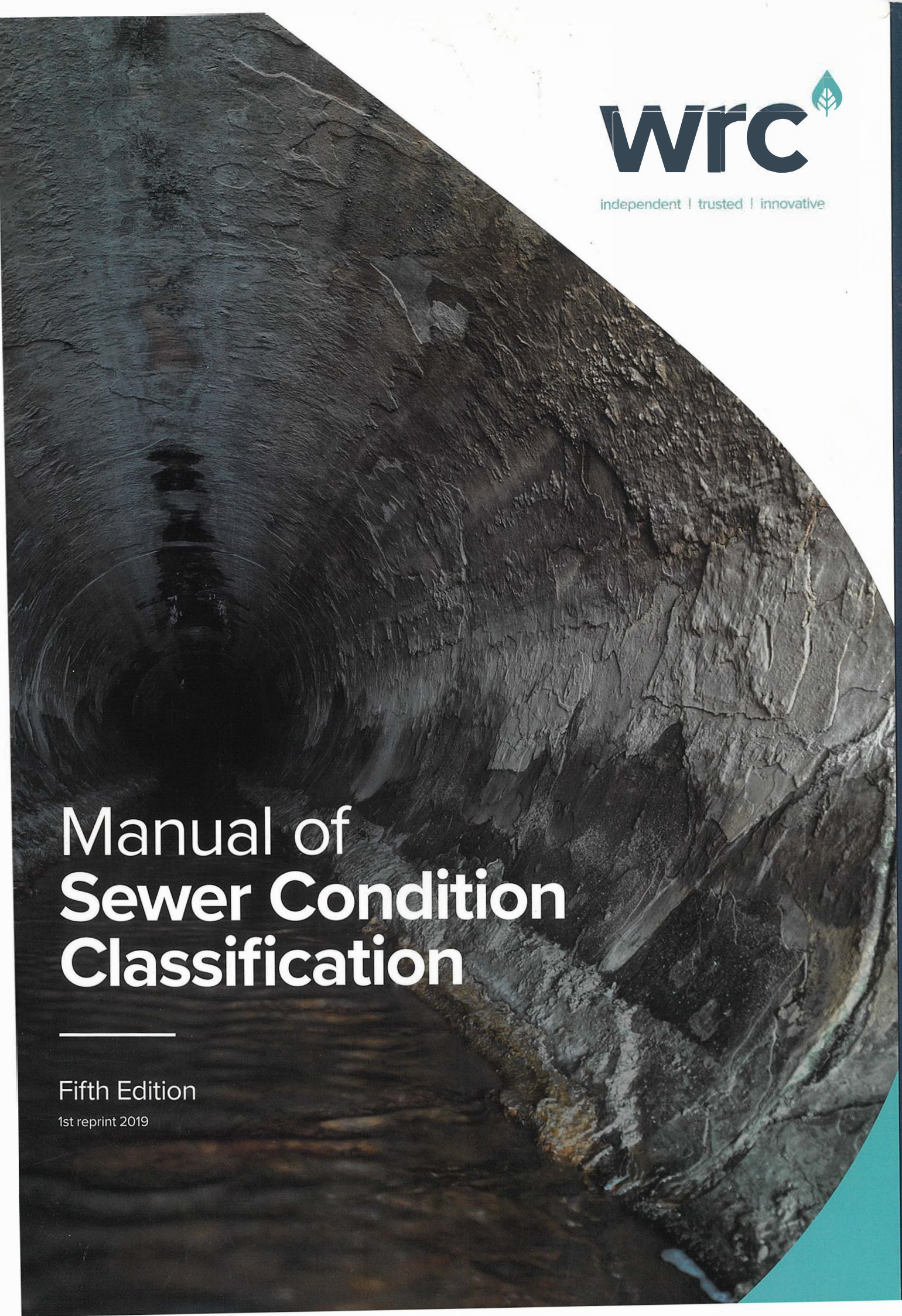

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Manual of **Sewer Condition Classification**

Fifth Edition

1st reprint 2019

Manual of Sewer Condition Classification
5th Edition

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FOREWORD

It is now over 30 years since the first edition of this manual was published by the then National Water Council. Since that time, many thousands of kilometres of sewers have been successfully surveyed and coded, enabling the owners of sewer and drainage systems to establish the condition of their assets.

The experience gained by sewerage undertakers and CCTV contractors has been incorporated into four subsequent editions and as confidence has grown in the methodology, this has been adopted by Highway Authorities and other users.

The concept of condition classification was also taken up in other countries and a European Standard has now been produced to provide a common language for exchange of this information. The codes used in the UK have been adapted to become the UK national equivalent codes and as such appear in BS EN 13508-2:2003+A1:2011.

This fifth edition has drawn once again on the experience of sewerage undertakers and CCTV contractors and describes the revised coding system for drains and sewers. It provides additional guidance on the use of CCTV inspection together with guidance on the use of the coding system for condition inspection of manholes and inspection chambers.

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PART A – DRAINS AND SEWERS

1. CCTV INSPECTION

1.1 Introduction

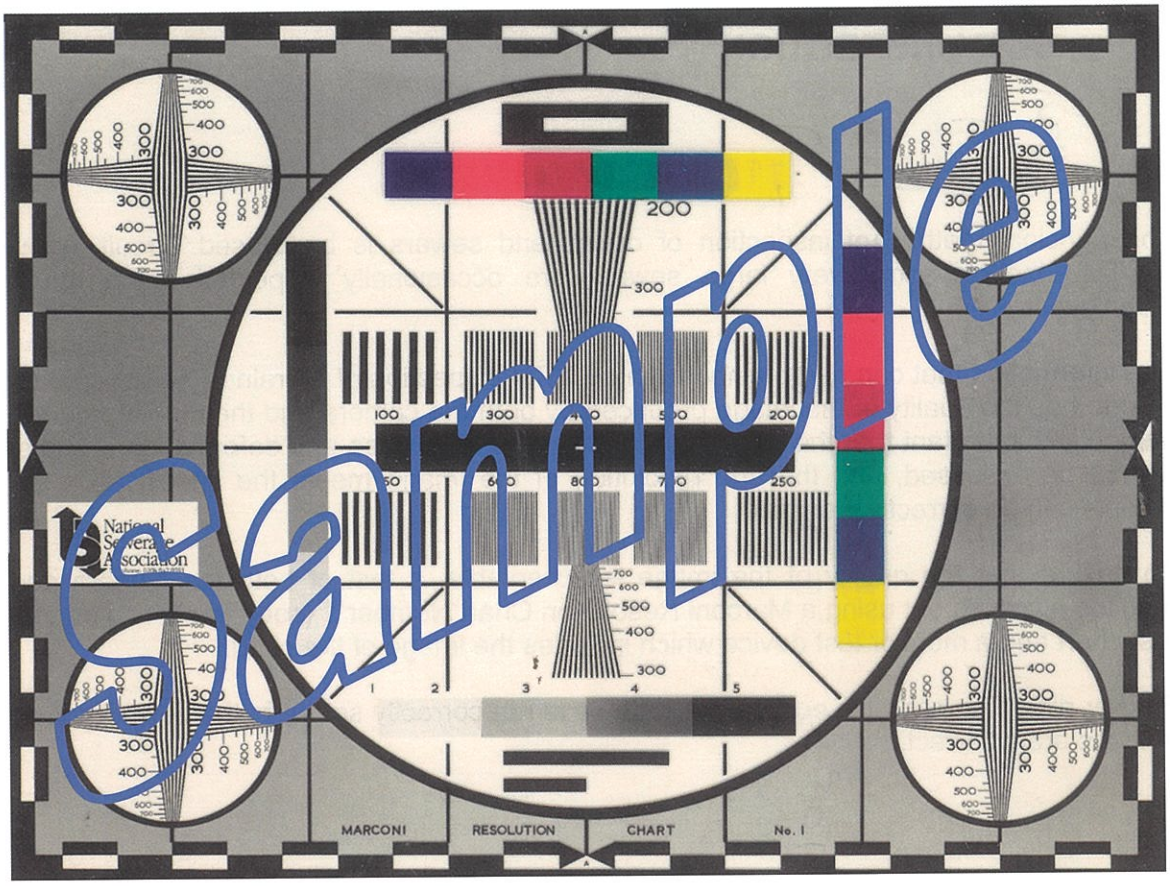
The principal method of inspection of drains and sewers is by Closed Circuit Television (CCTV), though some very large sewers are occasionally inspected using man-entry techniques.

The information that can be obtained from a CCTV inspection of a drain or sewer can only be as good as the quality of the image produced by both the camera and the monitor allows. It is particularly important that the picture is not distorted, otherwise any deformation of the sewer cannot be assessed, and that the resolution of the image meets the specification so that defects can be correctly identified.

To ensure that the quality of the image is acceptable, a test of both the camera and the monitor is carried out using a Marconi Resolution Chart Number 1 (see Figure 1.1) or a similar test chart and a monitor test device which includes the image of the chart.

Further distortion can also occur if the camera is not correctly set up in the sewer or if screen settings are incorrect.

Figure 1.1 Marconi Resolution Chart Number 1
(Reproduced courtesy of the National Sewerage Association)



Further information on camera specification can be found in the Model Contract Document for Sewer Condition Inspection, 2nd Edition (WRc plc 2005).

1.2 Test Procedures

1.2.1 Video display screen

To test the video display, the following procedure is recommended at the start of every working shift:

a) Play a video display screen test recording[1] to test the performance of the recording and playback equipment, and the video display screen.

b) When viewing the test chart, ensure that the full centre circle is visible and that the edges of the test card (castellations) coincide with the edges of the horizontal and vertical scan (raster) image on the screen.

[1] A video screen test DVD/CD can be obtained from the National Sewerage Association.

c) While playing the linearity test section, measure the distances between the centre and each of the "bow ties" with a transparent plastic ruler. Ensure that they are all within 5% of each other to prove circularity. If any is found to be over 5%, the test should be repeated until the required tolerance is achieved. For TFT screens, check that the aspect ratio has been set up correctly. If the test continues to show that the linearity of the screen is not within range, then professional adjustment is required.

1.2.2 Camera test

After testing the video display screen, test each camera on the unit once a week. The following procedure is recommended:

a) Place the camera in a proprietary test chart box and view the test chart (Marconi Resolution Chart Number 1[2]). The chart should be evenly illuminated from the rear. Illumination should be provided by a source compatible with the camera lighting being used (e.g., Quartz Halogen (3,200 K), White L.E.D. (5,600 K)).

b) Position the camera so that the edges of the test chart (castellations) coincide with the edge of the raster image; they must now be in equal position at the top, bottom, left and right of the screen display. The camera is now centred on the test chart.

c) Check that all five shades of grey can be clearly seen on the grey scale; shade 1 should be white and is the background within the centre circle. Adjustment of the screen brightness and contrast controls may be required.

d) Check the resolution by viewing the line wedges and line blocks, adjusting the camera focus to give the best view. The resolution should meet the requirements of the specification.

e) Check that the colour bars, the blue, red, magenta, green, cyan, and yellow sections, can clearly be seen with no tinting or smearing on their edges. Adjustment of the screen colour/chromatic level control may be required.

f) Record a section at the start of each month and at each change of the camera viewing the Marconi Resolution Chart Number 1, as set up above.

g) Record details of the camera checks in a picture quality form or log book.

1.3 Lighting Test

For pipe diameter up to 225 mm, the lighting should be checked monthly at the same time as the camera, using the following test procedure:

a) A screen shall be marked showing the smallest and largest sizes for which the camera is intended to be used. The following steps shall be repeated for both sizes.

b) The screen shall be set up in front of the camera unit, at the image plane (see Figure 1.4) specified by the camera manufacturer for that size.

[2] The Marconi Resolution Chart Number 1 can be obtained from the National Sewerage Association.

c) The lighting shall be turned on and the operator shall check that whole of the marked area of the screen is evenly illuminated without shadow.

d) Record details of the checks in a picture quality form/log book.

For larger diameter pipes/sewers, each time the camera is used, there is a need to ensure that at the camera image plane, the whole pipe surface is illuminated without shadow over a length of at least two diameters or one metre whichever is the least distance.

1.4 Camera Cable Calibration

The calibration of the distance measurement system, which is usually a measurement wheel on the cable, should be checked once a month and at each change of cable or equipment. The recommended test procedure is described below:

a) Ensure that the cable is fully wound onto the cable drum with the end of the cable passing through the measuring wheel.

b) Set the counter to zero.

c) Pull the cable off the drum until the counter indicates exactly 10 metres.

d) Measure the length of cable that has been pulled off the drum with a standard tape, and record this length on the linear measurement audit form (Model Contract Document for Sewer Condition Inspection, 2nd Edition (WRc plc 2005).

e) Repeat steps (c) and (d) four times, pulling 10 metres off the cable drum each time until a total of 50 metres has been checked.

f) Check that the error on the distance measurement is within the tolerance allowed in the specification (Model Contract Document for Sewer Condition Inspection, 2nd Edition (WRc plc 2005).

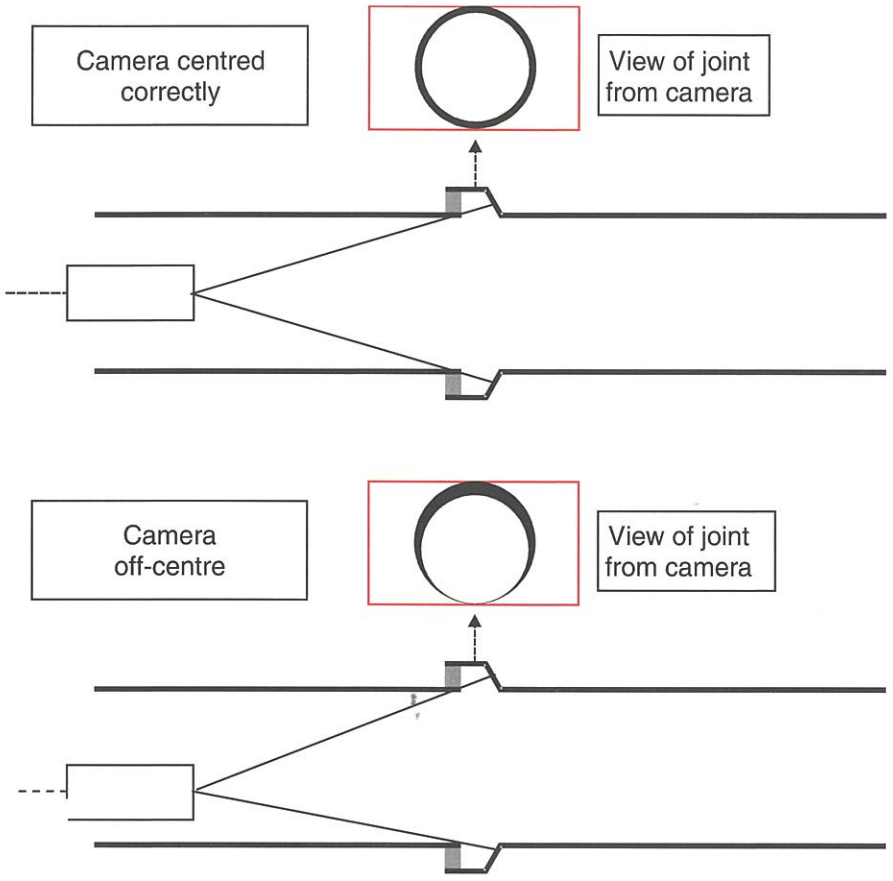
g) File the completed forms in a log book.

1.5 Setting up the Camera in the Drain or Sewer

1.5.1 Centring the camera

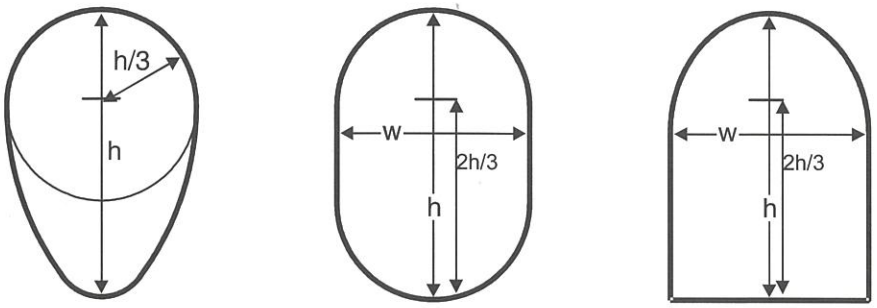
The camera should be set up in the drain or sewer so that the axis of the camera is in line with the central axis of the pipe. This should be to within 10% of the largest dimension of the sewer. If the camera is set too high or too low in the drain/sewer it can lead to distortion resulting in joints appearing to be displaced and errors in estimating water levels and deformation (see Figure 1.2).

Figure 1.2 Distortion Resulting from the Camera being Off-centre



For egg-shaped sewers or arched sewers, the centre of the camera should be aligned with the centre of the upper circle (normally two thirds of the vertical dimension).

Figure 1.3 Diagrams Indicating Camera Position for Egg, Oval and Arch-shaped Sewers



Egg 3:2 (old type) | Oval | Arch-shaped

1.5.2 Measuring the offset distance of the camera

The image of the pipe shown on the monitor is actually showing a point some distance in front of the camera lens at a point defined by the camera offset distance (see Figure 1.4). This depends on the camera type, the size of the drain or sewer and the setting of any zoom. It is important to know this distance before commencing the survey.

A look-up table for different pipe diameters should be requested from the camera manufacturer.

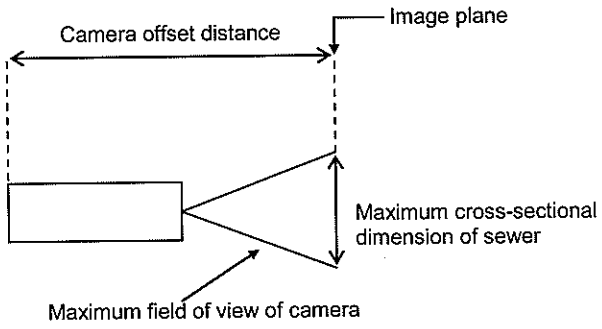
Alternatively, to calculate this distance, the following procedure is recommended:

a) Using a tape, hold it so that the distance between the fingers shows the largest dimension of the cross-section of the pipe to be surveyed (e.g., for a circular pipe this will be equal to the diameter; for other shapes this will be equal to the largest dimension, either vertically or horizontally). The tape should be held horizontally unless the vertical dimension is the largest.

b) View the tape through the camera system and move the tape nearer to or further from the front of the lens until the tips of the fingers on either side of the measured dimension are just in view at the edge of the screen.

c) To determine the camera offset distance, measure the distance from the tape to the rear of the camera.

Figure 1.4 Measuring Camera Offset Distance

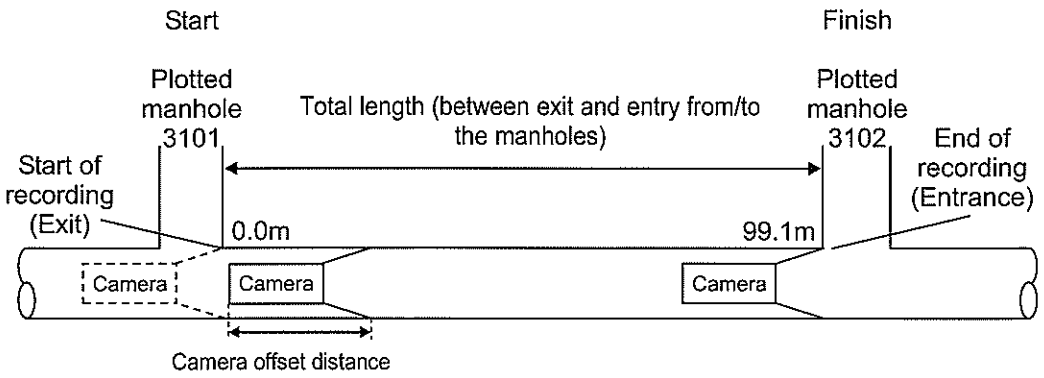


1.5.3 Positioning the camera at the start of the pipe

It should be noted that the cable counter will not normally start to record distance until the cable is taut. Practice has shown that this is best achieved once the rear of the camera is level with the exit/entry point of the pipe/sewer.

However, it is important that the survey should record the whole length of the sewer. The camera is, therefore, placed in the manhole so that the entry to the exit point of the pipe/sewer fills the picture. The cable counter is then set to zero. The video recording should commence and all defects and features recorded as the camera is moved fully into the pipe/sewer to the point, where the rear of the camera is level with the exit/entry and the cable is taut. At this point the cable counter should be reset to the camera offset distance reading from the exit/entry point of the pipe/sewer in the manhole (see Figure 1.5).

Figure 1.5 Survey of Sewer Length



2. CODING PRINCIPLES

2.1 Introduction

This section covers the principles of the procedures used to fill in the appropriate section of the standard coding form (Pages 36 to 39, Figures 3.2 to 3.5). For each sewer length start a new standard coding form, fill in a new header section, zero the distance counter and complete the survey data section in the normal way.

For the purposes of reporting condition, the length of drain or sewer between adjacent nodes, manholes or inspection chambers must be treated separately, with a separate report produced for each. Each report contains two sections as follows:

- The **header information** which generally relates to the whole length of the section of drain or sewer; and,
- The **condition details** which are reported as the survey proceeds along the line of the drain or sewer.

Only the codes normally used in the UK are described in this manual. The national equivalent codes for the remaining codes in BS EN 13508-2:2003+A1:2011 are listed in Appendix A and Appendix B.

For surveys of domestic drainage systems not more than 150 mm in diameter, a simplified set of codes may be used (see Quick Reference Cards).

Each standard coding form is given a sheet number using a sequential numbering system, e.g., 1, 2, 3, 4, etc. Where more than one sheet is required for any sewer length, the sheet should be given a suffix, e.g., A, B, C, etc., on the "continuation" sheet (see Figures 3.3 and 3.5).

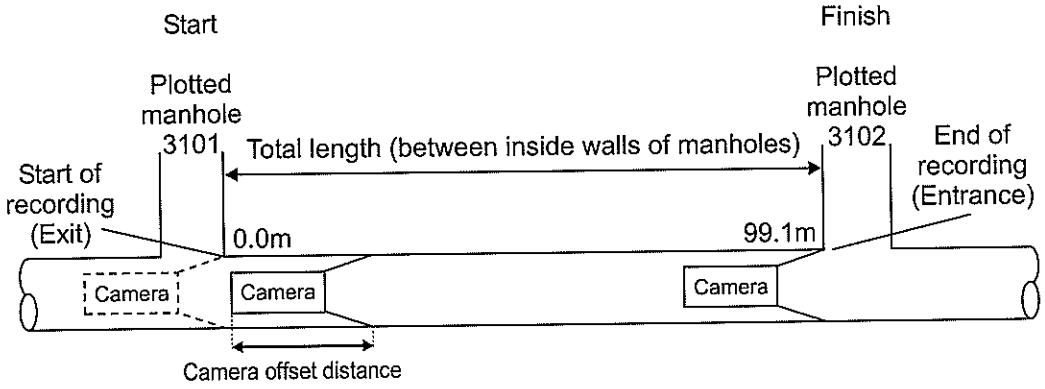
2.2 Sewer Length

The following definitions are used in this section:

Sewer length distance between exit and entry faces in consecutive manholes/nodes (NOT between manhole centrelines) (see Figure 2.1);

Survey run two or more lengths of sewer surveyed in a continuous operation. (Note that a separate report form is required for each sewer length in a survey run).

Figure 2.1 Survey of Sewer Length

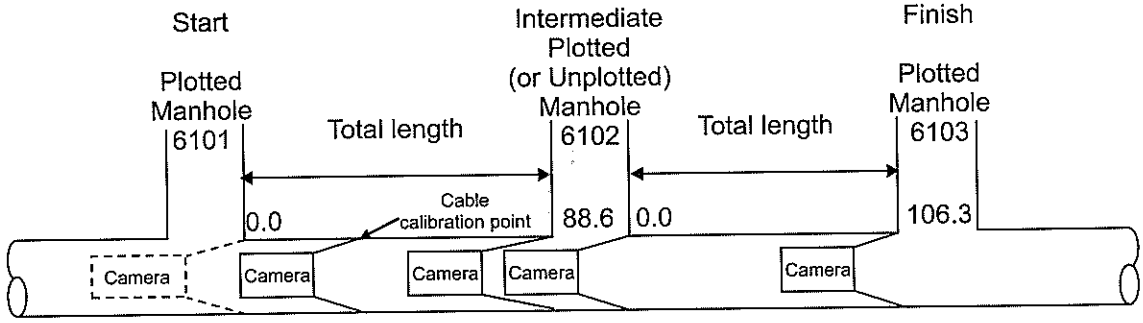


Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
03000		0.0		MH				AB12343101					
		0.0		WL						0			
04250		99.1		MHF				AB12343102					

Note: Ensure all continuous defects are finished at the entry to the finish manhole (99.1m).

Where an unplotted manhole (i.e., a manhole not allocated a reference) is located during the survey, start a new standard coding form, zero the metre counter and continue until the finish manhole is reached (see Figure 2.2). A lamphole, dropshaft, air vent or other node point should only be treated as a manhole if it has been allocated a reference. Check with the client regarding the required procedure for allocating references to unplotted manholes, where appropriate.

Figure 2.2 Survey of Sewer through Intermediate Manhole



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
04250		0.0		MH				AB12346101					
		0.0		WL					15				
05206		88.6		MHF				AB12346102					

Note: Ensure all continuous defects are finished at the entry to the manhole (88.6m).

START A NEW HEADER SHEET

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
05206		0.0		MH				AB12346102					
		0.0		WL						15			
15000		106.3		MHF				AB12346103					

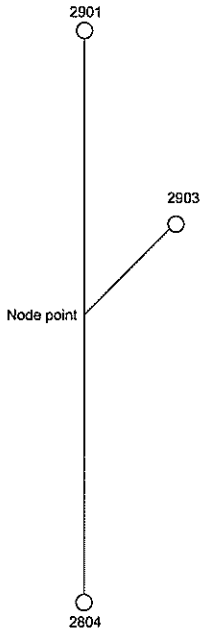
Note: Ensure all continuous defects are finished at the entry to the manhole (106.3m).

When surveying a sewer length which does not have a manhole at its exit but where the end point either has a node reference or is to be given one, this should be treated as a node point (see Figure 2.3).

Enter all data relating to the drain/sewer length and on reaching the finish manhole/node, enter the appropriate code (e.g., MHF) and record the full manhole reference in the Dimension 1 column.

If it becomes necessary to abandon a survey, the appropriate codes should be entered and all continuous defect codes finished prior to abandonment. The value to be entered in Total Length field in the header section is the total length of the sewer to the next manhole as shown on the plan (measured on-site where possible).

Figure 2.3 Survey to Node Point not given a Reference



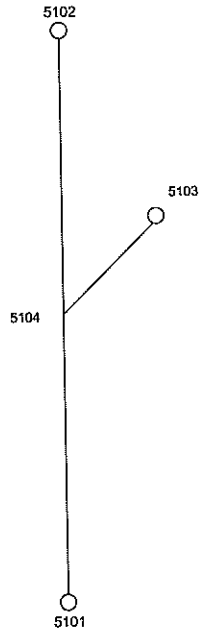
2901 – 2804

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
12100		0.0		MH				AB12342901					
		0.0		WL						10			
14250		28.2		JN				150			09		
20623		93.1		MHF				AB12342804					

2903 – JUNCTION SEWER

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
12100		0.0		MH				AB12342903					
		0.0		WL						10			
15420		30.5		SA									Junction Sewer limit of survey

Figure 2.4 Survey to Node Point that has a Reference



5102 – 5104

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
15610		0.0		MH				AB12345102					
		0.0		WL						10			
		28.3		JN				150			09		
20350		28.3		MHF				AB12345104					

START A NEW HEADER SHEET 5103 - 5104

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
20350		0.0		MH				AB12345103					
		0.0		WL						10			
21008		36.9		MHF				AB12345104					

START A NEW HEADER SHEET 5104 - 5101

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
20020		0.0		MH				AB12345104					
		0.0		WL						10			
22020		28.7		MHF				AB12345101					

2.3 Header Details

The header details are entered in the boxes at the top of the form (see Figure 3.2). The following general principles must be followed when completing the header section of the standard coding form:

- The header section is completed as fully as possible at the start of each sewer length. However, if a continuation sheet is used, only the following information is required on the continuation sheet - (1) Contractor/Operator; (7) Start Node Reference and (8) Date, together with the sheet number and continuation letter.

