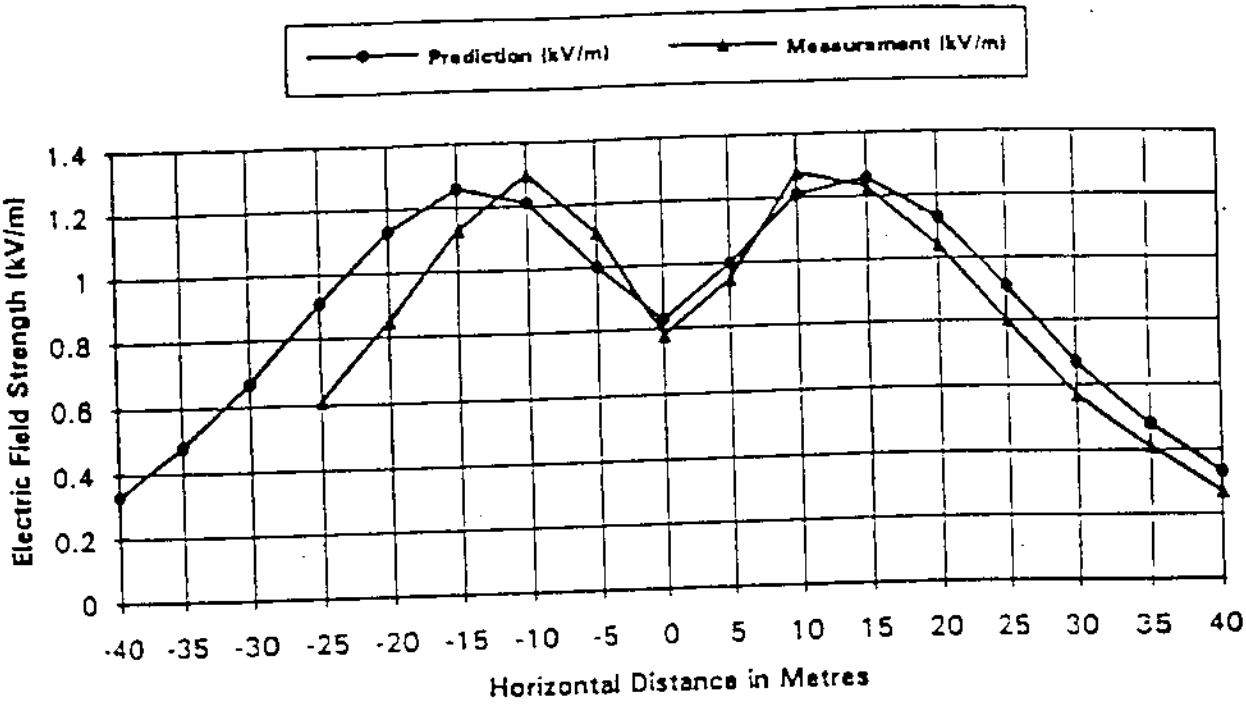


Fig. 1 400kV Overhead Line Electric Fields - Measurements Vs. Theoretical Predictions

