Code of Practice

Avoidance of Damage to Gas Pipes

Gas Authority EMSD

2nd Edition

Code of Practice

Avoidance of Damage to Gas Pipes

The Gas Authority
The Government of the Hong Kong Special Administrative Region
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Contents

Maps, Tables and Images

List of abbreviations

CAPCO	Castle Peak Power Company Limited
CLP	CLP Power Hong Kong Limited
GPP	Gas Production Plant
HKCG	The Hong Kong and China Gas Company Limited
HKE	The Hongkong Electric Company, Limited
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
Plan	Gas pipe layout plan
PE	Polyethylene
PRC	People's Republic of China
PRS	Pressure reduction station
Record	Underground gas pipes survey record
SNG	Synthetic natural gas

Foreword

This code of practice has been prepared by the Gas Authority and approved and brought into effect in accordance with the provisions of section 9 of the Gas Safety Ordinance, Cap. 51 (the Ordinance). Its purpose is to provide practical guidance in respect of the requirements of the Ordinance and the Gas Safety (Gas Supply) Regulations, Cap. 51B (the regulations) concerning the avoidance of damage to gas pipes. These requirements are more specifically defined in regulation 23A of the regulations as follows-

> **"23A. Works in the vicinity of gas pipes**
>
> (1) No person shall carry out, or permit to be carried out, any works in the vicinity of a gas pipe unless he or the person carrying out the works has, before commencing the works, taken all reasonable steps to ascertain the location and position of the gas pipe.
>
> (2) A person who carries out, or who permits to be carried out, any works in the vicinity of a gas pipe shall ensure that all reasonable measures are taken to protect the gas pipe from damage arising out of the works that would be likely to prejudice safety."

In addition, regulation 49A of the regulations provides that where a code of practice is in effect in relation to regulation 23A(1) or (2) then a person who shows that he has complied with that code of practice has a defence against a charge under regulation 49 alleging a contravention of regulation 23A (The defence provisions in regulation 49A are shown in **Appendix 1**). This code of practice has been brought into effect in relation to the requirements of regulations 23A(1) and (2) and may therefore be used to demonstrate compliance with regulation 23A(1) and/or (2) in accordance with regulation 49A.

Introduction

1. Many accidents occur when gas pipes are damaged during excavation and other works involving ground penetration. Not all accidents occur immediately; some happen years after the work has been completed, perhaps when a pipeline is damaged and it corrodes over a long period of time.

2. In addition to the risk of personal injury, damage can be very costly and can have serious knock-on effects. Incidents involving damage to gas pipes in Hong Kong have caused widespread interruption to gas supplies affecting many thousands of homes. Hospitals and other community services have been seriously affected with essential services such as hot water supply and catering being interrupted.

3. This code of practice outlines the dangers which can arise from works near gas pipes and gives guidance on how to reduce the risk. It deals specifically with risks to health and safety and the precautions needed to reduce the risk of accidents that will generally result from damage to gas pipes.

Scope

4. This code of practice applies to works carried out in all situations where gas pipes may be found, with particular emphasis on situations where work is undertaken and which involves excavation or any other means of penetrating the ground at or below surface level. The term "works" is defined in the Ordinance and this definition is also included under "Definitions" in section 14 of this code of practice. Gas pipes in Hong Kong are used to supply town gas, natural gas, liquefied petroleum gas (LPG) or any mixture of such gases, whether in the form of a liquid or vapour.

5. All works in roads are covered by this code of practice, together with works in areas other than built-up roads, including works in footways, on slopes, on Government and private land. Shallow works such as road resurfacing are also covered since there is a need to ensure that surface boxes for valves, and pipes which have been extended to ground level are not damaged. Other matters relating to works near gas pipes, such as the need to support excavations, are also covered. This code of practice should also be followed, in-so-far as is practicable, for works in the vicinity of the submarine gas pipelines and aboveground gas installations.

6. Works on or within buildings may also affect gas pipes, i.e. service pipes, and therefore such works are also covered by this code of practice.

7. This code of practice is intended to be used by all those who have responsibilities under relevant legislation (see **Appendix 1**), including employers, employees, contractors, persons who are competent, by virtue of their training and substantial practical experience, to carry out gas pipe detection work (hereinafter referred to as "Competent Persons") [1] , registered gas supply companies and gas pipe owners/operators and those concerned with planning, designing, organising and supervising works near such gas pipes. These include works by or for the utilities and also road works, construction (including the refurbishment of buildings) and demolition works. Separate guidance is available for workers involved in works near underground gas pipes (see **Appendix 2**).

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[1] *Apart from the underground gas pipe detection, the competent persons may be required to carry out detection for other underground utilities (such as underground electricity cables). In this regard, reference of the said competent persons can be made to the list of Approved Competent Persons for Locating Underground Electricity Cables at Electrical and Mechanical Services Department's website (www.emsd.gov.hk).*

8. The code of practice is divided into a main text and three appendices and the main text sets out safe systems of work. The text gives specific guidance on the precautions to be taken when working in the vicinity of gas pipes, but many of the precautions against damage apply equally to all utility services. The appendices deal with legislation, guidance for workers, registered gas supply companies, first aid and requirements for gas pipe layout plans (the plan) to be kept by gas pipe owners/operators.

9. During the preparation of this code of practice, the Gas Authority has consulted the registered gas supply companies, the construction 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 code of practice wherever possible. Persons involved in works in the vicinity of gas pipes and who wish to carry out their works in some other way than that advocated in this code of practice must ensure that they achieve an equal or higher standard of safety. Attention is drawn to section 10 of the Ordinance which deals with the use of approved codes of practice in criminal proceedings.

Definitions

10. The gas pipes referred to in this code of practice are pipes used or which are to be used to supply gas. Section 2 of the Ordinance defines “Gas” as meaning-

    (a) town gas;
    (b) liquefied petroleum gas (LPG);
    (c) natural gas; or
    (d) any mixture of such gases,
    whether in the form of a liquid or vapour.

11. It also defines “natural gas” as any gas which is primarily methane obtained from natural strata, and includes-

    (a) substitute natural gas; and
    (b) synthetic natural gas.

12. It also defines "gas pipe" as meaning-

    (a) an installation pipe;
    (b) a service pipe; or
    (c) a gas main.

For the purposes of Part V of the Gas Safety (Gas Supply) Regulations, "gas pipe" does not include "an installation pipe" and therefore this code of practice only covers works in the vicinity of service pipes and gas mains.

13. For specific definitions of service pipes and gas mains, reference shall be made to section 2 of the Ordinance. In general, however, they can be described as follows-

    - Service pipes are either connected to a gas main or to a store containing LPG and supply gas to a single building; and

    - Gas mains are pipes which are typically found in roads and footpaths (but which will also be found in many other situations) and which supply gas at a wide range of operating pressures. In this code of practice, the term "steel pipelines" is generally used when referring to welded steel pipelines operating at high pressures.

14. Section 2 of the Ordinance also defines the term "works" as follows-

"Works" means construction works, that is to say, any kind of work involving or in connection with-

(a) building works (within the meaning assigned to that term in section 2(1) of the Buildings Ordinance (Cap. 123) and for the purpose of this paragraph reference in that section to "ground investigation in the scheduled areas" shall be read as a reference to "ground investigation");
(b) the laying out, construction, alteration or repair of any road, footpath, tunnel, airport runway, canal, reservoir, pipe-line, railway or tramway;
(c) trench works carried out by or for any public utility;
(d) the extraction of material from land or the seabed;
(e) landfill works;
(f) river training works; or
(g) reclamation works.

For the purpose of this code of practice, building works includes-

any kind of building construction, site formation works, ground investigation, foundation works, repairs, demolition, alteration and every kind of building operation, and includes drainage works.

15. The majority of gas pipes are owned and managed by registered gas supply companies (as defined in regulation 2 of the Gas Safety (Registration of Gas Supply Companies) Regulations, Cap. 51E). For the purposes of this code of practice, the term "gas pipe owners/operators" shall include-

(a) a person who operates and maintains a gas pipe and keeps records of the location and position of that gas pipe;
(b) a registered gas supply company; and
(c) the owner of a gas pipe.

16. The following terminologies are used in this code of practice:

(a) “hand tool” means a non-power-driven tool designed for operation by hand including, but is not limited to spades, shovels, picks or forks.

(b) “hand-held power tool” means a hand-held power-driven tool designed for operation that utilizes electrical or hydraulic or pneumatic power.

(c) “trial hole” means an area of excavation for exposing part of the target gas installation.

(d) “Site Responsible Person” means an individual who has the overall management or responsibility for health and safety on the site.

Dangers associated with gas pipe damage

17. Damage to gas pipes can cause gas escapes which may lead to fires or explosions. There are two types of damage:

    (i) damage which causes an immediate escape of gas;

    (ii) damage which causes gas to escape some time later. The damage may occur at the time the work is carried out (for example the damage to a pipe wrapping may eventually lead to corrosion) or later, for instance, subsidence may occur as a result of works near a gas pipe and ground movement induces stress in the gas pipe causing it to fail at some later time.

In the former case, there would be gas risk poses to both the people carrying out the work and to others in the vicinity; in the latter, the risk is mainly to the public.

18. Sometimes, damage may not cause leakage but could hinder a gas pipe's future maintenance (e.g. driving a heavy plant across the line of a gas pipe during construction work may deform the pipe permanently and affect the ability to perform in-line inspection in future).

Areas of Hong Kong with piped gas supplies

19. Gas mains and service pipes are widespread throughout the whole of Hong Kong Island, Kowloon and the New Territories (hereinafter referred to as "the Territory") as follows-

(i) Town gas

Most buried gas pipes belong to the Hong Kong and China Gas Company Limited (HKCG) and this company has reticulated systems of buried gas pipes in the urban areas of Hong Kong Island and Kowloon and in all the new towns throughout the New Territories. Intermediate and high pressure gas pipelines interconnect the gas supply to these areas. Submarine pipelines are also laid in various locations throughout the Territory.

(ii) LPG

LPG is also widely distributed throughout the Territory. When LPG compound/cylinder LPG stores are used, the gas is usually supplied to consumer's premises through piped gas systems. Both the LPG compound/cylinder LPG stores and piped gas systems are usually located within the boundaries of the housing site or commercial/industrial site to which they supply. It is important to note, however, that in special circumstances some buried gas pipes carrying LPG are permitted along and/or across roads, but only where specific approval has been given by the Gas Authority. General information on the locations and ownership of buried LPG pipes in roads is separately set out in **Supplementary Information**[2]. Detailed information about specific piped LPG systems could be obtained from the gas pipe owners/operators. The name and telephone number (manned 24 hours) of the LPG supplier are displayed at the LPG compound/cylinder LPG store.