- Should any variation occur in pipe length, sewer size, shape, lining or material within the length, or if the video recording medium ends during the survey, then enter details of the change using the appropriate codes (see Section 4). The header section should NOT be altered.

2.4 Condition Details

Section 4 of this manual describes the codes which cover structural, service condition, constructional and miscellaneous features. A Quick Reference Guide is included as a separate card. The codes and the information are entered onto the lower section of the form together with the supporting information.

When the header section is complete, start entering the survey information in the data section of the standard coding sheet. Recording must start at the beginning of the sewer (0.0), **NOT** at the cable calibration point (see Figure 2.1). The first two codes used should always be:

- Start node type (e.g., MH). This is always the first piece of information to be entered in the data section.

- Water level, WL, is always the second piece of information to be entered in the data section. After this initial entry, only changes in water level are recorded. Enter the water level in terms of percentage height in the % column. If there is no flow in the sewer, zero (00) is entered.

The uses of the various columns are described below:

Video reference

The time reference to the location of entry on video recording in the format h:mm:ss (e.g., 1:23:30 indicates a point 1 hour 23 minutes and 30 seconds from the start of the recording).

Photograph reference

Wherever a still image or photograph is taken of the feature, a reference should be given.

Enter the still image filename or a photograph number. It is usual to number photographs consecutively.

Distance

Enter the distance in metres of each observation from the start of the survey length. Spaces can be zero filled or left blank. Distances are entered to one decimal place (e.g., 0.0).

Continuous defect

Letter (S = start, C = change or F = finish) followed by a number (integer).

This is used to indicate the start, change or finish of a continuous code by use of the letters S, C or F. Each continuous defect code must be allocated a number (01 – 99). Single digit numbers require a leading zero (i.e., 01-09). The continuous defect facility is described in more detail in Section 2.5.

Code

Enter the appropriate structural, service, constructional or miscellaneous code (see Section 4). The code is composed of a number of elements. There is a basic code which may be further described by ancillary codes. For example, the basic code F (fracture) may be further described by the ancillary code L (longitudinal).

These may then be further described by:

Joint - The letter 'J' should be added to the appropriate defect code where the defect starts and ends within 0.2 m of a single pipe joint or if the defect is at or on the joint. This should not be used where the defect code is always associated with a joint (i.e., the codes JD and OJ).

Material - Where the codes 'MC' or 'LC' are used, the code for the new material or lining material (see Pages 30 and 31) needs to be entered into this column (e.g., MC CO). This is the only time this column is used.

Band - If the code uses bands for quantification (see below) the letter code for the quantification band is the final letter of the code.

Quantification

The quantification is a measure of the feature. Depending on the type of feature this may be recorded as one or two dimensions, a percentage or a band.

Dimensions - For many codes the feature is measured using one or two values. Where these are not percentages, they should be entered in the Dimension columns on the form. Where only one value is used, the first column only should be used. Where the dimension is measured in mm this should be recorded to the nearest 5 mm increment. This column is also occasionally used to store other information such as the manhole/node reference.

Percentage - Where a code requires a percentage value to be entered (e.g., for diameter/height reduction or area loss), it should be entered in this column. Percentage should be entered to the nearest 5% increment. Some computer programs may require loading spaces to be zero filled, therefore, 5% should be written as 05.

Band - The descriptions of certain codes allow the feature to be quantified on the basis of certain bands, e.g., Medium (M) or Large (L). The code quantification is entered in the Band column (e.g., OJ entered within the Code column and M entered within the Band column). The bands for each of these codes are defined in Section 4.

Examples of certain percentages are shown in Figures 2.5 to 2.8 to assist in estimation.

Figure 2.5 Examples of Percentage Deformed

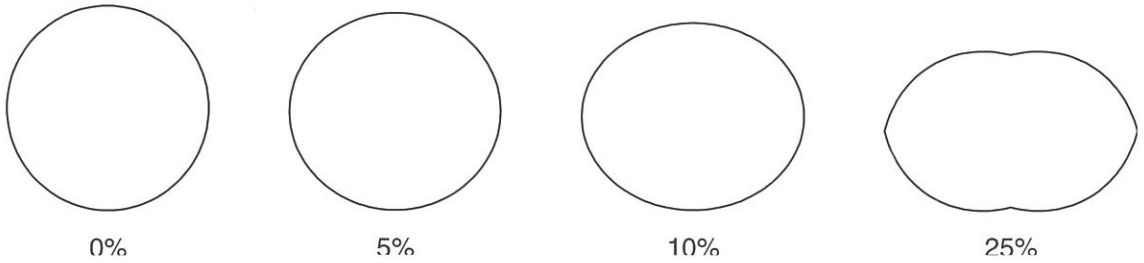


Figure 2.6 Examples of Percentage Area Reduction - Attached Deposits

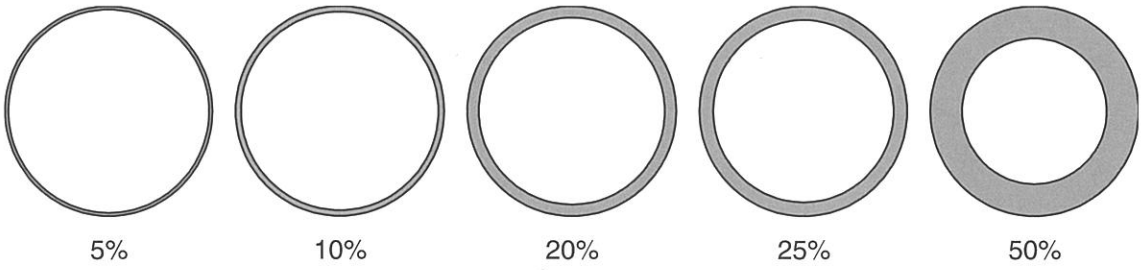


Figure 2.7 Examples of Percentage Area Reduction - Settled Deposits

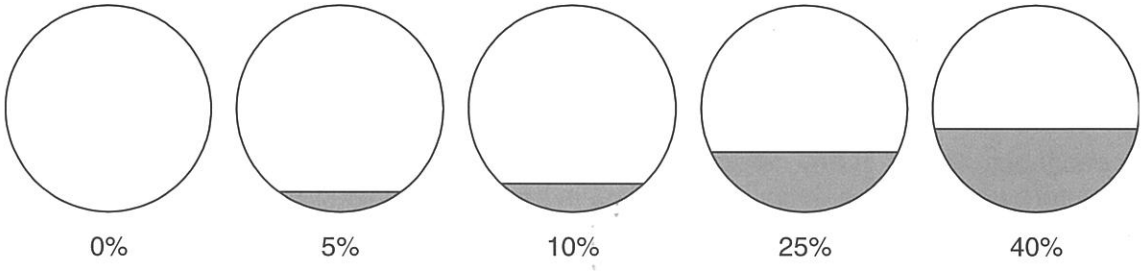
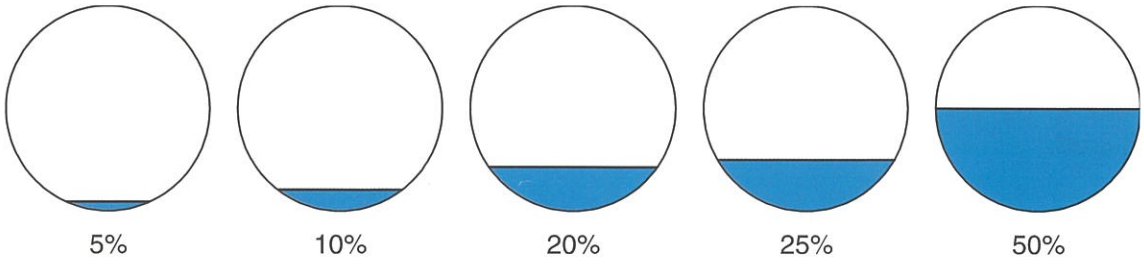


Figure 2.8 Examples of Water Depth Percentages

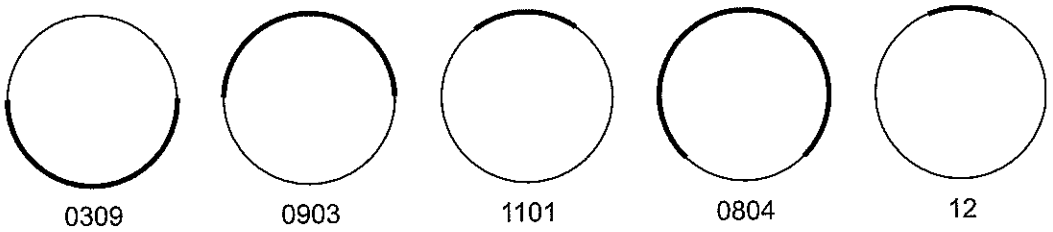


Clock reference

If one clock reference is required to describe a code it is entered in the first column. If two clock references are required, the second is entered in the second column. Some computer programs may require leading spaces to be zero filled. Therefore, 01-09 should have leading zeros.

Clock reference should be given clockwise, e.g., from 10 o'clock to 2 o'clock = 1002. If the defect is at a single point, only one clock reference needs to be given, e.g., at 12 o'clock = 12. Thus the upper half of a pipe is 0903 and the lower half 0309. This is illustrated in Figure 2.9.

Figure 2.9 Examples of Clock References



Remarks

This column may be used to provide further information about a coded feature.

The remarks column may also be used to record information unconnected with any coded feature. In these cases enter the Remarks (REM) code (see Section 4.4, Page 100). A distance must always be entered with each remark. **Do not** enter a description where an adequate code exists. Any remark should be as short as possible.

2.5 Continuous Defect Facility

A "continuous defect" is any defect which extends (or is repeated) beyond the first metre from the camera position. The definition of defect in this context includes structural defects, service conditions and features.

This facility is permitted as a short cut for the person completing the standard coding form and great care should be taken in its accurate use. If this facility is not used, then the defect should be recorded at the start and again at each metre of continuance or, in the case of repeated defects, at the point of occurrence.

To enable the client to interpret and analyse the reports, it is important that the type and description codes are correct and the total number of occurrences of each defect in any one metre length are correct. The distance from the manhole at which defects/features occur needs to be accurate and the clock references and percentages need to be given, where required.

Continuous defects, therefore, fall into one of two categories:

i) "Truly" continuous defects which run along the sewer without interruption over more than one metre. Examples include longitudinal cracks or fractures which run continuously along the pipe at a single clock reference for more than one metre.

OR

ii) "Point" defects which are repeated at regular intervals along the sewer, normally at pipe joints. Examples include defects occurring at joints such as attached deposits, circumferential cracks and fractures.

If the facility is used for repeated point defects, it is essential that almost **every** joint in the appropriate section is affected (i.e., at least 3 out of 4 joints are affected). It is important that the continuous defect is closed down at the point where this is no longer the case to prevent overestimation of the seriousness of the condition of the inspected length.

General rules

When a continuous defect of either type first appears, it is recorded on the data section of the standard coding form (see Figure 3.2) in the usual way. If it can be seen that it already continues for more than one metre then a "Start Label" is written in the Continuous Defect column (see Figure 2.10).

The "Start Label" is written Sn, where n is a number (01-99). If the defect is still there after one metre and the first entry was not labelled with a continuous defect code, then go back up the form to enter a sequential start label.

No further action is then necessary until the end of the defect is reached, or the clock reference of the defect changes and/or there is a change in the percentage entry.

Care must be taken to accurately note the finish of a defect at the correct distance. All outstanding defects must be closed down with the "Finish Label" (Fn) and its corresponding number on completion of each sewer length (including at each unplotted manhole).

If the survey is abandoned and this facility is being used, all continuous defects must be closed down even if the defect has not stopped at the point at which the survey was abandoned.

Should vision be lost due to the camera going under water or silt, record accurately the point where vision is lost and regained. Close down any continuous defect at the point where vision is lost and make a comment in the Remarks column "Defect continues" if it can be seen to do so.

When the end of the defect is reached, this is recorded as follows:

i) Enter the metreage at which the defect ends.

ii) Enter the "Finish Label", Fn, where n is the same number as used in the corresponding start label.

iii) Enter the defect code in the condition defect column exactly as at the start.

iv) Enter the other information relating to the code. This will be the same as at the start unless the defect "wanders" (see below), in which case it will reflect the last line recorded.

If the continuous defect facility is being used (e.g., CL or DEE) and at occasional points a more serious defect takes the place of this (e.g., FL or DEE) this must be recorded in full but there is no need to finish and restart the continuous defect. However, if the more serious defect extends beyond a metre (truly continuous) or is predominant (point defect) then the original defect should be finished and a new continuous defect started.

Figure 2.10 Truly Continuous Defect

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
		0.0		MH				AB123 45678					
		0.0		WL						05			
		12.3	S01	DES						05			
		16.9	S02	JD			M						
		28.0	F01	DES						05			
		30.0	F02	JD			M						
		30.0		MHF				AB123 45679					

Defects that "wander"

Truly continuous defects (see Figure 2.11)

If the defect "wanders" around on the sewer wall, e.g., changing clock references and/or increases/decreases in percentage (without changing the code) but is otherwise a truly continuous defect then:

i) Enter the metreage at which it changes.

ii) Enter the defect code in the Condition Defect column exactly as at the start.

iii) Enter the "Change Label", Cn, where n is the same number as used in the corresponding start label.

Repeated point defects

In pipe sewers only, if the continuous defect facility is used for repeated point defects and the clock references and/or percentage entry of the defect "wanders" along the sewer, this need not be recorded. However, the clock references and/or percentage at the start and finish labels must be given. A note should be made as a remark with the finish label that the clock references and/or percentages varied.

Note: If the extent of the defect varies so that the code would change, then the continuous defect shall be closed down and a new continuous defect started.

Figure 2.11 Truly Continuous Defect "Shorthand Method" Defect Wanders

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
0000		0.0		MH									
0000		0.0		WL						05			
		6.3	S01	CL							12		
		7.8		JN				100			10		
		9.4	C01	CL							01		
		10.0		CL							04		
		10.0		DES						10			
		13.0	S02	DES						05			
		14.2	C01	CL							12		
		18.0	F02	DES						05			
		18.0	S03	DES						10			
		20.0	F01	CL							12		
		28.0	F03	DES						10			
0100		28.0		MHF									

Points to check

At the end of each sewer length, check that all continuous defects have correct (i.e., matching) start, change and finish labels. The defect code must be identical in the start, change and finish entries. Continuous defects must be closed down at the end of each surveyed length whether completed or abandoned or when vision is lost.

If *errors* are noticed which cannot immediately be corrected, make a note in the Remarks column, e.g., Recheck defect 6 at 52.4 m to 79.6 m. It is the responsibility of the surveyor to make sure any anomalies are rechecked against the video record and amendments made to the final submitted report.

2.6 Quality Control Procedure

The accuracy of the coding system is highly reliant on the skill of the surveyor who carries out the inspection and produces the report. A quality control system to continuously monitor the standard of coding is, therefore, required.

The Quality Control Procedure should be agreed with the client, who should specify the level of accuracy required, prior to the commencement of any contract.

The system should measure the accuracy of reporting and in particular:

- The number of faults not recorded (omissions).
- The correctness of the coding and classification of each fault recorded.

Reports may fail due to inaccuracies in either the header or data sections.

Methodology

At the end of each week (or day if more appropriate), each surveyed length will be numbered sequentially in the order in which it was carried out and the total noted for each surveyor.

The sample surveys for quality control for each surveyor are then to be selected by the use of computer-generated random numbers or other such equivalent method[3]. The number of lengths selected should be 5% of the total lengths surveyed. A copy of the relevant section of the video recording relating to the selected lengths should be retained by the contractor for future reference. Information on the length selected and its contents are entered on a survey selection log (Model Contract Document for Sewer Condition Inspection, 2nd Edition (WRc plc 2005).

All **header** information should be checked to ensure that entries are correctly entered, codes or numbers are correctly used and all compulsory boxes filled in. The percentage of accurate entries should be determined and any that fall below the agreed threshold value should be rejected.

In checking the **data** section, each error/omission should be treated on an equal basis whether or not it is a minor or major error or omission. During the checking, each error/omission should be highlighted on the report from which the following totals are calculated for each survey report:

- The number of actual entries that should have been made.
- The number of actual errors/omissions made.

These totals should be entered on the right of the survey report being checked and the individual column totals should be entered onto the survey log.

The accuracy of each survey is determined from:

$$\text{Accuracy} = \frac{\text{(the actual number of entries - the number of actual errors/omissions)}}{\text{the actual number of entries}} \times 100\%$$

The percentage should be entered on the survey detail rating form.

It should be noted that all percentage points created by the control procedure should be rounded **down** to the nearest whole number.

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.

[3] Whatever method is used, it is important that the selection is random and not pre-determined.

The on-going accuracy of the surveyor (the confidence level) should be calculated by taking the mean of each five percentage results (each five representing one control unit).

Both the individual survey percentages and the mean results should be entered on to the surveyor's accuracy graph. This graph should have two boundaries:

- Specified mean – the level of accuracy expected.
- Specified tolerance – the level to which the accuracy can fall before specified action is taken.

Any surveyor whose quality control results fall below the specified accuracy on more than two occasions should be deemed to have failed his control criteria and should be subject to retraining before resuming duties.

Figure 2.12 An Example of a Quality Control Reporting Log

Rig Manager _

Q.C. No:	Factor	Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks	Video Quality	Totals	Result
						Code	Joint	Mate-rial	Band	Dimension		%	Clock					
										1	2		At/ From	To				
	Actual																	
	Errors																	
	Actual																	
	Errors																	
	Actual																	
	Errors																	
	Actual																	
	Errors																	
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	Errors																	
	Actual																	
	Errors																	

Figure 2.13 An Example of a Survey Detail Rating Form

Surveyor ______________________________**Company** ________________________________

Control Unit

Q.C.No:						Sum	X	Range
Actual							÷	
Errors							5	
Results								

Control Unit

Q.C.No:						Sum	X	Range
Actual							÷	
Errors							5	
Results								

Control Unit

Q.C.No:						Sum	X	Range
Actual							÷	
Errors							5	
Results								

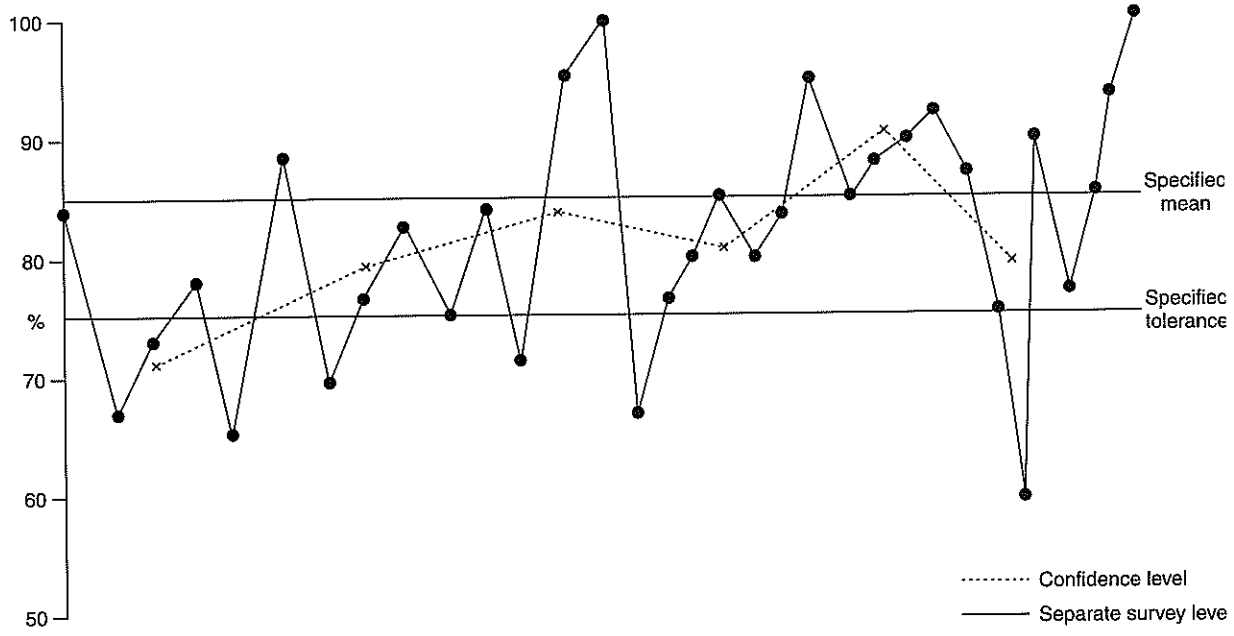
Control Unit

Q.C.No:						Sum	X	Range
Actual							÷	
Errors							5	
Results								

Control Unit

Q.C.No:						Sum	X	Range
Actual							÷	
Errors							5	
Results								

Figure 2.14 An Example of a Surveyor Accuracy Graph



Surveyor Accuracy Graph

3. HEADER DETAILS

This section of the manual describes how to enter the header details on to the standard coding form (see Figure 3.2). The header details are completed using standard header codes, where appropriate. The client may not require all of the fields to be completed in which case the standard coding should be "shaded" or "hatched" to indicate which fields need not be filled in. Where computer entry is made, these fields should be confirmed with the client.

Field 1 – Client

Enter the name of the sewerage undertaker, highway authority, Highways Agency Region or other owner of the drain or sewer.

Field 2 – Name of Surveyor

Enter the name of the person responsible for completing the survey and, if required, a standard abbreviation of the company name.

Field 3 – Client's Job Reference

Enter the client's job reference code, where required. This will be provided by the client.

Field 4 – Contractor's Job Reference

Enter the contractor's job reference code. This will be provided by the contractor.

Field 5 – Drainage Area

Sewerage undertakers have generally divided their systems into discrete "drainage areas" for planning purposes. When provided by the client, this should be entered here. Where a survey is for a highway authority, the route number should be entered.

Field 6 – Division/District

Enter an appropriate district/division code, normally provided by client.

Field 7 – Pipeline Length Reference

Enter the pipeline length reference which is derived from the upstream manhole of each survey plus the appropriate suffix or use another client-specified system. Where two or more drains/sewers exit from the same manhole, a suffix should be entered to distinguish between the sewers (usually X, Y and Z). This system is described in Appendix A. The client should state how these should be assigned.

Field 8 – Date

Enter the survey date in the order day, month, year, e.g., 01-08-2013 (1 August 2013). Note that blanks are to be zero filled.

Field 9 – Time

Enter the time at the commencement of survey of drain/sewer length. Use the 24-hour clock and the format hh:mm, e.g., 3.30 p.m. = 15:30. Note that blanks are to be zero filled.

Field 10 – Location (Street Name)

Enter "street name" through which the drain/sewer is situated. If the street name is not known, enter the place name and general description of the location. For a domestic drainage survey, the house number/name should also be included.

Field 11 – Location (Town or Village)

Enter a town, village or area (preferably a name which appears on the 1:50,000 Ordnance Survey map), where the drain/sewer is located. Check the requirements with the client when in a large conurbation.

Field 12 – Location Type Code

Enter the appropriate code for the location of the drain/sewer using the following tables (Tables 3.1 and 3.2). The type of location code used is dependent upon the client: for sewerage undertakers and domestic drainage the codes in Table 3.1 should be used; for highways authorities use the codes in Table 3.2 (in accordance with the Manual of Contract Documents for Highway Works (Volume 5, Section 9) (Highways Agency)).

Table 3.1 Codes for Location Type (Sewerage Undertakers and Domestic Drainage)

Code	Description
RD	Road
FWY	A footway beside a road
VG	Verge
PD	Other pedestrian area
FLD	Fields (farmland and public open space)
PR	Property with buildings
GDN	Gardens (within private property)
BLG	Under a permanent building
WLD	Woodland
DIF	Difficult access (motorway, railway, watercourse, inside building)
WWY	Under a waterway
Z	Other

Table 3.2 Codes for Location Type (Highways Authorities)

Code	Description	
	Roads other than motorways	**Motorways**
XS1	Left Outside Verge (adjacent to footway)	Not used
XS2	Left Footway	Not used
XS3	Left Verge	Verge
XS4	Lane 1	Hard shoulder
XS5	Lane 2	Left lane
XS6	Lane 3	Central lane
XS7	Lane 4	Right lane
XS8	Right Verge	Central reserve/Right verge
XS9	Right Footway	Not used
XS0	Right Outside Verge	Not used
XSE	Right turning lane	Lane 5
XSQ	Slip road	Slip road
XSR	Bus lane	Lane 6
XST	Crawler lane	Crawler lane
XSW	Left turning lane	Not used
XSY	Any other option	Any other option

Field 13 – Land Ownership

Enter the owner of the land on which the survey is carried out and one of the following prefixes:

PR	Private
PU	Public
X	Not known

Note: Lateral surveys from a main sewer

Camera units are available which have a facility on the main tractor unit to push the camera on a rod up a side branch (lateral). Where this technique is used, there is NO Start Node Reference so the start point for the survey is defined using the start and finish node of the main line (Fields 14 to 23), the distance of the start point along the main line, the position of the connection on the main line and the node point of the finish point of the survey (see Figure 2.3). The required fields are identified with the symbol ‡.

Field 14 – Start Node Reference

Enter reference in accordance with manhole/node (STC25) referencing system described in Appendix A.

Where an established local manhole referencing system exists, this may be used as a temporary reference pending adoption of the recommended system. Enter manhole reference on left of box.

The start node reference is not used when the survey of the lateral is carried out.

Field 15 – Start Node Coordinate

If the client specifies the use of a coordinate, then enter the XY coordinates.

Field 16 – Node 1 Reference ‡

Where a survey of the lateral is carried out from the main line, enter the node reference from which the camera started the survey of the main line.

Field 17 – Node 1 Node Coordinate

If the client specifies the use of a coordinate, then enter the XY coordinates.

Field 18 – Depth at Start Node

Enter in metres the distance between the cover level of the manhole and the invert level of the pipe/sewer being surveyed. All manhole levels and depths shall be recorded to two decimal places. This must be physically measured on-site. Where the manhole cover is not level, measure vertically from the lowest point on the top of the frame. If an unnumbered, buried manhole is encountered, this should be left blank and the word "Buried" entered in the General Remarks field.

Field 19 – Finish Node or Node 2 Reference

Enter a reference in accordance with the manhole/node (STC25) referencing system in the same way as for the start manhole.

Where a survey of the lateral is carried out from the main line, enter the node reference to which the camera is intending to finish the survey in the main line.

Field 20 – Depth at Finish Node

Enter the depth of the finish manhole in the same way as the start manhole.

Field 21 – Node 2 Node Coordinate

If the client specifies the use of a coordinate, then enter the XY coordinates.

Field 22 – Node 3 Reference ‡

Node 3 reference is only used when carrying out a lateral survey.

Enter a reference in accordance with the node (STC25) referencing system in the same way as for the start manhole.

Field 23 – Node 3 Node Coordinate ‡

If the client specifies the use of a coordinate, then enter the XY coordinates.

Field 24 – Lateral Inspection Start Point ‡

In the case of lateral inspection, enter the start point of the inspection:

A	Connection to the main sewer
B	Third node

Field 25 – Longitudinal Location of Start of Lateral ‡

Enter the length in metres of the start point of the lateral survey from Node 1.

Field 26 – Circumferential Location of Start of Lateral ‡

Enter the clock reference of the connection of the lateral being surveyed.

Field 27 – Use of Drain/Sewer

Enter one of the following codes to define the use of the drain/sewer:

C	Combined
F	Foul
S	Surface water
T	Trade effluent
W	Culverted watercourse
LD	Subsoil or field drainage
Z	Other

All doubtful cases should be brought to the attention of the client for a decision. A note may be put in the General Remarks field.

Field 28 – Type of Drain/Sewer

Enter one of the following single character codes for the type of drain/sewer:

A	Gravity drain/sewer
B	Rising main
V	Vacuum pipeline

Field 29 – Direction

Enter one of the following codes for the direction of survey in relation to flow:

U	Survey upstream (camera pointing against flow)
D	Survey downstream (camera pointing with flow)
Z	Not known

Field 30 – Height or Diameter

Enter the dimensions of either drain/sewer height or diameter, if circular, in millimetres.

Field 31 – Width

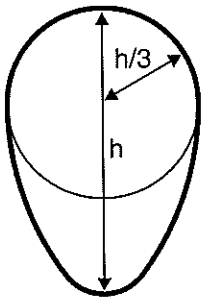
Enter the maximum drain/sewer width (if not circular) in millimetres.

