Hong Kong Institute of Utility Specialists
Non – profit Making Organization

Work Procedure
For
Water Leakage Detection survey
(WLD Survey)

Publisher:

Utility Training Institute (UTI)
A trade name of UTI (International) Ltd. 管綫學院

Supporting Organization:

CCPDC社建
Community & Construction Professionals' Development Centre
社區、建造及工程專業發展中心

Foreword

Since the disastrous landslip that occurred in Kwun Lung Lau on Hong Kong Island on 23 July, 1994. Since 1995, the Government of HKSAR is investing tens of millions of dollars in contracts related to detection of leakage from buried water carrying services (BWCS) both on slopes and on the roads throughout the territory. As expected, this sequence of events generated an increasingly large pool new profession in the Hong Kong market, Utility Specialists (US). Most of the Utility Specialist working almost independently, devoid of any standardized surveying methods and quality requirements (on survey results). No formal registration system was in place for Utility Specialist in the industry as recognized operational personnel in the market before the establishment of HKIUS in 2002.

In addition to the above, HKIUS consider it is the best to have a standardized work procedure for the industry to execute survey works and report under a standardized guideline. By consolidating all various method statements, specifications, training manuals, and the contracts documents produced for the vast number of underground utility survey contracts (government and private projects) available in the market, a comprehensive and standardized work procedure is produced. The standardized work procedure baiscally addressing the following topics in general:

(1) Planning and Preparation on Utility Services Information to be investigated
(2) Requirement of Personnel and Equipment for the Investigation Works
(3) Level of Accuracies
(4) Scheduling and Reporting
(5) Requirement of Deliverables in report format.

Such work procedure provides a straight forward and easy to follow to enable anyone from Client to Contractors and all Utility Specialist to understand. From here HKIUS unify all utility specialists in the Hong Kong market and become world class professionals.

You are welcome to take reference to this Particular Specification for your contract and in case you need further information, please send an e-mail to info@hkius.org.hk or call Ir Dr. King Wong.

Mr, Zico Kai Yip KWOK
(郭啟業先生)
President, HKIUS (2010-11)
April, 2011

If any error or mistake is found in this work procedure, please kindly contact us.
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1. Work procedures of Water Leakage Detection Survey(Leak Noise Correlator) 工作程序- 漏水探測(噪音相關儀)

Note: The working procedures is mainly for ease of site operation checking, details shall refer to relevant method statement submitted separately
注意: 此工作程序主要為地盤施工的檢查帶來方便，詳情請參閱另外提交的工作說明

1. Calibration, Planning and Preparation

Steps 步驟	Calibration, Planning and Preparation 較準，計劃和準備工作	Completed by 檢測者
1	Check Record Plans, Traffic Permit and other information. 檢查圖則，交通許可及其他資料。	
2	Boundary Definition and Visual Inspections for valves, chambers and pits of different utilities. 確認測量範圍，觀察不同管綫的沙井或閥門。	
3	Safety precautions – PTW, TTA, PPE. 執行安全措施，包括工作許可證(PTW)、臨時交通安排、個人保護措施等。	

2. Operation

Steps 步驟	Part 2. Operation 第二部份. 操作程序	Completed by 檢測者
1	WLD shall be carried out by qualified person (OMHKIUS (WLD)) who have been trained and tested with competence under the HKIUS' requirements. All crew leaders (OMHKIUS) shall be trained and tested for competence with at least 3 years experiences in conducting WLD. 漏水探測應由合資格人士執行,即在香港管綫專業學會之要求下接受了訓練以及測試之人士。 所有小組組長應最少擁有 3 年漏水探測的經驗。所有前綫領班/隊長應在香港管綫專業學會接受訓練及考試(合格),並擁有最少 3 年的相關經驗。	