(iii) Natural gas

Natural gas is imported from Mainland China through submarine pipelines to gas receiving stations at Black Point Power Station, Lamma Power Station and Tai Po Gas Production Plant. Buried onshore natural gas pipelines interconnect the gas receiving stations to dedicated power station/gas production plant.

[2] *The **Supplementary Information** can be viewed and downloaded via the following web-link:* https://www.emsd.gov.hk/en/gas_safety/publications/codes_of_practice/index.html

(iv) Synthetic natural gas (SNG) from landfill sites

SNG is manufactured at landfill sites and delivered to designated users.

Gas is therefore widely distributed throughout the Territory and it must be generally assumed that it will always be necessary to consult the gas pipe owners/operators for information about the locations of their gas pipes prior to the commencement of works[3].

[3] *Where emergency work is involved, this may not of course always be possible, but the gas pipe owners/operators shall be consulted by telephone as soon as possible after the works have begun.*

Safe systems of work

20. Sections 20 to 88 of this code of practice aim to minimise the possibility of damaging underground gas pipes. It sets out a safe system of work which is based on obtaining as much information as possible about gas pipes in the area, before work begins and then using that information to ensure safe working practices are employed. Specific guidance on aboveground gas pipes is also given in sections 81 to 84 of this code of practice.

21. There are four basic steps of the safe system of work, which are:

    (i) Collection of plans;
    (ii) Underground utility survey;
    (iii) Digging of trial holes; and
    (iv) Safe excavation practices.

Image 1 - Basic steps to the safe system of work

22. When working near gas pipes, all four of these key steps – collection of plans, underground utility survey, digging of trial holes and safe excavation practices must be employed. Using only one may not be enough: for example, a gas pipe 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 pipe may snake or may have been moved out of position. Reliance on the plan alone would give a false position, but this could be alleviated by the correct use of a pipe locating device. Conversely, if several pipes are close together, a pipe locating device may show them as a single pipe, whereas the plan would help give a more accurate picture. Once the general situation has been established, hand dug trial holes can provide physical confirmation of the position of the gas pipe.

23. Provision of gas pipe information

Anyone responsible for excavation work where underground gas pipes may be present must liaise with the appropriate gas pipe owner/operator when planning and carrying out the work. In public roads and footpaths, this will normally be HKCG, but very occasionally one of the other gas pipe owners/operators may have underground gas pipes in such locations. Gas pipe owners/operators accept the need for close cooperation with those who have to carry out works in the vicinity of their pipes and, where there is difficulty in locating the position of these pipes, will send technical staff to site to assist with their location in accordance with the provisions of paragraph 3.2(vi) of **Appendix 3**.

24. Emergency situation

All registered gas supply companies possessing gas pipes in public area maintain a 24-hour emergency service and inquirers can obtain information about gas pipes from these emergency centres at any time. (Information about the registered gas supply companies, how to contact them, the services they provide and, for LPG companies, the locations of LPG pipes in public roads, is separately set out in **Supplementary Information**[4]).

When emergency or other urgent work[5] has to be undertaken and it is not possible to obtain the plan, telephone contact must be made with the gas pipe owner/operator to seek the gas pipe owner/operator's verbal advice and request its attendance on site. If such assistance cannot be made available immediately and it is essential for work to continue, then the working party must assume that there are

[4] *The **Supplementary Information** can be viewed and downloaded via the following web-link:* https://www.emsd.gov.hk/en/gas_safety/publications/codes_of_practice/index.html

[5] *Urgent work is work that occurs at such short notice that it cannot be planned in advance. In the majority of such cases, it would be prudent to delay urgent work until more information about gas pipes has been obtained.*

buried gas pipes in the vicinity and follow the safe system of work. Any excavation work undertaken at that particular location or area must proceed with extreme caution.

Account shall be taken of any indications that buried gas pipes exist, such as the presence of gas service pipes entering buildings, pit covers, pipeline marker posts, evidence of reinstated trenches, etc. However, if there are no such indications, this does not mean that there are no buried gas pipes.

25. Safety measures and their implementation

(i) The arrangements and measures necessary for avoiding damage to gas pipes shall be written into, or form part of, the employers' and contractors' safety policies and this information must be effectively communicated to all persons likely to be engaged in works in the vicinity of gas pipes.
(ii) Before the commencement of works, on-site risk assessment should be carried out to ensure a safe system of work is in place.
(iii) All parties involved in the excavation process have the right to stop any part of the process where there is a risk to safety. This shall then be reported to the Site Responsible Person.

26. Training and supervision

(i) Employees must receive adequate instruction and training in the correct procedures and the precautions to be taken for works in the vicinity of gas pipes. The suggested text for workers' information shown in **Appendix 2** can be used as a basis for training programmes. A number of organisations, including the Vocational Training Council and the Construction Industrial Council can give advice on available training.
(ii) It is particularly important that anyone who uses a pipe locating device must have received thorough training in the operation and limitations of the particular type or model being used. Most manufacturers can provide such training, and employers must ensure that it is adequate for their employees' needs.
(iii) In general, a supervisor and at least one on-site operative shall be competent, by virtue of their training and substantial practical experience, in the relevant field of works. Supervisors shall check regularly that, among other things, the works are being carried out according to instructions and that all necessary precautions are in place.

27. Permit-to-work

A permit-to-work system may be appropriate for particularly hazardous works (e.g. welding or other hot work involving naked flames near aboveground gas installations or exposed gas pipes mentioned in section 68, trenchless works in adjacent to existing gas pipe mentioned in section 77 or works in confined spaces mentioned in section 92, etc.). This would involve written authorisation specifying the works to be done and the precautions to be taken. A guideline on formulating the permit-to-work system can be referred to Safe Systems of Work issued by Labour Department. A permit-to-work system needs suitable supervision and monitoring to ensure that the conditions of a permit are complied with.

Collection of plans

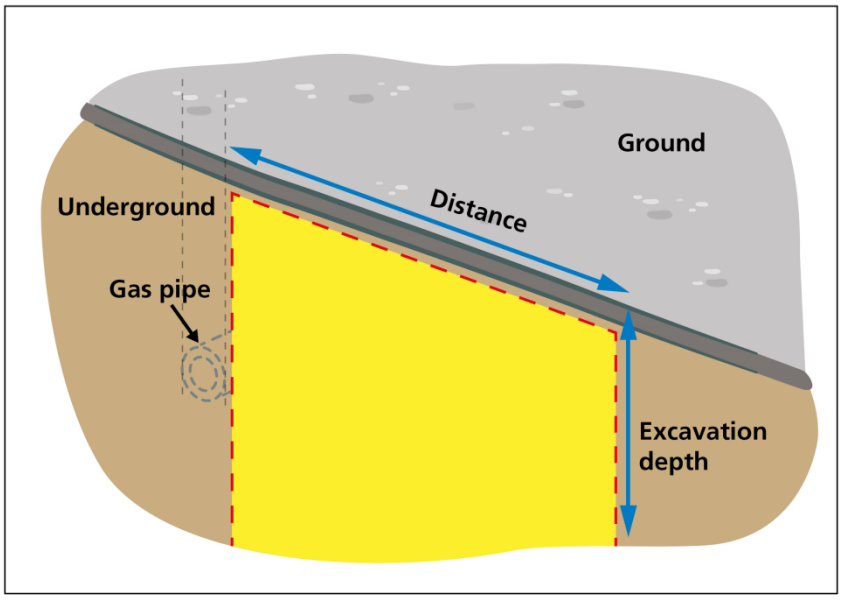
28. Wherever possible, persons undertaking construction works anywhere including but not limited to public road, waters of Hong Kong and private area shall obtain layout plans of or other suitable information about all gas pipes in the vicinity of their proposed works area before commencing the works. Early contact at the planning stage will allow full discussion about the proposals and identification of any pipe diversions or other protective measures necessary to ensure the safety of construction workers, the general public and gas pipes and other equipment affected. Consideration should be given to amending the proposals to avoid existing buried gas pipe or areas particularly congested with utilities plant. For major projects, approaching the gas pipe owners/operators at the earliest possible moment is recommended to ensure that sufficient time is available to plan and carry out any essential diversion of the gas pipes in the vicinity of the proposed works area. It should be noted that it can take many months to plan and complete the diversion in some instances where a major diversion of a gas system becomes necessary.

29. To ensure that all layout plans of gas pipes 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 gas pipe owner/operator. The extent to which gas pipes 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 gas pipes shall therefore include such essential information in order that gas pipe owner/operator can identify the area over which they consider their gas pipes may be affected, and indicate the positions of their gas pipes in that area.

Table 1 - Works in the vicinity of gas pipes

Type of Works	Distance
Trench or other excavation works in stable ground conditions up to 1.5 metres in depth	10 metres
Trench or other excavation works in stable ground conditions over 1.5 metres and up to 5 metres in depth	15 metres
Trench or other excavation works in stable ground conditions over 5 metres in depth	20 metres
Excavations under gas pipes (including any form of tunnelling, boring, construction of caverns, driving headings, pipe jacking, etc.)	always consult regardless of depth under gas pipe
Welding or other hot work near exposed metallic gas pipes or aboveground installations	10 metres
Welding or other hot work near exposed PE gas pipes	20 metres
Works near LPG storage compounds	15 metres
Piling, percussion moling, pipe bursting or jacking	15 metres
Works near high pressure pipelines and associated above and below ground installations	20 metres
Ground investigation and any kind of drilling or core sampling or ramming	30 metres
Vertical, horizontal or inclined penetration including sheet piling and/or soil nails installation	30 metres
Use of explosives	60 metres

Image 2 - Distance between gas pipe and works



30. Table 1 defines what is considered to be "in the vicinity of the gas pipes" for various types of work. The distances given are examples on the extent to which gas pipes may be affected by a range of typical works. Whenever there is doubt as to whether gas pipes are in the vicinity of the works, the gas pipe owner/operator must be consulted.

31. Upon receiving written notice of proposed works from a person, the gas pipe owner/operator shall without charge provide the plans of the proposed works site or its vicinity within 14 working days or such period as is mutually agreed between the concerned parties. Upon receiving the plans from the gas pipe owner/operator, persons undertaking the construction works are obligated to check whether the plans are in suitable scale and resolution, and shall contact the gas pipe owner/operator to clarify and/or to obtain more detailed plans if in doubt.

Image 3 - Provision of plans to working party

32. Upon receipt of the notice mentioned in section 31 above, the gas pipe owner/operator shall immediately date stamp the notice and shall thereafter retain the notice for a minimum period of 5 years. That date shall then be deemed to be the date of commencement of the time period stipulated in section 31 of this code of practice. Where required in the notice, the gas pipe owner/operator shall acknowledge receipt of the notice, stating the date on which it was received.