Field 32 – Shape

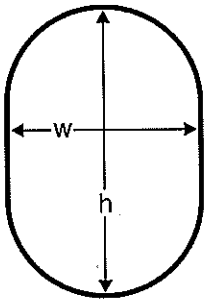
Enter one of the following codes to describe the drain/sewer shape:

A	Arched (with flat bottom)
B	Barrel (e.g., beer-barrel shape)
C	Circular
E	Egg-shaped
H	Horseshoe (i.e., inverted U)
O	Oval
R	Rectangular
T	Trapezoidal
U	U-shaped with flat top
K	Kerb block
CSC	Circular with smaller channel
RSC	Rectangular with smaller channel
Z	Other (state in General Remarks field)

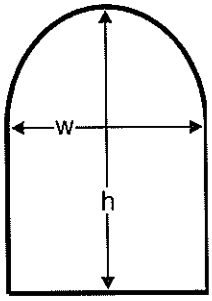
Figure 3.1 Commonly Occurring Non-circular Shapes



Egg 3:2
(old type)



Oval



Arch-shaped

Field 33 – Material

Enter one of the following codes for the drain/sewer material. Where there is a mixture of materials around the circumference of the drain or sewer (e.g., brick invert with a concrete soffit), the code MX is used and details are given in the General Remarks field. Where the drain/sewer has been relined, the material recorded is the material of the original drain/sewer, or enter Z if the original material is unknown.

AC	Asbestos cement
BL	Bitumen (lining)
BR	Brick
CI	Cast iron
CL	Cement mortar (lining)
CO	Concrete
CS	Concrete segments
DI	Ductile iron
EP	Epoxy
FC	Fibre cement
FRP	Fibre reinforced plastics
GI	Grey cast iron
MAC	Masonry – in regular courses
MAR	Masonry – randomly coursed
MX *	Mixed material construction
PVC	Polyvinyl chloride
PE	Polyethylene
PF	Pitch fibre
PP	Polypropylene
PS	Polyester
RC	Reinforced concrete
SPC	Sprayed concrete
ST	Steel
VC	Vitrified clay (i.e., all clayware)
X	Unidentified material
XI	Unidentified type of iron or steel
XP	Unidentified type of plastics
Z	Other (details should be recorded in the General Remarks field)

* Where this is used. Additionally, at the start of the sewer length or at the change of material, the MC code should be used for each of the materials with a clock reference (see page 97).

Field 34 – Lining Material

Where the drain/sewer has been relined, enter one of the codes listed under "Material" to define the lining material. If the drain/sewer is not lined, leave the field blank.

Field 35 – Lining Type

Where a drain/sewer has been lined, record the method of the lining as follows:

M	Lining inserted during manufacture
SP	Sprayed lining
CIP	Cured-in-place lining
SEG	Segmental linings
DP	Lining with discrete pipes
CP	Lining with continuous pipes
CF	Close-fit lining
SW	Spirally-wound lining
Z	Other – further remarks should be recorded in the General Remarks field
Blank	No lining

If the lining method is not known, the client may be able to advise which lining method was used.

Field 36 – Pre-cleaned

State whether cleaning was carried out prior to the survey. Enter Y if pre-cleaning was carried out, N if it was not and Z if not known. Y or N shall only be entered if the information is definitely known.

Field 37 – General Remarks

Enter any general information relevant to the survey of the complete drain/sewer length which cannot be included in any other way. The client may specify if any particular items are required.

Field 38 – Critical/Strategic Drain/Sewer

Enter a drain/sewer category code A, B or C as defined in the Sewerage Rehabilitation Manual (WRc plc (2013)) where this information is provided by the client. Enter Z if unknown.

Field 39 – Purpose of Inspection

Enter an appropriate code for the survey purpose:

A	Investigation of known structural or service defects
B	Investigation of infiltration problems
C	Post-completion inspection of repairs or renovations
D	Pre-adoption survey prior to vesting as public sewer
E	Post-completion inspection of new sewers
F	Sample survey of sewers to determine asset condition of a sewer system
G	Routine inspection of condition
H	Investigation of a suspected operational problem
I	Investment planning
J	End of warranty period
X	Other (state in General Remarks field)

The surveyor should insert this information where provided by the client.

Field 40 – Inspection Stage

Where some of the header information is provided by the client in advance of the survey, this field should be used to indicate the stage of the inspection:

A	Information provided by client
B	Information provided by the inspector to client
Z	Other

Field 41 – Flow Control Measures

Enter the measures taken to deal with the flow at the time of the inspection:

N	No flow control
BL	Flows blocked upstream
PB	Flows partially blocked upstream
X	Other – further details should be recorded in the General Remarks field

Field 42 – Weather

Enter an appropriate code for weather:

D	No rain or snow
R	Rain
S	Melting snow or ice

Field 43 – Temperature

Enter the temperature in Celsius or as a code as follows:

A	Temperature is above freezing
B	Temperature is below freezing

Field 44 – Pipe Unit Length

Enter the length in metres of a **normal** pipe, i.e., each individual pipe which forms the drain/sewer. Be careful not to measure the stub or rocker pipe adjacent to a manhole as it is normal to use only part of a pipe unit in this location.

Field 45 – Expected Length

Where the whole length is surveyed, enter the distance once the survey is complete, to one decimal place, between the exit of the start manhole and the entrance to the finish manhole as recorded on the metre counter. Note that this length is not the length between manhole centrelines. The accuracy required is generally ±1% or ±0.3 m, whichever is the greater.

Field 46 – Year Constructed

Enter the actual year the drain/sewer was constructed, either as a single year in CCYY format (e.g., 1923) or as a range in CCYY-CCYY format (e.g., 1923-1930). Enter Z if the year is not known. The client should supply the information where this is required.

Field 47 – Method of Inspection

Enter the method of access as follows:

A	Direct inspection (man-entry)
B	CCTV
C	Inspection from manhole or inspection chamber only

Field 48 – Standard

Enter the version of the standard used to record the data. This should be in the form BS EN 13508-2:2003+A1:2011 or the appropriate version. MSCC3 was developed prior to the publication of BS EN 13508-2; MSCC4 is based on BS EN 13508-2:2003 whilst MSCC5 is compliant with BS EN 13508-2:2003+A1:2011.

Field 49 – Video Image Storage Media

Enter the type of media used for recording images as follows:

VHS	VHS video cassette tape
CD	CD
DVD	DVD
PHD	Portable hard drive
X	Other – further details should be recorded in the General Remarks field

Field 50 – Video Image Location System

For moving images, the method of recording the position on the video medium (i.e., tape, CD, DVD, portable hard disk, etc.) should be recorded as follows:

A	The recording time in hours, minutes and seconds since the start of the tape (preferred)
B	A machine-dependant numeric counter
X	Other – further details should be recorded in the General Remarks field

Field 51 – Video Image Format

Enter the type of media used for storing videos as follows:

F	Fixed to media type
MPEG1	MPEG1
MPEG2	MPEG2
MPEG4	MPEG4
AVI	AVI
VOB	VOB
DIVX	DIVX
Z	Other

Field 52 – Video Image Filename

Enter the name of the file as stored. A unique filename should be used.

Field 53 – Video Volume Reference

Enter the reference number of the volume, i.e., film, tape, CD, DVD, portable hard disk, etc.

A unique location reference for each observation is also recorded in the feature codes, where applicable.

Field 54 – Photograph Image Storage Format

Enter the type of media used for storing images as follows:

A	Still photographs
C	Windows Meta File (WMF)
D	Graphic Image File (GIF)
E	JPEG file
F	TIF
G	PNG
X	Other – further details should be recorded in the General Remarks field

Field 55 – Photograph Volume Reference

Enter the reference number of the film, CD, DVD, portable hard drive, etc.

A unique reference for each photograph should also be included in the feature code, where applicable.

Fields 56 – 61 – Client Defined

These fields are to be used where specified by the client.

The client will also specify the way in which they are to be used.

Figure 3.2 Standard Coding Form (Sewerage Undertakers)

Client

Sheet Number

Name of Surveyor

Client's Job Reference

Contractor's Job Reference

Drainage Area

Division/District

Pipeline Length Reference

Date

Time

Location (Street Name)

Town or Village

Location Type Code

Land Ownership

Start Node Reference

Start Node Coordinate

Node 1 Reference

Node 1 Coordinate

Depth at Start Node

Finish Node or Node 2 Reference

Depth at Finish Node

Node 2 Node Coordinate

Node 3 Reference

Node 3 Node Coordinate

Lateral Inspection Start Point

Longitudinal Location of Start of Lateral

Circumferential Location of Start of Lateral

Use of Drain/Sewer

Type of Drain/Sewer

Direction

Height or Diameter

Width

Shape

Material

Lining Material

Lining Type

Pre-Cleaned

General Remarks

Critical Drain/Sewer

Purpose of Inspection

Inspection Stage

Flow Control Measures

Weather

Temperature

Pipe Unit Length

Expected Length

Year Constructed

Method of Inspection

Standard

Video Image Storage Media

Video Image Location System

Video Image Format

Video Image Filename

Video Volume Reference

Photograph Image Storage Format

Photograph Volume Reference

Client defined 1

Client Defined 2

Client Defined 3

Client defined 4

Client Defined 5

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/From	Clock To	

Figure 3.3 Standard Coding Form Continuation Sheet (Sewerage Undertakers)

Client

Start Node Reference

Sheet Number

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	

Figure 3.4 Standard Coding Form (Highway Authorities)

Highway Authority or Highways Agency Region

Sheet Number

Name of Surveyor | Client's Job Reference | Contractor's Job Reference | Route Number | Division/District

Pipeline Length Reference | Date | Time | Location (Street Name) | Town or Village

Location Type Code | Land Ownership | Start Node Reference | Start Node Coordinate | Node 1 Reference | Node 1 Coordinate | Depth at Start Node

Finish Node or Node 2 Reference | Depth at Finish Node | Node 2 Node Coordinate | Node 3 Reference | Node 3 Node Coordinate | Lateral Inspection Start Point

Longitudinal Location of Start of Lateral | Circumferential Location of Start of Lateral | Use of Drain/Sewer | Type of Drain/Sewer | Direction | Height or Diameter

Width | Shape | Material | Lining Material | Lining Type | Pre-Cleaned | General Remarks

Strategic Drain/Sewer | Purpose of Inspection | Inspection Stage | Flow Control Measures | Weather | Temperature | Pipe Unit Length | Expected Length

Year Constructed | Method of Inspection | Standard | Video Image Storage Media | Video Image Location System | Video Image Format

Video Image Filename | Video Volume Reference | Photograph Image Storage Format | Photograph Volume Reference | Client Defined 1

Client Defined 2 | Client Defined 3 | Client Defined 4 | Client Defined 5

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/From	Clock To	

Figure 3.5 Standard Coding Form Continuation Sheet (Highway Authorities)

Highway Agency Region

Start Node Reference

Sheet Number

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	

4. CONDITION CODES

The drain/sewer condition codes and their definitions are described below. Often more than one code may be needed to describe what is seen during the survey. A pipe may for instance be broken and deformed, or cracked and fractured. **It is important to note all that can be seen and not just the worst defect.** The descriptions given with the example photographs illustrate this further.

Data are normally entered in the order in which they occur as the survey proceeds along the pipe. However, where a paper form is used for entry, if an omission or error occurs then the corrected line of data or additional line may be entered at any intermediate point on the form, or after the last line of data, providing that it has a "metreage" entry, but before the MHF or SA code. Take care to record the correct metreage, ensuring the camera cable remains taut at all times.

Care must be exercised with the use of the defect codes for brick drains/sewers, particularly the codes for fracture and mortar loss.

A summary of all codes is given in the Quick Reference Cards and an alphabetical listing of all codes is given in Appendix A and Appendix B.

Enter J if the defect is associated with the joint. This should be restricted to those defects which start or end within 0.2 m of a single pipe joint or if the defect is at or on the joint. A defect which runs from joint to joint along the length of the pipe should NOT have a J entered.

4.1 Structural Condition

These codes describe the physical condition of the drain/sewer and the severity of the damage.

Crack

Definition: A **crack** line is apparent on the pipe wall but is *not* visibly open; the pieces have not moved apart.

A **longitudinal** crack runs approximately along the axis of the drain/sewer.

A **circumferential** crack runs approximately at right angles to the axis of the drain/sewer.

Multiple cracks are an area of crazed cracking (a combination of longitudinal, circumferential and/or spiral cracks) that cannot be easily identified and/or individually coded.

Spiral cracks are individual cracks that change position as they travel along the pipe.

A spiral crack should not be confused with a circumferential crack, or a wandering longitudinal crack. Spiral cracks typically do not travel from one pipe section/unit to the adjoining pipe section/unit crossing a joint.

In brick drains/sewers, crack lines are visible in the brickwork and/or mortar but the bricks are still in place.

Radiating cracks are cracks that radiate outwards from a single point in a star pattern. The J code is not used with this defect.

Code	Description
C L (J)	Crack longitudinal at ... o'clock (at joint)
C C (J)	Crack circumferential from ... to ... o'clock (at joint)
C M (J)	Cracks multiple from ... to ... o'clock (at joint)
C S (J)	Crack spiral from ... to ... o'clock (at joint)
C R	Crack radiates from ... o'clock

Figure 4.1 Longitudinal Crack at 9 o'clock

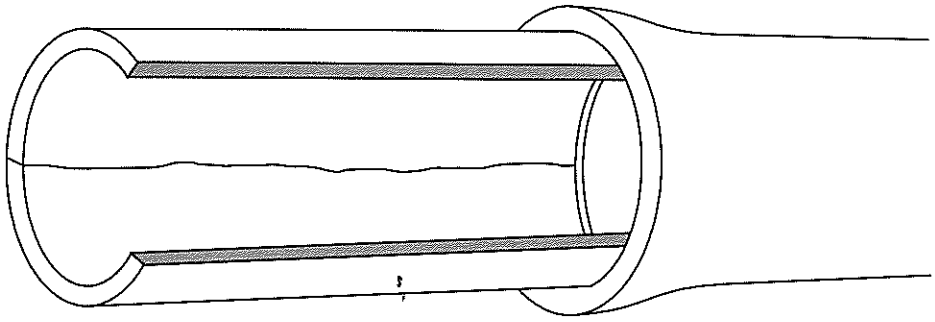


Figure 4.2 Spiral Crack from 10 o'clock to 3 o'clock

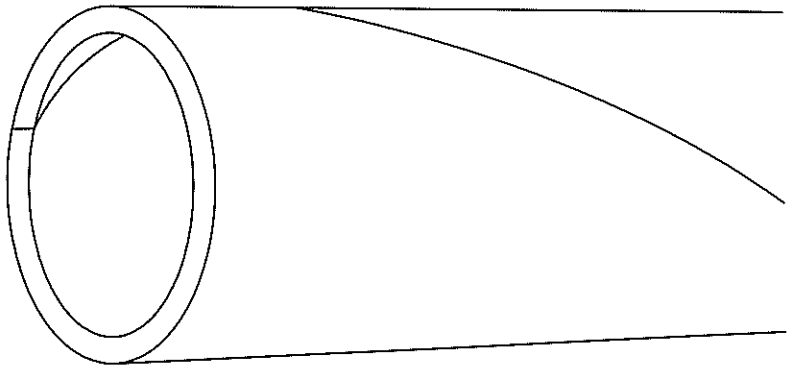
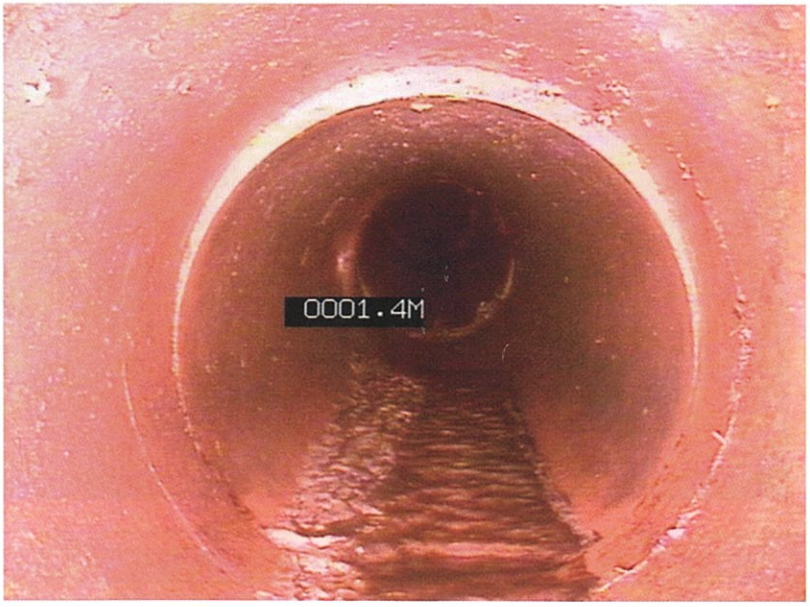


Figure 4.3 Longitudinal Cracks

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		0.5	S01	CL							09	
		0.5	S02	CL							03	
		0.5	S03	FL							12	
		0.5		WL						05		

Figure 4.4 Circumferential Crack



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		1.4		CC	J						08	05
		1.4		DER						5		

Figure 4.5 Multiple Cracks

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		9.5		CM							11	02
		9.5		WL						05		

Figure 4.6 Spiral Crack

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		16.2		FL	J						10	
		16.2		FL	J						02	
		16.2		CL	J						08	
		16.4		CS							08	05
		16.4		WL						10		

Fracture

Definition: A crack that has become visibly open on the pipe wall; pieces are still in place.

"Circumferential", "longitudinal", "multiple", "spiral" and "radiating" are as described previously.

In brick drains/sewers, fractures are visibly open in the brickwork and/or mortar and the bricks have moved apart from one another.

Code	Description
F L (J)	Fracture longitudinal at ... o'clock (at joint)
F C (J)	Fracture circumferential from ... to ... o'clock (at joint)
F M (J)	Fractures multiple from ... to ... o'clock (at joint)
F S (J)	Fracture spiral from ... to ... o'clock (at joint)
F R	Fracture radiates from ... o'clock

Figure 4.7 Longitudinal Fractures at 9 o'clock, 12 o'clock, 3 o'clock and 6 o'clock

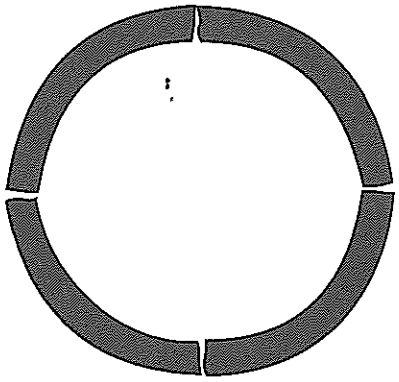
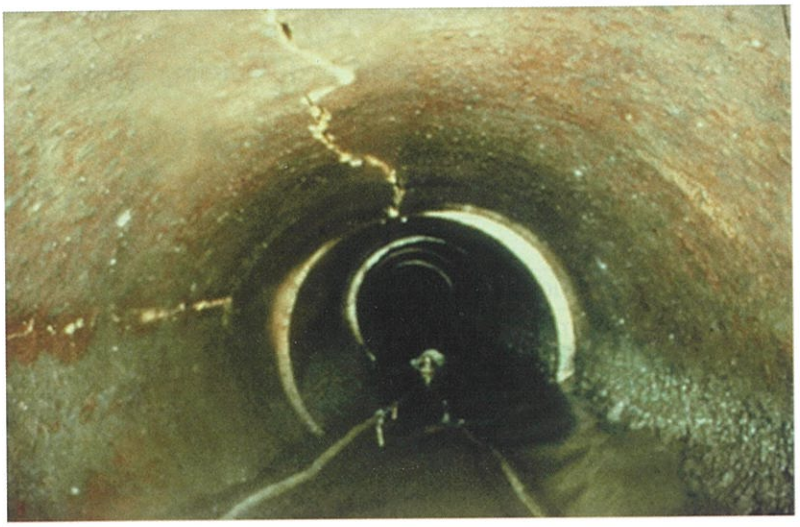


Figure 4.8 Longitudinal Fracture



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		6.8		FL							i2	
		6.8		CL							09	
		6.8		DEG						05	04	05
		6.8		WL						15		

Figure 4.9 Longitudinal Fracture

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		7.5		FL							01	

Broken (pipe drains/sewers)

Definition: A pipe where pieces are noticeably displaced and have moved from their original position.

Note: This defect code is used only for pipe sewers.

Pieces of pipe are noticeably displaced, i.e., half pipe wall thickness or greater. **If more than one break occurs within a one metre length, it is entered as one break.** Use either one or two clock references depending on the extent.

Code	Description
B (J)	Broken pipe at … (OR from … to …) o'clock (at joint)

Figure 4.10 Broken Pipe

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		1.03		FL							01	
		1.03		CC							01	03
		1.03		FL							03	
		1.03		CC							07	09
		1.03		FL							09	
		1.03		B							09	12
		1.03		D						10		

Hole

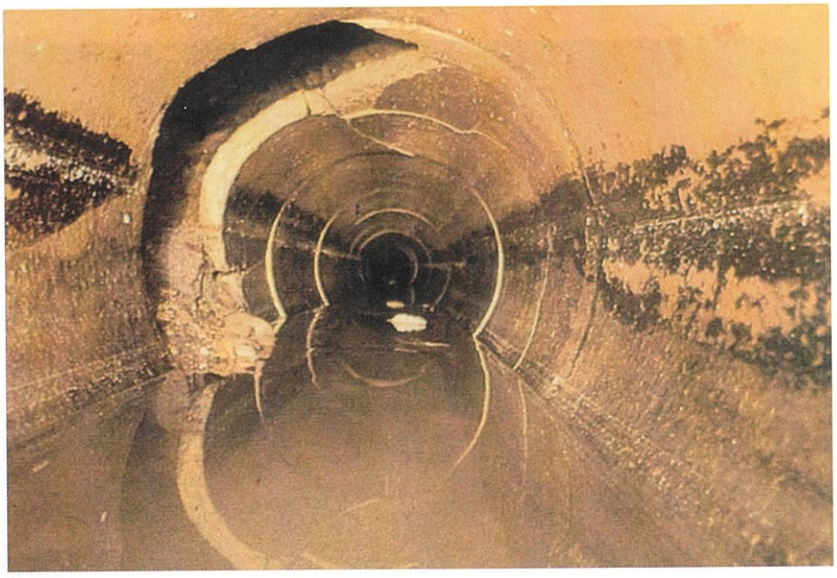
Definition: A visible hole in the pipe wall. **If more than one hole occurs within a one metre length, it is entered as one hole.** Use either one or two clock references depending on the extent.

Note: This defect code is used only for pipe sewers.

Code	Description
H	Hole in drain/sewer at ... (OR from ... to ...) o'clock

Where soil or a void is visible through the hole, the appropriate codes should also be used.

Figure 4.11 Hole



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		14.1		H							07	12
		14.1		SV								
		14.1		VV								
		14.1		CC							12	05
		14.1		CL							12	
		14.1		FL							09	
		14.1		WL						10		

Deformed

Definition: Original cross-section of drain/sewer is noticeably altered.

It is possible to have deformation without loss of visible structural integrity, e.g., flexible pipes such as plastics, pitch fibre pipes, etc.

Care must be exercised when using these codes in brick drains/sewers. Brick drains/sewers are sometimes not built to regular sizes and were frequently built to suit local site conditions.

Estimate vertical and/or horizontal change as a percentage of the original diameter/height and give it as a percentage in increments of 5%.

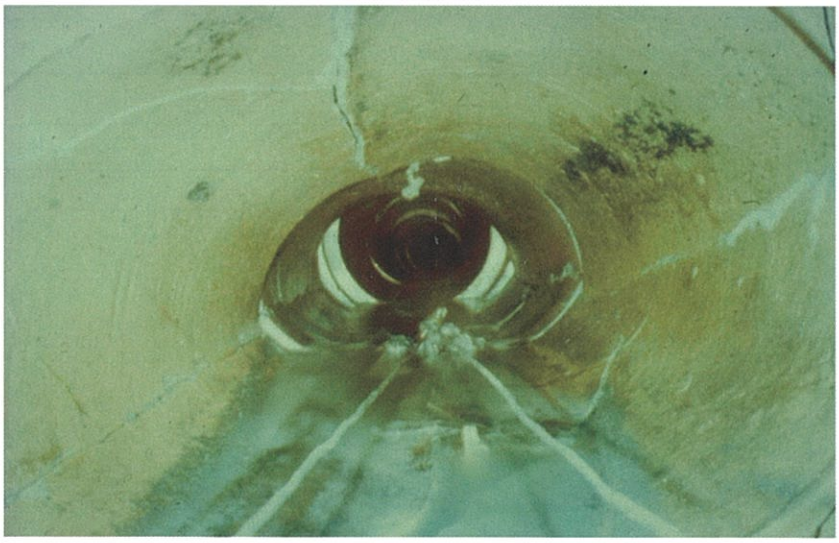
For brick drains/sewers, the codes DV and DH should be used in place of the code D to indicate whether the deformation is in the vertical or horizontal direction, respectively.

In flexible pipes (e.g., plastics) where no cracking is visible and where joints are less frequent, it can be very difficult to see deformation. The use of a light ring will make any deformation more apparent.

Code	Description
D †	Deformed drain/sewer …%
D V ‡	Deformed vertically …%
D H ‡	Deformed horizontally …%

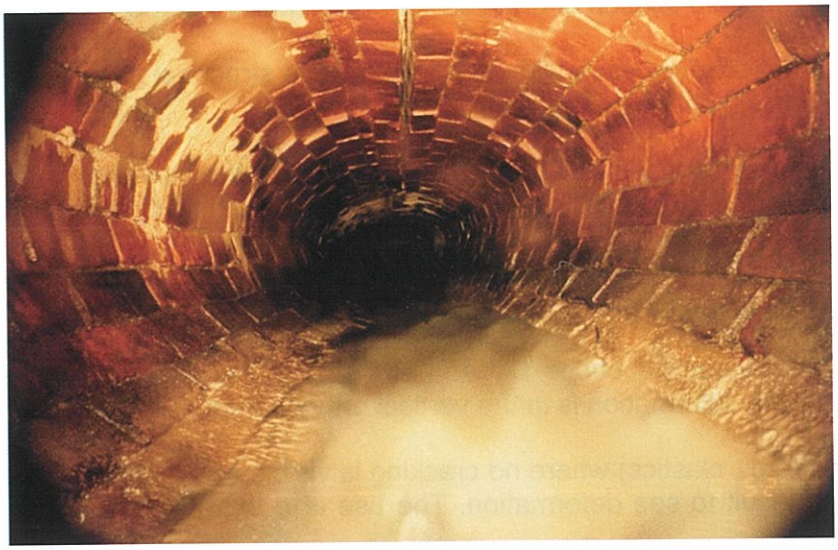
† Used for pipe sewers only.
‡ Used for brick sewers only.

Figure 4.12 Deformed Sewer



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		20.4		FL							11	
		20.4		CL							08	
		20.4		CL							06	
		20.4		FL							03	
		20.4		CC							10	11
		22.1		B							11	03
		22.1		D						20		
		22.1		WL						05		

Figure 4.13 Vertically Deformed Sewer (10%)



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		3.9		DV						10		
		3.9		FL							12	
		3.9		WL						05		

Collapse

Definition: Complete loss of structural integrity of the drain/sewer (i.e., 50% or more of cross-sectional area lost).

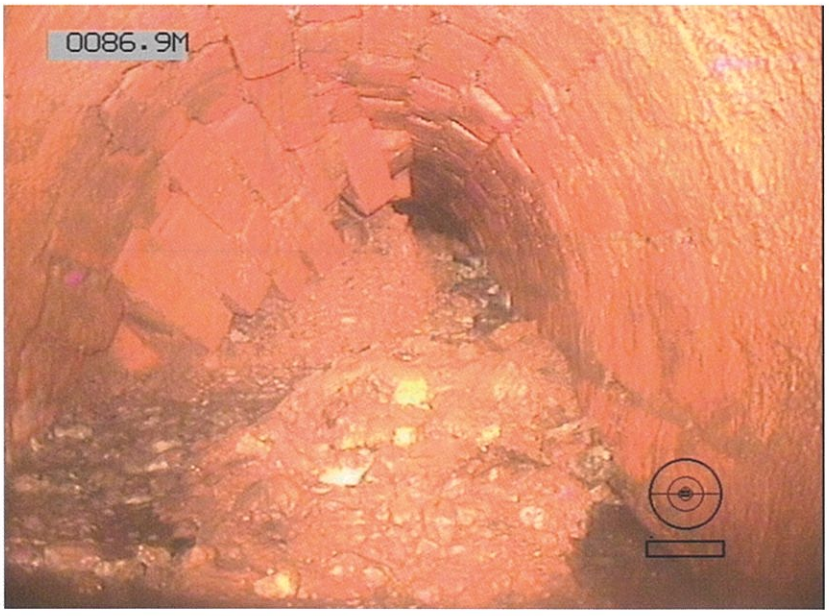
Only the collapse needs be coded. **It is not necessary to code the individual defects within the collapse.**

Code	Description
XP	Collapsed drain/sewer …%
XB	Collapsed brickwork or masonry …%

Figure 4.14 Collapsed Pipe

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		21.8		XP						50		
		21.8		SA								

Figure 4.15 Collapsed Brick Sewer



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		19.0		DER						25		
		19.3		XB						60		
		19.3		SA								

Joint displaced (pipe drains/sewers)

Definition: A pipe is not concentric with the socket of the adjacent pipe.

