

# *Advanced Water Leakage Detection of Buried Water Carrying Services*

## *Affecting Slope*

## 檢測斜坡帶水管道 正確方法你要知道



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## Why detect leakage of the buried water carrying services affecting slope?

Remember the disastrous Kwun Lung Lau Incident happened in 1994? One of the reasons was the leakage from the storm drain on the crest of the slope. The leak water saturates and lubricates the soil after heavy rainfall that finally resulted in a landslide. Leakage of the BWCS affecting slope may weaken the soundness of slopes and even cause landslide. As Hong Kong is hilly with massive number of slopes, assessment of the BWCS affecting slope shall be carried out properly and periodically to ensure the structural integrity of the conduits and thus the stability of slopes.

### 為甚麼要為斜坡帶水管道測漏？

猶記得1994年的觀龍樓事件嗎？斜坡地下渠管的滲漏乃其中一個原因，在大雨時，渠管漏出的雨水令斜坡壓力增大，最後倒塌。地下渠管的滲漏會削弱斜坡的穩定性，甚至導致山泥傾瀉。香港的地勢陡峭，斜坡林立，故須定期檢測地下渠管有否滲漏，方能及時維修，以確保斜坡結構完整和穩定。



## Methods for detection

Different methods are available for detecting different types of conduits. Before the investigation, visual inspection of any water spots and seepage on the ground can be performed.

For drains:

1. Closed Circuit Television (CCTV) Survey
2. Man-entry Survey (ME)
3. Manhole Internal Condition Survey

For water mains:

1. Leak Noise Correlation Survey
2. Mechanic/ Electronic Leak Detector
3. Noise Loggers
4. Hydrogen Gas Detection

Note that all surveys shall be carried out by Competent Person who has been trained for the specific discipline. All safety measures shall be carried out properly.

## 檢測方法

檢測方法按管道的種類而定。在檢測前，可先觀察地面有否水漬或滲水。

水渠：

1. 閉路電視檢測
2. 人員進入管內檢測
3. 沙井狀況評估

水管：

1. 漏水噪聲相關儀
2. 機械／電子測漏儀
3. 噪聲記錄儀
4. 氫氣測漏

所有檢測均須由已受訓的合資格人士進行，所有安全措施都必須妥善執行，以保障工人安全。



## Leak detection of drains

### CCTV & ME Survey

Both CCTV and ME Survey aim at observing the internal condition of the conduits. The former is the propulsion of a camera along the conduit while the later is a person passing through the conduit. Steps and points to note:

1. Monitor, camera and camera cable calibration shall be tested everyday before commencement.
2. Camera shall be positioned properly and travel through the sewers at a suitable speed according to the shape and size of the drains.
3. Inspection report shall be submitted after inspection with correct codes, it shall also include video clips, clear photographs and preliminary grading.

### 水渠測漏

閉路電視及人員進入管內檢測的目的皆為觀察管道內部狀況，前者使用閉路電視而後者則由工人進入管道視察。

步驟及注意事項：

1. 每天檢測前，監察器，攝影機及攝影機電纜校準應先進行測試。
2. 攝影機應按管道大小，放置於適當位置，以適當速度穿過管道。
3. 檢測後須撰寫調查報告，報告的特徵編碼必須完全正確，並應附有相關影片，清晰的相片及初步評級。



## Leak detection for water mains

### Leak Noise Correlation Survey (LNC)

The operator shall employ a leak noise correlator to pinpoint the leak location. This method is more scientific as it relies on electronic detection instead of manual listening.

Steps and points to note:

1. Alignment of the pipes shall be traced by utility survey/ utility mapping.
2. The two sensors shall be attached on the contact points of either side of the pipe.
3. Graph generated by the correlator shall be interpreted carefully, though usually the location with the peak frequency is the suspected leak point.