33. The gas pipe owner/operator will normally respond to requests for information about the location of its gas pipes by providing inquirers with copies of the relevant plans. The times by which the gas pipe owner/operator must respond to requests for information, advice or assistance shall be as follows-

(i) Gas related emergency - immediate dispatch of emergency personnel on receiving information about the emergency situation;

(ii) Advice on location of gas pipes, etc. during working hours where plans have already been provided and work is in progress - by arrangement with the gas pipe owner/operator, but normally during the next working day. In cases of genuine urgency/unforeseen circumstances, staff should be sent as soon as they become available; and

(iii) Requests for provision of plans/details of location and position of gas pipes, etc. - plans showing the location of gas pipes (and associated equipment) will be provided within the time period mentioned in section 31 above.

34. For works within or close to public roads or footways, HKCG will in the majority of cases be the main provider of such information. Gas pipes belonging to the gas pipe owners/operators who distribute LPG from bulk supply systems are generally situated within private developments and these are managed by a gas distributor who has a presence within the development. Information about gas pipes within such sites can therefore be obtained directly from the gas distributor at the site. More specific information relating to individual registered gas supply companies is separately set out in **Supplementary Information**[6].

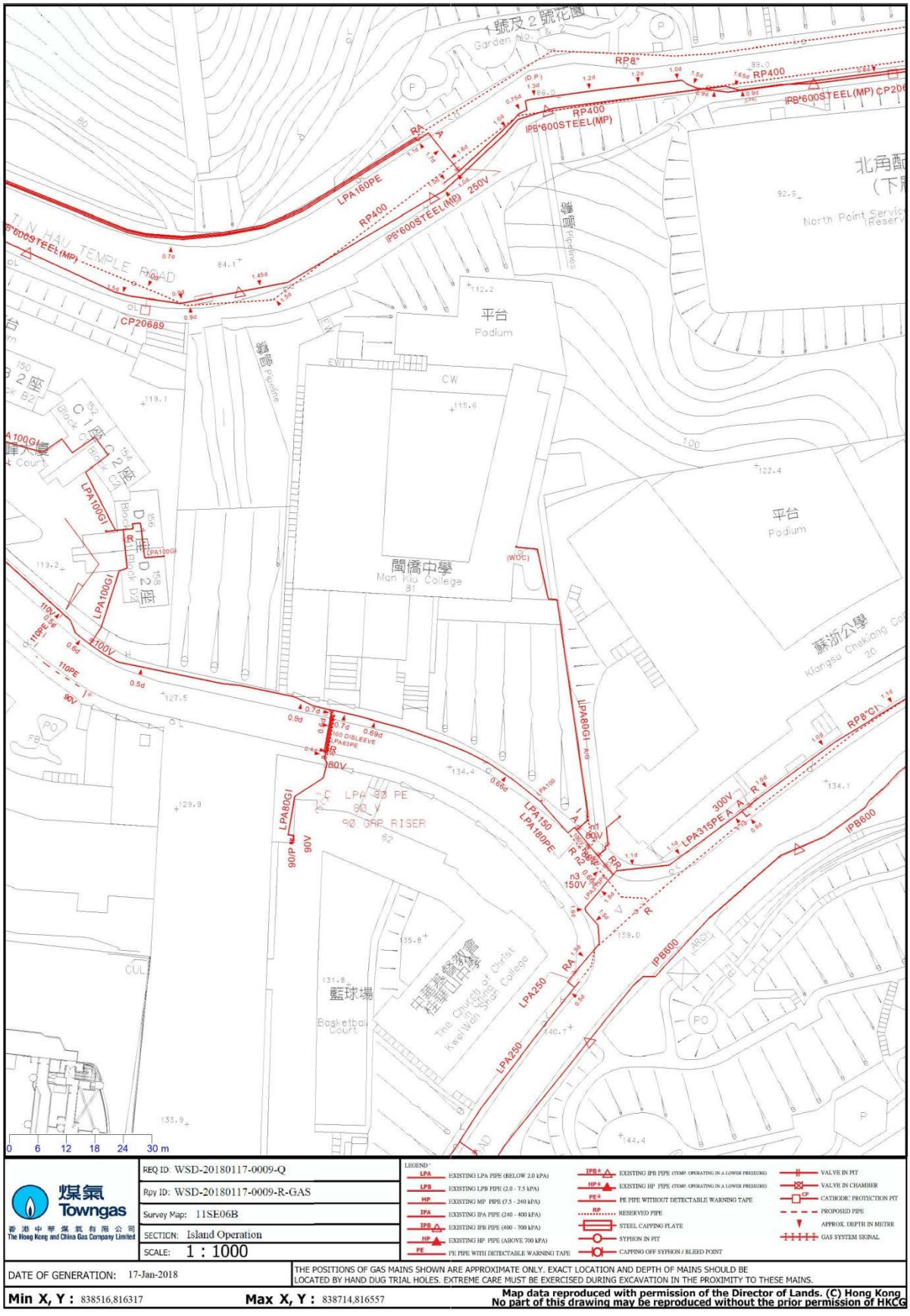
35. Where consultants or agents of major works obtain information about gas pipes for planning purposes, they must ensure the information obtained is passed on to the main contractor before works commence. The main contractor and/or the Site Responsible Person shall in turn ensure that this information is available to those who are actually involved in excavation and/or ground works. Particular care must be taken in the preparation of combined utilities drawings for major construction projects to ensure that information is transferred accurately.

[6] *The **Supplementary Information** can be viewed and downloaded via the following web-link:* https://www.emsd.gov.hk/en/gas_safety/publications/codes_of_practice/index.html

36. It is the responsibility of the persons actually carrying out the works to ascertain the location of any gas pipes and ensure that they are protected from damage. For major works, where information about gas pipes in the vicinity of the works will have been provided some months before works are due to commence, it may be necessary to consult the gas pipe owner/operator again, immediately before works are due to commence, to ensure that the up-to-date situation with regard to the location of gas pipes is known. If the plans in hand have been provided for more than three months, persons undertaking the construction works shall consult or request new plans from the gas pipe owner/operator 14 working days before commencement of works.

37. An example of a layout plan of underground gas pipes in accordance with the standard set out in this code of practice is shown in Map 1. The plans will indicate the size, material, operating pressure and the recorded line and depth (where known) of all gas pipes in the proposed works area. Where polyethylene (PE) gas pipes are laid[7], these will be shown in plans annotated "PE". Where no means of tracing such pipes has been provided, this shall also be distinctively indicated in the plans. Extra means shall be implemented to ascertain PE pipe position especially those without warning tape. All plans issued after the implementation of this code of practice shall meet the minimum standards set out in **Appendix 3**.

[7] *Note: Generally it is impractical to show materials used for short service pipes and minor alterations and repairs to gas mains and in these circumstances gas pipes may not necessarily be annotated "PE".*



煤氣 Towngas
香港中華煤氣有限公司 The Hong Kong and China Gas Company Limited

REQ ID:	WSD-20180117-0009-Q
Rpy ID:	WSD-20180117-0009-R-GAS
Survey Map:	11SE06B
SECTION:	Island Operation
SCALE:	1 : 1000

LEGEND

LPA	EXISTING LPA PIPE (BELOW 2.0 kPA)	IPB*	EXISTING IPB PIPE (TEMP. OPERATING IN A LOWER PRESSURE)
LPB	EXISTING LPB PIPE (2.0 - 7.5 kPA)	HP*	EXISTING HP PIPE (TEMP. OPERATING IN A LOWER PRESSURE)
MP	EXISTING MP PIPE (7.5 - 240 kPA)	PE*	PE PIPE WITHOUT DETECTABLE WARNING TAPE
IPA	EXISTING IPA PIPE (240 - 400 kPA)	RP	RESERVED PIPE
IPB	EXISTING IPB PIPE (400 - 700 kPA)		STEEL CAPPING PLATE
HP	EXISTING HP PIPE (ABOVE 700 kPA)		SYPHON IN PIT
PE	PE PIPE WITH DETECTABLE WARNING TAPE		CAPPING OFF SYPHON / BLEED POINT
			VALVE IN PIT
			VALVE IN CHAMBER
		CP	CATHODIC PROTECTION PIT
			PROPOSED PIPE
			APPROX. DEPTH IN METRE
			GAS SYSTEM SIGNAL

DATE OF GENERATION: 17-Jan-2018

THE POSITIONS OF GAS MAINS SHOWN ARE APPROXIMATE ONLY. EXACT LOCATION AND DEPTH OF MAINS SHOULD BE LOCATED BY HAND DUG TRIAL HOLES. EXTREME CARE MUST BE EXERCISED DURING EXCAVATION IN THE PROXIMITY TO THESE MAINS.

Min X, Y : 838516,816317 **Max X, Y :** 838714,816557

Map 1 – Typical HKCG gas pipe layout plan

38. 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 location may have changed. They can, however, give a good indication of the locations, sizes and number of underground gas pipes at a particular site, and will help subsequent tracing by pipe locating device. Those in charge of site work, and operators of pipe locating devices, shall be aware that the accuracy of plans is limited because:

    (i) the position of reference points (e.g. the kerb or building line) may have changed since the plans were drawn;
    (ii) regrading or resurfacing of the road may mean that the depths shown are now incorrect;
    (iii) the depth of service connections may be different from the gas pipe;
    (iv) gas pipes, particularly PE ones, may have been moved without the authority or knowledge of the gas pipe owner/operator;
    (v) gas pipes, marked as straight lines may, in practice, vary in alignment from a straight line; and
    (vi) the level and alignment of gas pipes may change rapidly over a short distance due to the presence of underground obstructions.

Adequate instruction and training in how to read and interpret the plans must be given to all those workers who need to use them.

39. Even when work has to start without plans, as may be the case for emergency and unforeseen work, every effort shall be made to locate buried gas pipes and the gas pipe owners/operators must be consulted. Telephone contact must be made with the gas pipe owner/operator to seek the gas pipe owner/operator's verbal advice and request its attendance on site. Telephone requests for information shall be presented so that names, locations, references, dimensions and instructions are recorded in a consistent way to avoid errors or misunderstandings; any information provided shall be read back to confirm accuracy. In the meantime, it shall be assumed that buried gas pipes are present and digging must proceed with extreme caution, and only after a pipe locating device has been used to detect metallic pipes. It is particularly important that anyone carrying out excavations in such circumstances must be adequately trained and supervised.