Steps 步驟	Part 2. Operation 第二部份. 操作程序	Completed by 檢測者
2	Connect two microphones (sensors) to the transmitter and processor at either side of the pipe under analysis. Contact points include exposed pipes, valves, hydrants and stopcocks. 在需要分析之喉管的任何一邊連接探頭至發射機和資料處理器。接觸點包括被暴露的喉管、閥門、消防栓和水龍頭/止流栓。	
3	The signal from the transmitter shall be amplified and transmitted by radio telemetry to the processor automatically. The Utility Specialists shall apply different frequencies and filters to obtain the best accuracy results. 從發射機送出的信號將由無綫電遥控自動地放大並且傳送到資料處理器。管綫專業監理師將會應用不同的頻率和過濾器去得到最準確的結果。	
4	Type of pipe material, pipe diameter, pipe length under investigation shall be entered into the correlator correctly to reflect the field measurement or as provided in the record Drawings. 需要勘察之喉管的材料,直徑和長度等資料應正確地輸入至相關儀去實行工地量度。	
5	Sound propagator from the leak to each sensor. The processor compares this signal and determines the difference between the time taken from the leak to reach one sensor compared to the other, and the distance of the leak from the sensors at each end of the pipe shall be computed and the leak position shall be automatically indicated. 洩漏聲會經過聲音擴散器傳輸到探頭。 資料處理器會自行比較和分辨探頭接收的信號所需要的時間,計算洩漏位置與在喉管末端的探頭之距離,最後洩漏位置將自動被顯示。	
6	Photographs should be taken at each LNC setup points and submitted with the survey report. 應該在每個 LNC 設定點拍照並遞交勘察報告。	

3. Report

Steps 步驟	Part 3. Report 第三部份. 報告	Completed by 檢測者
1	Process raw data from site team. 整理現場搜集的資料。	
2	Record the survey information and send the results to the client for each surveyed pipe. 記錄勘察結果並且發送至客戶。	
3	Report shall consist of the followings 報告需包含以下項目 (1) Name of Operator(s), (A/O/M/FHKIUS) (2) Location of Survey, (3) Date and Time of Survey, (4) Total length of survey, (5) Number of survey setups, (6) Results (LNC print outs), (7) Analysis of Results, (8) Suspected or confirmed leak location with plan, (9) Any difficulties encountered, (10) Recommendations	
4	All reports shall be drafted by MHKIUS (WLD) or MHKIE or MHKIS with at least 5 years relevant experiences. Survey report shall be checked and endorsed by RPUS (WLD) or MHKIE or MHKIS with at least 10 years relevant experiences. 所有報告應由最少擁有 5 年經驗的香港管綫專業學會會員(MHKIUS)(WLD))或最少擁有 10 年相關經驗的香港工程師學會會員(MHKIE)或香港測量師學會會員(MHKIS)擬定。 勘測報告將由最少擁有 10 年相關經驗的香港管綫專業學會會員(管綫專業監察師)(RPUS)(WLD))或最少擁有 10 年相關經驗的香港工程師學會會員或香港測量師學會會員檢查並且簽名作實。	

4. Final Verification

Steps 步驟	Part 4. Final Verification (if requested by the client) 第四部份 最後驗證 (如客戶要求)	Completed by 檢測者
1	If clients required, a random sample of 5%(desktop) and 1%(on site) of the whole survey work will be picked up for audit. 如客戶要求，工程的的 5% 報告檢查或 1% 工地檢查會被抽樣作樣本檢查。	
2	Samples will be checked by the competent person from another group from the same company or from other company as client request. 樣本會由另一組合資格人士作檢查。	
3	Update the utility survey drawing for final reporting after audit. 在抽樣檢查後更新管綫成果圖作為最後報告。	

2. Work procedures of Water Leakage Detection Survey (by Mechanical Leak Detector) 工作程序-漏水探測(機械式聽音棒)

Note: The working procedures is mainly for ease of site operation checking, details shall refer to relevant method statement submitted separately
注意: 此工作程序主要為地盤施工的檢查帶來方便，詳情請參閱另外提交的工作說明

1. Calibration, Planning and Preparation

Steps 步驟	Part 1. Calibration, Planning and Preparation 第一部份. 較準, 計劃和準備工作	Completed by 檢測者
1	Check Record Plans, Traffic Permit and other information. 檢查圖則，交通許可及其他資料。	
2	Boundary Definition and Visual Inspections for valves, chambers and pits of different utilities. 確認測量範圍，觀察不同管綫的沙井或閥門。	
3	Safety precautions – PTW, TTA, PPE. 執行安全措施，包括工作許可證(PTW)、臨時交通安排、個人保護措施等。	