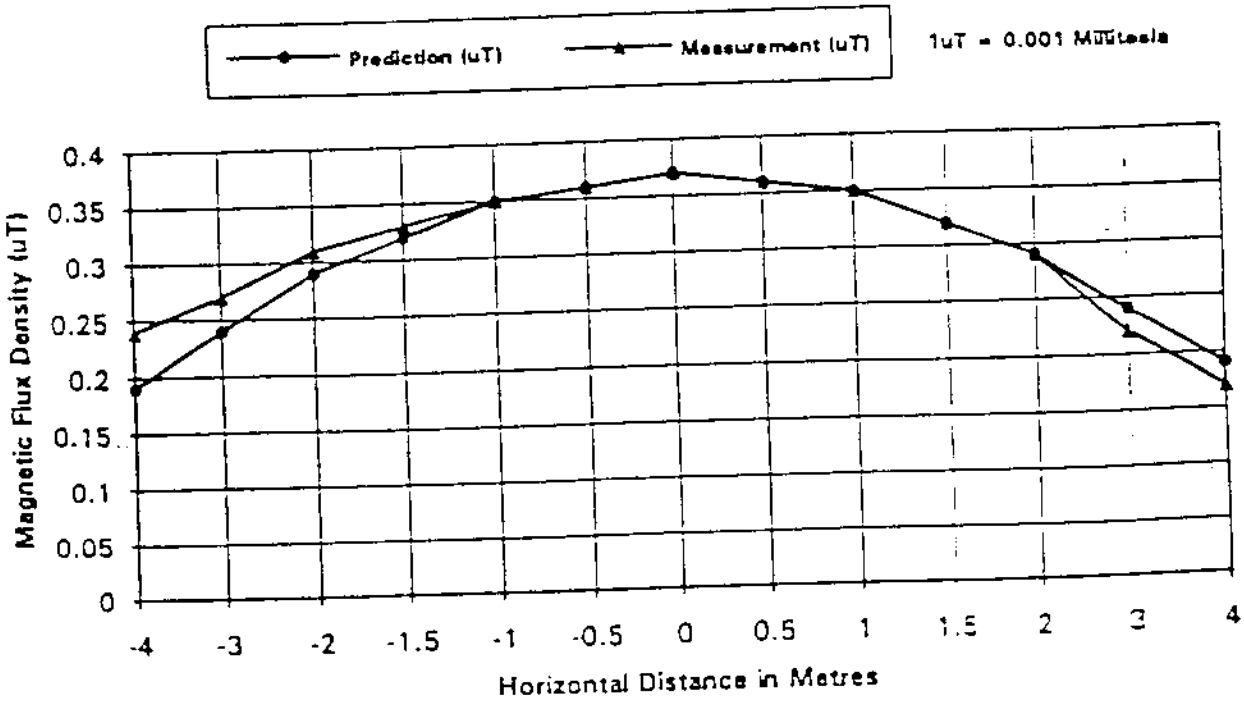


Fig. 2 33kV Cable Magnetic Fields - Measurements Vs. Theoretical Predictions

Attachment 5

1 : 5,000 scale route map Drg. No. 18290/RF1150-02 showing submarine cables option from Tsuen Wan to Sham Tseng.

(Note: The above A-0 size drawing is not included here. Please contact the EIA Ordinance Register Office at Tel 2835 1835 for further information.)

Project Profile

Number and types of designated projects to be covered by the project profile

This application is confined to overhead line project only.

Name and telephone number of contact person(s)

Benson Hui Hoi Chau, Project Manager (North) at Tel : 2678 6134
Y. M. Poon, Safety, Health & Environment Manager at Tel : 2678 0396

OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME

How will the project be planned and implemented?

The proposed routes are selected with consideration of land usage constraints, technical, safety & health and environmental aspects. Prior to the submission of this project profile, a preliminary route has been circulated to relevant government departments and other concerned parties for comments. Then the original route proposal has been modified to cope with the comments. In addition, light-type pole structure instead of lattice pylon will be used so as to minimise land occupation area and reduce visual impact.

Alternative options for transmission link had been considered and reviewed. The reasons of selecting this option are described in Attachment 3.

What is the project time-table ? (e.g. for appointment of consultants, finalising of design, commencement of construction, commissioning and operation)

Outline programme for the proposed 132kV overhead lines is as follows :-

1. Route investigation and government approval	July 1997 - June 1999
2. Site route survey (control, alignment profile & site pegging)	March 1998 - July 2000
3. Tender and issue purchase order for overseas material	May 1999 - September 1999
4. Manufacturing & delivery of material	October 1999 - April 2000
5. Pole erection and conductor stringing	May 2000 - January 2002
6. Commissioning test	January 2002 - February 2002
7. Circuit completion and start operation	February 2002

Are there any interactions with broader programme requirements or other projects which shall be considered?

