
**VOLUME 5 CONTRACT DOCUMENTS
FOR SPECIALIST
ACTIVITIES**

**SECTION 9 MODEL CONTRACT
DOCUMENTS FOR CCTV
SURVEY OF HIGHWAY
DRAINAGE SYSTEMS**

PART 3

**SERIES NG9000 - NOTES FOR
GUIDANCE**

Contents

Clause

NG9001	Scope
NG9002	Information
NG9003	Definitions
NG9004	General Requirements
NG9005	Survey Reporting
NG9006	Quality
NG9007	Health and Safety Issues
NG9008	Coding of Survey Information
NG9009	Drain Condition Inspection

NG9001 SCOPE

General

1 Closed Circuit Television (CCTV) survey of highway drainage systems is the remote inspection of these systems by the insertion of a camera connected to a monitor and recording apparatus.

2 The Specification assumes that the survey will be carried out in conjunction with Term Maintenance Contractor operations where traffic management will be provided by the Term Maintenance Contractor. It also assumes that any works on or adjacent to the carriageway necessary to remove blockages or recover survey equipment will be undertaken by the Term Maintenance Contractor. Where a contract is to be let as stand alone (and the services of a Term Maintenance Contractor are not available) then the Specification will need to be amended to reflect the changed circumstances.

NG9002 INFORMATION

General

1 The visual inspection of a drain pipeline by man-entry is a potentially hazardous, time consuming and labour intensive operation, hence the use of CCTV survey offers a practical alternative. In practice, the vast majority of highway drainage systems are of diameters too small to gain access by man-entry and thus can only be inspected using remote techniques, of which CCTV survey is the most obvious.

2 The use of CCTV survey has been widely practiced in the water industry for many years and the apparatus and techniques have been refined and developed. There is now an increasing use of CCTV for the inspection of highway drainage systems as a maintenance tool and identified benefits in terms of future expenditure to using this technique during the construction process.

3 The Highways Agency's research has shown there to be an unacceptable number of defects within the highway drainage system and also identified the need for more complete and accurate recording of the drain positions, sizes and condition. The use of CCTV survey will greatly assist in the collation of the record data and the programming of highway drainage maintenance. Identifying sections of drain in poor structural condition and the consequent remedial works can have a significant effect on the longevity of the pavement construction.

NG9003 DEFINITIONS

1 Definitions relating to CCTV survey of highway drainage systems are formally defined in Clause 9003.

2 It is important that a distinction is made between the Contractor engaged to undertake the survey and the individual who will perform the inspection. Therefore in the Particular Conditions of Contract, the Contractor is defined as the Survey Contractor and the individual performing the inspection is defined as the Surveyor. This is because only the Surveyor can hold the required current certification, WTI Training Group WTI OS20X.

NG9004 GENERAL REQUIREMENTS

General

1 The extent of the drainage system comprising the survey should be marked on plans and detailed in Appendix 90/1.

2 The access points should have unique reference numbers and individual drains to be surveyed should be referenced. The unique reference numbers will be inserted in to the Header Sheet, by the Survey Contractor, at the start of each survey.

3 The location of each survey should be stated in Appendix 90/1.

Pre-cleansing

4 Where pre-cleansing is to form part of the contract this should be specified in Appendix 90/1 and itemised in the Bill of Quantities.

5 Pre-cleansing should be carried out in accordance with Clause 520 of the SHW (MCHW1).

6 Drains that have been pre-cleansed should be identified in Appendix 90/1

7 Where the Survey Contractor is required to undertake pre-cleansing this should be identified in Appendix 90/1.

8 Pre-cleansing can remove evidence of siltation problems that affect the performance of the drain and hence consideration should be given to only removing silt from those drains where it is known that the silt level will prevent access by CCTV camera. It is important to record the location of the silt prior to its removal and the location and depths of silt removed should be reported.

Traffic

9 The CCTV survey of highway drainage systems should usually be carried out in conjunction with routine maintenance works or programmed maintenance contracts. In these instances the Overseeing Organisation's Representative should be responsible for the traffic management and should afford the CCTV Contractor the facilities to undertake

the survey works within the confines of the traffic management control.

