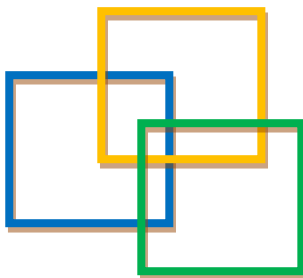




Hong Kong Institute of Utility Specialists  
Non – profit Making Organization

# Work Procedure For Conduit Condition Evaluation (CCTV and Man Entry Survey)



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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 basically 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](mailto:info@hkius.org.hk) or call Ir Dr. King Wong.



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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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# Conduit Condition Evaluation(CCTV and Man Entry Survey)

## 1. Work Procedures for Conduit Condition Evaluation by using CCTV Survey

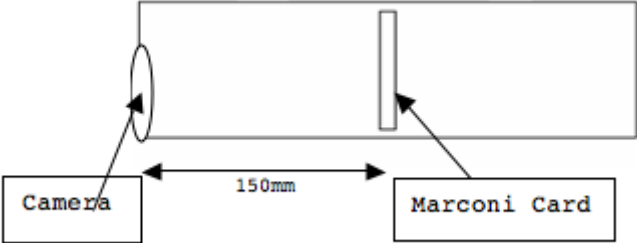
### 工作程序-管道狀況評價(閉路電視檢測)

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

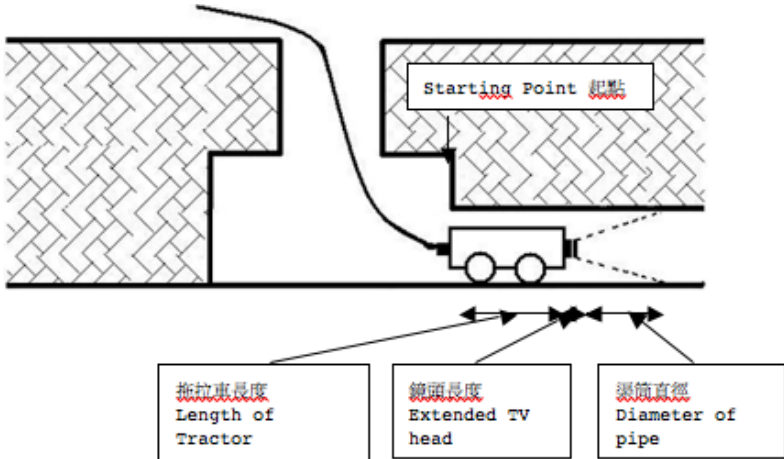
### 1. Calibration, Planning and Preparation

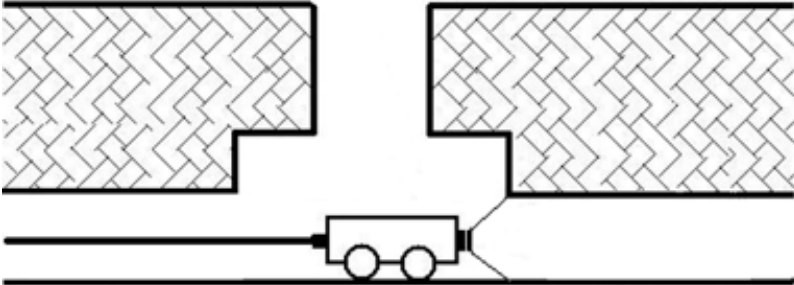
Steps 步驟	Part 1. Calibration, Planning and Preparation 第一部份 較準，計劃和準備工作	Completed by 檢測者
1	Collect all information available regarding the asset from the client (asset owner) 向客戶/ 資產擁有者索取所有相關資料。	
2	High pressure water jetting if necessary or requested by the client 如有需要或客戶要求，應進行高壓清洗。	
3	Safety precautions include Permit-to-work (PTW), Temporary Traffic Arrangement (TTA), Personal Protective Equipment (PPE), etc. 執行安全措施，包括工作許可証(PTW)、臨時交通安排、個人保護措施等。	
4	Assemble the CCTV components (refer to Fig.1) 組合閉路電視部件 (參考圖一)。	