Displacements can be medium (between 1.0 and 1.5 times the pipe wall thickness) or large (greater than 1.5 times the pipe wall thickness); where the displacement is **more than 20% of the diameter, record in mm.** Displacements less than the pipe wall thickness are not reported.

Code	Description
JD *	Joint displaced
JD (M)†	Joint displaced medium
JD (L) †	Joint displaced large
JD ‡	Joint displaced ... mm

* This code is only to be used as part of the domestic drainage coding system.
† The M or L should be entered in the Band column.
‡ The number of mm should be entered in the Dimension 1 column.

Figure 4.16 Displaced Joint

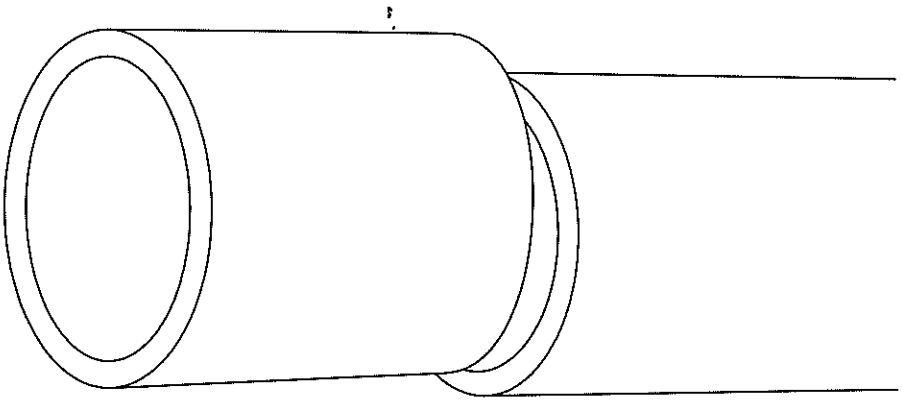
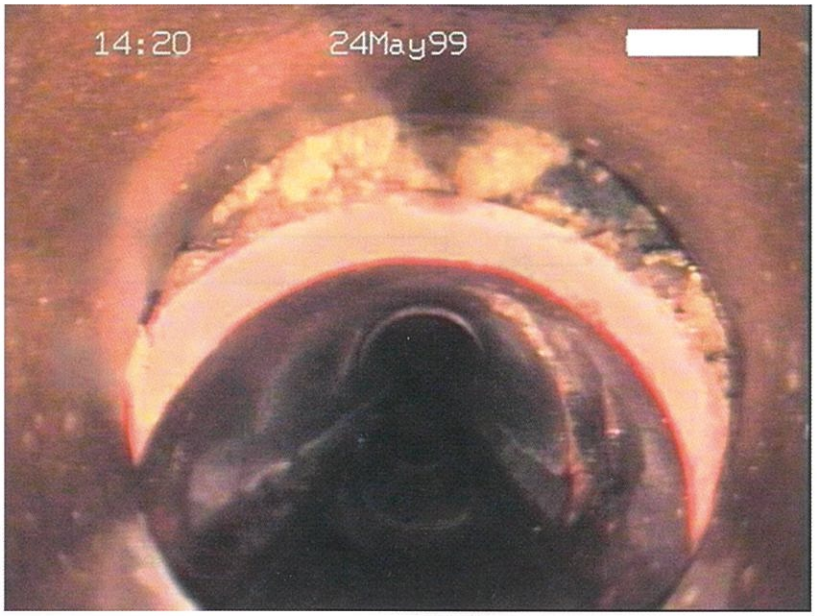


Figure 4.17 Displaced Joint



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		15.2		JD			L					
		15.2		SV								
		15.2		LD								

Open joint (pipe drains/sewers)

Definition: Adjacent pipes which are longitudinally displaced at the joint.

Displacements can be medium (between 1.0 and 1.5 times the pipe thickness) or large (greater than 1.5 pipe thickness); where the displacement is **more than 20% of the diameter, record in mm.**

This defect can be very difficult to estimate using a forward-facing camera. The use of a pan and tilt camera should be considered where accuracy is required.

Code	Description
OJ *	Open joint
OJ (M) †	Open joint medium
OJ (L) †	Open joint large
OJ ‡	Open joint …mm

* This code is only to be used as part of the domestic drainage coding system
† The M or L should be entered in the Band column
‡ The number of mm should be entered in the Dimension 1 column

Figure 4.18 Open Joint, Medium

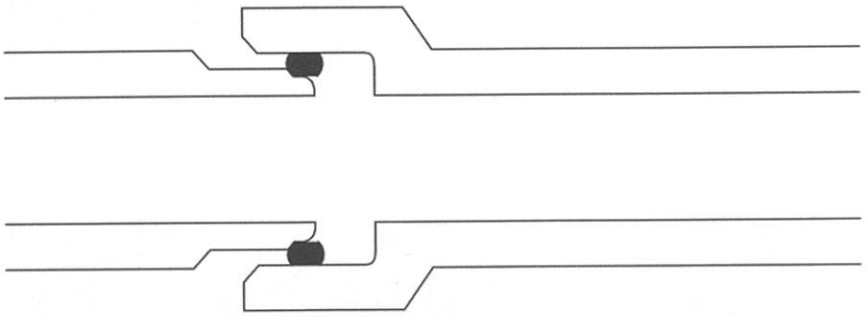


Figure 4.19 Open Joint, Medium

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		41.4		OJ			M					
		42.2		DER						05		
		42.2		WL						10		

Surface damage

Definition: Codes used to describe a wide range of surface damage failures.

The surface of the pipe or brick is damaged by spalling (surface splintered off in layers or small fragments have broken from the surface), or wear (surface worn or scoured, e.g., by corrosion, or cleansing tools, road grit, etc.). Use either one or two clock references depending on the extent.

The codes can be applicable to both pipe and brick drains/sewers.

Definitions:

- **Increased roughness:** refers to slight surface damage where the surface of the pipe or brickwork is slightly worn.
- **Spalling:** refers to surface damage where the surface of the pipe is damaged by spalling (surface splintered off in layers or small fragments have broken from the surface or the expansion action of corroded reinforcement in concrete pipes/culverts). The defect is likely to be associated with fractures in which case both sets of codes will need to be used. Surface spalling may also be the result of poor pipe material.
- **Aggregate visible:** refers to more serious surface damage where the pipe aggregate is visible due to the fines in the concrete/clayware pipe material being worn away.
- **Aggregate projecting**: refers to surface damage where the pipe aggregate (usually larger stones) is visible and projecting above the surface of the remaining concrete matrix.
- **Reinforcement visible**: refers to surface damage in concrete pipes where sufficient aggregate is missing to enable the reinforcement to be visible. This type of surface damage is usually associated with chemical attack. Applicable to reinforced concrete sewers only.
- **Reinforcement projecting:** refers to more serious damage where the aggregate has been further eroded to leave reinforcement projecting out from the pipe wall. Applicable to reinforced concrete sewers only.
- **Reinforcement corroded:** refers to surface damage where the reinforcement is visibly corroded. This will usually be recognised by missing sections of reinforcement where the remainder is projecting from the surface. Applicable to reinforced concrete sewers only.
- **Corrosion products:** refers to products from corrosion or chemical attack on the surface of the pipe, e.g., rust on a metal pipe or hydrogen sulphide attack (H_2S attack on concrete leaves a white powder on the surface).
- **Other:** refers to a surface defect in a drain/sewer which is not suitably classified by the above codes. The code should be entered and a description of the defect should be inserted into the Remarks column.

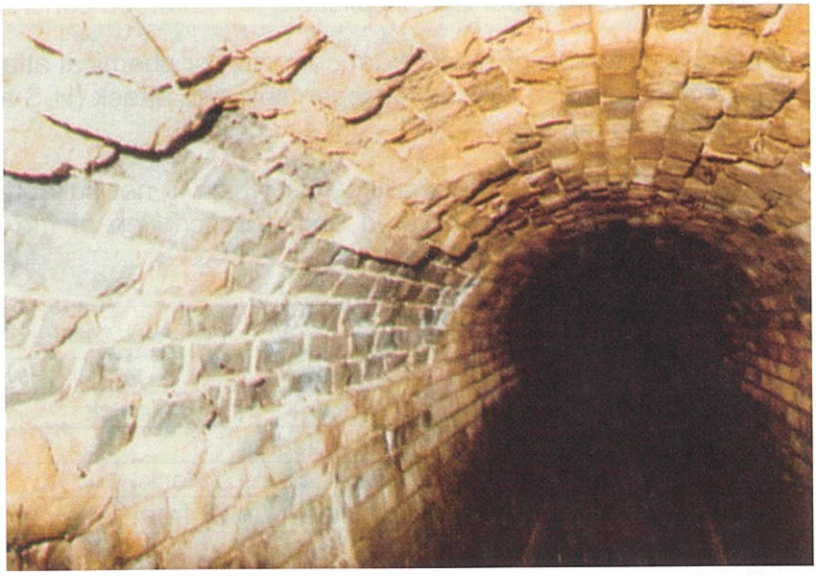
Code	Description
S *	Surface damage
S W	Increased roughness at ... (OR from ... to...) o'clock
S S	Spalling at ...(OR from ... to...) o'clock
S AV	Aggregate visible at ...(OR from ... to...) o'clock
S AP	Aggregate projecting from surface at ...(OR from ... to...) o'clock
S RV	Reinforcement visible at ... (OR from ... to...) o'clock
S RP	Reinforcement projecting from surface at ...(OR from ... to...) o'clock
S RC	Reinforcement corroded at ...(OR from ... to...) o'clock
S CP	Corrosion products at ...(OR from ... to...) o'clock
S B	Internal blister/bulge at ... (OR from ... to ...) o'clock
S Z †	Other damage at ...(OR from ... to...) o'clock

* This code is only to be used as part of the domestic drainage coding system.
† Additional information to be provided in the Remarks column.

Figure 4.20 Surface Damage, Increased Roughness

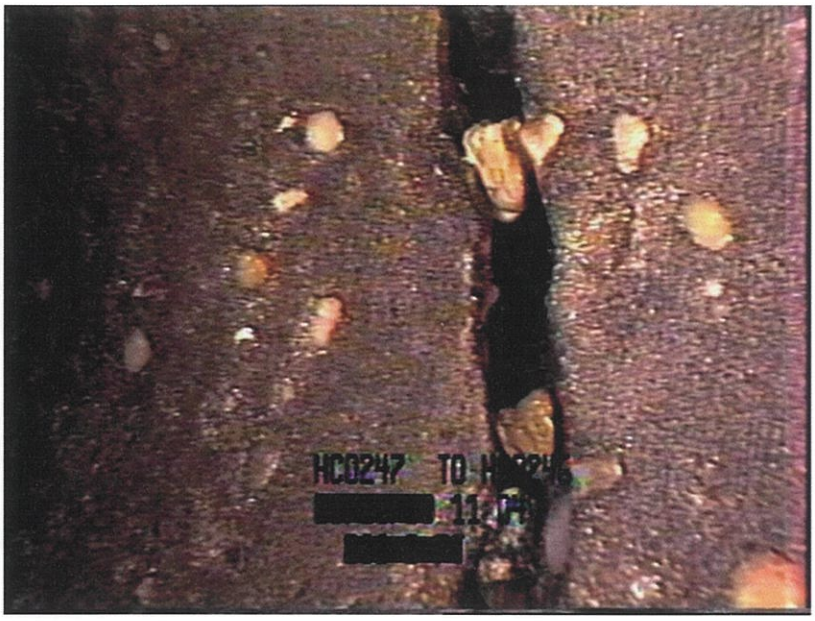
Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		59.2		SW							01	05
		59.2		SV								
		59.2		OJ			L					

Figure 4.21 Surface Damage, Spalling



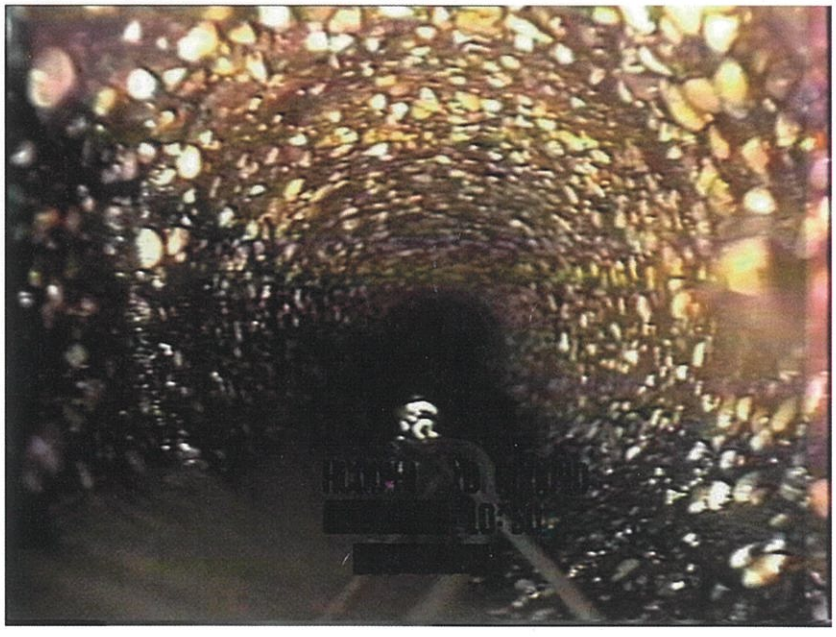
Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		9.6		SS							09	01
		9.6		WL						05		
		9.6		MB							09	11

Figure 4.22 Surface Damage, Aggregate Visible



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		80.0		SAV							12	

Figure 4.23 Surface Damage, Aggregate Projecting

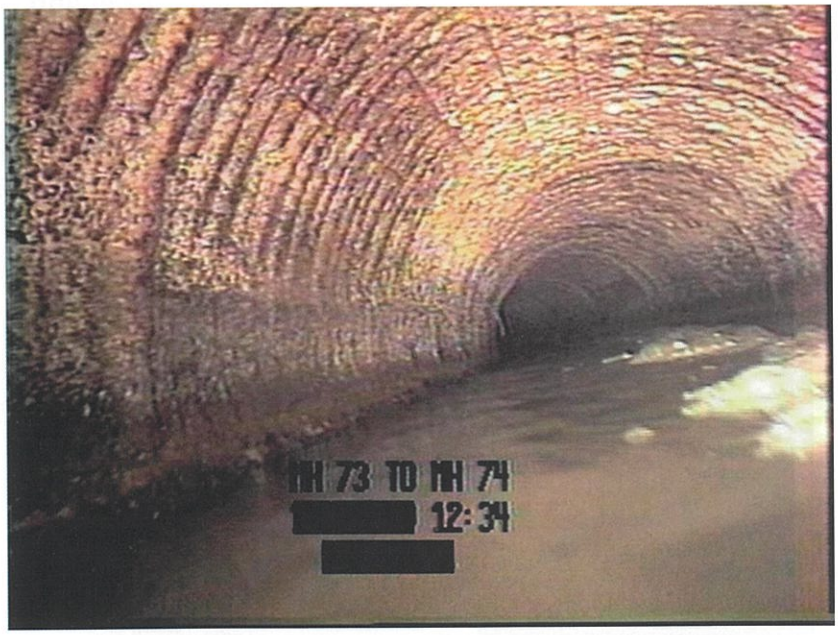


Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		60.0		SAP							07	05
		60.0		WL						05		

Figure 4.24 Surface Damage, Reinforcement Visible (in area circled)

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		20.0		SRV							03	05
		29.0		WL						05		

Figure 4.25 Surface Damage, Reinforcement Projecting

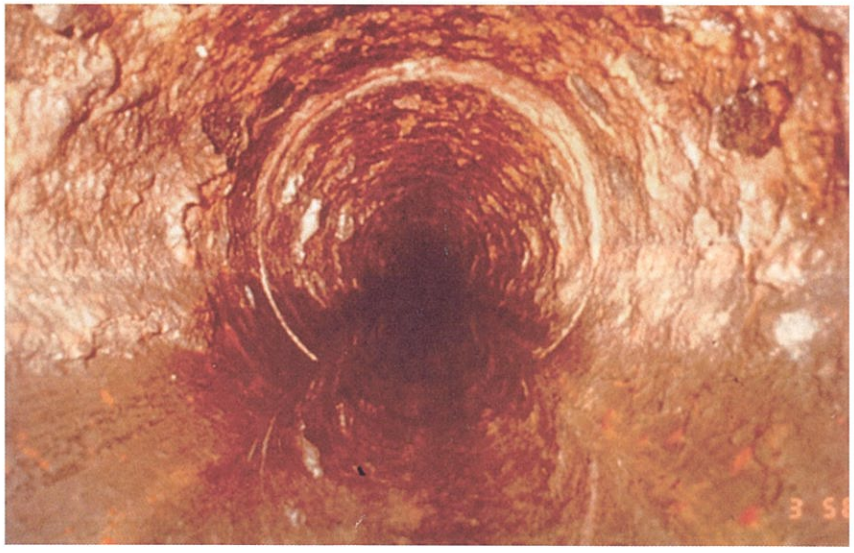


Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		16.2		SRP							08	04
		16.2		WL						30		

Figure 4.26 Surface Damage, Reinforcement Corroded

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		24.7		SRC							10	01

Figure 4.27 Surface Damage, Corrosion Products



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		140.2		SCP							07	05
		140.2		WL						05		

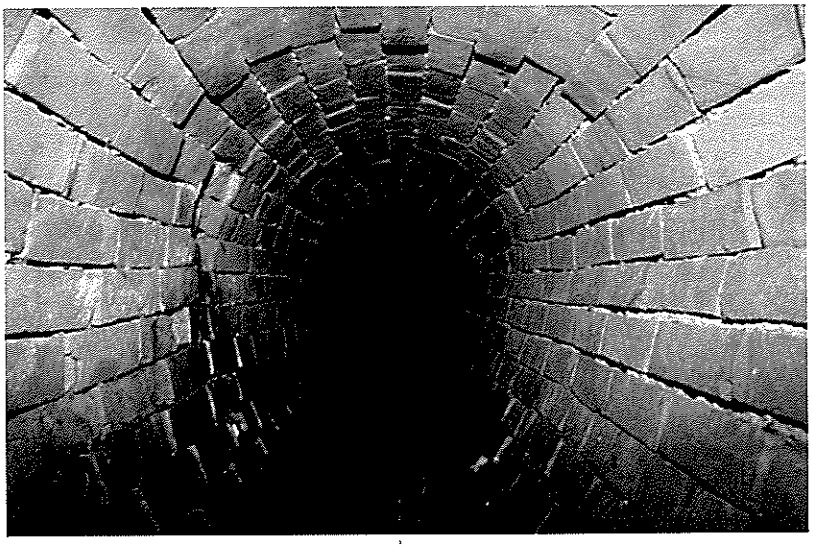
Mortar missing (brick drains/sewers)

Definition: The mortar between brickwork is missing; bricks are still in place.

Use either one or two clock references depending on the area of mortar loss. The depth of the mortar loss should be recorded in mm using the bands indicated in the table below.

Code	Description
MM	Mortar missing between ...mm and ...mm at ...(OR from ... to...) o'clock
MM S	Mortar missing slight (between 5 mm and 15 mm) at ...(OR from ... to...) o'clock
MM M	Mortar missing medium (between 15 mm and 50 mm) at ...(OR from ... to...) o'clock
MM T	Mortar missing total (between 50 mm and 100 mm) at ...(OR from ... to...) o'clock

Figure 4.28 Mortar Missing Medium



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		31.5		MM			M				02	05
		31.5		MM			M				07	10
		31.5		DB							10	02

Displaced bricks

Definition: Single bricks/areas of brick have visibly moved from their original position.

Displacements less than 20 mm should be ignored.

Use either one or two clock references depending on the extent.

Code	Description
DB	Displaced bricks at … (OR from … to …) o'clock

Figure 4.29 Displaced Bricks

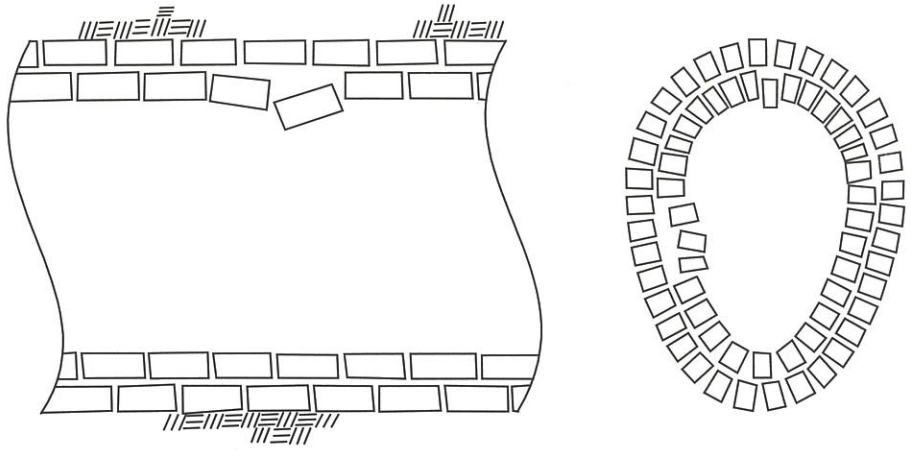


Figure 4.30 Displaced Bricks

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		23.2		DB							01	
		23.2		MM			M				03	05
		23.2		MM			M				07	08
		23.2		WL						05		
		23.2		DES						10		

Missing bricks

Definition: Single bricks/areas of brick are missing.

This code applies if more than a quarter of the brick is missing. If less, one of the surface damage codes may be more appropriate. More than one ring may be affected. Use either one or two clock references depending on the extent.

Code	Description
MB	Missing bricks at ... (OR from ... to ...) o'clock

Figure 4.31 Missing Bricks

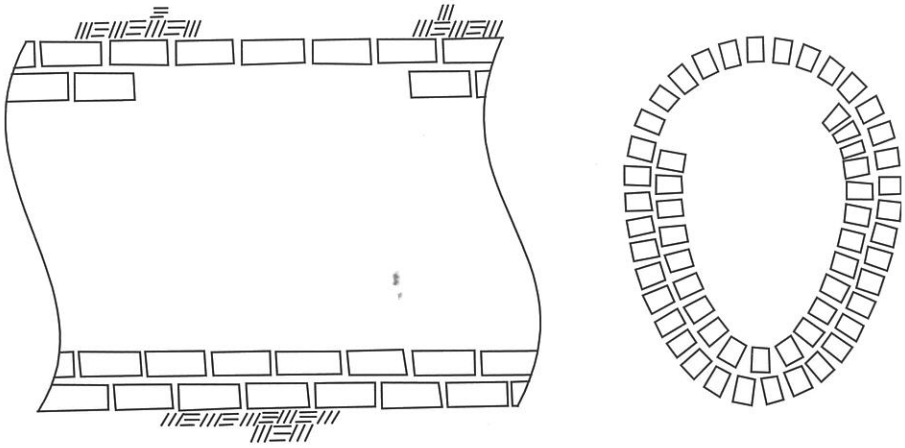


Figure 4.32 Missing Bricks

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		1.9		MB							09	12
		1.9		DB							09	10

Dropped invert (brick drains/sewers)

A section of the invert of the brickwork has "dropped" relative to the drain/sewer walls with a horizontal gap between bricks greater than 2 x thickness of the mortar joint or minimum of 20 mm. The invert may be dropped on one or both sides. The horizontal gap should be measured in 5 mm increments.

Code	Description
DI	Dropped invert, gap … mm

Figure 4.33 Dropped Invert

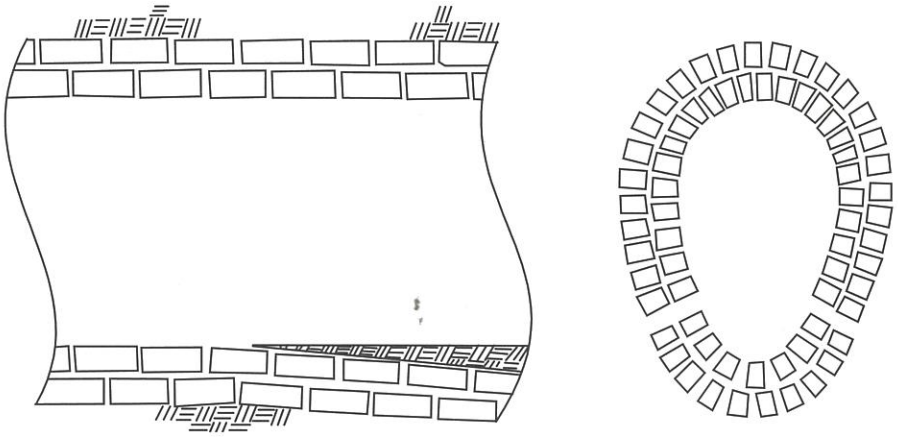


Figure 4.34 Dropped Invert

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		5.7		WL						15		
		5.7		DI				20				

4.2 Service Defects

These codes describe the capability of the drain/sewer to meet its service requirements and indicate loss of capacity, potential for blockage and watertightness.

Roots

Definition: The ingress of roots through defects in the drain/sewer, connections or joints.

Where the defect through which the root enters is also visible, e.g., a fractured pipe or defective connection, separate entries for both the defect and roots should be made on the inspection form.

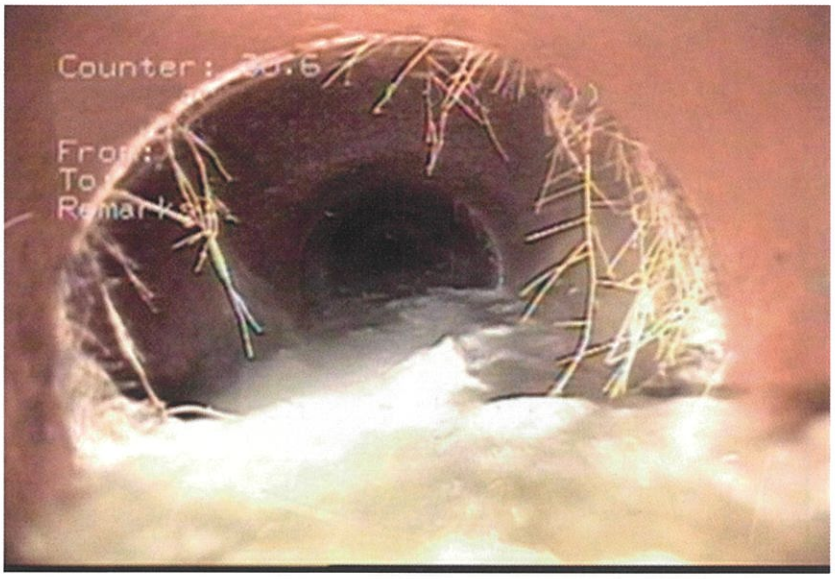
Described as fine, mass or tap roots depending on severity.

- **Fine** (F) - The occasional intrusion of fine roots. Such roots are insufficient to cause a reduction to overall available pipe cross-sectional area.
- **Tap** (T) - Tap means individual roots that are over 10 mm thick. That is of sufficient size to cause damage to the pipe material.
- **Mass** (M) - Mass means roots that have formed a congealed density of roots restricting the flow. Percentage loss should be entered to the nearest 5%. Where mass roots occur on both sides of a pipe, one entry should be made and the loss of cross-section aggregated.

Code	Description
R *	Roots
R F (J)	Roots fine (at joint)
R T (J)	Roots tap (at joint)
R M (J)	Roots mass ...% cross sectional area loss (at joint)

* This code is only to be used as part of the domestic drainage coding system.