10 Where the survey works are to be undertaken separately from the routine maintenance works, the Overseeing Organisation's Representative should determine the traffic management measures appropriate for the classification of road and the locations of the surveys. These requirements should be inserted into Appendix 1/17 irrespective of whether or not the Survey Contractor will be required to provide the traffic management.

11 Where the Survey Contractor is to provide the traffic management, this will be stated in the Appendix 1/17 and identified in the Bill of Quantities.

Chambers

12 It will be the Survey Contractor's responsibility to raise all the access (manhole) covers necessary for gaining access to the drains for the survey. The Overseeing Organisation's Representative should endeavour to ensure that all chambers within the survey are accessible. Where any covers are found to be broken, damaged or fast, these should be replaced prior to the commencement of the survey. Where, during the course of the survey, covers are found to be broken, damaged or fast, the Survey Contractor should notify either the Main Contractor (if sub-contracted) or the Overseeing Organisation's Representative who should replace the covers and inform the Survey Contractor.

Flows and blockages

13 Where a blockage is reported by the Survey Contractor during the course of the survey, this should be promptly dealt with by the Overseeing Organisation's Representative and the Survey Contractor notified accordingly. Where responsibility for clearing blockages is stated in Appendix 90/1 as being that of the Survey Contractor, the works should be carried out in accordance with Clause 521 (MCHW1).

14 The Survey Contractor should be responsible for dealing with the flows within the drains to be surveyed. Where survey is suspended due to temporary excessive flows within the drain, this should be the Survey Contractor's liability and the Overseeing Organisation's

Representative should not incur the Overseeing Organisation any additional costs in this respect.

Site Availability

15 Where the Survey Contractor's working hours are to be restricted during certain parts of the day or night, or where there are any other restrictions on access to the site, a schedule of restrictions should be provided in Appendix 1/7 and in the Schedule of Constraints in Appendix 1/13.

NG9005 SURVEY REPORTING

General

1 Where any changes to the EN 13508-2:2001 format of the Report are required, these should be stated in Appendix 90/1.

2 Where the Overseeing Organisation requires some items of the Survey Report to be supplied during the course of the survey, this should be made clear in the Instructions to Tenderers and these items should be stated in Appendix 90/1.

CCTV Photographs

3 Where the size of the photographs required is different to those specified in sub-Clause 9005.13, the required dimensions should be stated in Appendix 90/1.

4 The frequency of condition photographs should be specified in Appendix 90/1. The spacing between general condition photographs should not be more than 10 metres.

5 The format that the Survey Contractor is required to submit the record photographs should be entered in Appendix 90/1 by the compiler.

6 Where the requirement for the provision of negatives is different from the specification sub-Clause 9005.19, the compiler should insert the requirements into Appendix 90/1.

Condition grade

7 The Overseeing Organisation's Representative should submit a proposed survey programme for future surveying to the Overseeing Organisation for consideration. The programme should be based on the condition grade from Table NG90/1 below and this will identify the need for work. A risk assessment should be used to set the time limit between surveys.

Grade 1 and 2 then the survey frequency should not be more than once in 10 years and not less than once in 15 years

Grade 3 then the survey frequency should be no less than once in 10 years

Grade 4, the survey frequency should be once in 5 years

Grade 5, the survey frequency should be once in 1 year.

8 The frequency may be increased where the drain gradient or the connection of land drains may affect the performance of the drain.

Table NG 90/1: Application of Condition Grade to piped drainage systems

Internal condition grade	Typical defect descriptions
5	Already collapsed Deformation > 10% and broken Extensive areas of fabric missing Fracture with deformation > 10%
4	Broken Deformation up to 10% and broken Fracture with deformation 6-10% Multiple fracture Serious loss of level Serious joint defects with voids or soil visible (open joint with >50mm soil or void visible or joint displacement >25% of diameter) Surface damage – spalling large Surface damage – wear large
3	Fracture with no deformation or deformation < 5% Longitudinal cracking or multiple cracking Minor loss of level Severe joint defects, ie open joint (large) or joint displaced (large) Surface damage – spalling medium Surface damage – wear medium
2	Circumferential crack Moderate joint defects ie open joint (medium) or joint displaced (medium) Surface damage – spalling slight Surface damage – wear slight
1	No structural defects
Notes 1: Deformed pipes that have subsequently been relined with a structural lining can normally be considered to have no deformation. 2: Exercise caution when assessing open joints since this may be a feature of pipelines for filter drains. 3: The Overseeing Organisation should be consulted where the condition of brickwork drains is to be assessed.	

