Hong Kong Institute of Utility Specialists

Non – profit Making Organization

Particular Specification For Manhole Internal Condition Survey

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Foreword

It's been more than ten years now since the disastrous landslip that occurred in Kwun Lung Lau on Hong Kong Island on 23 July, 1994. Since 1995, the Government of HKSAR has awarded 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 of "Utility Specialists (US)", with most working almost independently, devoid of any standardized surveying methods, quality requirements (on survey results) and the "registration" of operation personnel in the market before the establishment of HKIUS in 2002.

In view of the availability of the multitude of method statements, specifications, training manuals, and the contracts documents produced for the vast number of underground utility survey contracts (by government and private projects), the following sections try to provide a comprehensive set of method statement, by addressing the following topics in general and where the abbreviation can be found in the Appendix:

(1) Utility Services Information to be Investigated
(2) Level of Accuracies
(3) Types of Deliverables and Schedules
(4) Requirements for Deliverables

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.

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B1. Description

Manhole Internal Condition Survey (MHICS) provides information on the features and defects of the manholes like whether there are excessive infiltration and inflow. It also provides information for system maintenance. With information on the manhole condition constantly, remedial actions can be taken in time and in turn prevent potential landslips.
For manhole inspection, safety are particularly important because it may involve entry into confined space which with potential high risks. Besides, special attentions shall be paid on record taking, as there are specific systems for recording different information like the numbering system and referencing system.

B2. Survey Equipment

B2.1 General Equipment

The Utility Specialists shall equip the team undertaking the manhole survey work with the following:

(1) Equipment for easing and lifting manhole covers;

(2) Sewer safety equipment;

(3) Road safety equipment.

(4) Personnel Protective Equipment, PPE.

B2.2 Personal Protective Equipment

PPE shall include:

(1) Steel toe cap, rubber safety boots

(2) Safety helmet

(3) Safety vest (reflective at night)

(4) Safety goggles/Anti-glare glasses

(5) Breathing apparatus/Disposable respirator

(6) Harness and Fall arrester

(7) Gloves

(8) Ear muffs / ear plugs

(9) Handy gas detector

(10) Audio-visual alarm

(11) Resuscitator

B2.3 Equipment for confined Space

All works carried out within sewers, manholes or other confined spaces shall be performed in accordance with the requirements for works in the vicinity of Confined Space and Occupational Health and Safety Legislations, as well as any additional precautions that may be specified by the asset owner.

B3. Survey procedure

B3.1 Scope of Reconnaissance survey

The Utility Specialist shall conduct a reconnaissance survey at each slope/site before commencement of works. The survey shall cover the full survey extent as confirmed on the Layout Plans. The reconnaissance survey shall identify:

(1) The full extent of the assets (manholes, pipes, catch-pits and other ancillaries) located within the survey extents

(2) Any other manholes, pipes, catch-pits and other ancillaries.

(3) For pipelines extending beyond the survey extent the closest upstream and downstream manholes outside the survey extent.

(4) Any salient features which may impede the execution of the surveys

(5) Any additional features not shown on the base mapping or the Layout Plans, and/or revisions required to match existing conditions on-site.

The Utility Specialists shall establish the ownership of all manholes, pipes, catchpits and other ancillaries identified within the survey extent.

It is the Utility Specialists' responsibility to ascertain the ownership of manholes and pipes based on site survey information together with the latest available information from various sources.

The Utility Specialists shall ensure that all reconnaissance surveys, manhole surveys, pipeline investigations and all other surveys are carried-out under the supervision of an operative/professional member of HKIUS (O/M/FHKIUS) or otherwise agreed with the client. Any surveys carried-out without the supervision, or any data from such surveys, shall not be accepted and any such surveys will be required to be repeated under the supervision at no extra cost to the Contract.

The Utility Specialists shall make arrangements for the client’s staff to access survey sites not accessible by contract vehicles, including, but not limited to, survey sites in outlying islands, at no extra cost to the Contract for all reconnaissance surveys, manhole surveys, pipeline investigations and other surveys instructed by the Client or his representative.

The Utility Specialists shall provide all necessary justification as to the positions of all drainage and sewerage assets located within or adjacent to the survey extents, to the satisfaction of the Client or his representative.

B3.2 Method statement required for Reconnaissance surveys

The Utility Specialists shall submit a detailed method statement for undertaking the Reconnaissance surveys in advance of undertaking any Reconnaissance surveys. A method statement is not required for each slope or survey extent, however where there is significant difference in the scope of the Reconnaissance Survey the Utility Specialists may be required to produce a series of tailor-made method statements.

B3.3 Scope of Manhole Survey

The Utility Specialists shall carry out a survey of manholes and sewerage pipes within the Survey Extent for each of the slope/site specified in the Contract. The survey shall include manholes on both storm drains and foul sewers as identified in the agreed Reconnaissance Survey Report. The objective of the manhole surveys is to record all salient features, obtain evidence of the structural and surface condition of the manholes, evidence of leakage or infiltration, record and verify the position of the manhole structure against the supplied Layout Plans and survey manhole cover levels and invert levels and determine the location.

The manholes to be surveyed shall be designated on the Reconnaissance Survey Drawings agreed with the Client or his representative.

B3.4 Method statement required for Manhole surveys

The Utility Specialists is required to provide a detailed method statement of the procedures to be adopted for manhole surveys. Approval of the method statement by the Client or his representative's shall be required in advance of any surveys.

B3.5 Special considerations for confined spaces requirements

The Utility Specialists shall submit separately detailed method statement of the procedures to be adopted whenever men are required to work in confined spaces, in accordance with the latest Factories and Industrial Undertakings (Confined Spaces) Ordinance 1989 (amended year 2000). The Utility Specialists shall take special note of the recent amendments which require a risk assessment to be carried out under this ordinance as part of the safety procedures. Evidence shall be required in order to confirm that all personnel have attended the appropriate courses for this type of work. The approval by the Client or his representatives of this method statement shall not relieve the Utility Specialists of his responsibility for ensuring the safety of his personnel.