The above programme is scheduled in line with the electricity demand forecast in Sham Tseng and Tsing Lung Tau areas.

POSSIBLE IMPACT ON THE ENVIRONMENT

Major activities and related environmental aspects

- Clearance of vegetation for pole sites.
- Excavation of footings (1.2m x 1.2m x 2.95m deep) by hand-dig method for overhead line poles. No blasting will be applied.
- Delivery of construction material to site by helicopter or by labour. No access tracks will be required for the use of vehicles or the movement of power machines.
- Construction of single & H-poles and overhanging of conductors, at a minimum of 6.7 metres above ground, between poles.
- The pole sites will be restored to their original condition by planting.
- Where the powerline passes over scrub, there will be a limited amount of pruning / felling of trees beneath and adjacent to the conductor to keep a minimum distance of 2.8 metres between tree canopy and the conductors for safety reasons.
- Low level of noise or dust could be caused by the construction operations but they are of temporary nature and localised around the pole.

Possible environmental impacts identified at this stage include :

- Noise;
- Ecological; &
- Unsightly visual appearance

Noise Impact

Since helicopter may be used for transportation of construction materials, there may have noise nuisance to the surrounding residential areas.

However, the nearest noise sensitive receivers, Yau Kam Tau Village, is 150 m (horizontal distance) away from the noise source and the frequency of material delivery by helicopter will not be high. As such noise impact should not be significant.

Ecological Impact

About two-third of the Overhead Cable will cross through Tai Lam Country Park which is an area of ecological importance. However, the actual impact and its significance cannot be identified and evaluated at this stage unless an ecological assessment is carried out.

Unsightly visual appearance

The erection of pole lines may affect visual compatibility with the surrounding area.

Shape of pole lines from 33kV to 400kV are shown in the attached photos for reference. The total height of each pole is 21 m height in which 18 m above ground and 3 m buried below ground as foundation (refer to Attachment 2).

Electromagnetic Fields (EMF)

With regard to EMF concerns, studies on CLP's 132kV overhead lines in relation to electric and magnetic fields revealed that both calculated and measured values are well within the guideline limits adopted by the International Radiation Protection Association (IRPA) and stipulated in Hong Kong Planning Standards and Guidelines (HKPSG). A statement on "Electric and Magnetic Fields Associated with CLP Overhead Lines" together with a paper on "Electric and Magnetic Measurements", reflecting CLP's attitude towards the EMF issue and the current status of EMF values measurements on CLP transmission system respectively, are included in Attachment 4.

MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT

The only area with conservation value in the surrounding environment is the Tai Lam Country Parks.

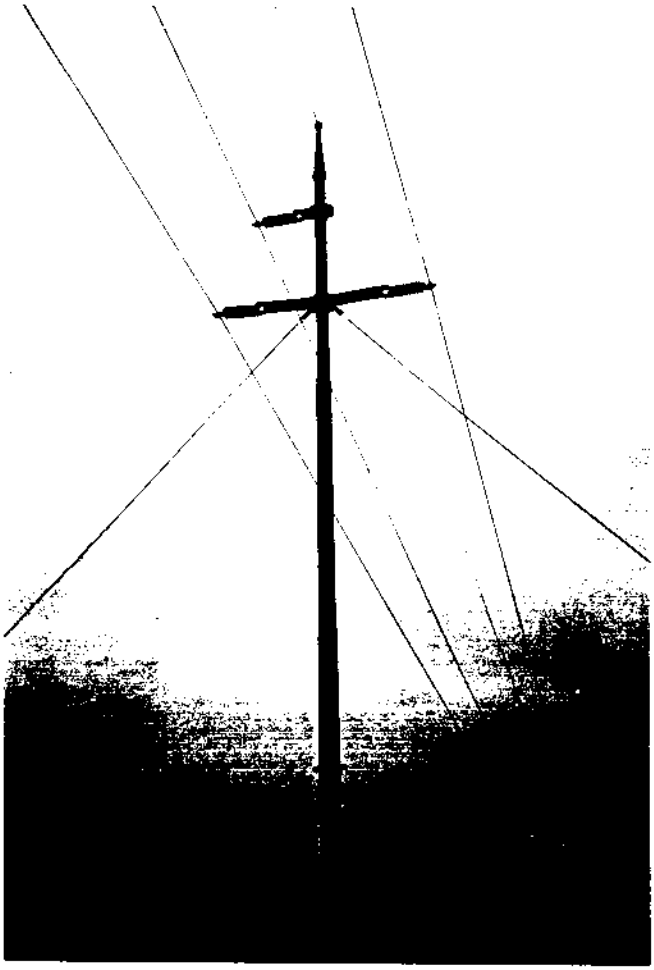
ENVIRONMENTAL PROTECTION MEASURES TO BE INCORPORATED IN THE DESIGN AND ANY FURTHER ENVIRONMENTAL IMPLICATIONS