NG9006 QUALITY

General

1 The Overseeing Organisation's Representative should ensure that the Survey Contractor's Surveyor who is to undertake the survey has current valid certification. The current appropriate certification is the WTI Training Group WTI OS20X, Pipe Sewer Condition Classification. The compiler should ensure that The Instruction for Tendering require the Survey Contractors to name the Surveyors proposed and to provide evidence that they hold the appropriate qualification.

2 All defects should be recorded on site, however, the technical judgement as to the significance of the defect in respect of highway drainage systems should be made by the Overseeing Organisation's Representative.

Quality control procedures

3 The 5% sample survey for quality control is to be selected by the use of randomly generated numbers.

4 Each Surveyor should have a different set of random numbers, which should be generated at the end of each week and applied to the previous week's surveys.

5 On site, the Surveyor logs certain information about the surveys being undertaken and the order in which they are carried out. The Survey Contractor's office staff then counts through the surveys that have taken place and selects the reports that coincide with the random numbers.

6 The derivation of Header accuracy is the proportion of entries made in the header fields, which are correctly entered using the correct symbols or codes.

7 The derivation of the Detail accuracy is the proportion of entries that are correct. A missing entry should be regarded as incorrect. The results are plotted on the Surveyor's accuracy graph.

8 The continued accuracy of the Surveyor is calculated by taking the mean of 5 percentage results. Both the individual survey percentages and the mean results are entered on to the Surveyors' accuracy graph.

9 If either two lines fall below the tolerances given in sub-Clause 9006.5 then the action is taken in accordance with sub-Clause 9006.8.

CCTV Picture quality – camera, video tape and monitor

10 The test device for the camera shall utilise the Marconi Resolution Chart No 1 or equivalent. Where the Survey Contractor proposes the use of an equivalent, the details of the chart should be supplied to the Overseeing Organisation for approval.

11 The Survey Contractor is required in sub-Clause 9005.10 to submit the test devices for the video tape recorder and monitor to the Overseeing Organisation for approval.

12 The performance of the camera is to be demonstrated by the recording of the approved test device for a minimum of 30 seconds at the commencement of each day. The Overseeing Organisation's Representative should ensure that the demonstration recordings are approved on a daily basis.

13 It may be necessary to vary the illumination to accommodate changes in drain fabric or environment. This should be undertaken prior to the setup as the illumination, generally, should not be varied during the survey.

NG9007 HEALTH AND SAFETY ISSUES

General

1 All chambers and pipelines comprising highway drainage systems should be treated as confined spaces. A confined space is defined as a workplace that does not have the benefit of natural ventilation. They are potentially dangerous because of the possible existence of toxic or flammable gases, deficiencies in oxygen, or the build-up of fumes due to the operations being undertaken. Where physical exertion is necessary to gain access or egress due to confinement can define a confined space.

2 The presence of known hazards should be stated in the pre-tender Health and Safety Plan and also refer to SD 10 (MCHW 6.1.1).

Zone classification

3 The Dangerous Substances and Explosive Atmospheres Regulations 2002 (SI 2002/2776) govern the use of electrical equipment in potentially explosive atmospheres. All electrical equipment to be used in such atmospheres should comply with the requirements of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 (SI 1996/192, amended by S.I. 2001/3766).

4 Potentially explosive atmospheres are classified, in the Dangerous Substances and Explosive Atmospheres Regulations 2002 (SI 2002/2776), as three zones, Zone 0, Zone 1 and Zone 2. No equipment presently in use will comply with the Zone 0 requirements. Zone 2 is the least onerous classification. It is general practice to classify highway drainage systems as Zone 2. The Overseeing Organisation should be consulted as to the most appropriate Zone Classification to be applied to the drainage systems to be surveyed.

NG9008 CODING OF SURVEY INFORMATION

General

1 The coding of survey information shall comply with EN 13508-2:2001 Condition of Drain and Sewer Systems Outside Buildings, Part 2 Visual Inspection Coding Systems. The report should use the UK National Equivalent Coding System (See MCHW 5.9.1 sub-Clause 1.6).