B3.6 Reference system

All assets (manholes, lamp holes and ancillaries) shall be referenced as below by the Utility Specialists. The referencing system is divided into three parts:

(1) 1:1000 Topographic Map Number
1/500 base map
e.g. 38135(e) and 21236(n)=HK3821

(2) 100 Meter Grid Co-ordinate
Referred to easting and northing of 100 meter grid.
e.g. 38135 (e) and 21236(n) = 12

(3) Manhole Reference Point Number
Each Manhole would be numbered as 01, 02 .12, 13 etc – 49 for foul & 51, 52, etc-99 for storm.

i.e. The first Foul Manhole on the left top corner shall be referenced as 3821 12 01 &;

The first Storm Manhole on the left top corner shall be referenced as 3821 12 51

The Utility Specialists shall ensure that each new manhole has a unique reference and is not duplicated in the original datasets provided at the start of the project. The Utility Specialists shall also maintain consistent references for each asset (ie an asset shall not be given two different numbers). Where appropriate pipeline assets shall be referred to by the upstream node number plus an appropriate suffix (eg HK 3821 135 236).

B3.7 Connecting testing

The Utility Specialists may use smoke, dye testing or electronic methods to determine connectivity of manholes.

B3.8 Planning for the Inspection

Carrying out the followings:

(1) Reconnaissance survey

(2) Safety Programme and Confined Spaces

B3.9 Inspection

Operation shall be carried out by OMHKIUS (at least 3 years' experience) or AMHKIUS (at least 2 years' experience).

The whole operation shall be supervised by OMHKIUS.

Detail can be referred to the HKIUS work procedure for Manhole Internal Condition Survey.

B3.10 Record

The report shall consists of the followings:

(1) Location plan with all the manholes plotted within the survey extent.

(2) Manhole record card.

(3) At least 2 photographs (location photo and internal photo).

(4) Condition photos for any other circumstances.

(5) Corresponding electronic data by computer programme validated by RPUS.

B3.11 Abandonment and rescheduling of manhole surveys

Abandonment of the survey of a manhole may be considered by the Utility Specialists subject to the agreement of the Client or his representative in any or a combination of the following circumstances:

(1) risk to Utility Specialists' equipment,

(2) inability to locate the manhole,

(3) inability to gain access to the manhole once located,

(4) risk to Utility Specialists' operations due to unsafe condition of manhole,

(5) inability to survey from the manhole due to blockage, silt or high water level

(6) inability to gain access to the manhole due to possession of the site by a third party.

In case (5) the Utility Specialists shall carry out cleaning works ventilation, flow control or other measures as necessary to complete the survey. The Utility Specialists shall report the matter to the Client or his representative's as soon as possible and report the same in the survey report. Cleansing works shall be paid under a separate item.

In case (1), (2), (3), and (4) the Utility Specialists shall, if possible, take photographs of the situation causing abandonment, mostly due to physical obstructions, abandon the survey of the manhole. The Utility Specialists shall report the matter to the Client or his representative and report the same in the survey report.

In case (6) the Utility Specialists shall first reschedule his works to minimize the effects of the possession of a site by a third party. Arrangements shall be made to revisit the site in order to complete the survey. The Utility Specialists shall report the matter to the Client or his representative's as soon as possible and report the same in the survey report. The Utility Specialists shall re-visit the site, as well liaise with any third parties, as required to ensure that the survey works are carried out where permitted.

In all cases (1)-(7), the Utility Specialists shall only be paid for the effort for manhole locating on site.

B4. Submission of survey result

B4.1 Accuracy of survey data

The standard of accuracy required in the Survey and completion of manhole record cards shall be as follows:

(1) All textual information shall be correct;

(2) All measurements shall be accurate within the following tolerances:

a.	Grid References	+ 1m
b.	Location Measurement	+ 300 mm
c.	Levels	+ 25 mm
d.	Relative levels of pipe inverts within the chamber	+ 20 mm
e.	Pipe sizes :	+ 20 mm
f.	box-culverts	+ 20 mm
g.	All other dimensions	+ 50 mm

Levels shall be referenced to Survey Bench Marks, the location and values of which are obtainable from the Lands Department of the Hong Kong Government.

Grid references shall be supplied in Hong Kong 1980 Grid format.

B4.2 Method Statement to be provided for Data validation

The Utility Specialists shall provide a method statement to the Client or his representative outlining his proposed data validation procedures. Data validation shall be undertaken in accordance with the established sewerage network data validation inconsistency checks such as those incorporated into IDMS software. These include but are not limited to checks for:

(1) Missing data (invert levels, cover levels, diameters)

(2) Inconsistent pipe sizes (eg downstream pipe smaller than upstream pipe)

(3) Inconsistent invert levels/reverse gradients (eg downstream invert level above upstream invert level)

(4) Inconsistent pipe materials

(5) Connectivity

B4.3 Submission of Survey Information

The Utility Specialists shall check the information to be submitted by M/FHKIUS(MHICS) and submit his validated Survey Information within 5 working days of the survey (or surveys). The submission shall comply with all requirements detailed in the Quality Assurance and Quality Control procedures:

(1) Location plan including all assets with connectivity delineated

(2) Completed Manhole cards Validation check sheet

(3) Corresponding IDMS electronic data

If errors are found to exceed the tolerances indicated in B4.1, the Client or his Representative shall instruct the Utility Specialists to return and re-survey the manhole at his own expense.

A fully completed Manhole Record Card showing the total data to be captured is shown in Appendix. The Utility Specialists shall obtain all relevant data to complete the record cards. In particular, the Utility Specialists shall complete the final MH record card by drawing the MH location Plan and the MH general arrangement plan with slope/road reference and manhole number on each page.

B4.4 Accuracy and Annotation for Location Sketches

Location sketches should be drawn with the manhole or spot level check location referenced to at least two fixed structures shown on the 1:1000 (Lands Information Centre) base mapping survey sheets. The sketch shall show the manhole layout, including the distance and direction of offset from the manhole cover to the centre line of flow in the main pipe. Lamp posts, traffic lights or similar shall not be acceptable as Fixed Structures. If existing buildings are taken as the fixed structures, the building names and numbers should be highlighted in the sketches. If village houses are taken as the fixed structures, the house number should be identified and indicated in the sketches.