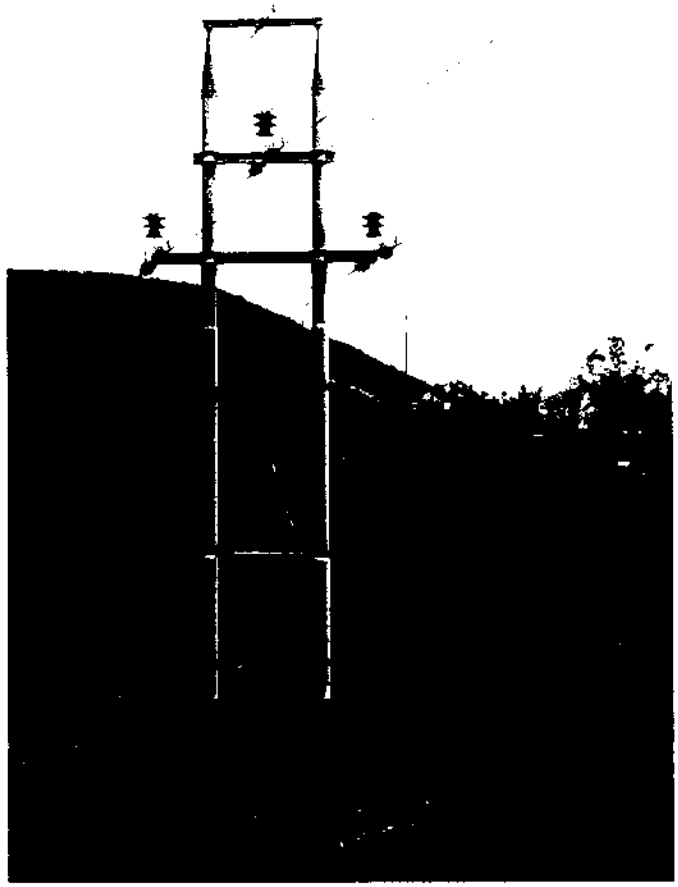
The following measures will be incorporated in the design stage to minimise environmental impacts :

- Poles will be painted in antique colour on original hot dip galvanized dull grey surface if required by EIA study.
- The proposed alignment will be adjusted to miminise ecological impact where required in accordance with EIA Report and land use constraints.
- The **existing 33kV overhead lines** close to and along Tuen Mun Highway and Castle Peak Road **will be removed** upon commissioning of the proposed 132kV overhead lines. As a result there will have beneficial effects on visual appearance along these areas.