Underground utility survey

40. Suitable pipe locating devices shall be used to pinpoint as accurately as possible any gas pipes in and near the proposed works area before excavation takes place. This shall be done in conjunction with the plans provided as these will help the operator using the pipe locating device to interpret the signal, and so give the maximum information to those involved with the works before digging starts.

41. Various pipe locating devices are available and the main types of those available can be classed as follows-

(i) Radio frequency detectors

Receiving instruments which respond to low frequency radio signals, which may be picked up and re-emitted by metallic pipes or tracer elements on PE gas pipes. If radio frequency detection is used, other metallic objects may re-radiate the signal and results may vary appreciably according to locality, length of the buried pipe or tracer element and distance from the termination, and geographical orientation;

(ii) Transmitter-receiver instruments

A small portable signal transmitter or generator can be connected to a metallic pipe or metallic tracer wire, or placed very close to it so that the signal is induced into it. The receiver can then detect this signal. Usually some part of the tracer wire or pipe needs to be already known so that the transmitter can be properly positioned, and these pipe locating devices generally require more skill to operate than other types. They can, however, provide useful information in difficult situations where the techniques in (i) have not been successful; and

(iii) Metal detectors

Conventional metal detectors will usually locate flat metal covers, valve boxes, etc. but will probably miss pipes. They can be a useful tool for finding inspection points which may provide connection points for a transmitter.

Some commercially available instruments use more than one of these techniques and may include a depth measuring facility.

42. Pipe locating devices of radio frequency detection or transmitter/receiver types are suitable for metallic gas pipes and PE gas pipes furnished with metallic tracer wire. Although no PE gas pipe shall be permitted to be laid unless an approved means for position tracing of that pipe is provided following the issue of this code of practice in July 1997, few PE gas pipes might not bear any metallic tracer elements prior to issue of this code of practice. Extra care shall be taken in excavation near PE gas pipes.

43. The degree of confidence with which buried gas pipes can be detected depends on a number of factors such as:

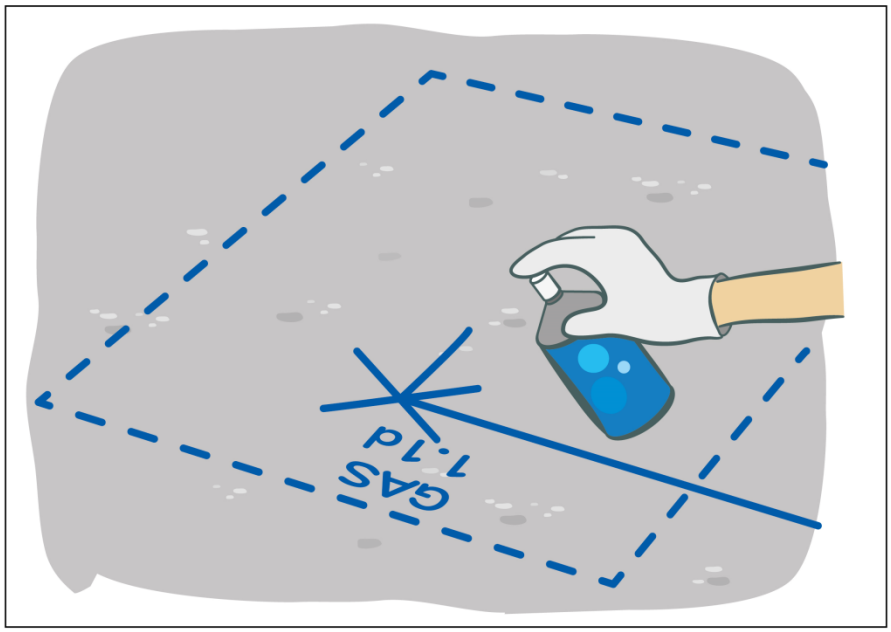
- the characteristics of the pipe locating device being used;
- the type and depth of the gas pipe;
- effects of other metallic services close by; and
- the training, skill, hearing and experience of the operator.

Furthermore, pipe locating devices shall always be used in accordance with the manufacturer's instructions and shall be regularly checked and calibrated and be maintained in good working order.

44. Pipe locating device may not be able to distinguish between 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 or pipe does not mean that there is not another close by. As such, frequent and repeated use of pipe locating devices shall be made during the course of the work.

45. It is very important that anyone who uses a pipe locating device must have received thorough training in its operation and limitations. The Competent Person is responsible for marking the alignment of all underground utilities at the location and its vicinity where the hand-dug trial hole is to be opened. This marking shall be done with waterproof crayon, paint or self-adhesive temporary road marking tapes on paved surfaces, or with wooden pegs in grass or unpaved areas. Steel pins, spikes or long pegs, which could damage gas pipes laid at shallow depth, shall not be used. Persons undertaking construction works shall ensure that the markings identified by the Competent Person are available at site before the commencement of works. Residual markings should be erased as far as possible after excavation.

Image 4 - Marking the alignment of underground gas pipes



46. The Competent Person shall brief the persons actually carrying out the excavation on the content of the underground gas pipes survey record, with particular reference to the locations of the proposed hand-dug trial hole opening and the number of target underground gas pipes and other services to be exposed.

47. The Competent Person shall issue a note in writing with respect to the existence of any underground gas pipes and related gas installations at the works site or its vicinity. This written record shall be regarded as an "underground gas pipes survey record" (hereinafter referred to as the "record") and include the following details:

    (a) name of the Competent Person;
    (b) name of the working party or site contractor;
    (c) location, date and time for which the work on locating the underground gas pipes was carried out;
    (d) underground gas pipes alignment and its depth (for each gas pipe) based on common reference points (e.g. lamp pole, traffic light post or hydrant, etc.);
    (e) brand name, model number, serial number, calibration record and mode of operation of the pipe locating device used for the detection;
    (f) proposed trial hole locations and depth;

(g) photos showing site markings for gas pipe alignment, proposed or completed trial holes;
(h) a briefing record on his findings mentioned in the report to the site personnel; and
(i) acknowledgement record of the site personnel who received the brief.

In case the digging of the trial holes is performed under the supervision of the Competent Person, the results shall also be incorporated in the record.

48. In case of a minor shallow excavation, the Competent Person shall still mark the gas pipe alignment, if any, within and in the vicinity of the works site and submit the record to the party appointing him. The Site Responsible Person shall keep a copy of the record at site at all times. The main contractor and/or whoever in charge of the site shall ensure that this information is available to those who are actually involved in excavation and/or ground works.

Digging of trial holes

49. After a pipe locating device has been used and the location of the gas pipe established, the Competent Person shall determine the number of trial holes based on the gas pipe alignment and the number of underground services. In case the alignment cannot be located due to some unforeseeable reasons, he shall propose trial hole locations by referring to the plans. In principle, the closer to the alignment and/or the greater the number of underground services, the more trial holes will be required. Trial holes shall be dug at the turning points to ascertain the alignment of the gas pipes. Site Responsible Person should compare the plan with the record for any discrepancies so as to determine extra number of trial holes to confirm the gas pipe alignment in doubt. In general, excavation of trial holes shall be supervised by the Competent Person who shall repeatedly use a pipe locating device and frequently update the working personnel as to the most accurate location until the target gas pipe is exposed.

50. Trial holes shall only be dug by hand tools to expose and confirm the position of any buried gas pipes. However, improper use of hand tools may damage the buried gas pipes. As such, the method on safe use of hand tools mentioned in section 53 shall be observed.

51. In many situations, it will be necessary to use hand-held power tools to break out paved surfaces to facilitate excavation of trial holes. As the position of excavation by hand-held power tools cannot be precisely controlled in practice, hand-held power tools shall not be used directly over the marked position of a gas pipe. A minimum horizontal clearance of 1 metre shall be maintained from the side of any gas pipe to the point where the equipment is used. Furthermore, great care must be exercised and use of such tools shall be limited to a depth of 150 millimetres in footpaths and 300 millimetres in roads. Putting a mark or a stopper on the tool may help visualise and control the depth of penetration.

Image 5 - Digging of trial holes by use of hand tools

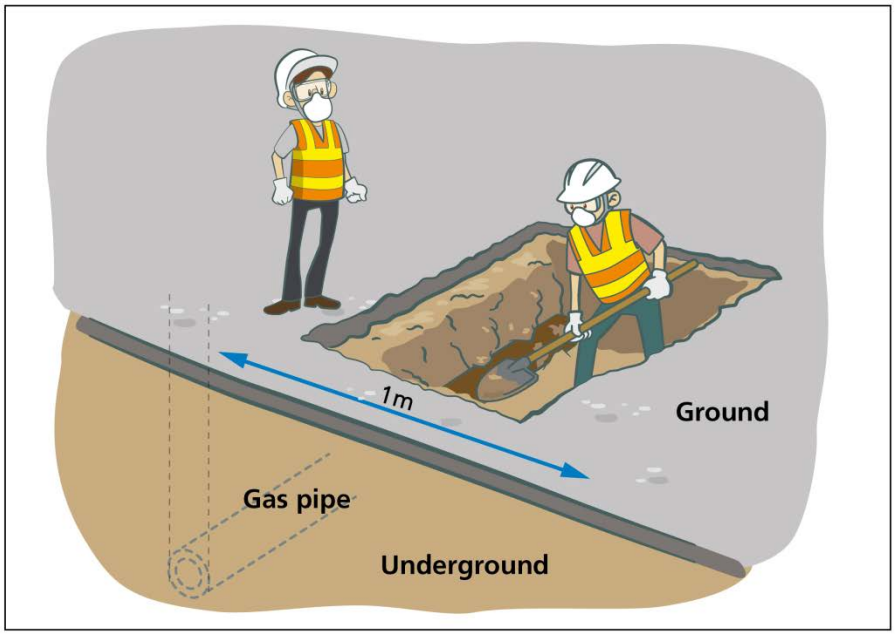
Safe digging practices and use of mechanical excavators

52. Once the location of the gas pipe has been established by exposing the target gas pipe at trial holes, excavation or other works involving ground penetration may begin. Special care must be taken when digging above or close to the assumed line of the gas pipe.

53. Hand tools are a common cause of accidents. They however provide a satisfactory way of exposing buried gas pipes when they are used carefully. 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:

    (i) spades and shovels (preferably those with curved edges) shall be used rather than other tools. They should not be thrown or spiked into the ground but eased in with gentle foot pressure;
    (ii) picks, pins or forks may be used with care to free lumps of stone etc. and to break up hard layers of sandstone; and
    (iii) picks should not be used in soft clay or other soft soils near to buried gas pipes.