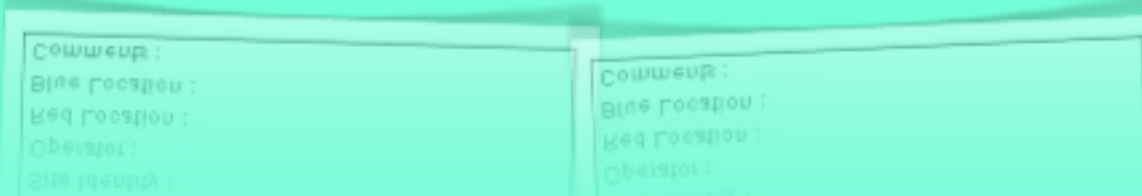
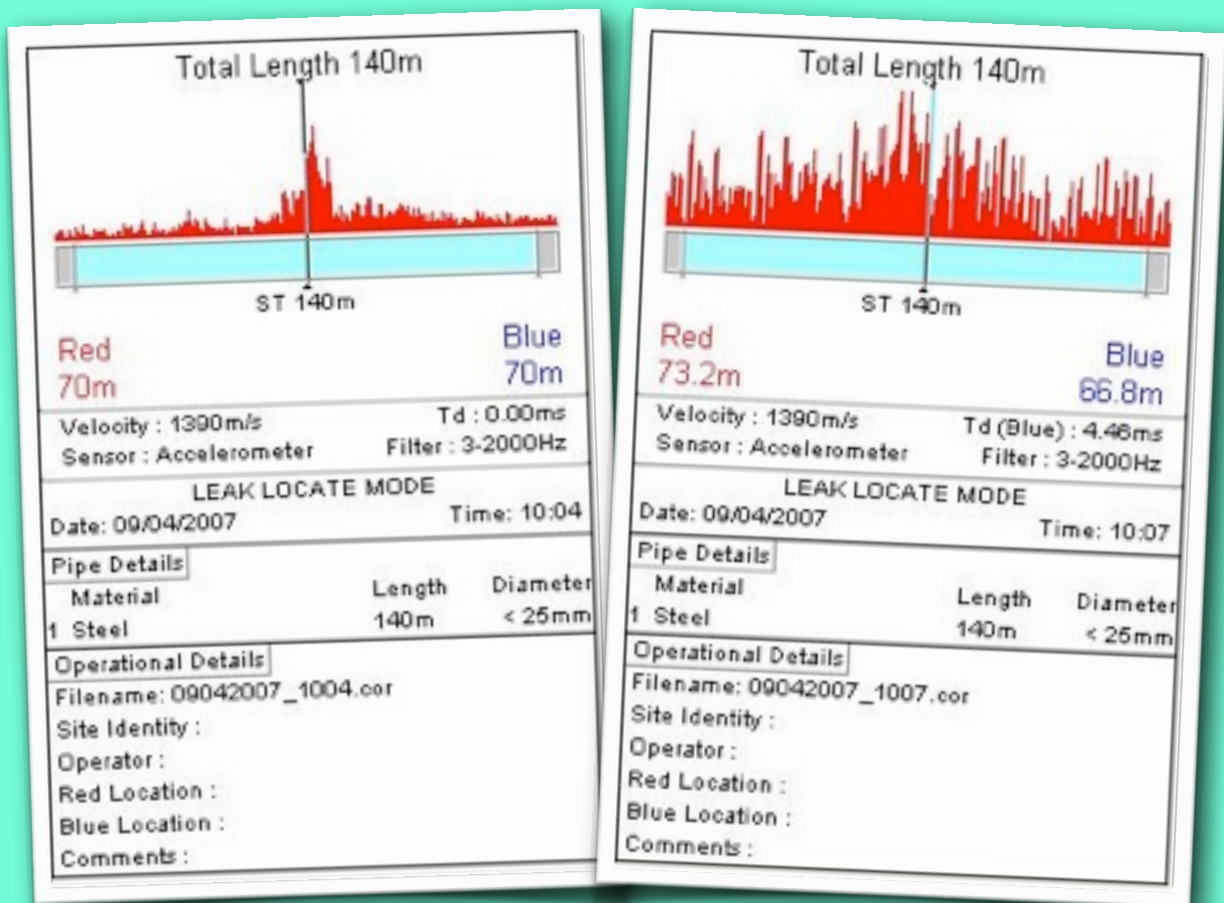
## 水管測漏

### 漏水噪聲相關儀

漏水噪聲相關儀能自動找出水管漏水的位置。相關儀利用電子探測代替人手聽漏，較科學化。

步驟及注意事項：

1. 探測水管的位置及路由。
2. 測漏儀的感應器應接駁水管兩邊的水制／水躉。
3. 雖然峰值的位置多為嫌疑漏水位置，但同時亦必須考慮其他因素，小心分析顯示圖。



## Mechanic Leak Detectors (MLD)

MLD amplifies the leak sounds so that the operator can hear them and find out the leak point. As manual listening and decision-making are keys to the accuracy of survey, accredited and experienced personnel shall be employed. Besides, MLD can be employed to confirm the result of LNC.

Steps and points to note:

1. Alignment of the pipes shall be traced by utility survey/utility mapping.
2. Listen to the valves/ ground along the alignment of the pipe at certain interval to locate the leak point.
3. Repeated listening shall be performed if the exact leak point is unsure.