B4.5 Manhole Photographs

The Utility Specialists shall provide a minimum of two photographs for each manhole as shown in Appendix. One photograph should show the general location of the manhole with respect to the road, slopes or buildings in the vicinity. The second photograph shall be a general view of the inside of the manhole. The manhole reference number shall be required to be shown on each photograph. The Utility Specialists may use a blackboard placed in the manhole or paint on the road surface to indicate the manhole reference number.

Where photographs are submitted in digital '*.jpeg' format a minimum resolution of 2 million pixels shall be provided. Samples shall be submitted to the Client or his representative's in advance.

It shall be subject to the opinion of the utility surveyor that whether additional photographs are required to highlight a defect or special feature. The Utility Specialists shall report to the Client or his representative's in a summary report on slope/ site by slope/ site basis for such occurrence on a weekly basis. The Client or his representative's shall spot-check and confirm the acceptance of such additional photographs prior to payment being made at the appropriate rate in the Bill of Quantities. The Utility Specialists shall include these accepted additional photographs in producing the relevant slope/site reports.

B4.6 Location of buried manholes

The Utility Specialists shall only carry out survey works to locate buried manholes when a written instruction has been given by the Client or his representative upon the request of the Utility Specialists.

The Utility Specialists shall report the findings of the buried manholes to the Client or his representative upon completion of the investigation in an approved format accepted by the Client or his representative's.

B4.7 Locating of intruding utilities

Intruding utilities located in manholes identified during the course of the surveys are to be commented in the remarks section of the manhole record card. In addition the Utility Specialists must indicate on the layout or other sketch the position and size of the utility.

B5. Quality Control and Quality assurance

B5.1 General

On completion of the survey of each 100 manholes or other similar structures the Utility Specialists shall supply completed computer generated manhole record cards (UTI IDMS) and a copy of the relevant portion of the map in respect of those manholes or other structures and notify in writing to the Client or his representative's that in the opinion of the Utility Specialists the records are ready for a site check to be carried out. The Client or his representative shall either reject the batch of data or arrange for a site check as specified below within 2 weeks of the written notification.

Prior to the supply of data to the Client or his representative, the Utility Specialists shall carry out his own validation test on all data according to the requirements as outlined in his method statement on data validation, which shall be approved by the Client or his representative's in advance of any surveys.

Specialists shall be required. The manholes to be resurveyed shall be randomly selected by the Client or his representative's and checked against the results obtained by the Utility Specialists in the initial survey. The resurvey shall include the reproving of all associated pipework lengths. The Utility Specialists shall supply a survey team to carry out the resurvey under the supervision of the Client or his representative's, and a person appointed by the Utility Specialists as his representative.

The resurvey shall be deemed to have failed if any item of manhole measurement falls outside the tolerances stated in this PS. Notwithstanding any of the foregoing if in the opinion of the Client or his representative's the other data on the manhole record sheets are sufficiently defective then the survey shall be deemed to have failed the quality control check and the Client or his representative is entitled to reject the data.

If the results of the resurvey are accepted by the Client or his representative, the Utility Specialists shall be entitled to payment for the resurvey at the rates included in the Bill of Quantities.

If the results of the resurvey are considered to be unacceptable to the Client or his representative, the Utility Specialists shall resurvey that portion of the work which failed to meet the tolerances stated in PS at his own expense and he shall not be paid for the work involved in that check. When he is satisfied that the previously failed work has been corrected he shall inform the Client or his representative and a further resurvey shall be carried out in accordance with the above procedure on five of the remaining 95 manholes. Quality control checks shall be repeated at the Utility Specialists' expense until the Client or his representative's is satisfied that this portion of the work has met the requirements of the check as stated in PS. The Utility Specialists shall then be paid for the resurvey of which results were accepted by the Client or his representative.

B5.2 Utility Specialists data management system

The Utility Specialists shall provide a method statement to the Client or his representative's outlining his proposed data management system to be implemented as part of the project.

Detail data requirement can be referred to Data Box Requirements (Appendix D in this particular specification) and Data Consistency Checks (Appendix E in this particular specification).
The method statement for the Utility Specialists data management system shall include but not limited to the following :

(1) Method for managing the sewerage data in different formats (e.g. IDMS)

(2) Method for performing connectivity and inconsistency validation checks on the imported data (ie. Checks for missing or inconsistent data as detailed in the specification)

(3) Method for managing Examiner or IDMS (*.dat) format CCTV data and validating the data

(4) Method of managing any GIS base data if used

(5) Method of managing / updating drawings (including slope polygons and survey extents) management of data associated with any drawings reporting of results and data to the Client or his representative's and client.

(6) The Utility Specialists shall host and maintain all checked data on a secured database to be accessed by Client or his representative, this shall include but not limited to the following information:

a. Daily Reports
   (i) Reconnaissance survey information
   (ii) Manhole survey information
   (iii) Pipeline survey information
   (iv) Other on site surveys/activities (eg. Cleaning)
   (v) Number of survey crews/staff deployed
   (vi) No of CCTV camera sets deployed
   (vii) Name of qualified crew leader on site (O/M/FHKIUS(MHICS))

b. Planning/ programme activities
   (i) Contract programme showing updated progress on each survey
   (ii) Planning of Temporary Traffic Arrangements
   (iii) Rescheduling of surveys due to site access conflicts.

The costs associated with the implementation of such a database system shall be deemed to have been included in the rates included in the Contract.

The Client or his representative may also operate a data management system. The Utility Specialists shall be responsible for interfacing with this system by ensuring:

(1) only validated data is issued to the Client or his representative's in the required format (UTI IDMS or Examiner)

(2) validation reports shall accompany each data submission.

The Utility Specialists shall be responsible for ensuring that all datasets submitted shall be in the correct format for input into the Client or his representative' s data management system.