Figure 4.35 Fine Roots through Joint



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		30.6		RF	J							
		30.8		WL						20		

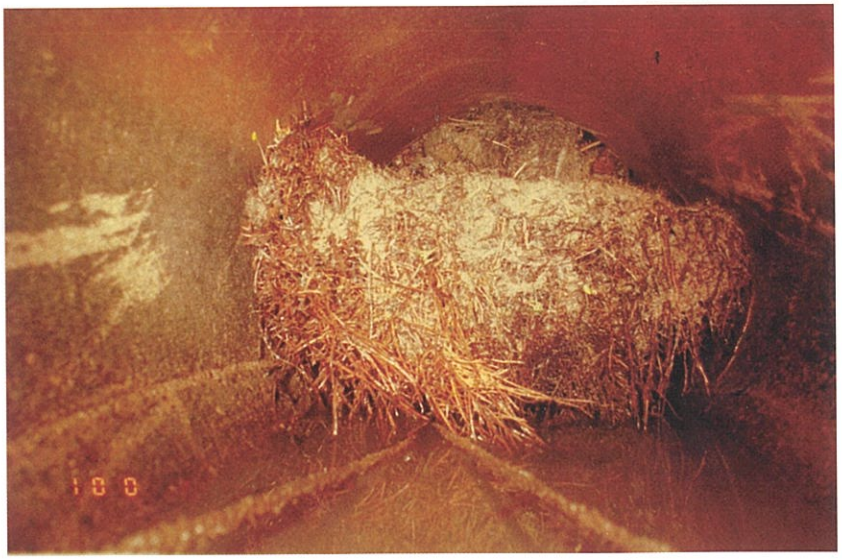
Figure 4.36 Fine Roots in a Brick Sewer

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		39.3		RF								
		39.3		MM			M				02	05
		39.3		MM			M				07	10

Figure 4.37 Tap Roots

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		3.8		FL							11	
		3.8		RT	J							
		3.8		FL	J						12	
		3.8		FL	J						03	
		3.9		CC							07	11
		4.0		FC	J						11	03
		4.0		CC							07	11
		4.0		D						5		

Figure 4.38 Roots Mass, 75% Loss of Area



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		47.8		RM						75		
		47.8		WL						05		

Infiltration

Definition: The ingress of groundwater through a defect or faulty joint or porous area of pipe wall.

Infiltration codes will often be used in conjunction with other codes. Where the defect enabling the infiltration is also visible, e.g., a cracked pipe, separate entries for both the infiltration and the cracked pipe will be recorded. However, if the enabling defect is not visible or significant enough to code (for instance, a slightly open joint), code only the infiltration.

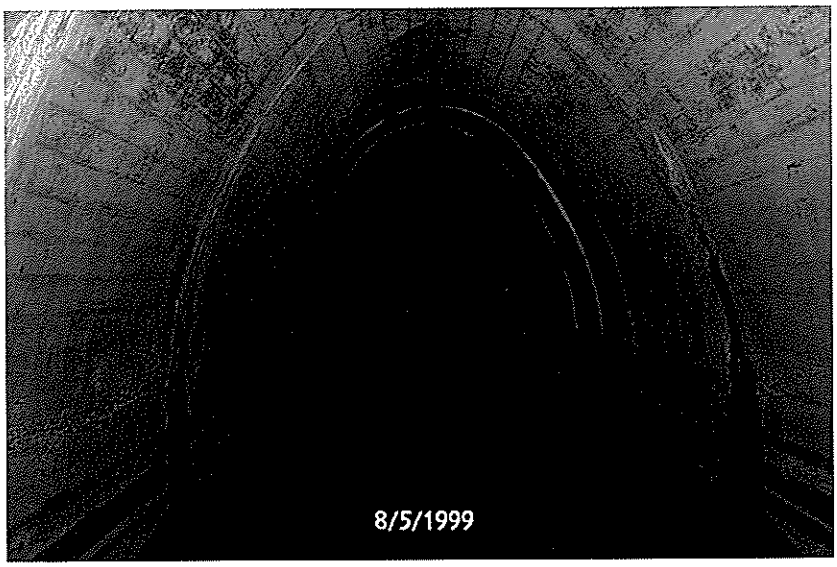
The following four terms are used depending upon the severity of the infiltration:

- **Seeping** (S) - The slow ingress of water through a defect or faulty joint or drain/sewer wall. No visible drips.
- **Dripping** (D) - Water dripping in through a defect or faulty joint or drain/sewer wall. Not a continuous flow.
- **Running** (R) - Water running in through a defect or faulty joint or drain/sewer wall. A continuous flow will be visible.
- **Gushing** (G) - Water entering the pipe 'under pressure' through a defect or faulty joint, not necessarily a heavy flow.

Code	Description
I *	Infiltration
I S (J)	Infiltration seeping at ... (OR from ... to ...) o'clock (at joint)
I D (J)	Infiltration dripping at ... (OR from ... to ...) o'clock (at joint)
I R (J)	Infiltration running at ... (OR from ... to ...) o'clock (at joint)
I G (J)	Infiltration gushing at ... (OR from ... to ...) o'clock (at joint)

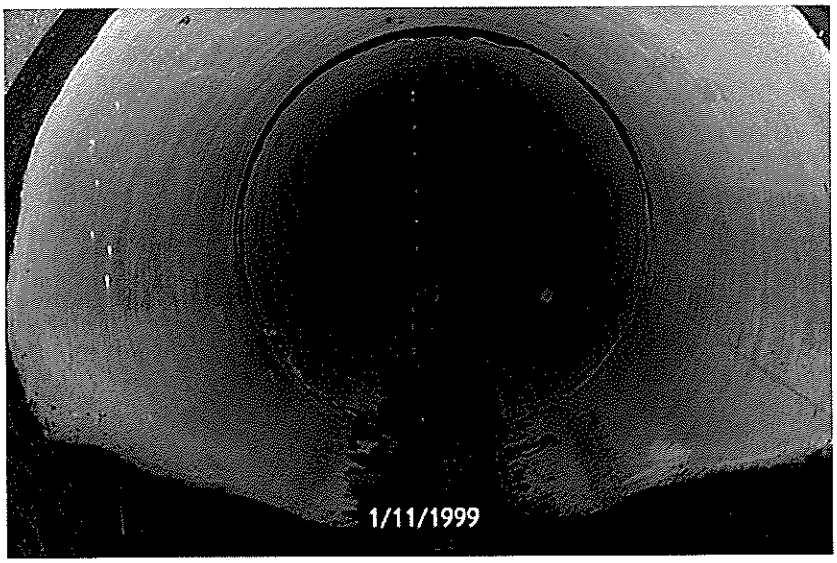
* This code is only to be used as part of the domestic drainage coding system.

Figure 4.39 Seeping Infiltration at Joint



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		0.7	S1	IS	J						03	05
		0.7	S2	IS	J						07	09

Figure 4.40 Dripping Infiltration



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		8.0		ID	J						12	

Figure 4.41 Running Infiltration and Gushing Infiltration

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		32.4		MM			T				07	05
		32.4		IG							08	09
		32.4		IR							11	01
		32.4		WL						20		

Exfiltration

Definition: The **visible** leakage of all or part of the flow out of the pipe through a defect or faulty joint or porous area of drain/sewer wall.

Code	Description
EX (J)	Exfiltration at … (OR from … to …) o'clock (at joint)

Attached deposits

Definition: Attached deposits are foreign materials that cling to the drain/sewer inner wall and often continue to accumulate, reducing the cross-sectional area of the drain/sewer.

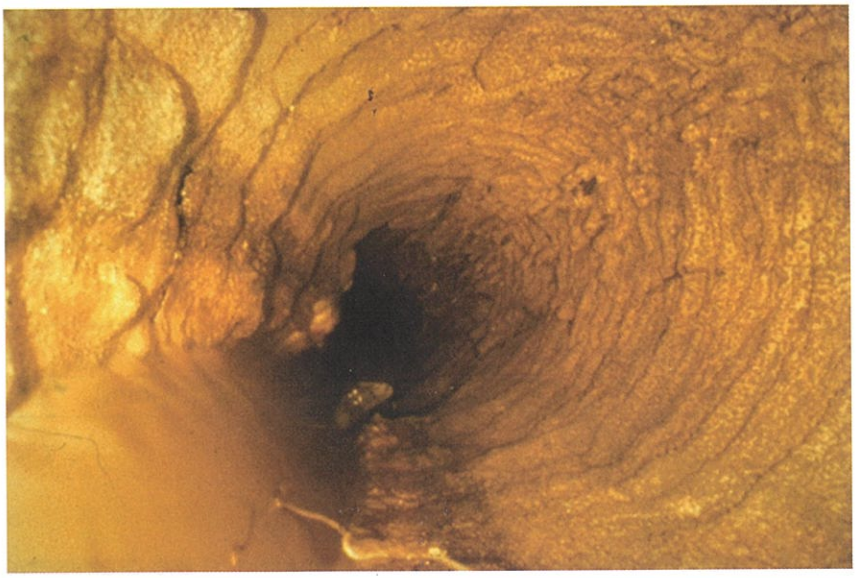
- **Encrustation** (E) - Deposits left by the partial evaporation of infiltrating groundwater containing dissolved salts. This will often be concentrated alongside seeping or dripping joints, cracks or fractures.
- **Fouling** (F) - Deposits from foul sewage on the wall of the drain/sewer.
- **Grease** (G) - Grease deposits normally found on the wall of the drain/sewer above the flow.
- **Other** (Z) - An attached deposit which cannot be classified by any of the above codes. A description of the deposit (e.g., hardened grout) should be recorded in the Remarks column.

An estimate of the percentage loss of cross-sectional area should be made and recorded to the nearest 5% and the location recorded using either one or two clock references depending on the extent.

Code	Description
DE E (J)	Attached deposits, encrustation at ... (OR from ... to ...) o'clock ...% cross-sectional area loss (at joint)
DE F (J)	Attached deposits, fouling at ... (OR from ... to ...) o'clock ...% cross-sectional area loss (at joint)
DE G (J)	Attached deposits, grease at ...(OR from ... to ...) o'clock ...% cross-sectional area loss (at joint)
DE Z (J) †	Other attached deposits at ...(OR from ... to ...) o'clock ...% cross-sectional area loss (at joint)

† Additional information to be provided in the Remarks column.

Figure 4.42 Attached Deposits, Encrustation



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		84.9		DEE						20	07	05
		84.9		WL						10		

Figure 4.43 Attached Deposits, Fouling

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		20.2		DEF						10	10	02

Figure 4.44 Attached Deposits, Grease

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		26.8		DEG						10	02	04
		26.8		DEG						10	08	10
		26.8		WL						15		

Settled deposits

Definition: Materials in a drain/sewer which could cause flow turbulence and a reduction in hydraulic capacity.

Settled deposits are generally described by their size or hardness. No attempt is made to further describe materials by type (for example, fine materials as sand, soil or silt). This is because it would be very difficult to identify the exact type of material from a remote CCTV inspection. Deposits include both organic and non-organic materials.

This code can be further defined by the use of the following codes:

- **Silt** (S) - Fine deposits, e.g., sand, silt, etc.
- **Coarse** (R) - Coarse sediment such as gravel, or debris from building activity.
- **Hard or Compacted** (C) - e.g., concrete.
- **Other** (X) - A settled deposit which cannot be suitably classified by any of the above codes. A description of the deposit should be recorded in the Remarks column.

An estimate of the percentage loss of cross-sectional area should be made and recorded to the nearest 5%.

Code	Description
DE S (J)	Settled deposits fine ...% cross-sectional area loss (at joint)
DE R (J)	Settled deposits coarse ...% cross-sectional area loss (at joint)
DE C (J)	Settled deposits hard or compacted ...% cross-sectional area loss (at joint)
DE X (J) †	Other settled deposits ...% cross-sectional area loss (at joint)

† Additional information to be provided in the Remarks column.

Figure 4.45 Coarse Settled Deposits (10%)

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		24.6		DER						10		
		24.6		B							11	01
		24.6		D						5		

Ingress of soil

Definition: Soil from the surrounding ground is intruding into the drain/sewer.

Normally concentrated in the invert close to faulty joints, broken pipes, holes, etc.

Ingress deposits will be most obvious in pipes/sewers with little base flow where higher flows have not washed the deposits downstream. It may, therefore, be possible to identify the type or material as Sand (S), Peat (P), other Fine material (F) or Gravel (G). The code Other (Z) should be used where the deposit is not suitably classified by the above codes. The code should be entered and a description of the defect should be recorded in the Remarks column.

Note: If the soil is down the pipe, i.e., not adjacent to a defect, it will be recorded under the Settled Deposits (DE) codes.

An estimate of the percentage loss of cross-sectional area should be made and recorded, to the nearest 5% and the location recorded using either one or two clock references depending on the extent.

Code	Description
ING	Ingress of soil
ING S (J)	Ingress of sand at ...(OR from ... to ...) o'clock ...% cross-sectional area loss (at joint)
ING P (J)	Ingress of peat at ...(OR from ... to ...) o'clock ...% cross-sectional area loss (at joint)
ING F (J)	Ingress of fine material at ...(OR from ... to ...) o'clock ...% cross-sectional area loss (at joint)
ING G (J)	Ingress of gravel at ...(OR from ... to ...) o'clock ...% cross-sectional area loss (at joint)
ING Z (J) †	Ingress of soil, other at ...(OR from ... to ...) o'clock ...% cross-sectional area loss (at joint)

† Additional information to be provided in the Remarks column.

Obstruction

Definition: An obstacle in the drain or sewer which causes a serious obstruction to the flow or a reduction in hydraulic capacity (e.g., drain rods, boulders, timber) and which cannot be reported more appropriately by another code.

The size of the object in relation to the drain/sewer dimensions needs to be taken into consideration when using this code. What may be considered an obstruction in a small diameter pipe, e.g., a brick, will be only be considered debris in a large drain/sewer.

The obstacles can be further defined by use of the following codes:

- **Brick or masonry in invert** (B) - Bricks or other obvious masonry items, causing a **considerable** reduction in available pipe area and/or obstructing the flow. Typically these obstacles will be lying in the invert.
- **Pipe material in invert** (M) - Large or medium-sized pieces of broken pipe lying in the invert.
- **Other object in invert** (X) - An object in the pipe/sewer invert which is not suitably classified by the above codes. The code should be entered and a description of the object should be recorded in the Remarks column.
- **Obstacle protruding through wall** (I) - Typically "third party" objects that have been inserted after the drain/sewer construction. For example, fence posts, gas pipes.
- **Obstacle through connection/junction** (C) - Objects that have entered the main sewer via the connection and have become wedged at the connection, e.g., drain rods.
- **External pipe or cable** (P) - Typically "third party" objects that have been inserted inside the drain/sewer after construction. For example, telephone cables and other small diameter service ducts laid by robotic means. If the type of cable can be identified, e.g., telecom cables, this should be noted in the Remarks column.

- **Obstacle built into structure** (S) - An object that existed prior to the drain/sewer being constructed. Typically the code will be used to record another service pipe duct or building foundation that becomes built into a large drain/sewer. A description of the structure should also be recorded in the Remarks column.

- **Other obstacles** (Z) - An obstacle in the pipe which is not suitably classified by the above codes. The code should be entered and a description of the defect should be recorded in the Remarks column.

An estimate of the percentage loss of cross-sectional area should be made and recorded to the nearest 5% and the location recorded using either one or two clock references depending on the extent.

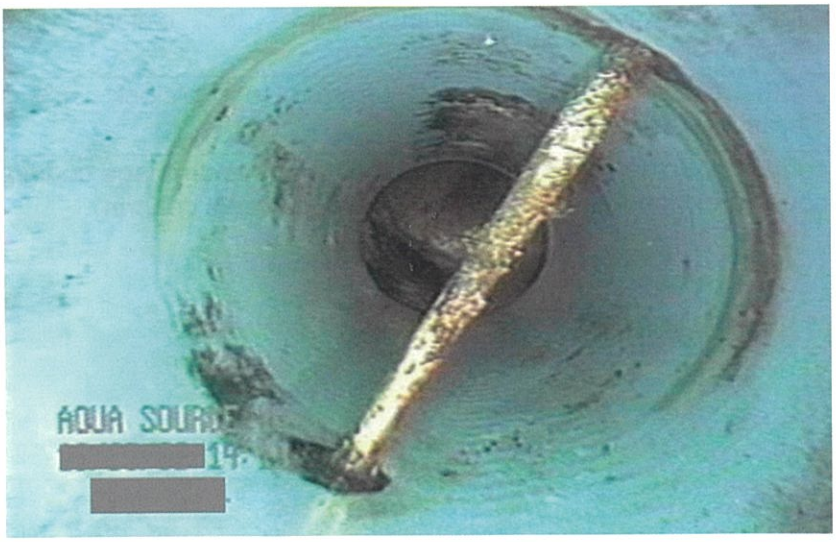
Code	Description
OB *	Obstruction ...% cross-sectional area loss
OB B (J)	Other obstacles, brick or masonry in invert at ...(OR from ... to ...) o'clock ...% cross-sectional area loss (at joint)
OB M(J)	Other obstacles, pipe material in invert at ...(OR from ... to ...) o'clock ...% cross-sectional area loss (at joint)
OB X (J) †	Other obstacles, other object in invert at ...(OR from ... to ...) o'clock ...% cross-sectional area loss (at joint)
OB I (J)	Other obstacles protruding through wall at ...(OR from ... to ...) o'clock ...% cross-sectional area loss (at joint)
OB C	Other obstacles through connection/junction at ...o'clock ...% cross-sectional area loss
OB P †	Other obstacles, external pipe or cable at...(OR from ... to ...) o'clock ...% cross-sectional area loss
OB S †	Other obstacles built into structure from ... to ... o'clock ...% cross-sectional area loss
OB Z (J) †	Other obstacles, other at ... (OR from ... to ... o'clock ...) % cross-sectional area loss (at joint)

* This code is only to be used as part of the domestic drainage coding system.
† Additional information to be provided in the Remarks column.

Figure 4.46 Obstacle, Brick or Masonry in Invert

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		61.4		OBB						40	03	07
		61.4		MM			M				07	09
		61.4		MM			M				04	05
		61.4		MB							11	02
		61.4		DB							11	02
		61.7		WL						10		

Figure 4.47 Obstacle Protruding through Wall



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
		44.4		OBI	J					05	01	07	Pipe runs diagonally through points noted

Figure 4.48 Obstacle through Connection/Junction

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
		78.1		OBC						25	02		Timber

Figure 4.49 Obstacle, External Pipe or Cable

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
		10.5	S01	OBP						05	09		
		10.5		DEC						30			
		10.5		WL						10			

Figure 4.50 Obstacle Built into Structure

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
		6.5		OBS						15	10	02	
		6.5		IS							07	09	

Water level

Definition: The depth of water at the observed point in the drain/sewer.

The depth of water at the observed point in the drain/sewer (includes flowing and stagnant water) i.e., depth from **the surface of the water to the invert of the drain/sewer**. Any silt in the pipe should be separately recorded.

Where the sewer inspection is being used as part of an infiltration study or to investigate misconnections, the nature of any flow may be of interest and the client may require additional information. In this case, codes should be added to give the type of water in the pipe, e.g., Clear (C) or Turbid (T).

Water level should be given as a percentage of the height of the drain/sewer, and should be to the nearest 5% (see Figure 2.8). If no water is observed, enter 00 (see Section 2.4).

Code	Description
WL	Water level …% height/diameter
WL C	Clear water level …% height/diameter
WL T	Turbid water level…. % height/diameter

Line

Definition: A visible deviation in the drain/sewer line.

This group of codes is used to describe a visible deviation in the drain/sewer line. This may be left, right, up or down. If the deviation is a long bend in the drain/sewer, the continuous defect facility can be used (see Section 2.5).

Code	Description
L L	Line of drain/sewer deviates left
L R	Line of drain/sewer deviates right
L U	Line of drain/sewer deviates up
L D	Line of drain/sewer deviates down

These codes are usually associated with brick sewers and with bends in pipe drains/sewers. These codes should NOT be used for angular deviation at joints.

The line of the deviation should be further defined using the following terms for the domestic drainage coding system. These should be recorded in the Band column:

Band	Description
Quarter **(Q)**	Where the line of the sewer deviates by approximately 22.5 degrees
Half **(H)**	Where the line of the sewer deviates by approximately 45 degrees
Full **(F)**	Where the line of the sewer deviates by approximately 90 degrees

Figure 4.51 Line of Sewer Deviates Down

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		42.0		JN				150			02	
		42.4		DEE							10	01
		43.8		LD								
		43.8		WL						05		

4.3 Construction Features

These codes define features relating to the construction of the drain/sewer.

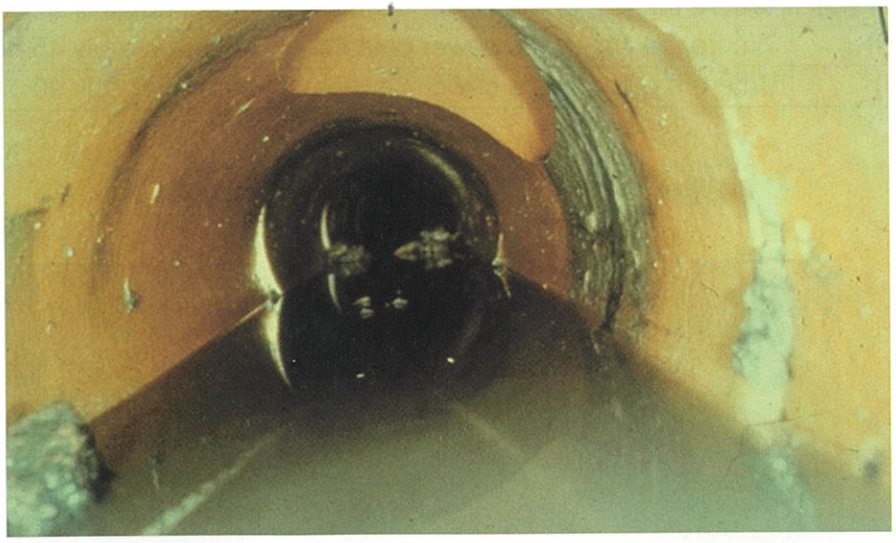
Junction

Definition: A purpose-made or pre-formed junction that has been built into the drain/sewer during construction; this includes junction "blocks" constructed in brick drains/sewers.

Junction diameter should be given in 5 mm increments and entered in the Dimension 1 column. A single clock reference should be taken at the centre of the junction to locate position. If the junction is obviously live, **and the client requires it,** use a separate code to note the flow from the incoming pipe (see Page 101). If not requested by the client, add "Live" in the Remarks column.

Code	Description
JN	Junction at ... o'clock, diameter ... mm
JN C	Junction, closed at ... o'clock, diameter ... mm

Figure 4.52 Junction



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		46.1		JN				100			01	
		46.1		DEE						05	01	04
		46.1		WL						20		

Connection

Definition: A lateral pipe which has been added to the drain/sewer; this includes all saddle connections.

Record the diameter of the connection in 5 mm increments and enter in the Dimension 1 column. If the connection is obviously live, **and the client requires it,** use a separate code to

note the flow from the incoming pipe (see Page 101). If not requested by the client, add "Live" in the Remarks column.

Code	Description
CN	Connection other than junction at ... o'clock, diameter ... mm (or ... mm x ... mm)
CN C	Connection other than junction, closed at ... o'clock, diameter ... mm (or ... mm x ... mm)

Defective connection or junction

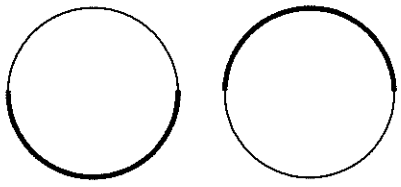
Definitions: The connection/junction has become damaged during or after construction; is of poor workmanship; is poorly positioned; it obstructs the flow causing a reduction in hydraulic capacity or the lining at the connection is defective.

Record the diameter of the connection/junction in 5 mm increments and enter in the Dimension 1 column. If the connection/junction is obviously live, **and the client requires it,** use a separate code to note the flow in the incoming pipe (see Page 101). If not requested by the client, add "Live" in the Remarks column.

A connection/junction is defective if:

- **Intruding connection** - The connection or junction block (brick sewers) intrudes into the drain/sewer. Give the length of the intrusion as a percentage of the diameter/height of the drain/sewer in 5% increments; or
- **Damaged** - The connection/junction has become damaged during or after construction; or
- **Incorrectly positioned** - The connection/junction is incorrectly positioned. A connection or junction is incorrectly positioned if it is positioned in the lower half of the pipe (the arc from 3 o'clock to 9 o'clock (see Figure 4.54 below) or is against the direction of flow.

Figure 4.53 Positioning of Connections or Junctions



0309 0903

- **Blocked** - The connection/junction is blocked.
- **Other** - The defect is not covered by the above codes. Further details should be recorded in the Remarks column.

The nature of the associated defect should also be recorded using the appropriate code.

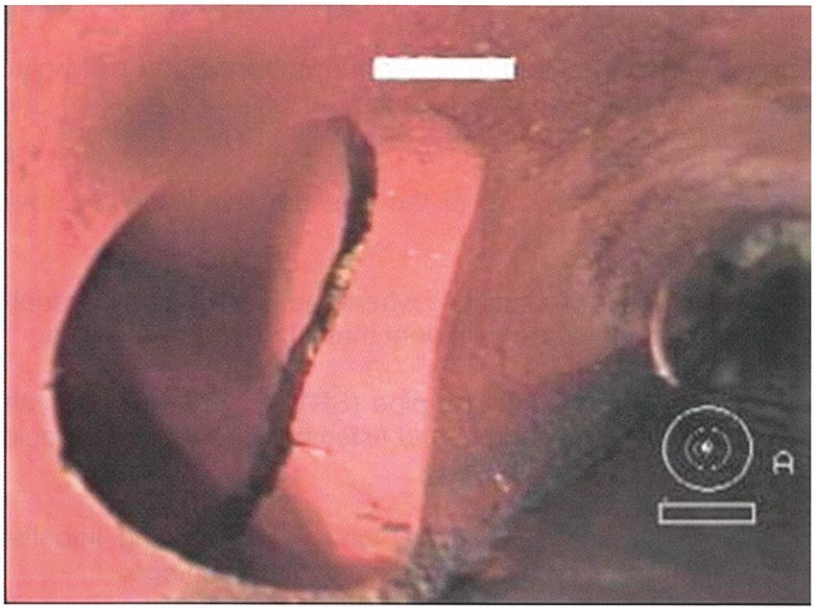
Code	Description
CX	Connection defective at …o'clock, diameter …mm
CX P (I)	Connection defective, position incorrect at …o'clock, diameter …mm, (intrusion … %)
CX D (I)	Connection defective, connecting pipe is damaged at …o'clock, diameter …mm, (intrusion …%)
CX B (I)	Connection defective, connecting pipe is blocked at …o'clock, diameter …mm, (intrusion …%)
CX Z	Defective connection, other at …o'clock, diameter …mm
CX I	Connection intruding at …o'clock, diameter …mm, (intrusion…%)

Code	Description
JX	Junction defective at …o'clock, diameter …mm
JX P	Junction defective, position incorrect at …o'clock, diameter …mm
JX D	Junction defective, connecting pipe is damaged at …o'clock, diameter …mm,
JX B	Junction defective, connecting pipe is blocked at …o'clock, diameter …mm,
JX Z	Defective junction, other at…o'clock, diameter…mm

Figure 4.54 Intruding Connection

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		20.3		DEE	J					5	01	04
		20.3		DEE	J					5	07	11
		20.3		WL						10		
		20.6		CXI				100		15	12	

Figure 4.55 Defective Junction - Damaged



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		112.2		JXD				150			09	

Figure 4.56 Defective Junction– Wrongly Positioned (Backfalls)

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		35.1		JXP				100			03	
		35.1		MB							04	
		35.1		MM			M				07	09
		35.1		MM			M				03	05
		35.1		WL						5		

Defective seal (pipe drains/sewers)

Definition: The joint sealing material between two pipe sections is defective.

Two clock references will be required to locate the entrance and exit points or the extent of any intrusion. If the sealing material is protruding at only one location, then only one clock reference is required.

For other sealing materials, the nature of the material should be recorded in the Remarks column.

These codes are used to describe situations where the joint sealing material between two pipe sections is protruding into the pipe to the extent that it has become visible.

- The sealing ring is protruding into the pipe (SR). If it is broken this should be recorded with the additional code (B). The start and finish clock references should define the cross-section where the sealing ring is missing.
- The seal is made with another material which is protruding into the pipe (SO). The reduction in cross-sectional area is expressed as a percentage.

Code	Description
SR	Sealing ring intruding at ...(OR from ... to ...) o'clock
SR B	Sealing ring, intruding and broken at ...(OR from ... to ...) o'clock
SO †	Other sealant intruding at ... (OR from ... to...) o'clock % cross-sectional area loss

† Additional information to be provided in the Remarks column.