Image 6 - Safe digging practices



54. Hand-held power tools shall not be used directly over the marked position of a gas pipe unless:

(a) the pipe has already be found at that position by careful hand digging and it is at a safe depth (at least 300 mm) below the surface to be broken out; or
(b) physical means have been used to prevent the tool striking it.

55. Hand-held power tools, mechanical excavators and vertical penetration machine (such as sheet piling machine or geotechnical investigation drilling) are the main causes of damage and they shall not be used too close to underground gas pipes. Reasonable steps shall be followed to establish the positions of the existing underground gas pipes by underground utility survey and digging of trial holes before proceeding with the excavation or vertical penetration works. The dangers created by damaging a gas pipe with these machines are much greater than if the damage is done with a hand-held power tool. Gas pipes may have projections such as valve housings, syphon standpipes, cables and anodes associated with cathodic protection systems, etc. which may not be shown on the plans. A minimum clearance of 1 metre must be maintained from the side of any gas pipe to the point where these machines are used. In situations where the operator of the excavator does not have a clear and unrestricted view of the attachment of the excavator during work, a signaller should be made available to give signals to the operator. If there is genuine difficulty in locating the underground gas pipes in the vicinity of the works site, assistance shall be sought from the gas pipe owner/operator. At any potential sheeting piling and gas pipe crossing point, the gas pipe shall be exposed and protected before works commence.

56. The gas pipe owner/operator must be consulted if the 1 metre clearance cannot be achieved and relevant records must be kept by the main contractor and/or whoever in charge of the site. Further safety distance may be required by the gas pipe owner/operator or the Gas Authority, depending on the operating pressure of the gas pipe and its strategic importance to gas supplies in the Territory. Before beginning any works or digging of trial holes, the gas pipe owner/operator shall be informed of the nature of the intended works if:

(a) the target gas pipes fall within the types of gas pipes mentioned in Schedule 1 of this code of practice; or
(b) the works involve trenchless excavation or horizontal drilling such as tunnelling, percussion moling, pipe jacking and soil nailing, etc.

The gas pipe owner/operator may deem the excavation of a trial hole unnecessary if the works involved are far below ground level or sufficient clearance are provided and where it is confirmed that underground gas pipes would not be affected or they do not exist. Any agreement between the gas pipe owner/operator and the party concerned shall be properly signed and recorded for inspection upon request by the Gas Authority.

57. It is important to note that a mechanical excavator may not only cause damage/leakage at the point of impact. Damage to a service connection outside the building may result in further, unseen damage to the connection inside the building. Gas leaking from the damage inside or gas travelling along the line of the service connection pipe from outside the building may cause a dangerous or even fatal build-up of gas within the building.

58. The depth of cover for gas pipes laid in footway and carriageway are normally 450 millimetres and 900 millimetres respectively. For high pressure and intermediate pressure B pipelines the depth of cover is normally 1.1 metres. These depths are only a guide and gas pipes may be found at shallower or deeper depths. Service pipes are normally connected to the top of gas pipes in carriageways and footpaths and may therefore be found at shallower depth. Service pipes may also be found at shallower depth near service entry positions to buildings. For gas pipes installed in the past, the depth of cover may have been altered, perhaps because other works (such as road alterations) have been carried out in the area. Pipes passing over underground obstructions or in the vicinity of bridge structures may also be laid at shallower depths.

Damaged or leaking gas pipes

59. If a gas leak is suspected, the following action shall be taken immediately:

    (i) call 999 police emergency hotline;

    (ii) evacuate all people in the vicinity of the leak. If the service connection to a building or the adjacent main has been damaged, warn the occupants to leave the building;

    (iii) evacuate all people (including workers) from areas where the smell of gas is found. When the leak is suspected to be LPG, particular attention should be given to evacuating workers from trenches, manholes and other low lying areas since LPG is heavier than air which collects in such places and does not disperse readily. It should be noted that LPG, or even town gas and natural gas under certain site conditions, will follow drains, ducts, etc. and can travel great distances in a relatively short time. Workers should therefore be immediately evacuated from any excavations, manholes, etc. which may be connected to the area of the gas leak by drains, ducts and pipes;

    (iv) inform the registered gas supply company concerned using their 24-hour emergency telephone number;

    (v) prohibit smoking and extinguish naked flames and other sources of ignition. Do not attempt to operate mobile phones or any kind of electrical switches as these may ignite the leaked gas; and

    (vi) assist the gas pipe owner/operator, Police or Firemen or the Gas Authority as requested.

60. If a gas pipe suffers damage, however slight, the gas pipe owner/operator shall be informed immediately and arrangements shall be made to keep people well clear of the area until it has been repaired or otherwise made safe. Equally, where an excavation uncovers a gas pipe with damaged wrapping, the gas pipe owner/operator shall be informed, so that repairs can be made to prevent future corrosion and leakage. Even apparently slight damage to a gas pipe can cause long-term failure and pose gas risk to the public. Under no circumstances shall any unauthorised repairs be made to a gas pipe.

Protecting gas pipes from damage

61. 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 code in identifying all services. As such, once underground pipes or cables have been uncovered, they shall be tagged with a weather proof marking for identity because failure to identify them correctly is another common cause of accidents.

62. The following approaches shall be adopted until the identity of the gas pipe has been positively confirmed:

    (a) Water pipes may look very like gas pipes and shall be treated as live gas pipes if uncovered.
    (b) Some electricity cables are also yellow in colour and may be mistaken for PE gas pipes. It must be treated as being live and potentially hazardous until proved otherwise.
    (c) Occasionally gas pipes may run in ducts, making them difficult to identify. Whenever there is doubt as to the identity of an exposed service (gas, water or electric), it must be treated as being live and potentially hazardous until proved otherwise.
    (d) New PE gas pipes may be inserted into reserved old metallic pipes.

All gas pipes must be assumed to be live until disconnected and proved to be safe at the point of work. Obtain written confirmation of disconnection and gas content check from the gas pipe owner/operator before attempting to remove a gas pipe. Never attempt to tap or drill on the gas pipes unless they have been decommissioned and properly purged with the assistance of the gas pipe owner/operator on site.

63. Gas pipes uncovered in an excavation will almost certainly need to be protected and supported. Gas pipe owner/operator's advice and agreement shall be sought for necessary measures. It shall never be used as handholds or footholds for climbing out of excavations.

64. Safeguarding the stability of the excavation is equally important for the protection of the gas pipe and adequate support shall be provided to ensure that the excavation would not collapse.

65. All backfilling of excavations shall be done carefully and warning tapes, marker tiles, capping plates, marker posts or other protection shall be put back to their original positions. Any fill containing items likely to damage the gas pipes, such as large pieces of rock and hard material, shall not be used.

66. If buried gas pipes have been found to be too shallow, or if the plans or other information have proved to be inaccurate, the gas pipe owner/operator shall be informed, preferably before the excavation is backfilled. Where the pipe is considered to be too shallow or otherwise at risk, the gas pipe owner/operator shall then take whatever steps are necessary to ensure the safety of the gas pipe. Where plans are inaccurate they shall amend their records accordingly.

67. Where explosives are to be used within 60 metres of a gas pipe, or piling, vertical boring, etc. are to be carried out within 15 metres of a gas pipe, then prior consultation must take place with the gas pipe owner/operator and agreement must be reached on the protective measures to be taken before any work takes place.

68. Exposure of gas pipes, in particular PE gas pipes, shall be avoided as far as practicable. If it cannot be avoided, the exposed pipe length and time span shall be minimal. If welding or other hot work involving naked flames is to be carried out within 10 metres of exposed metallic gas pipes or aboveground gas installations or within 20 metres near exposed PE gas pipes, the gas pipe owner/operator shall be consulted on any special protective measures required. Make sure that there is no flammable gas in the air of the work area before work begins and monitoring should continue during the work. Welding or naked flames shall not be permitted where a smell of gas is detected or where for any other reason, a gas leak is suspected. In these circumstances the Fire Services Department and the gas pipe owner/operator must be notified. Particular care shall be taken to avoid damage by heat, sparks or naked flames to PE gas pipes and to the protective coatings on other gas pipes.

69. Excavating close to gas pipes encased in concrete is dangerous. Using mechanical means to break up concrete surrounding a live gas pipe can cause damage to it and endanger anyone present. As such, careful planning is important to find alternative routes. The gas pipe owner/operator shall be consulted in advance for safety measures to protect the existing gas pipes throughout the construction period.

Avoiding long-term damage to gas pipes

70. No manhole, chamber or other structure shall be built over, around or under a gas pipe and no works shall be carried out which may result in a reduction of cover or protection over a gas pipe without first consulting the gas pipe owner/operator.

71. Where gas pipes cross or are parallel and close to excavations, changes in backfill etc. may cause differential ground settlement and increased stress in the pipe. For pipes parallel and close to excavations, the degree of risk depends upon the depth of the excavation, the distance of the pipe from the excavation, and the type of soil. Wherever an excavation may affect support for a gas pipe, the gas pipe owner/operator shall be consulted. In some cases, it may be necessary to permanently divert the gas pipe 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.

72. Where an excavation uncovers a gas pipe, the backfill shall be adequately compacted, particularly beneath the pipe, to prevent any settlement which would subsequently damage the pipe. Backfill material adjacent to gas pipe shall be fine material or sand, containing no stones, bricks or lumps of concrete etc., and shall be suitably compacted to give adequate support and protection to the gas pipe. No power compaction shall take place until 300 millimetres cover of selected fine fill has been suitably compacted.

73. If the road construction is close to the top of a gas pipe, the gas pipe owner/operator shall be consulted on the necessary precautions. The road construction depth must not be reduced without permission from the Highways Department.

74. No concrete or other hard material shall be placed or left under or adjacent to any gas pipe as this can cause pipe fracture at a later date. Concrete backfill must not be used within 300 millimetres of a gas pipe.

75. Pipe restraints or thrust blocks close to gas mains must never be removed. Interfering with these could result in a serious gas leakage.

76. Anyone who carries out works near underground gas pipes must observe any reasonable requirements made by the gas pipe owner/operator for the present and long-term protection of the gas pipes, and ensure that access to the gas pipes is available at all times. Where there is any doubt about the reasonableness or adequacy of the gas pipe owner/operator's requirements, or where the measures

called for are not adequately implemented, the Gas Authority shall be informed forthwith who shall then decide whether the gas pipe owner/operator's requirements are reasonable and/or implementation measures are appropriate.

Safe systems of work for trenchless methods

77. Trenchless methods are increasingly being used for laying and renovating buried pipes, particularly where there is a need to avoid surface disruption. The most widely used techniques are impact moling, pipe bursting and auger boring. Care must be taken when using trenchless methods to avoid colliding with and thereby damaging gas pipes. With moling or pipe bursting it is also important not to come too close to adjacent gas pipes, as displaced soil may also cause damage to the gas pipes.