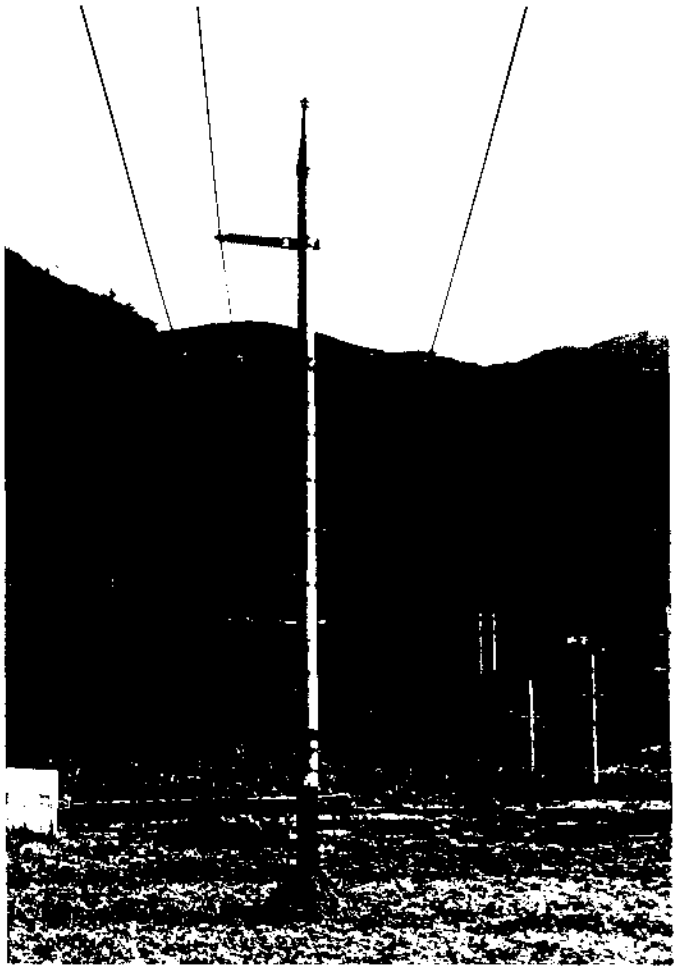
USE OF PREVIOUSLY APPROVED EIA REPORTS

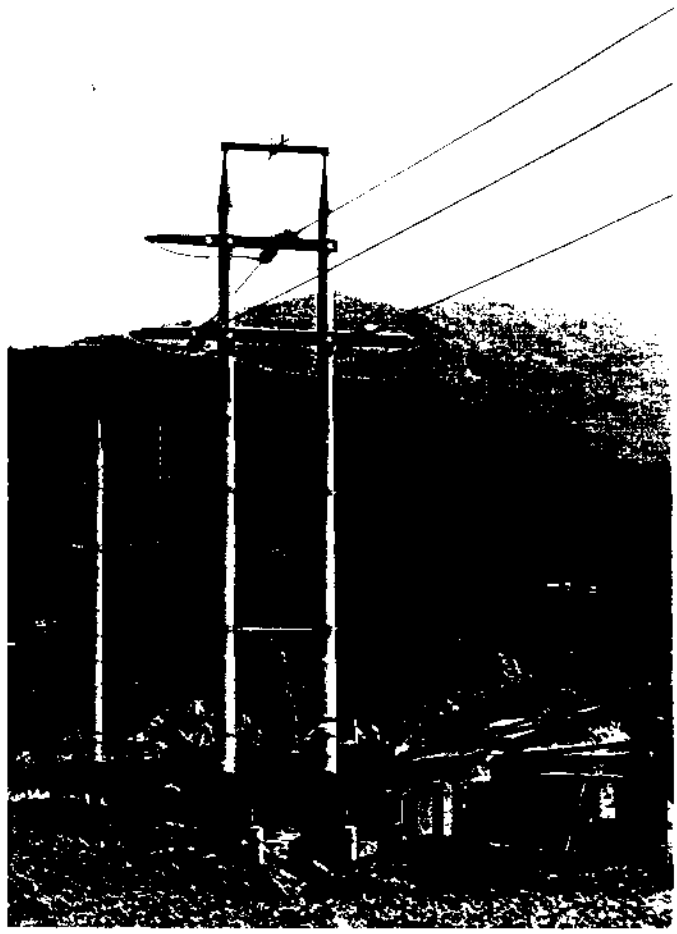
Not applicable.