Figure 4.57 Intruding Sealing Ring

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		40.3		SR							09	02

Lining observations

Observations relating to changes to or failure of the protective lining (LX), e.g., a bulge, weld failure, missing section or separation from the sewer wall. Use either one or two clock references depending on the extent and record any additional information in the Remarks column.

Definitions:

- **Blistered/internal bulge** (B) - The pipe lining contains pockets of air or resin solvent, for example, producing a blistering effect or an internal (convex) bulge.
- **Discolouration** (C) - An area of the lining that is a different colour to the rest of the lining. This does not include any obvious paint or other deliberate markings or attached deposits on the pipe wall.
- **Lining connection defect** (CX) - The lining is not sealed around the connection or the connection access has not been properly formed.
- **Detached lining** (D) - The lining of the pipe has become detached from the originally constructed pipe.
- **Defective end of lining** (E) - The end of the pipe repair, which may be a long or short length of lining, is ragged or warped.
- **External bulge** (EB) - The pipe lining has an external (concave) bulge.
- **End not sealed** (ES) - The end of the lining is not sealed to the host pipe or manhole.
- **Separated film** (F) - A separation of the internal film/coating of the lining.
- **Hole in lining** (H) - There is a hole in the lining.
- **Resin missing** (R) - The resin is missing from the laminate.
- **Crack/split/weld failure** (S) - A crack or split has occurred in the lining or there is a weld failure. These can be further described as Longitudinal (L), Circumferential (C), Multiple (M) or Spiral (H).
- **Lining appears soft** (SE) - The lining will move when touched by hand (manual inspection) or as the camera unit passes.
- **Separated seam covering** (SS) - The lining seam covering has become separated.
- **Wrinkled** (W) - The pipe lining has a wrinkled effect. The wrinkling effect is further described as Longitudinal (L), Circumferential (C), Multiple (M) or Spiral (H). This is usually present when the line of the pipe bends and there is excess material on the inside radius, resulting in wrinkling.
- **Other** (Z) - The pipe lining defect is not suitably classified by the above codes. A description of the defect should be recorded in the Remarks column.

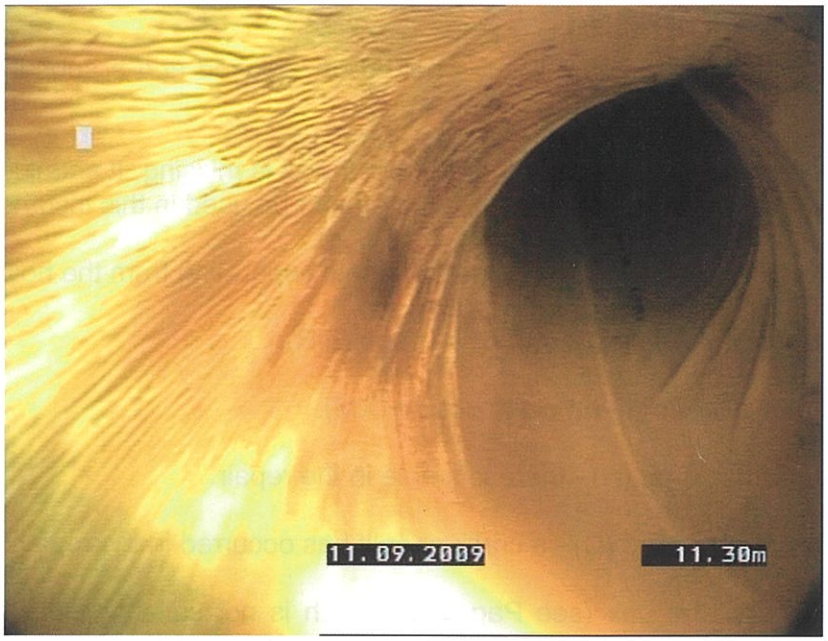
Code	Description
LX *	Lining defect
LX B	Defective lining, blistered lining or internal bulge at ...(OR from ... to ...) o'clock
LX C	Defective lining, discolouration of the lining at ...(OR from ... to ...) o'clock
LX CX	Defective lining, lining defect at connection at ...(OR from ... to ...) o'clock
LX D	Defective lining, lining detached at ...(OR from ... to ...) o'clock
LX E	Defective lining, defective end of lining at ...(OR from ... to ...) o'clock
LX H	Defective lining, hole in lining at ...(OR from ... to ...) o'clock
LX W L	Defective lining, longitudinal wrinkled lining at ...o'clock
LX W C	Defective lining, circumferential wrinkled lining from ... to ... o'clock
LX W M	Defective lining, complex (multiple) wrinkling from ... to ... o'clock
LX W H	Defective lining, spiral wrinkled lining from ... to ... o'clock
LX Z †	Defective lining, other at ...(OR from ... to ...) o'clock

* This code is only to be used as part of the domestic drainage coding system.
† Additional information to be provided in the Remarks column.

The following codes are used for specialist investigation only.

Code	Description
LX EB	Defective lining, external bulge at ...(OR from ... to ...) o'clock
LX ES	Defective lining, end not sealed at ...(OR from ... to ...) o'clock
LX F	Defective lining, separated film from ... to ... o'clock
LX R	Defective lining, resin missing at ...(OR from ... to ...) o'clock
LX S	Defective lining, crack or split in lining or weld failure at ...(OR from ... to ...) o'clock
LX S L	Defective lining, longitudinal crack or split in lining or weld failure at ... o'clock
LX S C	Defective lining, circumferential crack or split in lining or weld failure from ... to ... o'clock
LX S M	Defective lining, complex crack or split in lining or weld failure from ... to ... o'clock
LX S H	Defective lining, spiral crack or split in lining or weld failure from ... to ... o'clock
LX SF	Defective lining, lining appears soft at ...(OR from ... to ...) o'clock
LX SS	Defective lining, separated seam cover from ... to ... o'clock

Figure 4.58 Wrinkled Lining - Circumferential



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		11.3		LXWC	J						07	05

Figure 4.59 Blistered Lining from 12 o'clock to 6 o'clock

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		25.3	S01	LXB							12	06

Defective repair

Definitions:

Part of the drain/sewer has either been repaired or replaced and a subsequent defect (RX) has occurred.

- **Part of wall missing** (M) - part of the repaired wall is missing. It should be noted that the code for Hole (H) in an unrepaired pipe should not be used in this instance.
- **Separation from host pipe** (S) - a patch liner is separating from the host pipe.
- **Missing repair material on contact surface** (MR).
- **Excess material causing an obstruction** (XM).
- **Hole in repair material** (H) - there is a hole in the repair.
- **Crack in repair material** (C) - a crack or split has occurred in the repair.
- **Other** (Z) - a point repair (see Page 89), which is not suitably classified by the above codes. The code should be entered and a description of the type of repair should be recorded in the Remarks column.

Code	Description
RX M	Defective repair, part of wall missing at ...(OR from ... to ...) o'clock
RX S	Defective repair, separation from host pipe at ...(OR from ... to ...) o'clock ...% cross-sectional area loss
RX MR	Defective repair, missing repair material at ...(OR from ... to ...) o'clock
RX XM	Defective repair, excess material obstruction at ...(OR from ... to ...) o'clock ...% cross-sectional area loss
RX H	Defective repair, hole in material at ...(OR from ... to ...) o'clock
RX C	Defective repair, crack in material at ...(OR from ... to ...) o'clock
RX Z †	Defective repair, other at ...(OR from ... to ...) o'clock

† Additional information to be provided in the Remarks column.

Weld failure

Definition: A failure in a weld in the pipe fabric, i.e., the weld does not have a uniform pattern.

Weld failures can occur in:

- Large diameter plastic spirally-wound welded pipes or butt-fused pipes.
- Metallic pipes, e.g., in rising mains.

A Weld Failure (WX) is further described as being, Longitudinal (L), Circumferential (C) or Spiral (S) (see Page 41).

Code	Description
WX L	Weld failure longitudinal at ...o'clock
WX C	Weld failure circumferential from ...to ...o'clock
WX S	Weld failure spiral from ...to ...o'clock

Point repair

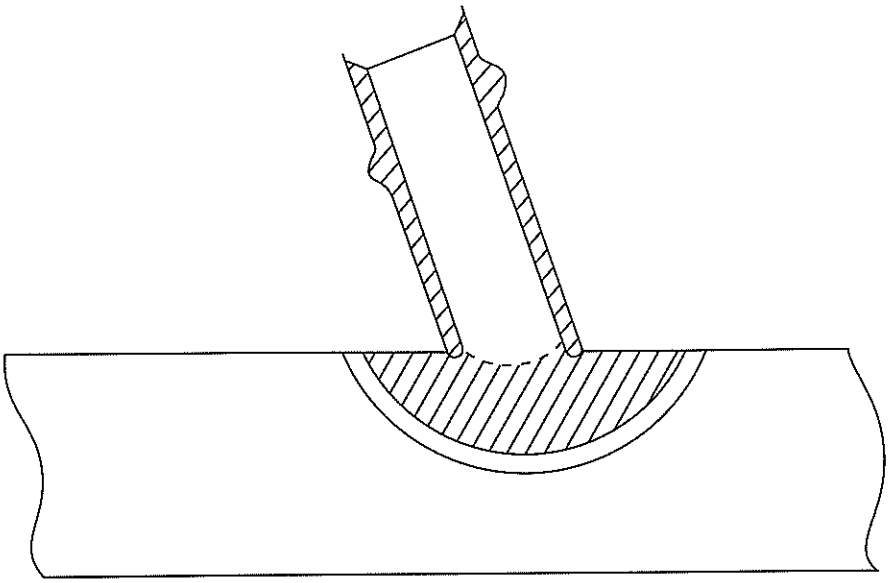
Definition: Part of the drain/sewer has been repaired or replaced by some method.

- **Pipe replaced** (R) - A section of the pipeline has been replaced. The continuous defect facility is used to indicate the start and the end of the replacement if it extends for more than one metre.
- **Localised lining of pipe** (L) - A short length of lining is inserted over the defects in the drain/sewer. The continuous defect facility is used to indicate the start and end of the defect if it extends for more than one metre.
- **Injected grout** (I) - Cement-based grout used to fill a void behind the pipe wall.
- **Other injected sealing material** (S) - Other sealing materials used to fill a void behind the pipe wall, e.g., chemical grouts.
- **Hole repaired** (H) - A hole in the pipe wall has been repaired.
- **Localised lining of connection** (T) - e.g., top hat (an insert lining system used to repair connections) (see Figure 4.60).
- **Other repair of connection** (C) - give further details in the Remarks column.
- **Other repair method** (Z) - A point repair which is not suitably classified by the above codes. Further details should be recorded in the Remarks column.

Code	Description
RP R	Point repair, pipe replaced from ...to ...o'clock
RP L	Point repair, localised lining from ...to ...o'clock
RP I	Point repair, injected mortar at ...(OR from ... to ...) o'clock
RP S	Point repair, other injected sealing material at ...(OR from ... to ...) o'clock
RP H	Point repair, hole repaired at ...(OR from ... to ...) o'clock
RP T	Point repair, localised lining of connection at .... o'clock
RP C †	Point repair, other repair to connection at ... (OR from ... to... o'clock
RP Z †	Point repair, other repair method at ...(OR from ... to ...) o'clock

† Additional information to be provided in the Remarks column.

Figure 4.60 Localised Lining of Connection



Porous pipe

Definition: All or part of the pipe wall allows water to pass through it.

Code	Description
PP	Pipe material is porous at ...(OR from ... to ...) o'clock

Soil visible through defect

Definition: Soil is visible through the defect (see Figure 4.11).

Code	Description
SV	Soil visible through defect

Void visible through defect

Definition: A void is visible through the defect (see Figure 4.11).

Code	Description
VV	Void visible through defect

Start and finish manhole/node

The start and finish manhole/node can be any type of manhole or node point, e.g., direct or side entry shaft, outfall, lamphole, dropshaft, air vent or node point. A node point is any point on a drain/sewer system that has been given a reference.

Enter the full manhole/node reference in the Dimension 1 column.

The suffix F to the code indicates the finish manhole/node.

If an intermediate node is encountered during the survey, the survey should be terminated (see Section 2.2) and the manhole/node coded as the finish manhole/node. The survey should then be restarted with this intermediate manhole/node as the start manhole/node of a new length.

Definitions:

- **Manhole** (MH/MHF) - An access point that is large enough to allow a person to enter.
- **Inspection chamber** (IC/ICF) - An access point comprising a chamber that is not large enough to allow a person to enter.
- **Rodding eye** (RE/REF) - An access point at the end of the pipe without any enlargement.
- **Lamphole** (LH/LHF) - An access point that is a small diameter vertical pipe from the ground level to the soffit of the pipe.
- **Outfall** (OF/OFF) - An access point where a pipe discharges into a receiving water, e.g., stream, river, lake, ditch or sea.
- **Major connection without a manhole** (BR/BRF) - Applies only to incoming or outgoing drains/sewers of diameter 900 mm and above.
- **Gully** (GY/GYF) - A point of entry for flow into the system.
- **Catchpit** (CP/CPF) - A chamber with a sump below the level of the incoming and outgoing pipes designed to retain sediments.
- **Soakaway** (SK/SKF) - A structure designed to store water and infiltrate it into the ground.
- **Oil separator** (OS/OSF) - A structure designed to retain light liquids, e.g., oil.
- **Running Trap** (RG) - An interceptor trap with neither riser nor evidence on the surface (i.e., a blind siphon).
- **Buchan Trap** (BN) - An interceptor trap that just has a pipe as a riser with a small access cover.
- **Winser Trap** (WR) - An interceptor trap that has a rodding access point on the outgoing pipe.
- **Other special chamber** (OC/OCF) - An access point which is not suitably classified by the above codes. Further details should be recorded in the Remarks column.

Code	Description
MH	Start node type, manhole, reference...
IC	Start node type, inspection chamber, reference ...
RE	Start node type, rodding eye, reference...
LH	Start node type, lamphole, reference ...
OF	Start node type, outfall, reference ...
BR	Start node type, major connection without manhole, reference ...
GY	Start node type, gully, reference...
CP	Start node type, catchpit, reference...
SK	Start node type, soakaway, reference ...
OS	Start node type, oil separator, reference...
RG	Start node type, running trap, reference ...
BN	Start node type, Buchan trap, reference...
WR	Start node type, Winser trap, reference ...
OC	Start node type, other special chamber, reference ...
MHF	Finish node type, manhole, reference ...
ICF	Finish node type, inspection chamber, reference ...
REF	Finish node type, rodding eye, reference ...
LHF	Finish node type, lamphole, reference ...
OFF	Finish node type, outfall, reference ...
BRF	Finish node type, major connection without manhole, reference...
GYF	Finish node type, gully, reference ...
CPF	Finish node type, catchpit, reference ...
SKF	Finish node type, soakaway, reference ...
OSF	Finish node type, oil separator, reference ...
RGF	Finish node type, running trap, reference...
BNF	Finish node type, Buchan trap, reference...
WRF	Finish node type, Winser trap, reference...
OCF	Finish node type, other special chamber, reference ...

Figure 4.61 Diagram of a Rodding Eye

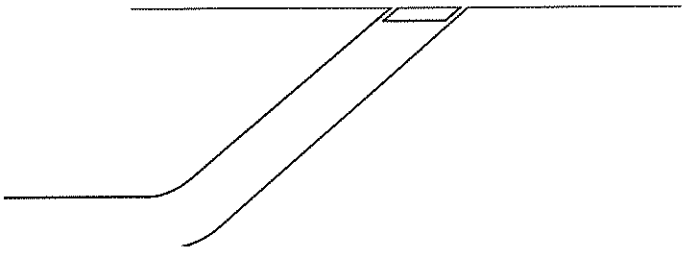


Figure 4.62 Diagram of a Lamphole

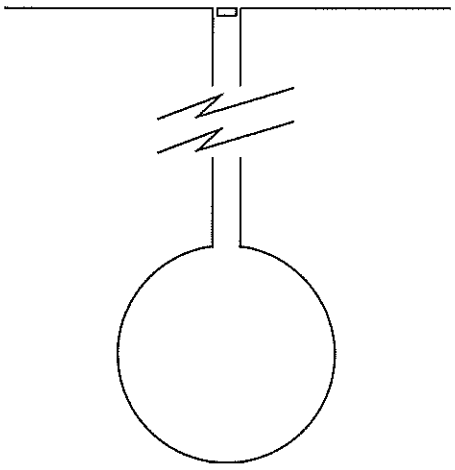


Figure 4.63 Diagram of a Catchpit

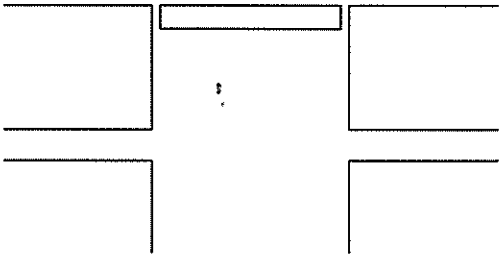


Figure 4.64 Diagram of a Running Trap

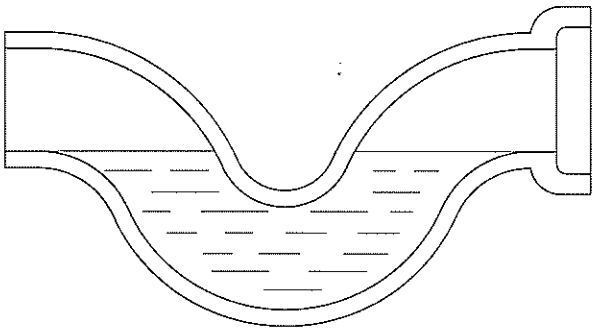


Figure 4.65 Diagram of a Buchan Trap

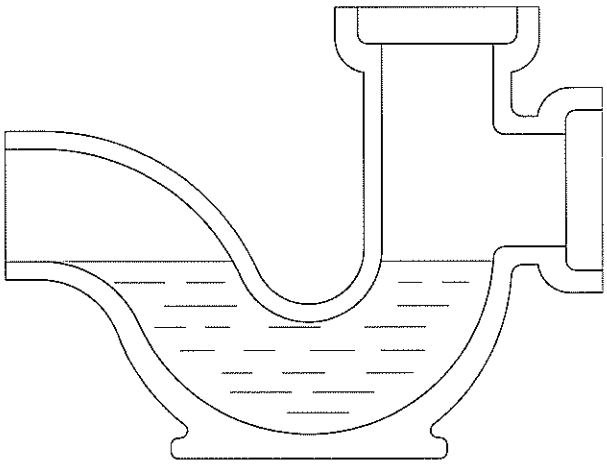
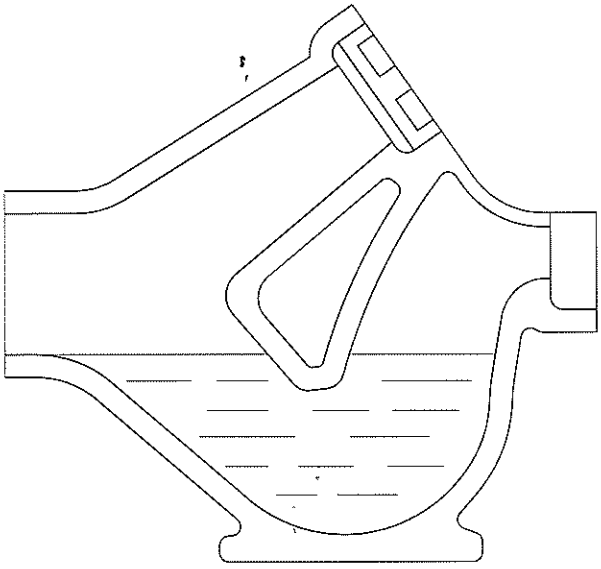


Figure 4.66 Diagram of a Winser Trap



4.4 Miscellaneous Features

These codes define general items concerning the drain/sewer.

Survey abandoned

Definition: The survey could not be completed.

Where a survey is abandoned, it is generally due to a structural, service or construction defect which prevents the camera progressing.

The appropriate code associated with the reason for abandoning the survey, if applicable, should be entered and any continuous defect codes closed down before entering the survey abandonment code (SA). Enter in the Remarks column the reason for abandoning the survey.

A survey should normally be undertaken from the other manhole to complete the inspection of the survey length.

Code	Description
SA †	Survey abandoned

† Additional information to be provided in the Remarks column.

Shape and/or size change

Definition: The shape and/or dimension/s of a drain/sewer changes (SC) between manholes.

Where a shape change occurs, the code for the new shape is added as an ancillary code (see Page 30) and the new dimension is recorded in millimetres in the dimension column(s), e.g., SC E 600 mm x 400 mm.

Where there is a change in dimension/s, there is no ancillary code but the new dimension is recorded in millimetres, e.g., SC 600 mm.

Code	Description
SC + [Shape code]	Shape of drain/sewer changes to [*Shape]* ...mm (OR ...mm x ...mm)
SC	Dimension/s of drain/sewer changes to ...mm (OR ...mm x ...mm)

Figure 4.67 Shape/Dimension Change – Circular 300 mm Diameter

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		64.6		FL							12	
		64.6		DV						15		
		64.6		FL							07	
		65.2		DER						15		
		66.4		SCC				300				

Figure 4.68 Shape/Dimension Change – Oval 1800 x 1200 mm

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		5.8		CN				225			04	
		5.8		SCO				1800	1200			

Lining change

Definition: The drain/sewer fabric remains intact but a lining has been introduced into the drain/sewer or the lining material changes between manholes.

Code	Description
LC *	Lining of drain/sewer changes
LC + [Material code]	Lining of drain/sewer changes to ... at this point

* This code is only to be used as part of the domestic drainage coding system.

The code for the method of lining (see Page 31) is suffixed to the lining change code (e.g., LC CIP) and the new material code (see Page 30) should be recorded in the Material column (e.g., PVC).

If a lining ends, the appropriate code is used and the material code should be left blank.

This code should not be used for localised point repairs (<10% of survey length).

Material change

Definition: The material of the drain/sewer fabric changes between manholes.

Code	Description
MC *	Material of drain/sewer changes
MC + [Material code]	Material of drain/sewer changes to ... at this point from ... to ... o'clock

* This code is only to be used as part of the domestic drainage coding system.

Use the MC code plus the code for the new material (see Pages 30 and 31), e.g., MC CO. Where there is only a partial material change, the clock references should be used.

Figure 4.69 Material Change to Concrete

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		38.5		MM			M				11	12
		38.5		MM			M				04	05
		38.5		SW							05	07
		39.0		MC		CO						
		39.0		SCC				530				

Pipe length change

Definition: The individual pipe length (i.e., distance between joints) changes.

Record new pipe length in nominal pipe sizes in millimetres in the Dimension 1 column.

Code	Description
PC	Length of individual pipe forming drain/sewer changes at this point, new length … mm (enter in Dimension 1 column)

Video volume reference

Definition: The film, tape, CD, DVD or hard disc needs to be replaced during the survey.

Enter the reference number of the new video volume in the Dimension 1 column.

Code	Description
VVR	Video volume reference new volume … (enter in dimension 1 column)

Photograph volume reference

Definition: The medium used to record photographs or still images needs to be replaced during the survey.

Enter the reference number of the new photographic volume in the Dimension 1 column.

Code	Description
PVR	Photograph volume reference new volume ... (enter in Dimension 1 column)

Vermin

Definition: The observation of vermin in the drain/sewer.

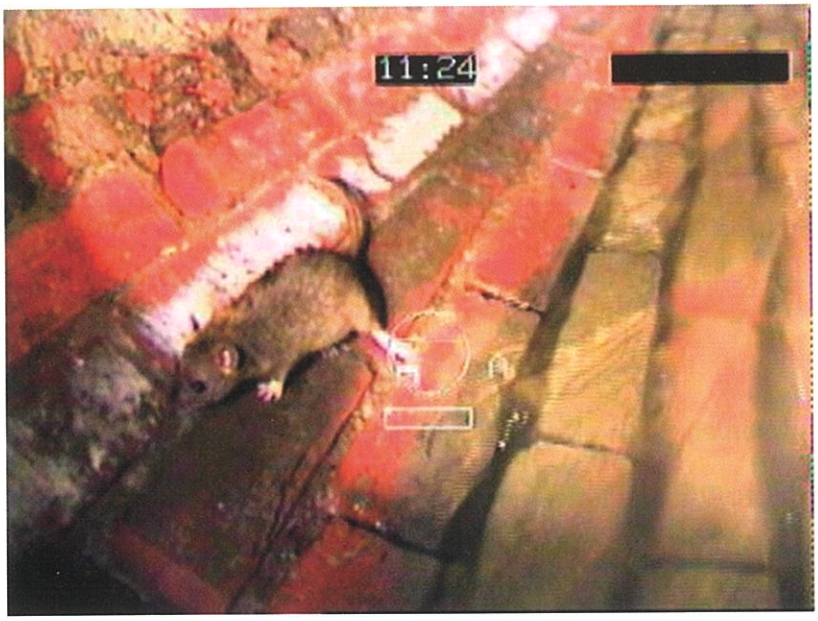
This code should only be used if vermin rats are actually observed. If only evidence of vermin is observed (e.g., damage, nest or droppings), use a REM (general remarks) and enter details in the Remarks column.

It is not necessary to record the number of rats.

Code	Description
V *	Vermin
V R	Vermin, rat
V R C	Vermin, rats observed in connection
V R J	Vermin, rats observed in open joint
V R Z †	Vermin, rats observed other

* This code is only to be used as part of the domestic drainage coding system.
† Additional information to be provided in the Remarks column.

Figure 4.70 Vermin, Rat



Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		76.4		VR								

General photograph

Definition: A photograph is taken without a defect being recorded; this may reflect the typical condition of the length being inspected.

Record the photograph reference in the Photo Ref. column; this can be the photograph number or the image filename.

Code	Description
GP	General photograph taken at this point

Remarks

When there is no appropriate code for an observation, the REM code is used. This extra information is to be recorded in a concise manner in the Remarks column.

Code	Description
REM	General remark

Flow from incoming pipe

Where the sewer inspection is part of an infiltration study or to investigate misconnections, the nature of any flow may be of interest and the client may require additional information. In this case, this code should be used. **Where the client does not request its use, it is not required.**

Definition: The presence of flow (FW) entering through an incoming pipe.

This may be further described depending on the nature of the incoming flow:

- **Turbid** (T) - Flow in pipe is turbid - the pipe invert is not visible due to turbidity of the flow.
- **Clear** (C) - Flow in pipe is not turbid - the pipe invert is visible through the flow.

The incoming water level should be given as a percentage of the diameter/height of the incoming pipe and should be to the nearest 5%. If no water is observed, enter 00 (see Section 2.4).

In addition, these codes should be used where it is observed that a wrong flow is entering through an incoming drain/sewer. It can be defined as follows:

- Turbid flow (i.e., foul water) (TF) entering into a surface water drain/sewer.
- Clear flow (i.e., surface water) (CS) entering into a foul drain/sewer.

These codes should always be recorded below the junction/connection (JN/CN) entry to which they refer.

Code	Description
FW	Flow from incoming pipe at ...o'clock ...% of the vertical dimension
FW C	Clear flow from incoming pipe at ...o'clock ...% of the vertical dimension
FW C S	Wrong clear flow from incoming foul pipe at ...o'clock ...% of the vertical dimension
FW T	Turbid flow from incoming pipe at ...o'clock ...% of the vertical dimension
FW T F	Wrong turbid flow from incoming surface water pipe at ...o'clock ...% of the vertical dimension

Hazardous atmosphere

Definition: A hazardous atmosphere has been identified.

Where the information is available, the percentage of gas in the atmosphere or the concentration of gas in ppm should be recorded.

Where the hazardous atmosphere code GZ is used, further details should be given in the Remarks column.

These codes are only likely to be used where there is a manual inspection.

Code	Description
OD §	Hazardous atmosphere, oxygen deficiency [% or ppm]
HS §	Hazardous atmosphere, hydrogen sulphide [% or ppm]
ME §	Hazardous atmosphere, methane [% or ppm]
GZ † §	Hazardous atmosphere, other [% or ppm]

† Additional information to be provided in the Remarks column.
§ If ppm is recorded then it should be placed in the mm column.

Loss of vision

Definition: The view from the camera lens is obscured by the flow or other material in the pipe.

Where the cause for loss of vision is recorded as "Other" (CU Z), further information should be recorded in the Remarks column.

Code	Description
CU *	Loss of vision
CU W	Loss of vision, camera under water
CU D	Loss of vision, silt
CU S	Loss of vision, steam
CU Z †	Loss of vision, other

* This code is only to be used as part of the domestic drainage coding system.
† Additional information to be provided in the Remarks column.