78. Plans, pipe locating devices and trial excavations must be used to locate existing gas pipes 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 gas pipes shall be either one and a half times the diameter of the pipe being laid or 600 millimetres for steel pipelines and 300 millimetres for all other gas pipes, whichever is the greater. However, these clearances may need to be varied taking into account 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. Moles are prone to deflection from their original course and if there are existing gas pipes in the vicinity, a mole tracking device must be used.

Construction and demolition sites, new and existing housing developments, protection of aboveground and underground gas pipes and associated installations

79. Special problems can arise in the case of works being carried out on construction and demolition sites. Anyone concerned with construction works has a duty to give sufficient notice to the relevant gas pipe owner/operator so that adequate precautions can be taken to ensure the safety of the gas pipes within and adjacent to the site area. Consideration should be given to disconnecting gas supplies within the site in advance of the works commencing where practicable. Particular attention shall be given to the protection of underground gas pipes where construction traffic will access the site. Vulnerable gas facilities such as syphon standpipes, valve boxes, cathodic protection systems, etc. shall be effectively fenced off to ensure that damage is minimised. Works shall not start until all appropriate safeguarding actions have been taken.

80. Particular care is necessary for avoiding damage to gas pipe when penetrating the ground with a sharp object, (e.g. driving in fence pins/tree support bars, bar-holing, etc.).

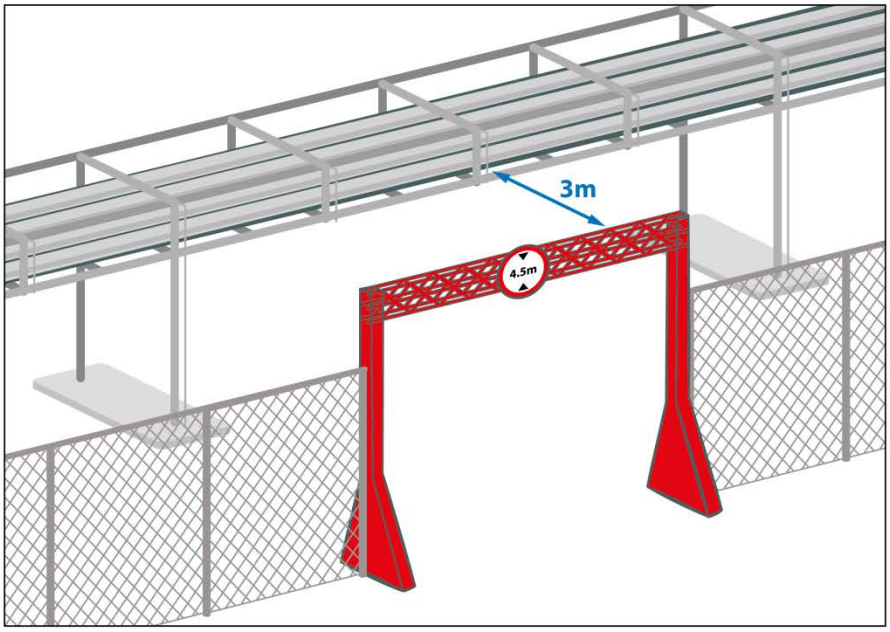
81. Safe working practices near an aboveground gas installation:

    (a) The gas pipe owner/operator shall be consulted before carrying out any excavation work within 10 metres of any aboveground gas installation, or any hot work within 20 metres near exposed PE gas pipes.
    (b) Ground level barriers parallel to the aboveground/overhead gas installations should be erected at a horizontal distance of at least 3 metres from the outermost of the aboveground/overhead gas installations to prevent any part of the mechanical propelled device damages the gas installations accidentally. The gas pipe owner/operator shall be consulted if the above cannot be achieved.
    (c) If mechanical propelled device passage is provided under the overhead gas pipe whilst reasonable alternative routes are not available, the number of the passageways for the mechanical propelled device should be minimised in order to minimise the risk associated. For safest crossing, the passageway, if provided, should be at right angle to the alignment of the pipeline wherever

possible. Gateways to the passageway should be set up at both sides of the entrance by erecting goal posts. Sufficient height limit warning signs should be erected to warn the driver of the mechanical propelled device approached.

(d) If lifting equipment (e.g. mobile crane and tower crane) is to be used near aboveground gas installations, the installations shall be suitably protected from damage by falling objects. The hoisted loads should never cross the space above such installations. A minimum horizontal safety distance which is agreed with the gas pipe owner/operator should always be maintained between any part of the lifting equipment (including the loads) and such installations.

Image 7 – Erection of ground level barriers parallel to the overhead gas installations



82. Where works are carried out to buildings, care must be taken to identify and safeguard service pipes attached to and installed within the building. Such pipes may not be owned by the registered gas supply company and therefore any person intending to carry out such works shall consult the building owner or the management company for details of these pipes.

83. When structural or refurbishing works are carried out to buildings and there is the possibility that damage to gas pipes could occur, the gas pipe owner/operator shall be consulted about shutting off the gas supply to the building until the works are completed.

84. Gas pipes attached to the outside of the building must not be used to secure scaffolding, be climbed on, be loaded with construction material/waste or be interfered with in any other way. Where structural or refurbishing works, demolition works or the dismantling of scaffolding or lifting equipment take place on completion of works, care shall be taken to ensure that all gas pipes are suitably protected from damage by falling objects.

85. Water pipes may look very like gas pipes. If discovered, they shall be treated as live gas pipes. Never try to cut an unidentified pipe. All gas pipes must be assumed to be live until disconnected and proved to be safe at the point of work. Even if a gas pipe is believed to have been disconnected and abandoned, NO attempt to drill, cut into or dismantle shall be made until the approval has been obtained from the gas pipe owner/operator. Written confirmation of disconnection and gas content check from the gas pipe owner/operator must be obtained and conducted respectively before attempting to remove a gas pipe.

86. Buried gas pipes on industrial or commercial sites or housing estates with LPG supply system may be owned by the site occupier. Any person who intends to carry out works on such a site shall contact the gas pipe owner/operator to ensure that all relevant gas pipes have been identified and all necessary precautionary work undertaken before the commencement of any construction works.

87. Underground gas pipes 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 control the position and separation distances among all underground utilities. Where buried gas pipes are laid on partly developed sites, special arrangements may be necessary for their temporary protection at vehicle and mobile plant crossing points.
88. Close liaison shall be maintained among the developers, their contractors, and the utilities. A marked-up plan of the estate showing the up-to-date position of buried gas pipes (including any variations from planned routes) shall be kept on site by the contractor/developer for the information of those involved in excavation and/or ground works. Such information must also be made known to the personnel who take over the site wherever there is switchover of working parties.

Installation of new utility pipes and cables near existing underground gas pipes

89. New underground utilities often have to be laid in ground which contains existing gas pipes. Where it is reasonably practicable to do so, the utility planning the new installation shall aim to site it so that it is separated from all existing buried gas pipes by the distances agreed with the gas pipe owner/operator. In general, the clearance shall be 600 millimetres for steel pipelines and 300 millimetres for all other gas pipes to allow for future maintenance or emergency operations. Further safety distance may be required by the gas pipe owner/operator or the Gas Authority, depending on the operating pressure of the gas pipe and its strategic importance to gas supplies in the Territory. Before beginning any works or trial hole excavation, the gas pipe owner/operator shall be informed of the nature of the intended works if:

    (a) the target gas pipes fall within the types of gas pipes mentioned in Schedule 1 of this code of practice; or
    (b) the works involve trenchless excavation or horizontal drilling such as tunnelling, percussion moling, pipe jacking and soil nailing, etc.

90. Where this standard cannot be attained because of congestion of utilities plant in a particular location, the separation distance should be maximised as far as reasonably practicable.

91. Where the utility which is laying the new buried service has to reduce the separation, it must inform the gas pipe owner/operator whose gas pipe is affected and agree with the gas pipe owner/operator on what special measures are necessary to protect the gas pipe from future damage.

Work in confined spaces

92. Every effort shall be made to avoid any works that will result in gas pipes being enclosed in confined spaces. Consideration must be given to the refinement of works method/procedure and diversion/disconnection of the gas pipes before the works commence.

93. Where gas pipes are inevitably enclosed in confined spaces, gas pipe owner/operator shall be consulted on the necessary precautions to ensure that the safety of workers and the general public are assured. Consideration must be given to partition and replacement with suitably designed welded steel pipes which are properly supported and protected against potential damage.

94. A safe system of work must be in place for confined space work. A competent person, as specified in the Factories and Industrial Undertakings (Confined Spaces) Regulation, Cap. 59AE, must be appointed to assess, including but not limited to, the potential hazards associated with gas entering or escaping into confined space. A written safe operating procedure, pursuant to the requirements of the aforesaid legislation, shall be prepared and agreed between the owner/operator of the gas pipe and the site operator. Only certified workers who have received statutory mandatory training in working in confined spaces shall be permitted to enter a confined space and then only in accordance with the written safe operating procedure which defines the safe working system to be followed and under supervision. Attention shall be paid to the additional statutory requirements under the aforesaid legislation of using approved breathing apparatus to enter confined space.

Schedule 1

The following schedule provides a description of the locations of gas pipes for which the Gas Authority requires special arrangements to be implemented, in accordance with section 56 and 89 of this code of practice, when works are carried out in their vicinity. Details of the location and position of these gas pipes must be obtained from the respective owners of the pipes concerned.