B5.3 Interpretation of Results

Should a report of any survey length fail to achieve the specified standard, it should be recoded and the report of that length resubmitted.

In addition the coding of the five lengths completed immediately before and after the failed length should also be subjected to rechecking as part of an additional quality control check.

If there are any failed reports in this additional check, these should be recoded and resubmitted. Should any failure occur in the increased sample the selection should be increased by a further five lengths before and after, as above, until the required accuracy is achieved.

The ongoing accuracy of the specialist (the confidence level) should be calculated by taking the mean of each 5 percentage results (each 5 representing one control unit).

Both the individual survey percentages and the mean results should be entered on to the Specialist's Accuracy Graph. This graph should have three boundaries:

(1) Header - Record Accuracy

(2) Specified mean – Average Utility Specialist's accuracy for each survey or inspection

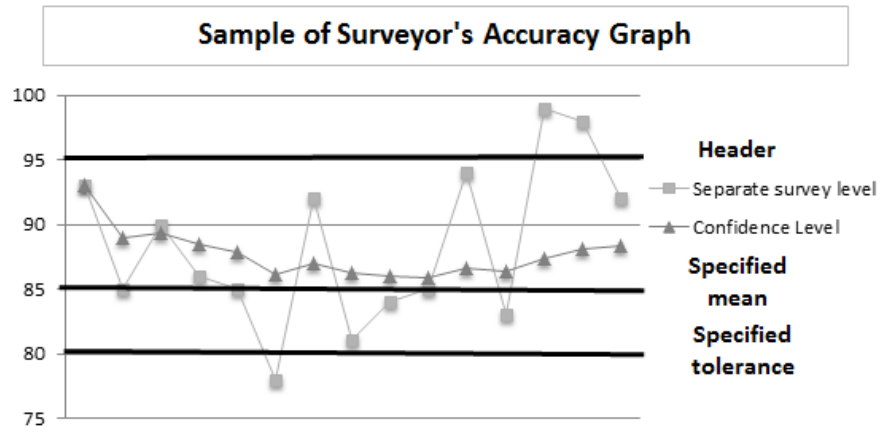
(3) Specified tolerance – The minimum Specialist's accuracy for each survey or inspection

The manhole accuracy of the header, specified mean, specified tolerance is 95%,85% and 80% representatively.

Any Specialist whose particular report is scored below the tolerance, the report has to be reviewed and re-submitted until achieving the HKIUS requirement.

For the separate survey level which means the particular surveyor's accuracy for his each survey or inspection. It should be recorded and submitted by particular surveyor's supervisor who shall be RPUS.
For the confidence level which means the mean of particular surveyor's accuracy for each year. It represents how much confidence the utility specialist can provide to client.

Sample of Specialist's Accuracy Graph



B6. Deliverable

The Utility Survey Specialist shall supply the following for each site:

B6.1 Preliminary Stage

(1) One set of preliminary digital data.

(2) One set of paper copy of drawings.

(3) Control results, including simple description of permanent ground markers.

(4) One copy of brief technical report drafted by MHKIUS (MHICS) and checked by RPUS.

(5) One set of photographs.

B6.2 Interim Stage (where necessary)

(1) One set of interim digital data.

(2) One set of paper drawings in 1:100 scale.

(3) One copy of interim technical report drafted by MHKIUS (MHICS) and checked by RPUS.

B6.3 Final Stage

2 copies of Final Report drafted by MHKIUS (MHICS) and checked by RPUS which is a compilation of all deliverables required under interim stage to incorporate all comments provided by the Engineer.

B7. Deliverable Schedule

The Utility Specialist shall supply for the Site preliminary digital data and paper check plots including a draft technical report with control results within one (1) week after the programmed completion of the works for the Site. The Engineer may direct the Contractor to submit preliminary reports of the Site during the execution of investigation, the Contractor shall submit the reports within 1 week after the Engineer has given such written instruction at no additional costs.

The Client Representative shall return a copy of preliminary data with comments and correction progressively within one week of receipt of preliminary data. The Utility Specialist shall incorporate the Client Representative's comments on the preliminary data within the preparation of his Final Survey report.

The Utility Specialist shall submit a Final Report for the investigation within 4 weeks after the completion date of the Works.

B8. Presentation of Drawings

B8.1 Electronic Data Files for Utility Services

The results of the investigation (layout plan only) shall be supplied in AutoCad2000 or above or DGN/GIS/IDMS format. All surface and underground features shall be located as described in Particular Specification For Utility Mapping By Non-Destructive Methods, HKIUS. Non graphic information shall be included in the AutoCad or DGN/GIS/IDMS file database as block attributes or similar. All data shall be separated by type into a logical system of AutoCad or DGN/GIS/IDMS layers as approved by the Engineer.

The Utility Surveyor shall submit a schedule of DGN/GIS/IDMS standards to the Engineer for approval, which shall contain proposed division of investigation data into separate AutoCad or DGN/GIS/IDMS files and layers; naming conventions; symbol definitions and annotation.

Data files shall be labelled with the filename, number, extent, size, date of investigation, or revision, to be agreed with the Engineer.

B8.2 Presentation requirement

The investigation results (layout plan only) shall be plotted in 1:100 scale or other scale to be confirmed in A1 drawings on the specified grid and datum approved by the Engineer. The layout, border and title block shall be approved by the Engineer.

The drawings shall show building lines, roads with road names and traffic lane road markings, pavement and kerbs, and other significant physical features within the investigated area.

B8.3 Base topographical mapping

Base maps shall be the latest published version of the 1:1000 (B1000) series Digital Topographic Maps published by Lands Department. The base maps will be supplied to the Utility Specialists in a suitable digital format to enable him to carry out his work.

The Utility Specialists shall bring any deficiencies in the original base maps to the attention of the Client or his representative

B8.4 Connecting points without manholes

Where sewers and drains connect without a manhole the connection point shall be numbered as though a manhole were present and the actual point of connection physically located. This shall apply to the first manhole outside the survey extents which is required to be located but not fully surveyed.