Header information

2 The pipe or manhole reference shall be unique. The reference numbering shall be supplied to the Survey Contractor by the Overseeing Organisation's Representative. The use of a numbering system that identifies the access points (chambers) by reference to the Ordnance Survey grid will enable the unique numbering system to be maintained when new reference numbers are applied to chambers discovered during the course of the survey. Where a new node is located during the survey, the Survey Contractor shall request the Overseeing Organisation's Representative to assign the node a new number which the Survey Contractor should use in the report.

3 **Length of drain:** shall be measured between the exit faces of the manhole or access chamber at the point of entry to the next manhole or access chamber. These are referred to as the Node Points.

4 **Method of inspection:** Should always be CCTV.

5 **Pre-cleansing:** is to be specified by the Overseeing Organisation's Representative. The minimum pre-cleansing should be sufficient to ensure that the camera can pass through the drainage system. Warning, pre-cleansing the drain may remove evidence of Service Defects within the system. The Specification for cleaning drainage systems is given in Clause 520 of the SHW (MCHW1).

6 **Location:** should grade each drain in terms of its location. Graded A/B/C should determine how important the drain is in terms of consequence of failure.

Table NG 90/2: Strategic grade

Grade	Position of drain
A	Transverse drain Central reserve Carrier drain in motorway/trunk road
B	Verge Shoulder
C	Remote from carriageway and verge

7 **Year of construction:** where this is known the information should be included, but is more applicable to new construction.

8 **Name of the surveyor:** should be the name of the Surveyor undertaking the survey and not the name of the Survey Contractor, refer to sub-Clause 9006.1. This should be the person for whom certification has been submitted.

NG9009 DRAIN CONDITION INSPECTION

General

1 The Overseeing Organisation's Representative should supply the Survey Contractor with 2 sets of plans showing the drains to be surveyed. The Survey Contractor should return one copy of the plans accurately referencing the extent of the completed survey.

Survey

2 Where the covers will be removed by the Overseeing Organisation's Representative this should be stated in Appendix 90/1.

3 The CCTV camera lens should be positioned to a tolerance of $\pm 10\%$ of the vertical drain dimension. The Overseeing Organisation's Representative should verify that the Survey Contractor has complied with the tolerance in the positioning of the camera. Should the alignment be outside the tolerance, the survey for that section of drain should not be accepted.

4 The length of drain from the zero chainage to the cable calibration point should be recorded and reported. The Overseeing Organisation's Representative should ensure that the Survey Contractor supplies the records for scrutiny on a daily basis.

NG SAMPLE APPENDIX 90/1: CCTV SURVEY OF HIGHWAY DRAINAGE SYSTEMS

[Note to the compiler: This should include]

- 1 Identification of the plans and details of the survey [9004.1]
- 2 The location of the surveys is to be detailed in accordance with sub-Clause NG9008.8 [9004.2]
- 3 Requirement for Pre-cleansing [9004.4]
- 4 Where traffic management is to be provided by the Survey Contractor details of the Overseeing Organisation's requirements in respect of the traffic management should be inserted. [9004.6]
- 5 Restricted working hours or work periods outside normal hours to be scheduled. [9004.12]
- 6 Responsibility for clearing blockages to be stated. [9004.13]
- 7 The content of the survey report, including number of copies and types should be specified [9005.1]
- 8 Requirement for items of the survey report to be provided to the Overseeing Organisation during the survey. [9005.2]
- 9 Recording format should be specified [9005.5]
- 10 Changes to the coding used for the survey should be specified [9005.8]
- 11 Photograph size should be stated if different from specification [9005.13]
- 12 Requirement for colour film or digital imager should be stated [9005.13]
- 13 Photographs intervals should be defined [9005.14]
- 14 The format for the presentation of survey photographs is to be specified. [9005.18]
- 15 The format for the presentation of photograph negatives where different to the specification [9005.19]
- 16 Requirement to photograph defects, features and condition to be stated [9008.10]
- 17 Where the removal and replacement of all manhole or access chamber covers will be undertaken by the Overseeing Organisation's Representative, this should be stated [9009.01]