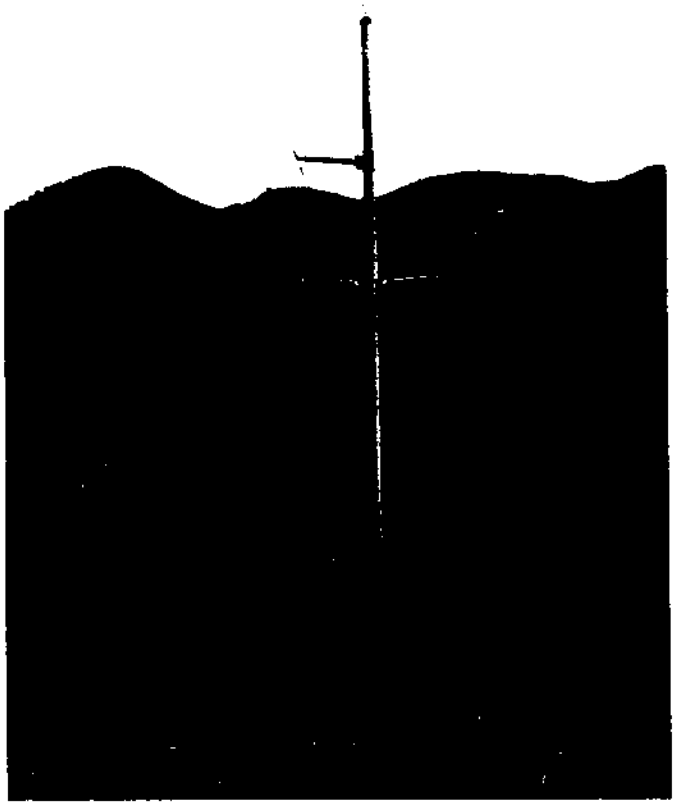


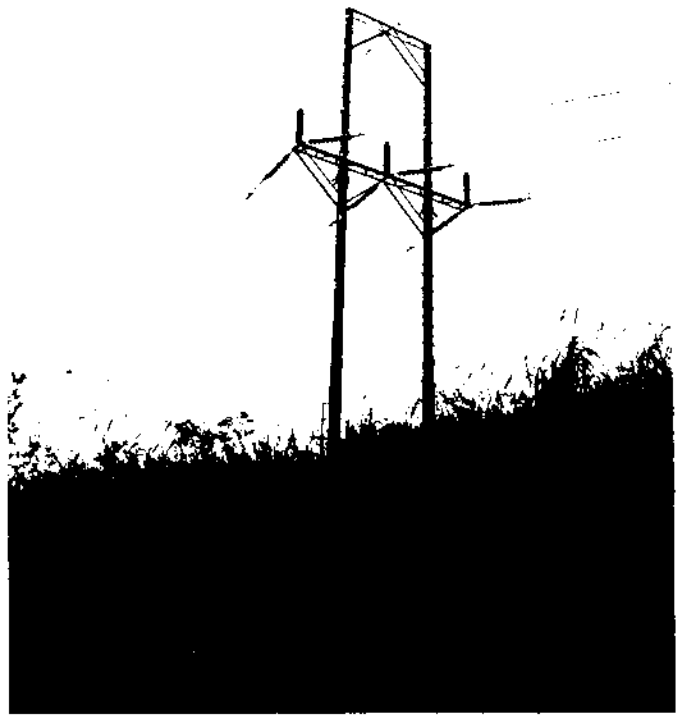
33kV Pole Line