Locating of connecting points without manholes shall only be carried out once a written instruction has been given by the Client or his representative upon the request of the Utility Specialists.

B9. Preliminary and Final Report

B9.1 Preliminary and Final Report

Report shall consist of the followings:

(1) Introduction
   a. Project name and Location
   b. Site appreciation

(2) Details of Investigation
   a. Date of Investigation
   b. Detailed description of the investigation procedure adopted
   c. All equipment used for the investigation
   d. Identification of supervisor and equipment operators carrying out the investigation

(3) Investigation results
   a. Summary of buried utilities
   b. Report on examination, analysis and interpretation of the investigation results
   c. Identification of utilities, chambers, manholes and relevant surface installations
   d. Records of on-site verification of data handled by qualified person responsible for the report
   e. Report on difficulties encounted

(4) Appendix
   a. Floppy diskettes or CDR for the digital data files of qualitative and numeric data about the underground assets found;
   b. Engineering Drawings (updated) showing the types and location of various underground assets;
   c. Survey Photographs - 3R colored photographs (prints and negatives/digital copy in JPEG format)

The drawings and textual report will be certified and stamped by the approved qualified person who responsible for the preparation of the report

The Utility Specialist shall supply the Survey Report as described fully as in the above. This report shall include all results with a detailed discussion and accompanying plans. It shall be prepared and signed by an qualified person who shall hold one of the following qualifications:

(4) RPUS or MHKIUS (MHICS) with two years local post qualification experience ;
   or The followings:

(5) MICE, or MHKIE or MHKIS with 10 years experiences, each year 35 hours CPD training, and 14hours refreshment training every 3 years.

B9.2 Non-compliance: utility investigation result

The utility investigation survey result for a site shall be considered as not complying with the specified requirements if the position or level of any underground services reported in the preliminary stage deliverables does not comply with the requirements of B4.1 in this particular specification.

If the utility investigation result for a particular site does not comply with the specified requirements, the Contractor shall re-execute utility investigation in the area within a week from receiving notification by the Engineer. The Utility Surveyor shall submit the investigation result as deliverables defined in B6 in this particular specification within 2 weeks from receiving notification.

If the utility investigation result again fails to comply with the specified requirements, the Utility Survey Specialist shall repeat the work specified until the result complies with the specified requirements. The costs for re-execution of utility investigation shall be borne by the Contractor.

B10. Personnel Requirement

In order to maintain the Utility Profession's requirements for the consistency, reliability and accuracy of reports, inspection shall be performed by a properly trained and accredited personnel, for example, OMHKIUS or MHKIUS.

Personnel responsible for surveying and report preparation shall hold a certified qualification issued by a Registered Training Organization (RTO), such as Utility Training Institution(UTI) or The Hong Kong Polytechnic University or equivalent approved by HKIUS.

A certified qualification shall be:

Either Degree, Professional Diploma, Professional Certificate or equivalent approved by HKIUS in Utility Surveying and Management or related subject awarded by a RTO such as Utility Training Institute or The Hong Kong Polytechnic University.

Further information can be referred to the Appendix A2 in this PS.

References

(1) 16/WSD/97, Leakage Detection of Buried Watermains Affecting Slopes - Stage I, Water Supplies Department

(2) Constitution, Hong Kong Institute of Utility Specialists (2011).

(3) Course Note, Advanced Manhole Condition Survey for Operators, Engineers/Surveyors and Managers, UTI, 2007.

(4) DC96/19, Investigation of Sewers and Drains Behind and Adjacent Fill Slopes and Retaining Walls, Drainage Services Department.

(5) DC98/01, Investigation of Sewers and Drains Behind and Adjacent Fill Slopes and Retaining Walls, Drainage Services Department.

(6) King Wong(2009), Hong Kong Conduit Condition Evaluation Codes(HKCCEC) The Code of Practice on Conduit Condition Evaluation using CCTV in Hong Kong, 4th Edition,UTI

(7) HKHA161/95, Detection of Leakage from buried water carrying services in the vicinity of slopes 'and retaining walls within the lands 'maintained by Housing Authority.

(8) Method Statement for Manhole Internal Condition Survey, HKIUS, 2011.

(9) Sample report for Manhole Internal Condition Survey, HKIUS, 2011

(10) Work procedures for Manhole Internal Condition Survey, HKIUS, 2011

(11) Works Branch, Code of Practice on Monitoring and Maintenance of Water Carrying Services Affecting Slope, 2006.

Appendix

A1 Abbreviations

Company/ Organization	
Code	Description
BD	Buildings Department, HKSARG
CEDD	Civil Engineering and Development, HKSARG
DSD	Drainage Services Department, HKSARG
EMSD	Electrical and Mechanical Services Department, HKSARG
EPD	Environmental Protection Department, HKSARG
HA	Hong Kong Housing Authority, HKSARG
HKIUS	Hong Kong Institute of Utility Specialists, HKSARG
HKURC	Hong Kong Utility Research Centre
HyD	Highways Department, HKSARG
LandsD	Lands Department, HKSARG
LD	Labour Department, HKSARG
PolyU	The Hong Kong Polytechnic University
UTI	Utility Training Institute
WRc	Water Research Centre
WSAA	Water Services Association Australia
WSD	Water Supplies Department, HKSARG
WTI	Water Training Institute
Others	
Code	Description
%	Percentage
BMP	Bitmap (Picture Format)
BWCS	Buried Water Carrying Service
CCE	Conduit Condition Evaluation

Company/ Organization	
CCE(CCTV & ME)	Conduit Condition Evaluation(Closed Circuit Television & Man- Entry)
CCES	Conduit Condition Evaluation Specialists
CCTV	Closed Circuit Television
CD	Compact Disc
CL	Cover Level
COP	Code of practice
CP	Competent Person
DN	Nominal Diameter
DP	Design Pressure
DVD	Digital Versatile Disc
e.g.	Exempli Gratia
GIS	Geo-Information System
EPR	Environmental Protection Requirements
etc.	et cetera
GL	Ground Level
H	Height
HKCCEC	Hong Kong Conduit Condition Evaluation Codes
HPWJ	High Pressure Water Jetting
hr	Hour
Hz	Hertz
ICG	Internal Condition Grade
ID	Internal Diameter
IDMS	Integrated Data Management System
IL	Invert Level
ISO	International Standards Organization
JPEG	Joint Photographic Experts Group (Picture Format)