PART B - MANHOLES AND INSPECTION CHAMBERS

5. CODING PRINCIPLES

5.1 Introduction

This section covers the principles of the procedures used to fill in the appropriate section of the standard manhole/inspection chamber coding form. The method is similar to that previously described for Drains and Sewers in Part A and requires a separate report for each manhole/inspection chamber. Once again the standard coding form contains two sections, one detailing the Header information and the other giving Condition details for the manhole/inspection chamber.

Details on completing the coding form are described in Part A and these should be referred to when completing the coding form for manholes and inspection chambers.

A separate standard coding form is required for manholes and inspection chambers as there are some differences in the survey method, resulting in a significant change to some of the condition codes.

There are a number of differences in the codes due to the fact that the survey moves vertically through the manhole/inspection chamber. As a consequence:

- Longitudinal defects become vertical.
- Circumferential defects become horizontal.
- Spiral defects become inclined.
- Codes are used to describe the survey location within the chamber.

5.2 Condition Details

Section 7 of this manual defines the codes which cover structural and service condition and constructional and miscellaneous features. The codes for the condition details are described in Section 7.1. A Quick Reference Guide is included as a separate card. The codes and the information are entered onto the lower section of the form together with the supporting information.

When the header section is complete, start entering the survey information in the data section of the standard coding sheet.

When the survey reaches the water level, the code WL should be entered in the data section. The vertical location records the water level. If there is no flow, the code WL should not be entered.

The following fields in the coding form are used in the same way as they are described in Part A - Drains and Sewers:

- Video reference (see Page 13)
- Photograph reference (see Page 13)
- Continuous defect (see Page 13)
- Code (see Page 14)
- Joint (see Page 14)
- Material (see Page 14)
- Band (see Page 14)
- Dimensions (see Page 14)
- Percentage (see Page 14)
- Remarks (see Page 16)

The following codes are either used differently or are not included in Part A.

Distance

The client should specify whether the distance (i.e., depth/height) is to be entered as either:

- the distance in metres of each structural, service, constructional or miscellaneous code from either the highest point of the frame of the cover, or the lowest invert level; or
- the level related to an agreed national or local datum.

Spaces should be zero filled or left blank. Distances are entered in metres to two decimal places.

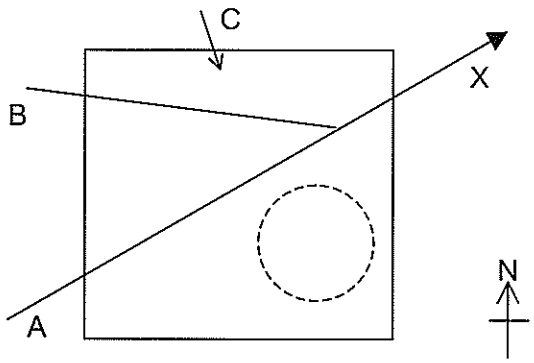
Location of observation

The location of the observation within the manhole/inspection chamber should be recorded using the following codes:

CF	Cover and frame
AC	Adjusting construction
S	Shaft
T	Taper
RS	Reducing slab
CH	Chamber
L	Landing
B	Benching
CHL	Channel
I	Invert

A sketch plan of the layout of the manhole/inspection chamber should also be provided with the coding form.

e.g.,

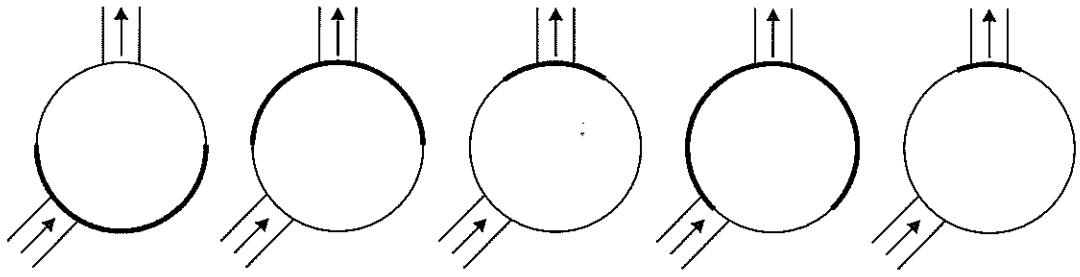


Clock reference (at or from/to)

The position of the observation around the circumference of the manhole/inspection chamber should be recorded using clock references with reference to the circumferential reference point.

The circumferential reference point is defined as the direction of the lowest outgoing pipe being at 6 o'clock. Otherwise, clock references are used in the same way as in Part A. Examples of clock references are shown in Figure 5.1.

Figure 5.1 Examples of Clock References



1	2	3	4	5
09 03	03 09	05 07	02 10	06

Figure 5.2 Standard Coding Form (Sewerage Undertakers)

Client

Sheet Number

Name of Surveyor | Client's Job Reference | Contractor's Job Reference | Drainage Area | Division/District

Node Type | Manhole/Node Reference | Manhole/Node Coordinates | Date | Time | Location (Street Name)

Town or Village | Location Type Code | Land Ownership | Vertical Reference Point | Circumferential Reference Point

Use of Manhole/Inspection Chamber | General Remarks | Shape of Cover | Material of Cover | Width of Cover

Breadth of Cover | Cover Level | Shape of Access | Width of Access | Breadth of Access | Material | Types of Steps | Material of Steps | Pre-cleaning

Strategic Drain/Sewer | Purpose of Inspection | Inspection Stage | Flow Control Measures | Weather | Temperature | Chamber Unit Length

Year Constructed | Method of Inspection | Standard | Video Image Storage Media | Video Image Location System | Video Image Format

Video Image Filename | Video Volume Reference | Photograph Image Storage Format | Photograph Volume Reference | Client Defined 1

Client Defined 2 | Client Defined 3 | Client Defined 4 | Client Defined 5

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/From	Clock To	

Figure 5.3 Standard Coding Form Continuation Sheet (Sewerage Undertakers)

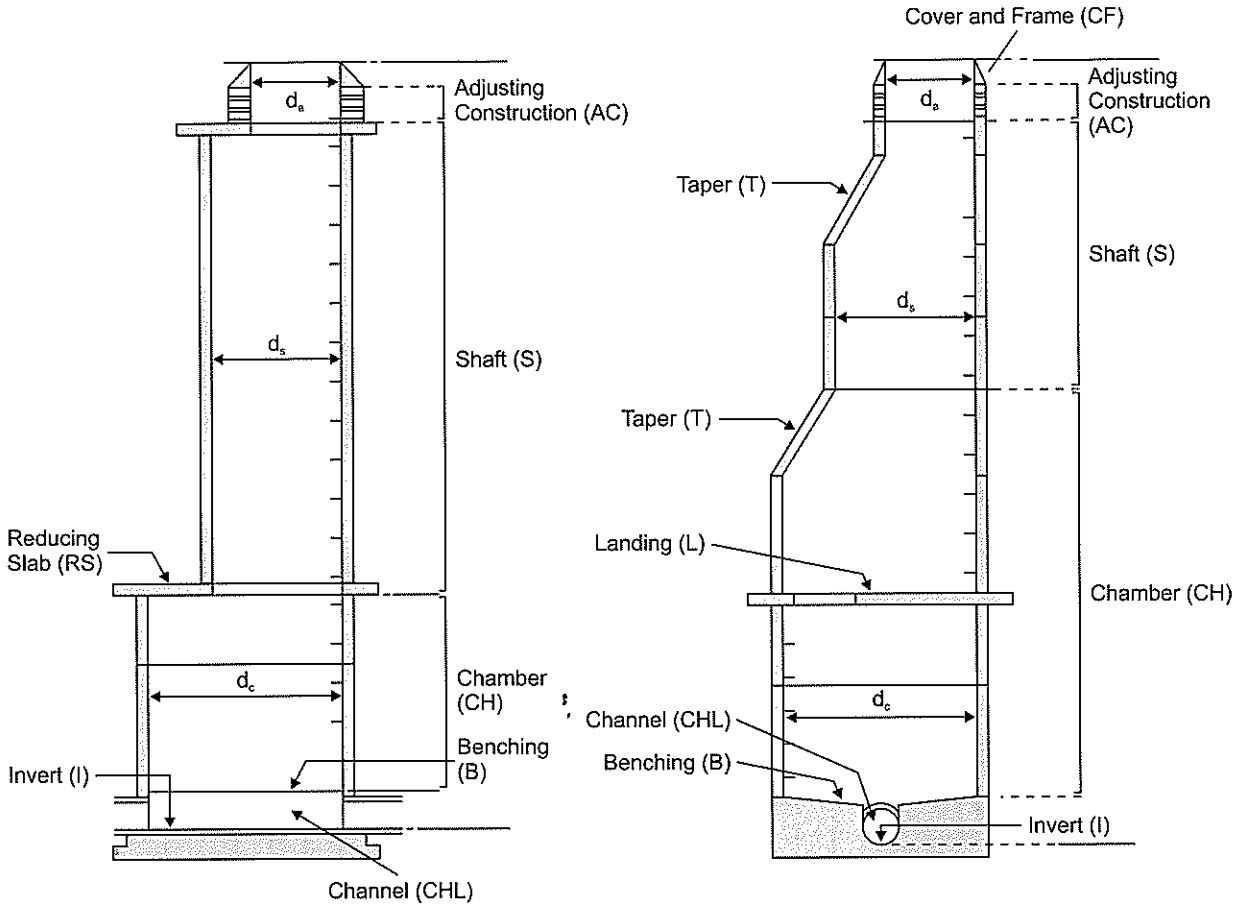
Client

Manhole/Node Reference

Sheet No.

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension		%	Clock		
								1	2		At/ From	To	

Figure 5.4 Location Codes for Manhole and Inspection Chamber Surveys



d_a is the dimension of the adjusting construction.

d_s is the dimension of the shaft.

d_c is the dimension of the chamber.

6. HEADER DETAILS

This section of the manual covers the standard codes and formats to be used when completing the header details of the standard coding form for manholes and inspection chambers (see Figure 5.2). The header details are filled in using standard header codes, where appropriate. The client may not require all of the fields to be completed, in which case the standard coding should be "shaded" or "hatched" to indicate which fields need not be filled in. Where computer entry is made, these fields should be confirmed with the client.

Fields 1 - 6

The following fields are used in exactly the same way as in Part A (see Page 25).

- Client
- Name of Surveyor
- Client's Job Reference
- Contractor's Job Reference
- Drainage Area
- Division/District

Field 7 - Node Type

Enter the type of node.

MH	Manhole
IC	Inspection chamber
RE	Rodding eye (see Figure 4.61)
LH	Lamphole (see Figure 4.62)
OF	Outfall
BR	Major connection without manhole
GY	Gully
CP	Catchpit (see Figure 4.63)
SK	Soakaway
OS	Oil separator
RG	Running trap (see Figure 4.64)
BN	Buchan trap (see Figure 4.65)
WR	Winser trap (see Figure 4.66)
OC	Other special chamber

Field 8 – Manhole/Node Reference

Enter a reference in accordance with the manhole/node (STC25) referencing system described in Appendix A.

Where an established local manhole referencing system exists, this may be used as a temporary reference pending adoption of the recommended system. Enter the manhole reference on the left of box.

Field 9 - Manhole/Node Coordinates

This consists of the Ordnance Survey map number and 100-metre grid coordinates as described in Appendix A Parts 1) and 2).

Fields 10 - 14

The following fields are used in exactly the same way as in Part A (see Pages 25 to 26).

- Date
- Time
- Location (Street Name)
- Town or Village
- Location Type Code

Field 15 - Land Ownership

This field is only to be used on the instruction of the client.

PR	Private
PU	Public
X	Not known

Field 16 - Vertical Reference Point

Enter an appropriate vertical reference point code used in the survey:

I	Invert lowest outgoing pipe in the manhole/inspection chamber
C	Cover (highest corner of frame or highest point on a circular frame)
OD	National Datum
LD	Local Datum
Z	Other

Field 17 - Circumferential Reference Point

The circumferential reference point is defined as being the lowest outgoing pipeline. Where more than one outgoing pipeline is at the same level, the reference should be to the largest of the pipes at the lowest level. In the UK, this should be taken as 6 o'clock, and the code 06 is always used.

Field 18 - Use of Manhole/Inspection Chamber

The surveyor should enter one of the following codes to define the use of the manhole/inspection chamber:

C	Combined
F	Foul
S	Surface Water
T	Trade Effluent
W	Watercourse (culverted)
Z	Other (give details in the General Remarks field)

All doubtful cases should be brought to the attention of the client for a decision. A note may be put in the General Remarks field.

Field 19 - General Remarks

Enter any general information relevant to the survey of the complete manhole/inspection chamber which cannot be included in any other way. The client should specify any particular items required.

Field 20 - Shape of Cover

Enter one of the following codes to describe the manhole/inspection chamber cover shape:

R	Rectangular
C	Circular
T	Triangular
OV	Oval
HX	Hexagonal
OC	Octagonal
Z	Other (give details in General Remarks field)

Field 21 - Material of Cover

Enter one of the codes listed in Part A to describe the manhole/inspection chamber cover material (see Pages 30 and 31).

Field 22 - Width of Cover

Enter the width of the cover of the manhole/inspection chamber in millimetres.

Field 23 - Breadth of Cover

Enter the breadth of the cover of the manhole/inspection chamber in millimetres.

Field 24 - Cover Level

Enter the level of the cover of the manhole/inspection chamber in metres.

Field 25 - Shape of Access

Enter the shape of access to the manhole/inspection chamber using a code from the list given in Field 20 (Shape of Cover) above.

Field 26 - Width of Access

Enter the width of the smallest part of the access into the manhole/inspection chamber in millimetres.

Field 27 - Breadth of Access

Enter the breadth of the smallest part of the access into the manhole/inspection chamber in millimetres. This field is not required where the access is circular.

Field 28 - Material

Enter one of the codes listed in Part A for manhole/inspection chamber material (see Pages 30 and 31). Where a mixture of materials is used, the first material (in the survey sequence) encountered in the chamber should be entered. Where the manhole/inspection chamber has been relined, the material recorded is the material of the original manhole/inspection chamber or enter Z if the original material is unknown.

Field 29 - Type of Steps

Enter the code for the type of steps used in the manhole/inspection chamber:

S	Single width – wide enough for one foot only
D	Double width – wide enough for both feet
L	Ladder
T	Toe holes in benching or wall of chamber or shaft
N	No steps provided
Z	Other (give details in the General Remarks field)

Field 30 - Material of Steps

Enter the code for the material of steps or ladder used in the manhole/inspection chamber:

IR	Iron/Steel
GI	Galvanised iron
SS	Stainless steel
PM	Metal encapsulated in plastic
PL	Plastic
AL	Aluminium
Z	Other (give details in the General Remarks field)

Field 31 - Pre-cleaning

State whether cleaning was carried out prior to the survey. Enter Y if pre-cleaning was carried out, N if it was not and Z if not known. The codes Y or N are only to be entered if definitely known.

Field 32 - Strategic Drain/Sewer

Enter the sewer category code A, B or C as defined in the Sewer Risk Management website (WRc plc (2013)). This is the value applicable to the most critical sewer at the manhole (information is to be provided by the client). Enter Z if unknown.

Field 33 - Purpose of Inspection

This code is used in a similar way to the equivalent code in Part A (see Page 32).

Field 34 - Inspection Stage

Where some of the header information is provided by the client in advance of the survey, this field should be used to indicate the stage of the inspection:

A	Information provided by client
B	Information provided by the inspector to client
Z	Other

Field 35 - Flow Control Measures

Record the measures, if any, taken to deal with the flow at the time of the inspection:

N	No flow control
BL	Flows blocked upstream
PB	Flows partially blocked upstream
X	Other – further details should be recorded in the General Remarks field

Field 36 - Weather

This code is used in a similar way to the equivalent code in Part A (see Page 33).

Field 37 - Temperature

This code is used in a similar way to the equivalent code in Part A (see Page 33).

Field 38 - Chamber Unit Length

Enter the length in millimetres of the individual manhole/inspection chamber ring unit. Where these vary, enter the length of the first ring encountered in the survey. Leave blank if the chamber is not made of prefabricated units.

Fields 39 - 53

The following codes are used in exactly the same way as in Part A (see Pages 33 to 35).

- Year Constructed
- Method of Inspection
- Standard
- Video Image Storage Media
- Video Image Location System
- Video Image Format
- Video Image Filename
- Video Volume Reference
- Photograph Image Storage Format
- Photograph Volume Reference
- Client Defined

7. CONDITION CODES

The manhole and inspection chamber condition codes and their definitions are given below. Often more than one code may be needed to describe what is seen during the survey. A manhole/inspection chamber may, for instance, be broken and deformed or cracked and fractured. **It is important to note all that can be seen and not just the worst defect.** The descriptions given with the example photographs illustrate this further.

Data are normally entered in ascending/descending metreage order as the survey proceeds. However, if an omission or error occurs then the corrected line of data or additional line may be entered at any intermediate point on the form or after the last line of data, providing that it has a vertical distance entry, but before the WL, CH or SA code. Take care to record the correct vertical distance.

Care must be exercised with the use of the defect codes for brick chambers, particularly the codes for fracture and mortar loss.

A summary of all codes is given in the Quick Reference Cards and an alphabetical listing of all codes is given in Appendix C.

The letter J should be added to the appropriate defect code where the defect starts and ends within 0.2 m of a ring joint or if the defect is at or on the joint. This should not be used where the defect code is always associated with a joint (i.e., the codes JD and OJ).

7.1 Structural Condition

These codes describe the physical condition of the manhole/inspection chamber and the severity of the damage.

The definitions for Crack, Fracture, Broken, Hole, Deformed, Collapsed, Surface Damage, Mortar Missing, Displaced Bricks and Missing Bricks are as given in Part A – Drains and Sewers (Pages 41 to 62).

Crack

Horizontal cracks run approximately along the axis of the manhole/inspection chamber.

Vertical cracks run approximately at right angles to the axis of the manhole/inspection chamber.

Multiple cracks are an area of crazed cracking (a combination of horizontal, vertical and/or inclined cracks) that cannot be easily identified and/or individually coded.

Inclined cracks change position as they travel up the manhole/inspection chamber. An inclined crack should not be confused with a horizontal crack or an erratic vertical crack. In brick or masonry chambers, an inclined crack may follow a stepped pattern along mortar joints or individual bricks may be cracked.

Radiating cracks are those that radiate outwards from a single point in a star pattern. The J code is not used with this defect.

Note: In brick manhole/inspection chambers, crack lines are visible in the brickwork and/or mortar but the bricks are still in place.

Code	Description
C V	Crack vertical at ... o'clock
C H	Crack horizontal from ... to ... o'clock
C M	Cracks multiple from ... to ... o'clock
C IN	Crack inclined from ... to ... o'clock
C R	Crack radiates from ... o'clock

Fracture

"Horizontal", "vertical", "multiple", "inclined" and "radiating" are as defined above.

Note: In brick manhole/inspection chambers, fractures are visibly open in the brickwork and/or mortar and the bricks have moved apart from one another.

Code	Description
F V	Fracture vertical at ... o'clock
F H	Fracture horizontal from ... to ... o'clock
F M	Fractures multiple from ... to ... o'clock
F IN	Fracture inclined from ... to ... o'clock
F R	Fracture radiates from ... o'clock

Broken

This code should be used only in chambers made from prefabricated units or in-situ formed concrete. The code is otherwise used as defined in Part A (see Page 47).

Code	Description
B	Broken manhole/inspection chamber at ... (OR from ... to ...) o'clock

Hole

This code should be used only in chambers made from prefabricated units or in-situ formed concrete. The code is otherwise used as defined in Part A (see Page 48).

Code	Description
H	Hole in manhole/inspection chamber at ... (OR from ... to ...) o'clock

Deformed

It is possible to have deformation without loss of visible structural integrity, e.g., in flexible material such as plastics.

Care must be exercised when using these codes in brick manholes/inspection chambers. Brick manholes/inspection chambers are sometimes not built to regular sizes and were occasionally built to suit local site conditions. The maximum percentage change in the dimension which reduces should be recorded in increments of 5%.

Code	Description
D	Deformed (manhole) ...% change in dimension

Collapse

The code XP should be used only in chambers made from prefabricated units or in-situ formed concrete. The code XB should be used in chambers made from brickwork or masonry. The codes are thus used as defined in Part A (see Page 50).

Code	Description
XP	Collapse ...%
XB	Collapse due to defective brickwork or masonry ...%

Displaced joint

Definition: The two adjacent manhole/inspection chamber units are not concentric.

Displacements can be vertical or horizontal. This code is only used in chambers made from prefabricated chamber units.

The length of the displacement between the manhole/inspection chamber units should be recorded in millimetres.

Code	Description
OJ *	Displaced joint, vertical
JD *	Displaced joint, horizontal
OJ	Displaced joint, vertical ...mm
JD	Displaced joint, horizontal ...mm

* These codes are only to be used as part of the domestic drainage coding system.

Surface damage

These codes are used in a similar way to the equivalent codes in Part A. See Page 54 for details.

Code	Description
S W	Increased roughness at ...(OR from ... to ...) o'clock
S S	Spalling at ... (OR from ... to ...) o'clock
S AV	Aggregate visible at ...(OR from ... to ...) o'clock
S AP	Aggregate projecting from surface at ...(OR from ... to ...) o'clock
S RV	Reinforcement visible at ...(OR from ... to ...) o'clock
S RP	Reinforcement projecting from surface at ...(OR from ... to ...) o'clock
S RC	Reinforcement corroded at ...(OR from ... to ...) o'clock
S CP	Corrosion products at ...(OR from ... to ...) o'clock
S B	Blistering (internal bulge) at ... (OR from ... to ...) o'clock
S Z †	Other damage at ...(OR from ... to ...) o'clock

† Additional information to be provided in the Remarks column.

Mortar missing

This code is used in a similar way to the equivalent code in Part A. See Page 60 for details.

Code	Description
MM	Mortar missing between ...mm and ...mm at ...(OR from ... to...) o'clock

Displaced bricks

This code is used in a similar way to the equivalent code in Part A. See Page 60 for details.

Code	Description
DB	Displaced bricks at ... (OR from ... to ...) o'clock

Missing bricks

This code is used in a similar way to the equivalent code in Part A. See Page 62 for details.

Code	Description
MB	Missing bricks at ... (OR from ... to ...) o'clock

7.2 Service Defects

These codes describe the capability of the manhole/inspection chamber to meet its service requirements and indicate loss of capacity, potential for blockage and watertightness.

The following terms are as defined in Part A - Drains and Sewers: Roots, Infiltration, Exfiltration, Attached Deposits and Settled Deposits.

Roots

These codes are used in a similar way to the equivalent codes in Part A. See Page 64 for details.

Code	Description
R F	Roots fine
R T	Roots tap
R M	Roots mass …% cross-sectional area loss

Figure 7.1 Roots

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		0.0		ST								
		0.1		RF								

Infiltration

These codes are used in a similar way to the equivalent codes in Part A. See Page 67 for details.

Code	Description
I S	Infiltration seeping at ... (OR from ... to ...) o'clock
I D	Infiltration dripping at ... (OR from ... to ...) o'clock
I R	Infiltration running at ... (OR from ... to ...) o'clock
I G	Infiltration gushing at ... (OR from ... to ...) o'clock

Exfiltration

This code is used in a similar way to the equivalent code in Part A. See Page 69 for details.

Code	Description
EX	Exfiltration at ... (OR from ... to ...) o'clock

Attached deposits

These codes are used in a similar way to the equivalent codes in Part A (see Page 69 for details), except that the estimated thickness of the deposit should be recorded in millimetres.

Code	Description
DE E	Attached deposits, encrustation at .... (OR from ... to ...) o'clock ...mm
DE F	Attached deposits, fouling at .... (OR from ... to ...) o'clock ...mm
DE G	Attached deposits, grease at .... (OR from ... to ...) o'clock ...mm
DE Z †	Other attached deposits at .... (OR from ... to ...) o'clock ...mm

† Additional information to be provided in the Remarks column.

Settled deposits

These codes are used in a similar way to the equivalent codes in Part A (see Page 72 for details), except that the estimated depth of the material should be recorded in millimetres.

Code	Description
DE S	Settled deposits fine at ...(OR from ... to ...) o'clock ...mm
DE R	Settled deposits coarse at ...(OR from ... to ...) o'clock ...mm
DE C	Settled deposits hard or compacted at ... (OR from ... to ...) o'clock ...mm
DE X †	Other settled deposits at ...(OR from ... to ...) o'clock ...mm

† Additional information to be provided in the Remarks column.

Ingress of soil

Where soil enters a chamber through a defect, it is normally concentrated on the benching. The surveyor should ensure that this is from outside the chamber and not just settled deposits from the flow deposited on the benching.

This code is used in the same way as in Part A (see Page 73) although it is not necessary to record the volume of the deposit.

Code	Description
ING	Ingress of soil at ... (OR from ... to ...) o'clock

Obstruction

These codes are used in a similar way to the equivalent codes in Part A (see Page 74 for details), except that the maximum estimated dimension of the material should be recorded in millimetres.

Code	Description
OB B	Other obstacles, brick or masonry at ... (OR from ... to ...) o'clock ...mm
OB M	Other obstacles, pipe material at ... (OR from ... to ...) o'clock ...mm
OB X	Other obstacles, other object at ... (OR from ... to ...) o'clock ...mm
OB I	Other obstacles protruding through wall at ... (OR from ... to ...) o'clock ...mm
OB C	Other obstacles through connection/junction at ... o'clock ...mm
OB P	Other obstacles, external pipe or cable from ... to ... o'clock ...mm
OB S	Other obstacles built into structure from ... to ... o'clock ...mm
OB Z †	Other obstacles, other from ... to ... o'clock ...mm

† Additional information to be provided in the Remarks column.

7.3 Construction Features

These codes define features relating to the construction of the manhole.

With the exception of those that are described fully in this section, the following terms are as defined in Part A - Drains and Sewers.

Connection

Definition: There is a connection to the manhole/inspection chamber which may be one of the following types:

- A connection via a branch channel formed in the benching.
- A free-drop connection is where the flow enters the chamber above the lowest invert and falls through the air.

- A backdrop is where the flow joins above the lowest invert and is directed down a vertical pipe outside the chamber to a connection at a lower level.
- An internal drop pipe – where the flow joins above the lowest invert and is directed down a vertical pipe inside the chamber to a connection at a lower level.

The nature of discharge within the benching arrangement can be further described:

- A connection discharges to a channel in the benching.
- A connection discharges across the benching.
- A connection discharges to a ramp channel in the benching.
- A connection discharges to a pipe under the benching.
- A connection discharges to another benching arrangement. Give further information in the Remarks column.

Details of the connection diameter are recorded using the connecting pipeline code (PJ).

The pipeline reference of the connecting pipe should be recorded in the Dimension 1 column. The manhole/node reference of the next manhole/node should be recorded in the Dimension 2 column.

Code	Description
CN BD	Connection, backdrop at ... o'clock from node ...
CN C	Connection in benching at ... o'clock to/from node ...
CN C C	Connection discharges to channel in benching at ... o'clock to/from node ...
CN C A	Connection discharges across benching at ... o'clock to/from node ...
CN C R	Connection discharges to ramp channel in benching at ... o'clock to/from node ...
CN C U	Connection discharges to pipe under benching at ...o'clock to/from node ...
CN C Z †	Connection discharges to another benching arrangement at ... o'clock to/from node ...
CN FD	Connection, free drop into channel at ... o'clock from node ...
CN ID	Connection, internal drop pipe at ... o'clock from node ...
CN RP	Connection, ramp connection at ... o'clock from node ...
CN VP	Connection, ventilation pipe at ... o'clock to/from node ...
CN Z †	Connection, other at ... o'clock to/from node ...

† Additional information to be provided in the Remarks column.