2. Operation

Steps 步驟	Operation 操作程序	Completed by 檢測者
1	WLD shall be carried out by qualified person (OMHKIUS (WLD)) who have been trained and tested with competence under the HKIUS' requirements. All crew leaders (OMHKIUS) shall be trained and tested for competence with at least 3 years experiences in conducting WLD. 漏水探測應由合資格人士執行,即在香港管綫專業學會之要求下接受了訓練以及測試之人士。 所有小組組長應最少擁有 3 年漏水探測的經驗。所有前綫領班/隊長應在香港管綫專業學會接受訓練及考試(合格),並擁有最少 3 年的相關經驗。	
2	The Utility Specialists (qualified person) is responsible to find the location and alignment of water main by using pipe locator for locating pipes if necessary. 如有需要,管綫專業監理師(合資格人士)需要利用綫道測量器找出主要水管的位置和綫道。	

Steps 步驟	Operation 操作程序	Completed by 檢測者
3	Use contact microphone(sensor) to listen for leak sounds at meters, hydrants, valves and other points of direct contact. 使用探頭細聽計量器、消防栓、閥門和其他地點是否有洩漏聲音。	
4	Place the sensing heads(sensors) on the ground firmly against the surface. 固定探頭在地面。	
5	Move the sensing heads(sensors) along the top of water main until the sound is the same intensity in both sensing heads and reaches both ears at the same time. This is the spot directly above the leak 沿著大水管的頂部移動探頭,直到聲音的強度和兩個探頭的強度達至一致,那就是滲漏的位置。	

3. Report

Steps 步驟	Report 報告	Completed by 檢測者
1	Process raw data from site team. 整理現場搜集的資料。	
2	Record the survey information and send the results to the client for each surveyed pipe. 記錄勘察結果並且發送至客戶。	

Steps 步驟	Report 報告	Completed by 檢測者
3	Report shall consist of the followings 報告需包含以下項目 (1) Name of Operator(s), (A/O/M/FHKIUS) (2) Location of Survey, (3) Date and Time of Survey, (4) Total length of survey, (5) Number of survey setups, (6) Results (LNC print outs), (7) Analysis of Results, (8) Suspected or confirmed leak location with plan, (9) Any difficulties encountered, (10) Recommendations	
4	All reports shall be drafted by MHKIUS (WLD) or MHKIE or MHKIS with at least 5 years relevant experiences. Survey report shall be checked and endorsed by RPUS (WLD) or MHKIE or MHKIS with at least 10 years relevant experiences. 所有報告應由最少擁有 5 年經驗的香港管綫專業學會會員(MHKIUS)(WLD))或最少擁有 10 年相關經驗的香港工程師學會會員(MHKIE)或香港測量師學會會員(MHKIS)擬定。 勘測報告將由最少擁有 10 年相關經驗的香港管綫專業學會會員(管綫專業監察師)(RPUS)(WLD))或最少擁有 10 年相關經驗的香港工程師學會會員或香港測量師學會會員檢查並且簽名作實。	

4. Final Verification

Steps 步驟	Part 4. Final Verification (if requested by the client) 第四部份 最後驗證 (如客戶要求)	Completed by 檢測者
1	If clients required, a random sample of 5%(desktop) and 1%(on site) of the whole survey work will be picked up for audit. 如客戶要求，工程的的 5% 報告檢查或 1% 工地檢查會被抽樣作樣本檢查。	
2	Samples will be checked by the competent person from another group from the same company or from other company as client request. 樣本會由另一組合資格人士作檢查。	

Steps 步驟	Part 4. Final Verification (if requested by the client) 第四部份 最後驗證 (如客戶要求)	Completed by 檢測者
3	Update the utility survey drawing for final reporting after audit. 在抽樣檢查後更新管綫成果圖作為最後報告。	

3. Work procedures of Water Leakage Detection Survey (by Electronic Leak Detector) 工作程序-漏水探測(電子式聽音棒)

Note: The working procedures is mainly for ease of site operation checking, details shall refer to relevant method statement submitted separately
注意: 此工作程序主要為地盤施工的檢查帶來方便，詳情請參閱另外提交的工作說明

1. Calibration, Planning and Preparation

Steps 步驟	Calibration, Planning and Preparation 較準，計劃和準備工作	Completed by 檢測者
1	Check Record Plans, Traffic Permit and other information. 檢查圖則，交通許可及其他資料。	
2	Boundary Definition and Visual Inspections for valves, chambers and pits of different utilities. 確認測量範圍，觀察不同管綫的沙井或閥門。	
3	Safety precautions – PTW, TTA, PPE. 執行安全措施，包括工作許可證(PTW)、臨時交通安排、個人保護措施等。	