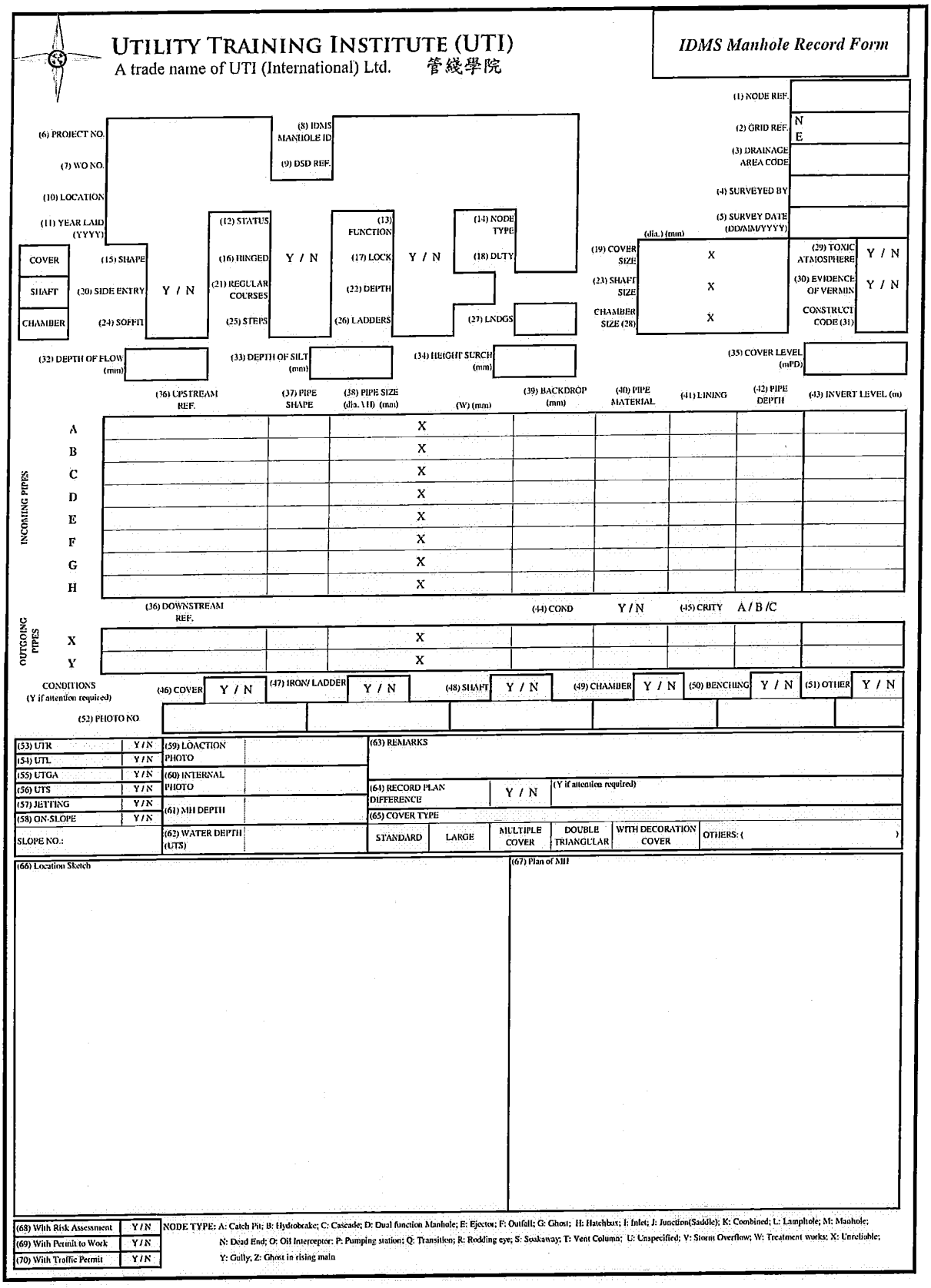
Company/ Organization	
kHz	Kilo- Hertz
kPa	Kilopascal
m	Meter(s)
ME	Man Entry
MHICS	Manhole Internal Condition Survey
mm	Millimetre(s)
Mpa	Megapascal
MPEG	Motion Picture Experts Group (Video Format)
MS	Method Statement
MSCC	Manual of Sewer Condition Classification, UK
OHSAS	Occupational Health and Safety Assessment Series
PPE	Personal Protective Equipment
ppm	Parts per million
PS	Particular Specification
PSI	Pound Per Square Inch
QA/ QC	Quality Assurance/ Quality Control
Ref.	Reference
RMSE	Root Mean Square Error
RPUS	Recognized Professional Utility Specialist
RTO	Recognized Training Organization
SCG	Service Condition Grades
SOPs	Safe Operator Procedures
SPF	Sun Protection Factor
SPG	Structural Performance Grade
SRM	Sewer Rehabilitation Manual
STP	System Test Pressure
TTA	Temporary Traffic Arrangement

Company/ Organization	
US	Utility Specialist
VHS	Video High Speed
W	Width
WLD	Water Leakage Detection
WO	Works Order
WP	Work Procedure