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
	<p>Calibration of equipments before commencing the survey everyday 每天檢測前必須檢查儀器和作電纜較準。</p> <p>Monitor and Camera Test by Marconi Resolution Chart No.1 (refer to Fig. 1) 使用 Marconi Resolution Chart No.1 作螢幕及攝影機檢查。(參考圖五) (Picture quality samples in method statement) (畫面質素載於工作說明)</p> <p>The distance between Camera and Marconi Card should be kept in 150mm during the calibration. 當進行較準時，攝影機鏡頭應與 Marconi Card 的距離保持 150 毫米</p>  <p style="text-align: center;">Fig. 1 圖一</p> <p>Cable Calibration (30-50m,+/-0.3m or 1%) whichever is bigger. 電纜較準 (30-50 米, +/-0.3 米或 1%) 以較大為準。</p>	

**2. Operation**

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	<p>Operation shall be carried out by OMHKIUS(at least 3 years experience) or AMHKIUS (at least 2 years experience). The whole operation must be supervised by OMHKIUS. 操作員應為管綫專業監理員(最少三年經驗)或助理管綫專業監理員(最少兩年經驗)。整個探測過程必須由管綫專業監理員監督。</p>	
2	<p>For pipe size &gt; 750mm, roller should be installed for the cable control. 如渠筒大於或等於 750 毫米時，應安裝滾輪以便控制電纜進度。</p>	

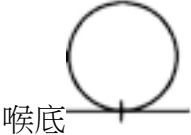
Steps 步驟	Part 1. Calibration, Planning and Preparation 第一部份 較準，計劃和準備工作	Completed by 檢測者
3.1	<p>If it is necessary to use tractor for CCTV survey, the steps should be as follows: 如需使用拖拉車協助進行閉路電視檢測，應參照下列步驟：</p> <p><b>Case 1: Terminal Manhole</b> 方案一：起點/終點井</p>  <p style="text-align: center;">Fig. 2</p> <p>Chainage length at starting point = Length of (inserted tractor + extended TV head + Diameter of pipe) 管道開始長度 = 拖拉車長度 + 鏡頭長度 + 渠筒直徑</p> <p>Release the cable around 1.5m before the tractor entering to start point. And set the reading to be zero; 在拖拉車未進入渠筒前，放鬆纜繩約 1.5 米，然後調較讀數為零；</p> <p>Start recording before the tractor entering to the pipe; 在拖拉車進入渠筒前，開始記錄；</p> <p>When the tractor entering to the start point, the reading of the distance should be kept to zero until the tractor completely entered to pipeline and stopped; 當拖拉車進入渠筒時，距離讀數應保持為 0 米，直到拖拉車完全進入渠筒內，然後停下來；</p> <p>Strain the cable; 將纜繩拉緊；</p> <p>By referring to the diameter of pipe and the tractor model, select the proper chainage and then input to CCTV. (Chainage can be refer to the Table 1 根據渠筒直徑及拖拉車型號，選擇 Chainage 長度及輸入在 CCTV 儀器內；(Chainage 長度可參考附表一)</p>	