2. Operation

Steps 步驟	Part 2. Operation 第二部份. 操作程序	Completed by 檢測者
1	WLD shall be carried out by qualified person (OMHKIUS (WLD)) who have been trained and tested with competence under the HKIUS' requirements. All crew leaders (OMHKIUS) shall be trained and tested for competence with at least 3 years experiences in conducting WLD. 漏水探測應由合資格人士執行,即在香港管綫專業學會之要求下接受了訓練以及測試之人士。 所有小組組長應最少擁有 3 年漏水探測的經驗。所有前綫領班/隊長應在香港管綫專業學會接受訓練及考試(合格),並擁有最少 3 年的相關經驗。	
2	The Utility Specialists (qualified person) is responsible to find the location and alignment of water main. The Utility Specialists shall use pipe locator for locating pipes if necessary. 如有需要,管綫專業監理師(合資格人士)需要利用綫道測量器找出主要水管的位置和綫道。	

Steps 步驟	Part 2. Operation 第二部份. 操作程序	Completed by 檢測者
3	Use contact microphone(sensors) to listen for leak sounds at meters, hydrants, valves and other points of direct contact. 使用探頭細聽計量器、消防栓、閥門和其他地點是否有洩漏聲音。	
4	Place the sensing heads(sensors) on the ground firmly against the surface. 固定探頭在地面。	
5	Take readings along the top of water main at two meters interval. Listen to the sound, and adjust the filter for the highest response to the leak frequency to locate the leaks. 沿著主要水管二米間隔的地方獲取讀數。細聽聲音，並且調整過濾器至最高的洩漏頻率去找出洩漏位置。	

3. Report

Steps 步驟	Part 3. Report 第三部份. 報告	Completed by 檢測者
1	Process raw data from site team. 整理現場搜集的資料。	
2	Record the survey information and send the results to the client for each surveyed pipe. 記錄勘察結果並且發送至客戶。	
3	Report shall consist of the followings 報告需包含以下項目 (1) Name of Operator(s), (A/O/M/FHKIUS) (2) Location of Survey, (3) Date and Time of Survey, (4) Total length of survey, (5) Number of survey setups, (6) Results (LNC print outs), (7) Analysis of Results, (8) Suspected or confirmed leak location with plan, (9) Any difficulties encountered, (10) Recommendations	

Steps 步驟	Part 3. Report 第三部份. 報告	Completed by 檢測者
4	All reports shall be drafted by MHKIUS (WLD) or MHKIE or MHKIS with at least 5 years relevant experiences. Survey report shall be checked and endorsed by RPUS (WLD) or MHKIE or MHKIS with at least 10 years relevant experiences. 所有報告應由最少擁有 5 年經驗的香港管綫專業學會會員(MHKIUS)(WLD))或最少擁有 10 年相關經驗的香港工程師學會會員(MHKIE)或香港測量師學會會員(MHKIS)擬定。 勘測報告將由最少擁有 10 年相關經驗的香港管綫專業學會會員(管綫專業監察師)(RPUS)(WLD))或最少擁有 10 年相關經驗的香港工程師學會會員或香港測量師學會會員檢查並且簽名作實。	

4. Final Verification

Steps 步驟	Part 4. Final Verification (if requested by the client) 第四部份 最後驗證 (如客戶要求)	Completed by 檢測者
1	If clients required, a random sample of 5%(desktop) and 1%(on site) of the whole survey work will be picked up for audit. 如客戶要求，工程的的 5% 報告檢查或 1% 工地檢查會被抽樣作樣本檢查。	
2	Samples will be checked by the competent person from another group from the same company or from other company as client request. 樣本會由另一組合資格人士作檢查。	
3	Update the utility survey drawing for final reporting after audit. 在抽樣檢查後更新管綫成果圖作為最後報告。	

4. Work procedures of Water Leakage Detection Survey (by Noise Logger) 工作程序-漏水探測((漏水噪聲紀錄儀)

Note: The working procedures is mainly for ease of site operation checking, details shall refer to relevant method statement submitted separately
注意: 此工作程序主要為地盤施工的檢查帶來方便，詳情請參閱另外提交的工作說明