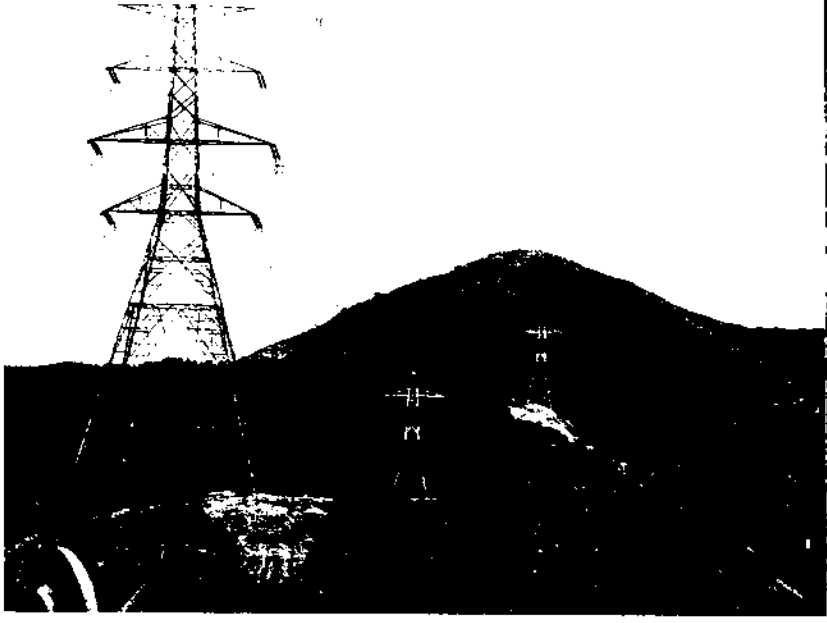


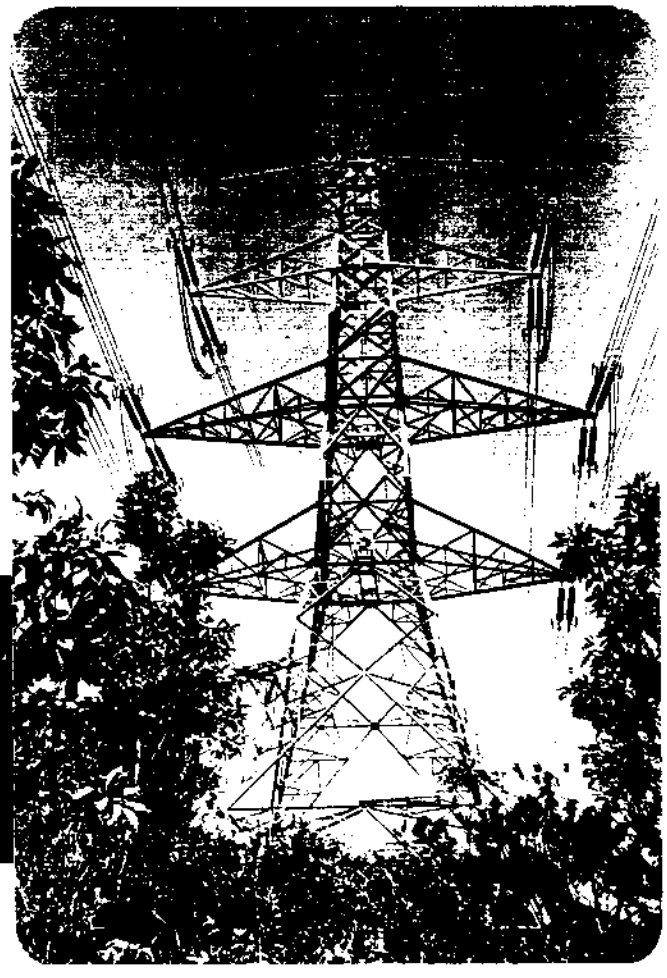
66kV Pole Line





132kV Pole Line





400kV Tower Line