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																																																
3.2	<p><b>Case 2: Passing Through Manhole</b> 方案二：通過沙井</p>  <p style="text-align: center;">Fig. 3</p> <p>When CCTV survey is completed for Pipe X, the tractor moves to point A location ; 當 PipeX 完成閉路電視檢測後，將拖拉車行到 PointA 位置；</p> <p>The camera should clearly display the opening of the pipe when the tractor locates at Point A ; 當拖拉車在 PointA 位置時，鏡頭需清楚看到整個渠筒口；</p> <p>Set the reading to be zero ; 調較讀數為零；</p> <p>Start to carry out CCTV survey for Pipe Y 開始進行 Pipe Y 的閉路電視檢測。</p> <p>Table 1 表一:</p> <table border="1"> <thead> <tr> <th>CCTV Model</th> <th>Telespec SP-CCTV-10-006</th> <th>Pearpoint (P332)</th> <th>Pearpoint (P350)</th> </tr> <tr> <th>Diameter of pipe (mm) 渠筒直徑 (毫米)</th> <th>Chainage (m) 長度 (米)</th> <th>Chainage (m) 長度 (米)</th> <th>Chainage (m) 長度 (米)</th> </tr> </thead> <tbody> <tr><td>150</td><td>1.0</td><td>0.45</td><td>0.75</td></tr> <tr><td>200</td><td>1.0</td><td>0.50</td><td>0.80</td></tr> <tr><td>225</td><td>1.0</td><td>0.52</td><td>0.82</td></tr> <tr><td>250</td><td>1.0</td><td>0.55</td><td>0.85</td></tr> <tr><td>300</td><td>1.0</td><td>0.60</td><td>0.90</td></tr> <tr><td>375</td><td>1.0</td><td>0.67</td><td>0.97</td></tr> <tr><td>400</td><td>1.0</td><td>0.70</td><td>1.00</td></tr> <tr><td>450</td><td>1.0</td><td>0.75</td><td>1.05</td></tr> <tr><td>525</td><td>1.0</td><td>0.2</td><td>1.12</td></tr> <tr><td>600</td><td>1.0</td><td>0.90</td><td>1.20</td></tr> </tbody> </table> <p>Remark: SP-CCTV-10-006 can only display 1 decimal place. 備註: SP-CCTV-10-006 只可顯示一個小數位 (Correct to 2 decimal places) (顯示二個小數位)</p>	CCTV Model	Telespec SP-CCTV-10-006	Pearpoint (P332)	Pearpoint (P350)	Diameter of pipe (mm) 渠筒直徑 (毫米)	Chainage (m) 長度 (米)	Chainage (m) 長度 (米)	Chainage (m) 長度 (米)	150	1.0	0.45	0.75	200	1.0	0.50	0.80	225	1.0	0.52	0.82	250	1.0	0.55	0.85	300	1.0	0.60	0.90	375	1.0	0.67	0.97	400	1.0	0.70	1.00	450	1.0	0.75	1.05	525	1.0	0.2	1.12	600	1.0	0.90	1.20	
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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
4	<p>At the start point, place the CCTV into the conduit at suitable position (centered with tolerance within +/-10% of the internal diameter).</p> <p>開始時，將閉路電視置於管道內的適當位置 (置喉中，誤差為直徑的+/-10%)。</p>	
5	<p>Fill all the information in the form first and then enter to the computer. Check any mistake between the filled form and the screen before starting CCTV survey.</p> <p>填寫所需的檢測資料於表格上，然後輸入電腦。於錄影前再核對畫面上的資料與表格上的是否一致。</p>	
6	<p>At page 1, enter survey data and display for at least 15 seconds (refer to Fig.2).</p> <p>於頁一輸入檢測資料並於畫面上顯示最少十五秒 (參考圖二)。</p>	
7	<p>At page 2, enter survey data and display on screen throughout the survey (refer to Fig. 3 &amp; Fig. 4).</p> <p>於頁二輸入檢測資料並在檢測全程顯示於畫面上 (參考圖三及圖四)。</p>	
8	<p>CCTV should travel at suitable speed (<math>\leq 0.2\text{m/s}</math>)</p> <p>閉路電視應以適當速度行駛 (<math>\leq</math>每秒 0.2 米)。</p> <p>0.1m/s, for Internal Diameter (內徑)<math>&lt; 200\text{mm}</math>  0.15m/s, for <math>200\text{mm} \leq</math> Internal Diameter(內徑)<math>\leq 300\text{mm}</math>  0.2m/s, for Internal Diameter (內徑)<math>&gt; 300\text{mm}</math></p>	
9	<p>On site operation by A/OMHKIUS.</p> <p>即場由合資格操作員進行操作(助理或管綫專業監理員，至少兩年經驗)。</p>	
10	<p>On site coding by qualified operator (OMHKIUS, at least 3 years experience)</p> <p>即場由合資格操作員進行編碼(管綫專業監理員，至少三年經驗)。</p>	

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
11	Code whenever defect is encountered, pan and zoom on the defect if it is a significant one. 若發現有缺陷，應立即進行編碼，若是較嚴重的缺陷，應轉向並放大它，以便觀察。	
12	Take note if there is any special circumstances 如有任何特別情況，應紀錄下來。	
13	On site preliminary coding in site coding sheet 即場將初步編碼填寫於現場編碼表格內。	
14	Finish survey or survey abandoned with reason noted. 完成勘查。如放棄勘查，需注明原因。	
15	QA/QC check on site by verifying some of the located alignment and check with existing records again. Determine which information is correct on site if there are difference with the records. 即場作品質監控，驗證一些已標記的路由並與現時的紀錄作對比，如與圖則有差異，需即場決定哪個是正確的資料。	
16	Clean and tidy up the equipment and site 收拾、清潔儀器及還原現場。	
17	Hand in raw data and completed forms (see attachment) to report team. 將現場搜集的資料和檢測者的記錄表格(附件)交給報告組。	