A2 Requirements for Personnel Carrying Out Inspection

Training and Experience Requirements for Personnel Carrying Out Inspection (HKIUS standard, 2011)				
Title	Role	Minimum Training Requirement	Minimum Years of Practical Experience	Qualification
Project Leader	Responsible for contract administration and preparation, checking and certifying of reports for compliance with the technical specification.	➢ At least 35 hours of CPD every year ➢ At least 14 hours for refreshment training in every three years ➢ Relevant training in RTO (e.g. PolyU, UTI) for surveys and data collection ➢ Has attended training courses for relevant survey/detection methods, and Possesses a valid training certificate for relevant survey/detection methods used	10 years in contract administration, preferably in works related to the inspection, survey and in data management.	Either: M/FHKIUS, RPUS plus CP, CW or MHKIE/ R.P.E. plus CP, CW and relevant training in RTO (e.g. PolyU, UTI) for surveys and data management
Deputy Project Leader	Responsible for assisting project leader and acting the post of project leader when project leader temporary not with the team	➢ At least 35 hours of CPD every year ➢ At least 14 hours for refreshment training in every three years ➢ Relevant training in RTO (e.g. PolyU, UTI) for surveys and data collection ➢ Has attended training courses for relevant survey/detection methods, and Possesses a valid training certificate for relevant survey/detection methods used	10 years in contract administration, preferably in works related to the inspection, survey and in data management.	Either: M/FHKIUS, RPUS plus CP, CW or MHKIE/ R.P.E. plus CP, CW and relevant training in RTO (e.g. PolyU, UTI) for surveys and data management
Team Leader	Responsible for works arrangement and data processing including checking of raw data for quality and consistency.	➢ At least 35 hours of CPD every year ➢ At least 14 hours for refreshment training in every three years ➢ Relevant training in RTO (e.g. PolyU, UTI) for surveys and data collection ➢ Has attended training courses for relevant survey/detection methods, and Possesses a valid training certificate for relevant survey/detection methods used	5 years in works related to the inspection, survey and in data management.	M/FHKIUS, RPUS, CP, CW
Crew Leader	Responsible for supervising the field works and site safety.	➢ At least 35 hours of CPD every year ➢ At least 14 hours for refreshment training in every three years ➢ Relevant training in RTO (e.g. PolyU, UTI) for surveys and data collection ➢ Has attended training courses for relevant survey/detection methods, and Possesses a valid training certificate for relevant survey/detection methods used	3 years in works related to the inspection, survey and in data collection	O/MHKIUS, CP, CW
Operators	Responsible for operating equipment and carrying out inspection and survey.	➢ At least 35 hours of CPD every year ➢ At least 14 hours for refreshment training in every three years ➢ Relevant training in RTO (e.g. PolyU, UTI) for surveys and data collection ➢ Has attended training courses for relevant survey/detection methods, and Possesses a valid training certificate for relevant survey/detection methods used	2 years in works related to the inspection, survey and in data collection.	AMHKIUS, CP, CW

A3 IDMS Manhole Record Form



UTILITY TRAINING INSTITUTE (UTI)
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IDMS Manhole Record Form

(1) NODE REF.
(2) GRID REF. N E
(3) DRAINAGE AREA CODE
(4) SURVEYED BY
(5) SURVEY DATE (DD/MM/YYYY)
(6) PROJECT NO.
(7) WO NO.
(8) IDMS MANHOLE ID
(9) DSD REF.
(10) LOCATION
(11) YEAR LAID (YYYY)
(12) STATUS
(13) FUNCTION
(14) NODE TYPE
(15) SHAPE
(16) HINGED Y / N
(17) LOCK Y / N
(18) DLTY
(19) COVER SIZE (dia.) (mm) X
(20) SIDE ENTRY Y / N
(21) REGULAR COURSES
(22) DEPTH
(23) SHAFT SIZE X
(24) SOFFIT
(25) STEPS
(26) LADDERS
(27) LNDGS
CHAMBER SIZE (28) X
(29) TOXIC ATMOSPHERE Y / N
(30) EVIDENCE OF VERMIN Y / N
CONSTRUCT CODE (31)
COVER
SHAFT
CHAMBER
(32) DEPTH OF FLOW (mm)
(33) DEPTH OF SILT (mm)
(34) HEIGHT SURCH (mm)
(35) COVER LEVEL (mPD)

	(36) UPSTREAM REF.	(37) PIPE SHAPE	(38) PIPE SIZE (dia. / H) (mm)	(W) (mm)	(39) BACKDROP (mm)	(40) PIPE MATERIAL	(41) LINING	(42) PIPE DEPTH	(43) INVERT LEVEL (m)
INCOMING PIPES A			X						
B			X						
C			X						
D			X						
E			X						
F			X						
G			X						
H			X						
	(36) DOWNSTREAM REF.				(44) COND Y / N		(45) CRITY A / B /C		
OUTGOING PIPES X			X						
Y			X						

CONDITIONS (Y if attention required)
(46) COVER Y / N (47) IRON/ LADDER Y / N (48) SHAFT Y / N (49) CHAMBER Y / N (50) BENCHING Y / N (51) OTHER Y / N
(52) PHOTO NO

(53) UTR	Y / N	(59) LOACTION PHOTO	
(54) UTL	Y / N		
(55) UTGA	Y / N	(60) INTERNAL PHOTO	
(56) UTS	Y / N		
(57) JETTING	Y / N	(61) MH DEPTH	
(58) ON-SLOPE	Y / N		
SLOPE NO.:		(62) WATER DEPTH (UTS)	

(63) REMARKS

(64) RECORD PLAN DIFFERENCE Y / N (Y if attention required)

(65) COVER TYPE
STANDARD | LARGE | MULTIPLE COVER | DOUBLE TRIANGULAR | WITH DECORATION COVER | OTHERS: ( )

(66) Location Sketch

(67) Plan of MH

(68) With Risk Assessment	Y / N
(69) With Permit to Work	Y / N
(70) With Traffic Permit	Y / N

NODE TYPE: A: Catch Pit; B: Hydrobrake; C: Cascade; D: Dual function Manhole; E: Ejector; F: Outfall; G: Ghost; H: Hatchbox; I: Inlet; J: Junction(Saddle); K: Combined; L: Lamphole; M: Manhole; N: Dead End; O: Oil Intercepter: P: Pumping station; Q: Transition; R: Rodding eye; S: Soakaway; T: Vent Column; U: Unspecified; V: Storm Overflow; W: Treatment works; X: Unreliable; Y: Gully; Z: Ghost in rising main