1. Calibration, Planning and Preparation

Steps 步驟	Part 1. Calibration, Planning and Preparation 第一部份. 較準, 計劃和準備工作	Completed by 檢測者
1	Check Record Plans, Traffic Permit and other information. 檢查圖則，交通許可及其他資料。	
2	Boundary Definition and Visual Inspections for valves, chambers and pits of different utilities. 確認測量範圍，觀察不同管綫的沙井或閥門。	
3	Safety precautions – PTW, TTA, PPE. 執行安全措施，包括工作許可證(PTW)、臨時交通安排、個人保護措施等。	

2. Operation

Steps 步驟	Operation 操作程序	Completed by 檢測者
1	WLD shall be carried out by qualified person (OMHKIUS (WLD)) who have been trained and tested with competence under the HKIUS' requirements. All crew leaders (OMHKIUS) shall be trained and tested for competence with at least 3 years experiences in conducting WLD. 漏水探測應由合資格人士執行,即在香港管綫專業學會之要求下接受了訓練以及測試之人士。 所有小組組長應最少擁有 3 年漏水探測的經驗。所有前綫領班/隊長應在香港管綫專業學會接受訓練及考試(合格),並擁有最少 3 年的相關經驗。	
2	The Utility Specialists (qualified person) shall carry out the preparation works, visual inspection and seepage water sampling and reporting, etc. 管綫專業監理師(合資格人士)應進行準備工作,包括視野檢測,水滲漏採樣和報告等等。	

Steps 步驟	Operation 操作程序	Completed by 檢測者
3	Install loggers to listen for leak sounds at appropriate locations of the pipe under analysis. The spacing between noise loggers shall not exceed 100m unless otherwise requested by the client. 安裝漏水聲噪紀錄儀在需要分析之喉管的適當位置,並細聽洩漏聲音。除非客戶個別要求,否則喉管與漏水聲噪紀錄儀之間的間距不可超過 100 米。	
4	The data from the logger shall be transmitted by radio signal to the receiver. The logger shall be interrogated from a moving vehicle or human. 從漏水聲噪紀錄儀獲取的數據將由無綫電信號發送至接收器。 漏水聲噪紀錄儀可以利用人手或者汽車移動。	
5	The information shall be downloaded into a computer to display the leak position. 把數據包括喉管洩漏的位置下載至電腦分析。	

3. Report

Steps 步驟	Report 報告	Completed by 檢測者
1	Process raw data from site team. 整理現場搜集的資料。	
2	Record the survey information and send the results to the client for each surveyed pipe. 記錄勘察結果並且發送至客戶。	

Steps 步驟	Report 報告	Completed by 檢測者
3	Report shall consist of the followings 報告需包含以下項目 (1) Name of Operator(s), (A/O/M/FHKIUS) (2) Location of Survey, (3) Date and Time of Survey, (4) Total length of survey, (5) Number of survey setups, (6) Results (LNC print outs), (7) Analysis of Results, (8) Suspected or confirmed leak location with plan, (9) Any difficulties encountered, (10) Recommendations	
4	All reports shall be drafted by MHKIUS (WLD) or MHKIE or MHKIS with at least 5 years relevant experiences. Survey report shall be checked and endorsed by RPUS (WLD) or MHKIE or MHKIS with at least 10 years relevant experiences. 所有報告應由最少擁有 5 年經驗的香港管綫專業學會會員(MHKIUS)(WLD))或最少擁有 10 年相關經驗的香港工程師學會會員(MHKIE)或香港測量師學會會員(MHKIS)擬定。 勘測報告將由最少擁有 10 年相關經驗的香港管綫專業學會會員(管綫專業監察師)(RPUS)(WLD))或最少擁有 10 年相關經驗的香港工程師學會會員或香港測量師學會會員檢查並且簽名作實。	

4. Final Verification

Steps 步驟	Part 4. Final Verification (if requested by the client) 第四部份 最後驗證 (如客戶要求)	Completed by 檢測者
1	If clients required, a random sample of 5%(desktop) and 1%(on site) of the whole survey work will be picked up for audit. 如客戶要求，工程的的 5% 報告檢查或 1% 工地檢查會被抽樣作樣本檢查。	
2	Samples will be checked by the competent person from another group from the same company or from other company as client request. 樣本會由另一組合資格人士作檢查。	

Steps 步驟	Part 4. Final Verification (if requested by the client) 第四部份 最後驗證 (如客戶要求)	Completed by 檢測者
3	Update the utility survey drawing for final reporting after audit. 在抽樣檢查後更新管綫成果圖作為最後報告。	