**2.1 Accuracy Requirements**

Accuracy Requirements 準確性要求	Standard /Tolerance 標準／公差
Depth of duct direct measurement 直接量度管綫的深度	Bottom of duct  喉底
Cross checking length of duct 驗證管綫的長度	Ground surface 地面 (Note 注意: Length will be different due to gradient in pipe. 管綫的長度因自身的傾斜度會和地面長度有別。)

**3. Report**

Steps 步驟	Part 3. Report 第三部份 報告	
1	Process raw data from site. 整理現場搜集的資料。	
2	Check site records against existing Record Plans. 核對現場紀錄及原有紀錄圖則。	
3	Create technical report with site records, photographs, signature and proposed trial pit location (if necessary). 製作技術報告包括現場紀錄、相片、簽名及建議挖掘試孔位置（如有需要）。	
4	QA/QC before reporting by MHKIUS (at least 5 year experience). 報告前由管綫專業監理師進行品質監控程序（最少五年經驗）。	

Steps 步驟	Part 3. Report 第三部份 報告	
5	<p>Report shall consist of the followings. 報告需包含以下項目。</p> <ol style="list-style-type: none"> <li>(1) Operator's report – background information, summary of pipes, summary of defects, recommendations 檢測報告－背景資料、管道摘要、缺陷摘要、建</li> <li>(2) Layout plan 工作現場圖</li> <li>(3) Video record – video record of the entire inspection 影像紀錄－檢測全程的影像紀錄。</li> <li>(4) Survey result 檢測結果</li> <li>(5) Photographs - general photographs at 5m interval (if 相片－每五米一張一般相片(如無發現缺陷) 紀錄缺陷的缺陷相片，缺陷必須清楚顯示</li> <li>(6) Final grading of internal condition by RPUS. 內部狀況的最終評級由管綫專業監察師(至少八年</li> </ol>	

#### 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 檢測者
1	<p>If clients request, 5% samples of the whole project and 1% samples taken on site will be picked up randomly for audit. 如客戶要求，工程報告中的 5% 樣本及工地中的 1% 樣本會被抽出作抽樣檢查。</p>	
2	<p>Samples will be checked by the competent person from another group from the same company or competent person from third party as client request. 樣本將會由同一公司中另一組合資格人仕或獨立組織中的合資格人仕作出檢查核對。</p>	
3	<p>The utility survey drawing for final report will then be reviewed and updated after audit. 在抽樣檢查完成後，管綫成果圖會作出更新並加入最後報告中。</p>	



Fig.1 Assemble the CCTV components  
圖一. 組合閉路電視部件。



Fig.2 Data at Pages 1  
圖二. 頁一資料



Fig. 3 Data at Page 3  
圖三. 頁三資料



Fig.4 Data at Page 2  
圖四. 頁三資料

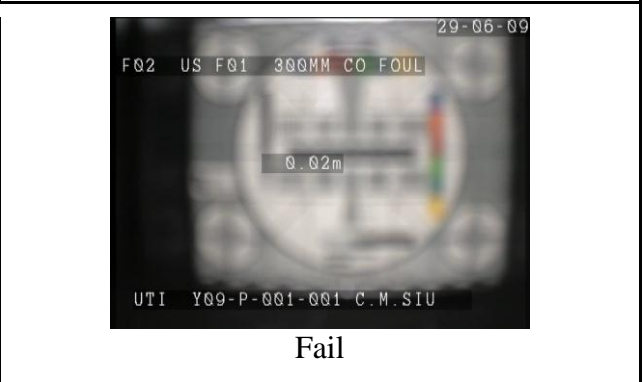
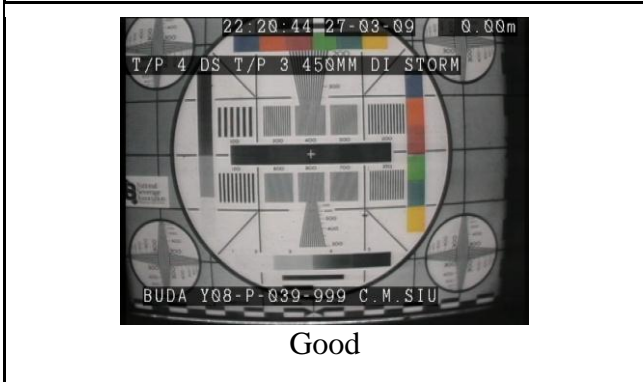


Fig. 5 Monitor and Camera Test by Marconi Resolution Chart No.1  
圖五. 使用 Marconi Resolution Chart No.1 作螢幕及攝影機檢查。