Ref.	Pipeline Description	Route of Pipeline	Owner of Pipeline
01	600 mm HP pipeline Black Point power station to Castle Peak power station.	From Black Point power station to Castle Peak power station following Nam Wan Road. (Note: 2 sections of the pipeline are laid in specially constructed reinforced concrete pipe bridges).	CAPCO
02	Twin 750 mm HP Submarine Pipelines Tai Po Gas Production Plant (GPP) to Sha Tin.	From the Gas Production Plant under Tolo Harbour to the Shing Mun River into Siu Lek Yuen Nullah and from there to the Sha Tin North pressure reduction station (PRS) in On Ping Street.	HKCG
03	Twin 750 mm HP pipelines Tai Po GPP to Yuen Chau Tsai, 600 mm underground pipeline to Lam Kam Pigging Station.	From the Gas Production Plant, under Tolo Harbour to Yuen Chau Tsai, along the Tolo Highway to Lam Kam Pigging Station. (Note: a branch pipeline is also laid along the slip road leading to Tai Wo Estate and crosses under the Lam Tsuen River, along the slip road again and ends at the Tai Po West PRS).	HKCG
04	600 mm HP pipeline Tai Po GPP to Lam Kam Roundabout, Tai Po.	Along Dai Fat Street, Yuen Shin Road, Tai Po Tai Wo Road, Tai Po Road – Tai Wo, and crosses Lam Tsuen River to the Lam Kam Road Roundabout.	HKCG
05	750 mm HP pipeline Lam Kam Roundabout to Route Twisk PRS, Tsuen Wan.	Along Lam Kam Road, Shek Kong Interchange, Route Twisk (part laid inside Ministry of Defence Areas) and ends at Route Twisk PRS.	HKCG
06	600 mm HP pipeline Lam Kam Roundabout to Au Tau, Yuen Long. 750 mm HP pipeline Au Tau to Tuen Mun.	Along Tai Wo Service Road West, Wo Hop Shek Interchange (a branch crosses under the MTR East Rail Line tracks), Castle Peak Road – Fanling, Castle Peak Road – Kwu Tung, Kwu Tung Road, Castle Peak Road – Chau Tau, Shek Wu Wai Road, San Tam Road, Fairview Park Interchange (a branch to Fairview Park Boulevard), then crosses Kam Tin River, Au Tau PRS, Au Tau interchange, Castle Peak Road – Yuen Long, Tuen Mun – Yuen long Eastern Corridor and ends at the Tuen Mun PRS.	HKCG
07	750 mm HP Pipeline crossing Tai Lam Country Park, Chuen Lung to Tai Lam.	Crosses Tai Lam Country Park from the pigging station at Chuen Lung, on Route Twisk, to the PRS at Tai Lam.	HKCG
08	Twin 300 mm HP submarine pipelines Tai Lam to Ta Pang Po. 300 mm underground pipeline Tai Pang Po to Tai Ho, Lantau Island.	From Tai Lam crosses underneath the Ma Wan Channel, lands at Ta Pang Po, then follows the North Lantau Expressway and ends at Tai Ho.	HKCG

Ref.	Pipeline Description	Route of Pipeline	Owner of Pipeline
09	600 mm IP pipeline On Ping Street, Sha Tin to Ma Tau Kok PRS.	From Sha Tin North PRS across Siu Lek Yuen Nullah, along Tai Chung Kiu Road, Che Kung Miu Road, through old Beacon Hill Tunnel, True Light Lane, To Fuk Road, Rutland Quadrant, Cumberland Road, across Boundary Street, along Knight Street, Prince Edward Road West, Lomond Road, across Argyle Street, Fu Ning Street, Shing Tak Street, Ma Tau Kok Road, across Ma Tau Chung Road, along San Shan Road, Pau Chung Street, Sheung Heung Road, Tokwawan Road, San Ma Tau Street and ends at Ma Tau Kok PRS.	HKCG
10	Twin 450 mm IP submarine pipelines, To Kwa Wan to North Point.	From the pigging station at To Kwa Wan both cross under Victoria Harbour and land near junction of Hoi Yu Street, Java Road, then continue as underground pipelines to the North Point PRS.	HKCG
11	600 mm IP pipeline Ka Yip Street, Chai Wan to Wong Nai Chung Gap Road.	Along Ka Yip Street, Wing Tai Road, Chai Wan Road, Aldrich Street, Aldrich Bay Road, crossing underneath Eastern Corridor, along Tai On Street, Lei King Road, Quarry Bay Park, Hoi Yu Street, Java Road, Man Hong Street, across King's Road, along Healthy Street West, Tsat Tsz Mui Road, Healthy Street Central, Pak Fuk Road, Tin Hau Temple Road (with a branch up to Cloud View Road), Braemar Hill Road, through a tunnel from Braemar Hill to Tai Hang Road, across Blue Pool Road to Wong Nai Chung Cap Road and ends at the Wong Nai Chung PRS.	HKCG
12	600/400 mm IP pipeline from Old Beacon Hill Tunnel South Portal to Cha Kwo Ling and Tseung Kwan O.	Along Cornwall Street, Ede Road, Waterloo Road, Lung Cheung Road Park, Lung Cheung Road, Wong Tai Sin Road, Shatin Pass Road, Fung Tak Road, Po Kong Village Road, Fung Shing Street, New Clear Water Bay Road, San Lee Street, Lee On Road, Shun On Road, Sau Mau Ping Road, Tseung Kwan O Tunnel Road (with a branch through Tseung Kwan O Tunnel, along Tseung Kwan O Tunnel Road, Po Lam Road, Po Ling Road and ends at Hang Hau Road), Kai Tin Road, Lei Yue Mun Road, Yau Tong Road, Cha Kwo Ling Road and ends at Cha Kwo Ling PRS.	HKCG
13	Twin 600 mm IP submarine pipeline, Cha Kwo Ling to Quarry Bay.	From the PRS at Cha Kwo Ling crosses Victoria Harbour and lands in Quarry Bay near the Tai Koo Shing interchange on the Eastern Island Corridor and ends at Quarry Bay Pigging Station.	HKCG
14	600 mm IP pipeline from York Road, Kowloon to Route Twisk, via Tsuen Wan.	From York Road crosses under the MTR East Rail Line tracks, along Tat Che Avenue (with a branch to Cornwall Street), To Yuen Street, Nam Shan Cheun Road, Tai Hang Sai Street, Nam Cheong Street, Pak Tin Street, crosses Tai Po Road, along Kowloon Road, Kiu Kiang Street, Shun Ning Road, Camp Street, Po On Road, Cheung Wah Street, Un Chau Street, Castle Peak Road, Kom Tsun Street, crosses Butterfly Valley Road, along Cheung Sha Wan Road, Mei Lai Road, Lai Chi Kok Park, Slip Road, Container Port Road South, Container Port Road, Kwai Tai Road, Kwai King	HKCG

Ref.	Pipeline Description	Route of Pipeline	Owner of Pipeline
		Road, crosses Kwai Tsing Road, along Kwai Tai Road, Kwai Yue Street, Wing Shun Street, underneath Tsuen Wan Road, along Texaco Road, crosses Castle Peak Road, along Texaco Road North, Tsuen Kam Interchanges, along Route Twisk to Chuen Lung and ends at Route Twisk PRS.	
15	600 mm HP pipeline Sha Tin North PRS to Sai O PRS.	From Sha Tin North PRS along On Ping Street, Tate's Cairn Highway, Ma On Shan Road, Hang Tak Street, Ma On Shan Tsuen Road, Ma On Shan Country Park, Nin Wah Road and ends at Sai O PRS.	HKCG
16	750mm HP pipeline from Sai O PRS to Tseng Lan Shue PRS.	From Sai O PRS along Nin Wah Road, Sai Sha Road, Tai Mong Tsai Road, Sha Ha Road, Mei Yuen Street, Po Tung Road, Hiram's Highway, Clear Water Bay Road and ends at Tseng Lan Shue PRS.	HKCG
17	Submarine pipe from Guangdong DaPeng LNG Terminal to Tai Po GPP.	From Guangdong DaPeng LNG Terminal under Mirs Bay, Tolo Harbour, Tai Po waterfront Park and ends at the GPP.	HKCG
18	Submarine pipe from PRC to HKE.	From Guangdong DaPeng LNG Terminal and ends at Lamma Power Station.	HKE
19	600/500mm IP pipeline Sha Tin North PRS to Ma Tau Kok GPP.	From Sha Tin North PRS along On Muk Street, On Ming Street, Chap Wai Kon Street, Ngan Shing Street, Sha Tin Road, Sha Tin Wai Road, Sha Kok Street, Tai Chung Kiu Road, Che Kung Miu Road, Hung Mui Kok Road, Tin Sam Street, Fu Kin Street, Hin Keng Street, another section of Che Kung Miu Road, through old Beacon Hill Tunnel, Cornwall Street, Devon Road, Somerset Road, Waterloo Road, Junction Road, Inverness Road, Nga Tsin Wai Road, Grampian Road, Prince Edward Road West, Lomond Road, Argyle Street, Tin Kwong Road, Farm Road, Ma Tau Chung Road, Sheung Heung Road, To Kwa Wan Road, Ma Tau Kok Road and ends at Ma Tau Kok GPP.	HKCG
20	600 mm IP pipeline Ma Tau Kok Offtake to To Kwa Wan pigging station.	From Ma Tau Kok Offtake, along San Ma Tau Street, Wai King Street, Kwei Chow Street, Yuk Yat Street, Chi Kiang Street to To Kwa Wan pigging station.	HKCG
21	Submarine pipe from YaCheng Gas Field of Hainan Island to Black Point Power Station.	From YaCheng Gas Field off Hainan Island to Black Point Power Station.	CAPCO
22	Submarine pipe from ShenZhen DaChan Island to Black Point Power Station.	From ShenZhen DaChan Island to Black Point Power Station.	CAPCO

Appendices

Appendices 1 to 3 give advice on matters which relate to various aspects concerning gas pipes and the companies that own and operate them. These provided additional information and should be read and used in conjunction with the advice contained in the main text.

Appendix 1: Legislation

Relevant legislation enforced by the Gas Authority

1.1 The Gas Safety (Gas Supply) Regulations, Cap. 51B (the regulations), made under the Gas Safety Ordinance, Cap. 51 (the Ordinance), apply to any works in the vicinity of gas pipes. In particular, regulation 23A of the regulations requires that:

> "23A. Works in the vicinity of gas pipes
>
> (1) No person shall carry out, or permit to be carried out, any works in the vicinity of a gas pipe unless he or the person carrying out the works has, before commencing the works, taken all reasonable steps to ascertain the location and position of the gas pipe.
>
> (2) A person who carries out, or who permits to be carried out, any works in the vicinity of a gas pipe shall ensure that all reasonable measures are taken to protect the gas pipe from damage arising out of the works that would be likely to prejudice safety."

Regulation 49A of the regulations sets out the defence provisions as follows-

> "49A. Defences
>
> (1) Where a code or codes of practice are in effect in relation to the requirements of regulation 23A (1) or (2), it shall be a defence to a charge under regulation 49 alleging a contravention of that subregulation for the person charged to show that he has complied with the provisions of that code or those codes as regards such requirements.
>
> (2) It shall be a defence to a charge under regulation 49 alleging a contravention of regulation 23A(2) in relation to works carried out in the vicinity of a gas pipe for the person charged to show that he did not know the location and position of the gas pipe and that –
>
> (a) before the works were commenced, he had taken all reasonable steps to ascertain the location and position of any gas pipe in the area of the works; and

(b) he could not reasonably have been expected, having regard to the steps so taken, to have known that location and position of the gas pipe,

and for the purposes of paragraph (a), where a code or codes of practice are in effect in relation to regulation 23A(1), a person who shows that he has complied with the provisions of that code or those codes as regards such requirements shall be deemed to have shown that he has taken all reasonable steps to ascertain the location of any gas pipe in the area of the works".