### 機械聽漏儀

機械聽漏儀將漏水聲放大，檢測人員可循聲尋找漏水點。此方法全賴人手聽漏，檢測人員的判斷乃準確程度的關鍵，故檢測人員必須為合資格人士及具豐富相關經驗。另外，此方法亦可為漏水噪聲相關儀的檢測結果作進一步確認。

步驟及注意事項：

1. 探測水管的位置及路由。
2. 沿著水管的路由，每隔一段距離，將聽漏儀緊貼水制／地面細聽，直止找到漏水點。
3. 若不確定漏水的準確位置，應反覆細聽，以提高準確度。

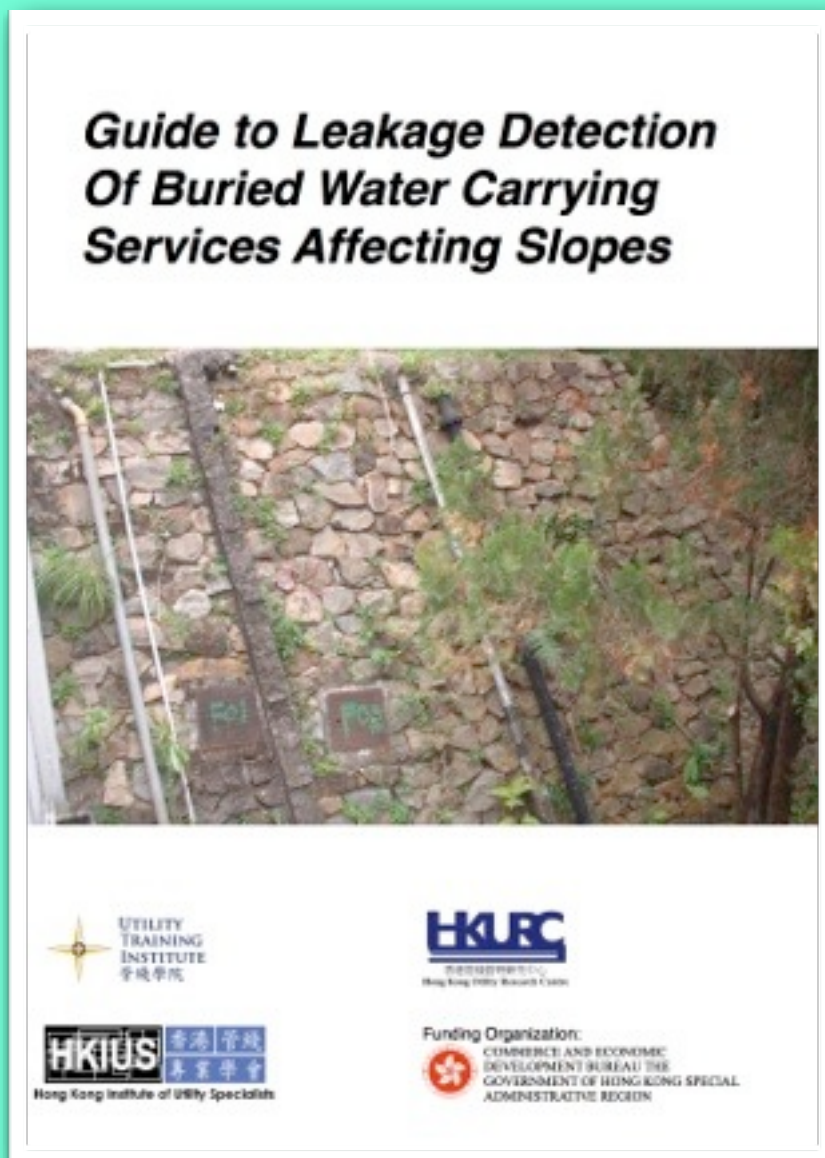


## Further Information

Documents are available for further information about the survey work. The Work Branch has prepared *Code of Practice on Monitoring and Maintenance of Water-carrying Services Affecting Slopes*; this document provides detailed information regarding the methods of inspecting the BWCS affecting slopes. Specifications for the survey works are also included in this CoP. Specifications for 4 utility disciplines: Utility Mapping, CCTV Survey, Manhole Internal Condition Survey and Water Leakage Detection Survey, have been proposed by HKIUS. These specifications set standards for the survey works and can be accessed via [www.hkius.org.hk](http://www.hkius.org.hk).

## 更多資訊

有關檢測的詳情請參閱下列相關文件。由工務局出版的《影響斜坡安全的帶水管道檢查及維修守則》載有各個檢測方法的詳細資料和規格。而香港管綫專業學會亦編制了相關的四個專項的規格，分別是《非破損管綫探測規格》，《管道狀況評估規格（閉路電視檢測）》，《沙井狀況評估規格》及《測漏規格》。該等規格可透過香港管綫專業學會網頁<http://www.hkius.org.hk> 查閱。



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