Manhole Record Form
Revision 1 : Jan 2009

Form: PM02

A4. IDMS Manhole Record Form (Filled)

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IDMS Manhole Record Form

(6) PROJECT NO.	Y10-BS-LG-P-004-002	(8) IDMS MANHOLE ID	GVMH15354200001	(1) NODE REF.	F4201 (F01)						
(7) WO NO.	--	(9) DSD REF.	--	(2) GRID REF.	N 815428.4975 E 835212.6195						
(10) LOCATION	One Pacific Place			(3) DRAINAGE AREA CODE	11SW14A						
(11) YEAR LAID (YYYY)	Z	(12) STATUS PR	(13) FUNCTION F	(14) NODE TYPE M	(4) SURVEYED BY	H. S. Leung					
					(5) SURVEY DATE (DD/MM/YYYY)	2/9/2010					

COVER	(15) SHAPE	S	(16) HINGED	N	(17) LOCK	N	(18) DUTY	H	(19) COVER SIZE (dia.) (mm)	780	X	780	(29) TOXIC ATMOSPHERE	N
SHAFT	(20) SIDE ENTRY	N	(21) REGULAR COURSES	0	(22) DEPTH	510			(23) SHAFT SIZE	740	X	740	(30) EVIDENCE OF VERMIN	N
CHAMBER	(24) SOFFIT	S	(25) STEPS	3	(26) LADDERS	0	(27) LNDGS	0	CHAMBER SIZE (28)	1340	X	2210	CONSTRUCT CODE (31)	I

(32) DEPTH OF FLOW (mm)	(33) DEPTH OF SILT (mm)	(34) HEIGHT SURCH (mm)	(35) COVER LEVEL (mPD)
20	0	0	5.01

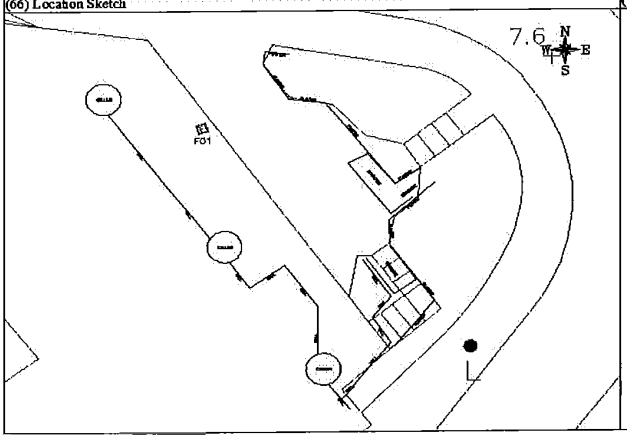
		(36) UPSTREAM REF.	(37) PIPE SHAPE	(38) PIPE SIZE (dia. \ H) (mm)		(W) (mm)	(39) BACKDROP (mm)	(40) PIPE MATERIAL	(41) LINING	(42) PIPE DEPTH	(43) INVERT LEVEL (m)
INCOMING PIPES	A	F03	C	150	X			CI		1.94	3.07
	B	GN (BUILDING)	C	300	X			CI		1.81	3.20
	C	GN (BUILDING)	C	225	X			CI		1.84	3.17
	D				X						
	E				X						
	F				X						
	G				X						
	H				X						
		(36) DOWNSTREAM REF.					(44) COND	Y / N	(45) CRITY	A / B /C	
OUTGOING PIPES	X	F02	C	375	X			CI		2.00	3.01
	Y				X						

CONDITIONS (Y if attention required)	(46) COVER	(47) IRON/ LADDER	(48) SHAFT	(49) CHAMBER	(50) BENCHING	(51) OTHER
	N	Y	N	N	Y	N

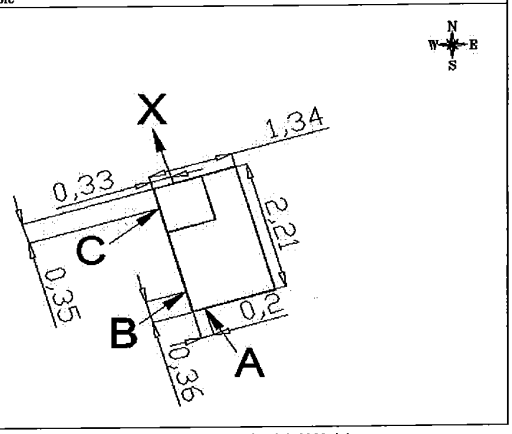
(52) PHOTO NO.		F01-P5&6			F01-P7&8	

(53) UTR	N	(59) LOACTION PHOTO	F01-P1&2	(63) REMARKS				
(54) UTL	N			3 steps were found broken and crack was found at the benching.				
(55) UTGA	N	(60) INTERNAL PHOTO	F01-P3&4	(64) RECORD PLAN DIFFERENCE	N	(Y if attention required)		
(56) UTS	N			(65) COVER TYPE				
(57) JETTING	N	(61) MH DEPTH	2.00	STANDARD	LARGE	MULTIPLE COVER	DOUBLE TRIANGULAR	WITH DECORATION COVER	OTHERS ( )
(58) ON-SLOPE	N							
SLOPE NO.:		(62) WATER DEPTH (UTS)						

(66) Location Sketch



(67) Plan of Manhole



(68) With Risk Assessment	Y	NODE TYPE: A: Catch Pit; B: Hydrobrake; C: Cascade; D: Dual function Manhole; E: Ejector; F: Outfall; G: Ghost; H: Hatchbox; I: Inlet; J: Junction(Saddle); K: Combined; L: Lamphole; M: Manhole;
(69) With Permit to Work	Y	N: Dead End; O: Oil Interceptor; P: Pumping station; Q: Transition; R: Rodding eye; S: Soakaway; T: Vent Column; U: Unspecified; V: Storm Overflow; W: Treatment works; X: Unreliable;
(70) With Traffic Permit	N	Y: Gully; Z: Ghost in rising main

Manhole Record Form
Revision 1 : Jan 2009

Form: PM02