1.2 Only registered gas supply companies may carry on the business of a gas supply company under the Gas Safety (Registration of Gas Supply Companies) Regulations, Cap. 51E. Such companies are registered by the Gas Authority and have a duty to conduct their operations in a safe manner so that members of the public are not exposed to undue risks from gas. Difficulties with obtaining information from registered gas supply companies may be brought to the attention of the Gas Authority. Complaints will be investigated and such information as the Gas Authority finds appropriate will then be made available.

Occupational Safety and Health Legislation enforced by the Commissioner for Labour

1.3 The occupational safety and health legislation administered by the Labour Department includes the Occupational Safety and Health Ordinance, Cap. 509, Factories and Industrial Undertakings Ordinance, Cap. 59 and their subsidiary regulations. The aforesaid legislation seeks to ensure the safety and health of employees/workers at work.

1.4 Among others, the Factories and Industrial Undertakings Ordinance places duties on both the proprietors of industrial undertakings and the persons employed at their industrial undertakings with regard to health and safety at work:

a) Section 6A places a duty on the proprietor of an industrial undertaking to ensure, among other things, the provision and maintenance of plant and systems of work that are, so far as is reasonably practicable, safe and without risks to health, and the provision of such information, instruction, training and supervision as are necessary to ensure, so far as is reasonably practicable, the health and safety at work of all persons employed at the industrial undertaking. A proprietor who contravenes the said provision commits an offence.

b) Section 6B imposes a duty on every person employed at an industrial undertaking to take reasonable care for the health and safety of himself and others who may be affected by his acts or omissions at work. He must also cooperate with the proprietor so far as is necessary to enable the proprietor to meet his duty to secure the health and safety of persons employed at the industrial undertaking under Cap. 59. A person who contravenes the said provisions commits an offence. A person employed at an industrial undertaking who wilfully and without reasonable excuse does anything while at work likely to endanger himself or others also commits an offence.

1.5 The Gas Authority is of the view that the duties imposed by the provisions of these sections of the Factories and Industrial Undertakings Ordinance, Cap. 59, have implications for persons carrying out works in the vicinity of gas pipes. Failure to ensure the safety and health of workers at work shall constitute an offence under the aforesaid Ordinance.

Appendix 2: Guidance for workers

Anyone who works near underground gas pipes should be properly trained in safe procedures. Information issued to employees can usefully supplement this training and act as a reminder of the main points. A suggested text is given below. It could be usefully adapted to meet the needs of individual organisations by adding supervisors' names, contact points, etc. It could be produced as a pocket card or leaflet, or in some other appropriate forms.

Advice to site personnel when working near gas pipes

- Damaging underground gas pipes can be dangerous; gas leaks can cause fire, explosion, gas poisoning, loss of consciousness or asphyxiation.
- Damage can result from excavation or penetration of the ground.
- Underground gas pipes may be found in roads, footpaths and on sites. Always assume that they are present. Treat any pipes found anywhere as LIVE.
- Accidents have happened because people have mistaken one service for another, e.g. gas and water mains look alike. Check before you act.

Before starting work

- make sure you have plans of the underground gas pipes in the area. This may not always be possible for emergency or unforeseen works. Remember that service pipes inside the building boundary may not be shown on the plans;
- use a pipe locating device to trace metal pipes and PE pipes with a tracer element laid over them. You should have been trained how to do this. If in doubt, or if you have any difficulty, ask your supervisor for advice;
- mark the positions of the pipes using paint or other waterproof marking on the ground;
- look for signs of service risers, e.g. a gas meter or service entry into a building;
- look for signs of syphon standpipes, valves, vent pipes, cathodic protection systems, etc. by checking pit covers in roads and footpaths and check these against the plans; and
- hand dug trial holes (as many as necessary) to confirm the position of gas pipes in the area of your work. This is particularly important if there are PE pipes, which you may not be able to find using a pipe locating device.

When you start work

- wherever possible, hand dig near underground services. Spades and shovels are safer than picks or forks;
- check that any gas pipe which is embedded in concrete and has to be exposed has been suspended before work starts, or that another safe way of working has been agreed with the gas pipe owner/operator;
- watch out for signs of gas pipes as work continues;
- backfill around gas pipes with a fine material. DO NOT use stone, bricks, mass concrete or similar material;
- report any damage to a pipe or pipe coating. Even if there is no immediate danger, damage could lead to danger at a later date;
- keep a clear distance of 1 m from the side of any gas pipe when using hand-held power tools;
- do not use hand-held power tools directly over the marked position of a gas pipe unless:
  a) you have already found the pipe at that position by careful hand digging and it is at a safe depth (at least 300 mm) below the surface to be broken out; or
  b) physical means have been used to prevent the tool striking it;
- keep a clear distance of 1 m between the side of any gas pipe and the bucket of a mechanical excavator;
- do not use exposed gas pipes as a convenient step or hand-hold;
- do not handle or attempt to alter the position of an exposed gas pipe;
- do not install plant close to an existing gas pipe. Ask your supervisor to tell you what the separation distance should be;
- do not build existing gas pipes into a manhole or other structure or encase them in concrete;
- always provide adequate support and anchoring of exposed gas pipes according to the gas pipe owner/operator's recommendations; and
- even if you believe a gas pipe has been disconnected and abandoned, do not attempt to drill or cut into it, or to dismantle it until the gas pipe owner/operator's approval has been given.

If you suspect a gas leak

- immediately call 999 police emergency hotline;
- evacuate everyone in the vicinity of the leak. Remember that if a service connection to a building has been damaged, it may cause a leak in the building. Warn the occupants of the building, and of the adjoining buildings to leave;
- ban smoking and naked flames within 15m of the leak, and in area where gas can be smelled or where gas could collect; and
- assist the gas pipe owner/operator, Police or Firemen or the Gas Authority as requested.

First aid

- Burns are the main injuries that result from fire or explosion following a gas leak. In many cases the burns are made more severe by the fact that the injured person was working with little protection from clothing, especially on the arms and legs. Inhalation of smoke, especially from secondary fires resulting after the initial gas incident, can be another cause of severe injury.
- Workers should know how to give emergency aid until help arrives. Competence in cardio-pulmonary resuscitation and the immediate care of burns and unconsciousness would be an advantage. In remote locations it may be desirable to provide a means of communication, e.g. a mobile phone, so that help can be quickly sought if there is an accident.
- Generally a casualty should not be moved unless in a position of danger. This is particularly important when the person has been thrown some distance and may have suffered injuries in addition to burns. Casualties suffering from the effects of smoke inhalation should be moved into the fresh air and oxygen should be administered if this is available.
- Even ordinary work clothing can greatly reduce the severity of the burns and, of course, flame retardant clothing is better. However, clothing made from man-made fibres such as nylon may melt and stick to the skin increasing the severity of the burns. This document offers no opinion on whether or when flame retardant clothing should be provided or used, employers should consider the matter with respect to their own circumstances. The wearing of flame retardant clothing is no substitute for a safe system of work.
- A sterile covering should be placed over the affected areas as soon as possible to reduce the risk of infection, and all burn cases should receive professional medical attention. Urgent help is essential for severe burns, which can prove fatal.

- A first-aid container, or small travelling first-aid kit (for those working in dispersed locations with no fixed accommodation or storage on site) should be provided. The quantities of equipment should be appropriate for the number of employees involved. Sterile triangular bandages and sterile dressings can be used to cover burns, and a sterile, individually-wrapped, paper disposable sheet or similar sterile covering may be used for burns involving an extensive area.
- Advice on appropriate sources of first-aid training can be obtained from local offices of the Vocational Training Council and voluntary organisations such as the St. John's Ambulance Brigade.

Appendix 3: Gas pipe layout plans to be kept of the locations of underground gas pipes

3.1. It is essential that the gas pipe owners/operators-

- accurately record the locations of their underground gas pipes;
- maintain the accuracy of such records throughout the lifetime of the gas pipe; and
- cooperate with persons wishing to carry out works in the vicinity of gas pipes in providing them with information about the locations of gas pipes.

3.2 Following the implementation of this code of practice, the requirements for keeping and provision of information about gas pipes shall be as follows-

(i) Where a person, gas supply company or its agents constructs an underground gas pipe in any place, plans shall be kept by gas pipe owner/operator indicating the size, material, operating pressure, alignment and depth of the pipe and these shall be maintained for the lifetime of the gas pipe. Comprehensive legends shall be put on their plans to help the recipient to understand the details.

(ii) Where polyethylene gas pipes are laid[1], the individual pipes shall be shown in plans annotated "PE". Where PE pipes have been laid before July 1997, and no approved means of tracing the pipe has been provided, then this shall also be distinctively indicated in the plans.

(iii) The degree of accuracy to which the plans shall be kept shall be sufficient to enable the gas pipe to be readily located for repairs and maintenance. Significant deviations in alignment and depth of gas pipes, and special arrangements of pipes such as where branches are connected, shall be indicated in sufficient detail so as to clearly identify where such deviations and/or pipe arrangements occur.

(iv) All plans shall be properly kept by the gas pipe owners/operators for inspection upon request by the Gas Authority. The Gas Authority may give directions on the appropriate minimum standards for the keeping of such plans, when necessary.

[1] *Note: Generally it is impractical to show materials used for short service pipes and minor alterations and repairs to gas mains and in these circumstances gas pipes may not necessarily be annotated "PE".*

(v) Where the Gas Authority is not satisfied with the standard of plans being kept of underground gas pipes, or where no adequate records are kept, he may direct the gas pipe owners/operators to carry out such investigations as are necessary to establish the location of the gas pipes and to make accurate records at their own expense.

(vi) Where the gas pipe owner/operator has reason to believe, or gives another person reason to believe, that information kept by him on the location of that gas pipe is not sufficiently accurate to allow a person to proceed safely with works in the vicinity of that gas pipe, the owner shall be responsible for tracing the gas pipe. He shall indicate to the person the approximate position and the extent to which hand dug trial holes are necessary to physically verify the location of the gas pipe. The person carrying out the works in the vicinity of the gas pipe shall then excavate any trial holes at his own expense.

(vii) When new information about the location of existing underground gas pipes is informed or found during the course of maintenance works, road alterations, etc. the gas pipe owners/operators shall amend and update their records within 5 working days accordingly.

3.3 Plans prepared after the implementation of this code of practice shall meet the minimum standards of accuracy and detail required by the code of practice.