Figure 7.2 Pipe under Benching

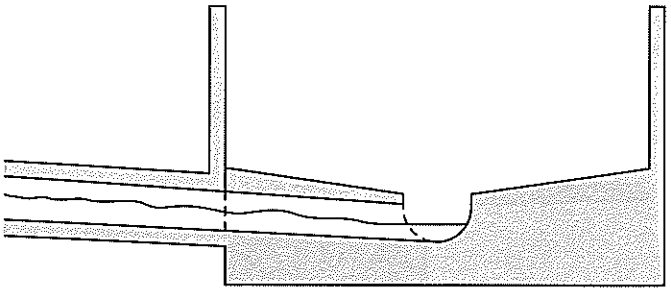


Figure 7.3 Channel in Benching

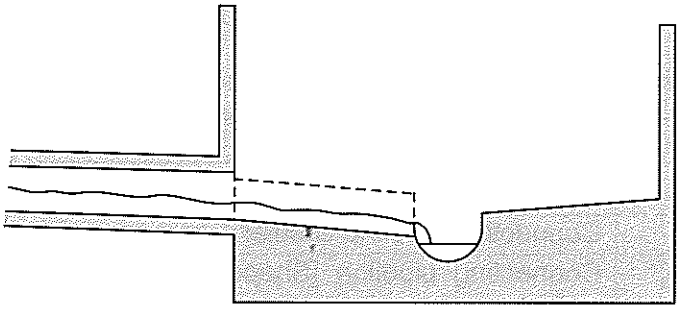


Figure 7.4 Connection Discharges across Benching

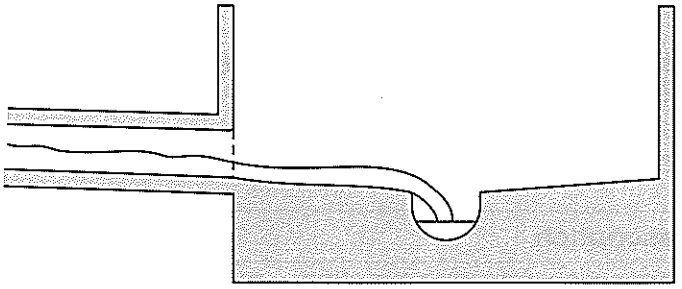
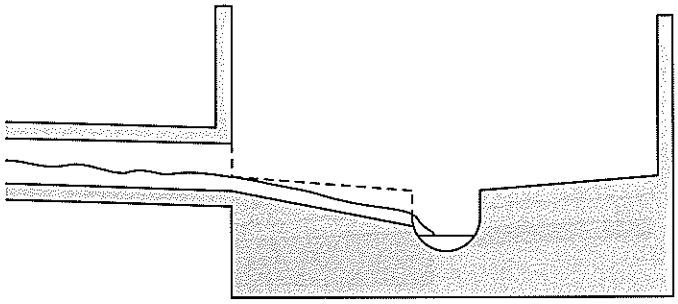


Figure 7.5 Ramp Channel



Connecting pipeline

Definition: The connecting pipeline to the manhole/inspection chamber.

The height, and width if non-circular, of the incoming pipeline should be recorded in millimetres. The position of the centre of the connection should be recorded.

Code	Description
PJ C	Connecting pipeline circular ...mm at ...o'clock
PJ + [Shape code]*	Connecting pipeline [Shape] ...mm height x ...mm wide at ... o'clock

* For a full list of Shape codes refer to Part A, Page 30.

Defective connection or junction

Unlike the equivalent code in Part A, separate entries for connection (CN) and connecting pipeline (PJ) should be included in addition to this code.

A connection is considered incorrectly positioned if it is against the direction of the flow and/or at the same level of that flow.

The length of intrusion should be entered in increments of 5 mm.

Code	Description
CX I	Connection defective intruding ...mm at ... o'clock
CX P (I)	Connection defective, position incorrect at ... o'clock (intruding ...mm)
CX D (I)	Connection defective, connecting pipe is damaged at ... o'clock (intruding ...mm)
CX B (I)	Connection defective, connecting pipe is blocked at ... o'clock (intruding ...mm)
CX Z (I) †	Defective connection, other at ... o'clock (intruding ...mm)

† Additional information to be provided in the Remarks column.

Benching

Definition: Benching in the manhole/inspection chamber.

Code	Description
BE X	Benching defective
BE	Benching not defective
BE N	No benching

The position is recorded with the vertical distance.

Channel

Definition: Channel in the manhole/inspection chamber.

The position is recorded with the vertical distance. The height and width of the channel should be recorded in millimetres.

Code	Description
CH	Channel not defective
CH X	Channel defective
CH N	No channel
CH YY	Channel not visible

Figure 7.6 Defective Channel

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		1.5		CNC				SX12345678			06	
		1.5		CHX				75	150			

Safety chains/bars

Definition: Safety chains or bars are fitted on the outgoing pipe.

The vertical distance is used to record the location.

Code	Description
SFC	Safety chain present with no defects
SFC M	Safety chain missing
SFC X	Safety chain defective
SFC D	Safety chain in position but coated with debris
SFB	Safety bar present with no defects
SFB M	Safety bar missing
SFB X	Safety bar defective
SFB D	Safety bar in position but coated with debris

Flow control

Definition: There is a weir or other flow device present to control:

- Continuation flow, i.e., the flow will normally pass through the control.
- Overflow, i.e., flow will only pass through the control when the incoming flow rate is high.

Code	Description
CO W	Weir at ...o'clock
CO SY	Syphon at ...o'clock
CO O	Orifice plate at ...o'clock
CO V	Vortex flow control at ...o'clock
CO G	Gate valve at ...o'clock
CO FG	Float operated gate valve at ...o'clock
CO MF	Measuring flume at ...o'clock
CO FV	Flap valve at ...o'clock
CO SC	Screens at ...o'clock
CO Z †	Other flow control at ...o'clock

† Additional information to be provided in the Remarks column.

Other sewer/drain through manhole

Definition: There is another sewer/drain through the manhole/inspection chamber.

Two or more connections to the manhole are joined by a sewer/drain. The connections and incoming and outgoing connecting pipeline should also be coded separately.

Code	Description
SP N	Other sewer/drain through manhole, no access to the pipe
SP N X	Defective other sewer/drain through manhole, no access to the pipe
SP C	Other sewer/drain through manhole, access cover in place
SP C X	Defective other sewer/drain through manhole, access cover in place
SP M	Other sewer/drain through manhole, access cover missing
SP M X	Defective other sewer/drain through manhole, access cover missing

Silt pit in invert

Definition: There is a silt pit in the invert of the manhole/inspection chamber.

Code	Description
CP	Silt pit in invert, pit not defective
CP X	Silt pit in invert, pit defective

Defective seal (pipe drains/sewers)

This code is used in a similar way to the equivalent code in Part A. See Page 84 for details.

Code	Description
SR	Sealing ring intruding at... (OR from ... to ...) o'clock
SR N	Sealing ring, not intruding
SO †	Other sealant intruding at... (OR from ... to ...) o'clock

† Additional information to be provided in the Remarks column.

Lining observation

This code is used in a similar way to the equivalent code in Part A. See Page 85 for details.

Code	Description
LX D	Defective lining, lining detached at ... (OR from ... to ...) o'clock
LX C	Defective lining, discolouration of the lining at .... (OR from ... to ...) o'clock
LX E	Defective lining, defective end of lining at .... (OR from ... to ...) o'clock
LX W H	Defective lining, horizontal wrinkled lining at ... o'clock
LX W V	Defective lining, vertical wrinkled lining from ... to ... o'clock
LX W M	Defective lining, multiple wrinkled lining from ... to ... o'clock
LX W S	Defective lining, spiral wrinkled lining from ... to ... o'clock

Code	Description
LX B	Defective lining, blistered or internal bulge of lining at .... (OR from ... to ...) o'clock
LX EB	Defective lining, external bulge at ... (OR from ... to ...) o'clock
LX F	Defective lining, separated film from ... to ... o'clock
LX SS	Defective lining, separated seam cover from ... to ... o'clock
LX S	Defective lining, crack or split in lining or weld failure at ... (OR from ... to ...) o'clock
LX H	Defective lining, hole in lining at ... (OR from ... to ...) o'clock
LX CX	Defective lining, lining defect at connection at ... (OR from ... to ...) o'clock
LX SF	Defective lining, lining appears soft at ... (OR from ... to ...) o'clock
LX R	Defective lining, resin missing at ... (OR from ... to ...) o'clock
LX ES	Defective lining, end not sealed at ... (OR from ... to ...) o'clock
LX Z †	Defective lining, other at ... (OR from ... to ...) o'clock

† Additional information to be provided in the Remarks column.

Defective repair

This code is used in a similar way to the equivalent code in Part A. See Page 88 for details.

Code	Description
RX M	Defective repair, part of wall missing at ... (OR from ... to ...) o'clock
RX S	Defective repair, separation from host wall at ... (OR from ... to ...) o'clock , ... % cross-sectional area loss
RX MR	Defective repair, missing repair material at ... (OR from ... to ...) o'clock
RX XM	Defective repair, excess material obstruction at ... (OR from ... to ...) o'clock, ... % cross-sectional area loss
RX H	Defective repair, hole in repair material at ... (OR from ... to ...) o'clock
RX C	Defective repair, crack in repair material at ... (OR from ... to ...) o'clock
RX Z †	Defective repair, other at ...(OR from ... to ...) o'clock

† Additional information to be provided in the Remarks column.

Weld failure

This code is used in a similar way to the equivalent code in Part A (see Page 88) except that the direction of crack is Horizontal (H), Vertical (V) or Inclined (IN) (see Page 115).

Code	Description
WX V	Weld failure, vertical at ... o'clock
WX H	Weld failure, horizontal from ... to ... o'clock
WX IN	Weld failure, inclined from ... to ... o'clock

Point repair

This code is used in a similar way to the equivalent code in Part A. See Page 89 for details.

Code	Description
RP R	Point repair, part of the wall replaced from ... to ... o'clock
RP L	Point repair, localised lining of manhole/chamber from ... to ... o'clock
RP I	Point repair, injection of sealing material at ... (OR from ... to ...) o'clock
RP H	Point repair, hole repaired at ... o'clock
RP T	Point repair, localised lining of connection at ... o'clock
RP C	Point repair, other repair to connection at ... (OR from ... to...) o'clock
RP Z †	Point repair, other at ... (OR from ... to ...) o'clock

† Additional information to be provided in the Remarks column.

Porous wall

This code is used in a similar way to the equivalent code in Part A. See Page 90 for details.

Code	Description
PP	Chamber material is porous at ... (OR from ... to ...) o'clock

Soil visible through defect

This code is used in a similar way to the equivalent code in Part A. See Page 90 for details.

Code	Description
SV	Soil visible through defect

Void visible through defect

This code is used in a similar way to the equivalent code in Part A. See Page 90 for details.

Code	Description
VV	Void visible through defect

Defective step or ladder

These codes are used to record where the steps or ladder of the manhole/inspection chamber are defective.

The number of steps affected by the defect should be recorded in the Dimension 1 column.

Code	Description
SX L	Defective step or ladder, ...steps loose
SX M	Defective step or ladder, ...steps missing
SX C	Defective step or ladder, ...steps corroded
SX B	Defective step or ladder, ...steps bent
SX P	Defective step or ladder, plastic encapsulation of step is broken on ...steps
SX H	Defective step or ladder, ladder handrail corroded
SX SL	Defective step or ladder, ladder support loose
SX SM	Defective step or ladder, ladder support missing
SX SC	Defective step or ladder, ladder support corroded
SX RC	Defective step or ladder, ladder runner corroded on ...steps
SX T	Defective step or ladder, toe holes defective
SX Z †	Defective step or ladder, other, ...steps

† Additional information to be provided in the Remarks column.

Defective cover or frame

These codes are used to record where the cover and frame of the manhole/inspection chamber are defective.

Where the cover is above or below the surface, the difference in levels should be recorded in millimetres.

Code	Description
TX CB	Defective cover or frame, cover broken
TX CR	Defective cover or frame, rocking cover
TX CM	Defective cover or frame, cover missing
TX FB	Defective cover or frame, frame broken
TX FL	Defective cover or frame, frame loose
TX FM	Defective cover or frame, frame missing
TX CD	Defective cover or frame, cover below surface level, ...mm
TX CU	Defective cover or frame, cover above surface level, ...mm
TX Z †	Defective cover or frame, other

† Additional information to be provided in the Remarks column.

Figure 7.7 Broken Frame

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To
		0.0		ST								
		0.0		TXFB								
		0.0		TXCU				10				

Figure 7.8 Cover below Surface Level

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers				
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/From	Clock To
		0.0		ST								
		0.0		TXCD				10				

Figure 7.9 Cover Worn Smooth

Video Ref.	Photo Ref.	Dist (m)	Cont defect	Letters				Numbers					Remarks
				Code	Joint	Material	Band	Dimension 1	Dimension 2	%	Clock At/ From	Clock To	
		0.0		ST									
		0.0		TXZ									Cover worn smooth

7.4 Miscellaneous Features

These codes define general items concerning the manhole/inspection chamber.

The following terms are as defined in Part A - Drains and Sewers, with the exception of those that are described fully in this section.

Survey abandoned

Code	Description
SA †	Survey abandoned

† Additional information to be provided in the Remarks column.

Cross-section

Used when the shape and/or dimension of the horizontal cross-section (plan) of the manhole/inspection chamber changes on descent/ascent.

The breadth and width of the section should be recorded in millimetres.

Code	Description
SC C	Cross-section of chamber, circular, new diameter …mm
SC R	Cross-section of chamber, rectangular, new size …mm x …mm
SC + [Shape code]	Cross-section of chamber, (new shape), new size …mm x …mm

Code	Description
SC Z †	Cross-section of chamber, other, new size ...mm x ...mm

† Additional information to be provided in the Remarks column.

Material change

Used when the material of the manhole/inspection chamber fabric changes.

Give the MC code plus the code for the new material (see Pages 30 and 31), e.g., MC CO.

Code	Description
MC + [Material code]	Material change to new material

Manhole/inspection chamber unit length change

Used when the manhole/inspection chamber ring length (i.e., distance between joints) changes. Record the new individual manhole/inspection chamber ring unit length in nominal ring sizes in millimetres in the Dimension 1 column.

Code	Description
PC	Manhole/inspection chamber ring unit length changes at this point, new length ...mm

Video volume reference

This code is used in a similar way to the equivalent code in Part A. See Page 98 for details.

Code	Description
VVR	Video volume reference new volume ... (enter in Dimension 1 column)

Photograph volume reference

This code is used in a similar way to the equivalent code in Part A. See Page 99 for details.

Code	Description
PVR	Photograph volume reference new volume ... (enter in Dimension 1 column)

Vermin

This code should only be used if vermin (rats and/or mice) are actually observed. If only evidence of vermin (e.g., damage, nest or droppings) is observed, use a REM (general remarks) code and enter details in the Remarks column.

Code	Description
V R	Vermin, rat
V R P	Vermin, rats observed in manhole/inspection chamber
V R C	Vermin, rats observed in connection
V R J	Vermin, rats observed in open joint
V R Z †	Vermin, rats observed other

† Additional information to be provided in the Remarks column.

General photograph

A photograph is taken without a defect being recorded; this may reflect the typical condition of the manhole/inspection chamber being inspected.

Record the photograph reference in the Photo Ref. column; this can be the photograph number or the image filename.

A clock reference should be given to record the direction of the camera.

Code	Description
GP	General photograph taken at this point at …o'clock

Remarks

When there is no appropriate code for an observation or extra information is to be recorded, the REM code is used. This additional information is to be recorded in a concise manner in the Remarks column.

Code	Description
REM	General remark

Water level

This is the water level at the observed point in the chamber (includes flowing and stagnant water). **Note**: The vertical location gives the level of the water.

In this case, codes should be added to give the type of water in the pipe, e.g., Clear (C) or Turbid (T).

Where the survey is part of an infiltration study or to investigate misconnections, the nature of any flow may be of interest and the client may require additional information.

Code	Description
WL	Water level
WL C	Water level – water clear
WL T	Water level – water turbid

Flow from incoming pipe

Definition: The presence of flow entering through the connecting pipe.

This code is used in a similar way to the equivalent code in Part A. See Page 101 for details.

These codes should always be recorded below the JN/CN entry to which they refer.

Code	Description
FW	Flow from incoming pipe, at ... o'clock ...% of the vertical dimension
FW C	Clear flow from incoming pipe, at ... o'clock ...% of the vertical dimension
FW C S	Wrong clear flow from incoming foul pipe, at ... o'clock ...% of the vertical dimension
FW T	Turbid flow from incoming pipe, at ... o'clock ...% of the vertical dimension
FW T F	Wrong turbid flow from incoming surface water pipe, at ... o'clock ...% of the vertical dimension

Hazardous atmosphere

This code is used in a similar way to the equivalent code in Part A. See Page 101 for details.

Code	Description
OD §	Hazardous atmosphere, oxygen deficiency [% or ppm]
HS §	Hazardous atmosphere, hydrogen sulphide [% or ppm]
ME §	Hazardous atmosphere, methane [% or ppm]
GZ † §	Hazardous atmosphere, other [% or ppm]

† Additional information to be provided in the Remarks column.
§ If ppm is recorded then it should be placed in the mm column.

Loss of vision

This code is used in a similar way to the equivalent code in Part A. See Page 102 for details.

Code	Description
CU	Loss of vision
CU W	Loss of vision, camera under water
CU D	Loss of vision, silt
CU S	Loss of vision, steam
CU Z †	Loss of vision, other

† Additional information to be provided in the Remarks column.

8. REFERENCES

1. **Sewers and Water Mains Records,** NWC/DoE Standing Technical Committee Report No 25, Department of the Environment/National Water Council (1980).

2. **Model Contract Document for Sewer Condition Inspection, 2nd Edition,** WRc plc (2005).

3. **Sewer Risk Management Website (formerly Sewerage Rehabilitation Manual)** WRc plc (2013). Available at srm.wrcplc.co.uk.

4. **BS EN 13508-2:2003+A1:2011, Investigation and Assessment of Drain and Sewer Systems Outside Buildings. Visual Inspection Coding System.**

5. **Model Contract Document for Manhole Location Surveys and the Production of Record Maps, 2nd Edition,** WRc plc (1993).

6. **Manual of Contract Documents for Highway Works: Volume 5, Section 9, Part 5: Highway Drain Condition Classification,** Highways Agency (2003).

APPENDIX A MANHOLE REFERENCING SYSTEM

The referencing system, as described in STC25 (Department of the Environment/National Water Council (1980)), is divided into three parts:

(1) Ordnance survey map number

The number of the 1:2500 base map. In the case of 1:1250 scale maps, the quadrant reference is omitted, e.g. SP 1381 SE is therefore SP 1381.

(2) 100-metre grid coordinate

The 100-metre grid in which the reference point occurs is allocated a number referring to the last digit of the easting and northing of the 100-metre grid square. For example, when the easting and the northing of the square is 135 and 811, respectively, the first two digits of the detail reference number will be 51.

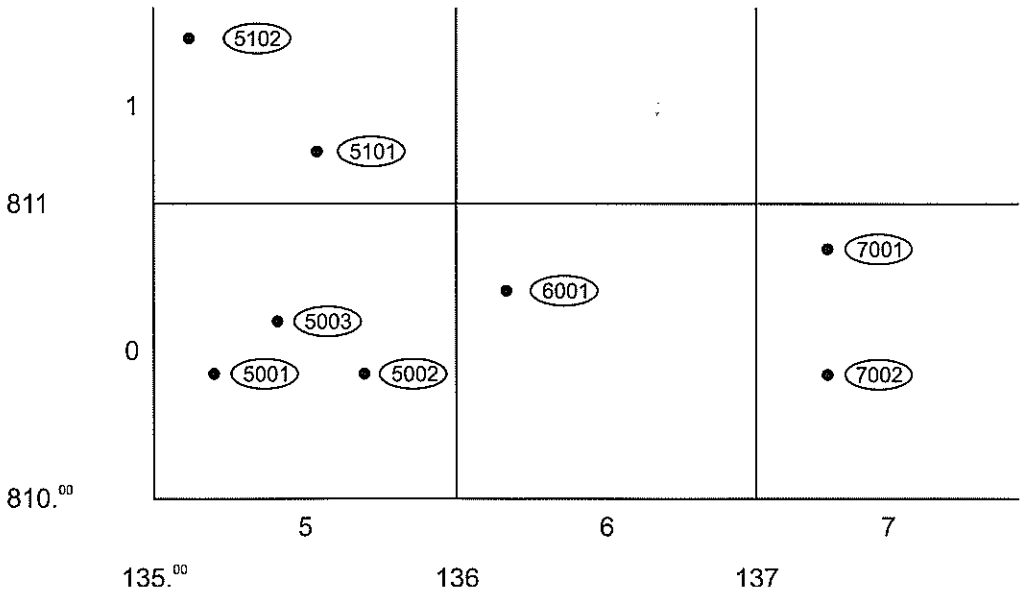
(3) Reference point number

Each manhole or node is then numbered consecutively within each 100-metre square, i.e., 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, etc.

The full reference using the above example is SP 13815101, abbreviated to 13815101.

A sewer length is distinguished from the associated upstream manhole by adding a letter suffix, usually X, Y or Z, to the upstream manhole reference, e.g., 13815101 X refers to the principal sewer length issuing from manhole 13815101. Additional outgoing pipes may then be labelled using the letters Y and Z.

Figure A.1 Manhole Referencing System



APPENDIX B ALPHABETICAL LIST OF DRAIN AND SEWER CODES

This Appendix contains a complete list of codes contained in BS EN 13508-2:2003+A1:2011(E) including those not normally used in the UK (shown in italics).

Code	Description	Page
AJ	*Angled joint ... degrees*	
B	**Broken pipe at ... (OR from ... to ...) o'clock**	**47**
BN	**Start node type, Buchan trap, reference ...**	**90**
BNF	**Finish node type, Buchan trap, reference ...**	**90**
BR	**Start node type, major connection without manhole, reference...**	**90**
BRF	**Finish node type, major connection without manhole, reference ...**	**90**
C	*Crack*	
C C	**Crack circumferential from ... to ... o'clock**	**41**
C L	**Crack longitudinal at ... o'clock**	**41**
C M	**Cracks multiple from ... to ... o'clock**	**41**
C R	**Crack radiates from ... o'clock**	**41**
C S	**Crack spiral from ... to ... o'clock**	**41**
CN	**Connection other than junction at ... o'clock, diameter ...mm (or ...mm x ...mm)**	**80**
CN C	**Connection other than junction, closed at ... o'clock, diameter ...mm (or ...mm x ...mm)**	**80**
CN O	*Connection other than junction, open at ... o'clock, diameter ...mm*	
CN PC	*Plain connection chiselled at ... o'clock, diameter ...mm*	
CN PC C	*Plain connection chiselled, closed at ... o'clock, diameter ...mm*	
CN PC O	*Plain connection chiselled, open at ... o'clock, diameter ...mm*	
CN PD	*Plain connection drilled at ... o'clock, diameter ...mm*	
CN PD C	*Plain connection drilled, closed at ... o'clock, diameter ...mm*	
CN PD O	*Plain connection drilled, open at ... o'clock, diameter ...mm*	
CN SC	*Saddle connection chiselled at ... o'clock, diameter ...mm*	
CN SC C	*Saddle connection chiselled, closed at ... o'clock, diameter ...mm*	
CN SC O	*Saddle connection chiselled, open at ... o'clock, diameter ...mm*	
CN SD	*Saddle connection drilled at ... o'clock, diameter ...mm*	
CN SD C	*Saddle connection drilled, closed at ... o'clock, diameter ...mm*	
CN SD O	*Saddle connection drilled, open at ... o'clock, diameter ...mm*	

† Additional information to be provided in the Remarks column.
* These codes are only to be used as part of the domestic drainage coding system.
§ If ppm is recorded then it should be placed in the mm column.

Code	Description	Page
CN U	*Connection type not evident at … o'clock, diameter …mm* (or …mm x …mm)	
CN U C	*Connection type not evident, closed at … o'clock, diameter …mm* (or …mm x …mm)	
CN U O	*Connection type not evident, open at … o'clock, diameter …mm* (or …mm x …mm)	
CN Z	*Connection unknown at … o'clock, diameter …mm*	
CN Z C	*Connection unknown, closed at … o'clock, diameter …mm*	
CN Z O	*Connection unknown, open at … o'clock, diameter …mm*	
CP	**Start node type, catchpit, reference …**	**90**
CPF	**Finish node type, catchpit, reference …**	**90**
CU*	**Loss of vision**	**102**
CU D	**Loss of vision, silt**	**102**
CU S	**Loss of vision, steam**	**102**
CU W	**Loss of vision, camera under water**	**102**
CU Z †	**Loss of vision, other**	**102**
CX	**Connection defective at … o'clock, diameter …mm**	**81**
CX B (I)	**Connection defective, connecting pipe is blocked at … o'clock, diameter …mm (intrusion …%)**	**81**
CX D (I)	**Connection defective, connecting pipe is damaged at … o'clock, diameter …mm (intrusion …%)**	**81**
CX G (I)	*Connection defective, gap (intrusion …%)*	
CX H (I)	*Connection defective, partial gap (intrusion …%)*	
CX I	**Connection intruding at … o'clock, diameter …mm, intrusion …%**	**81**
CX P (I)	**Connection defective, position incorrect at … o'clock, diameter …mm (intrusion …%)**	**81**
CX Z	**Defective connection, other at … o'clock, diameter …mm**	**81**
D	**Deformed drain/sewer …%**	**49**
D H	**Deformed horizontally …%**	**49**
D V	**Deformed vertically …%**	**49**
DB	**Displaced bricks at … (OR from … to …) o'clock**	**60**
DE C	**Settled deposits hard or compacted …% cross-sectional area loss**	**72**
DE E	**Attached deposits, encrustation at … (OR from … to …) o'clock …% cross-sectional area loss**	**69**

† Additional information to be provided in the Remarks column.
* These codes are only to be used as part of the domestic drainage coding system.
§ If ppm is recorded then it should be placed in the mm column.

Code	Description	Page
DE F	**Attached deposits, fouling at ... (OR from ... to ...) o'clock ...% cross-sectional area loss**	**69**
DE G	**Attached deposits, grease at ... (OR from ... to ...) o'clock ...% cross-sectional area loss**	**69**
DE R	**Settled deposits coarse ...% cross-sectional area loss**	**72**
DE S	**Settled deposits fine ...% cross-sectional area loss**	**72**
DE X †	**Other settled deposits ...% cross-sectional area loss**	**72**
DE Z †	**Other attached deposits at ... (OR from ... to ...) o'clock ...% cross-sectional area loss**	**69**
DI	**Dropped invert, gap ...mm**	**63**
EX	**Exfiltration at ... (OR from ... to ...) o'clock**	**69**
F	*Fracture*	
F C	**Fracture circumferential from ... to ... o'clock**	**45**
F L	**Fracture longitudinal at ... o'clock**	**45**
F M	**Fractures multiple from ... to ... o'clock**	**45**
F R	**Fracture radiates from ... o'clock**	**45**
F S	**Fracture spiral from ... to ... o'clock**	**45**
FW	**Flow from incoming pipe at ... o'clock ...% of the vertical dimension**	**101**
FW C	**Clear flow from incoming pipe, at ... o'clock ...% of the vertical dimension**	**101**
FW C N	*Flow from incoming foul pipe, clear, not observed wrong at ...o'clock*	
FW C S	**Wrong clear flow from incoming foul pipe at ... o'clock ...% of the vertical dimension**	**101**
FW T	**Turbid flow from incoming pipe at ... o'clock ...% of the vertical dimension**	**101**
FW T F	**Wrong turbid flow from incoming surface water pipe at ... o'clock ...% of the vertical dimension**	**101**
FW T N	*Flow from incoming surface water pipe, turbid, not observed wrong at ...o'clock ...% of the vertical dimension*	
FW CD	*Coloured flow from incoming pipe at ...o'clock ...% of the vertical dimension*	
FW TC	*Turbid and coloured flow from incoming pipe at ...o'clock ...% of the vertical dimension*	
FW Y Y	*Flow in incoming pipe at ...o'clock not visible*	
GP	**General photograph taken at this point**	**100**
GY	**Start node type, gully, reference ...**	**90**
GYF	**Finish node type, gully, reference ...**	**90**

† Additional information to be provided in the Remarks column.
* These codes are only to be used as part of the domestic drainage coding system.
§ If ppm is recorded then it should be placed in the mm column.

Code	Description	Page
GZ † §	Hazardous atmosphere, other [% or ppm]	101
H	Hole in drain/sewer at ... (OR from ... to ...) o'clock	48
HF	*Surface crack at ... o'clock*	
HF C	*Surface crack, circumferential from ... to ... o'clock*	
HF L	*Surface crack, longitudinal at ... o'clock*	
HF M	*Surface cracks, multiple from ... to ... o'clock*	
HF R	*Surface cracks, radiating at ... o'clock*	
HF S	*Surface crack, spiral from ... to ... o'clock*	
HS §	Hazardous atmosphere, hydrogen sulphide [% or ppm]	101
I*	Infiltration	67
I D	Infiltration dripping at ... (OR from ... to ...) o'clock	67
I G	Infiltration gushing at ... (OR from ... to ...) o'clock	67
I R	Infiltration running at ... (OR from ... to ...) o'clock	67
I S	Infiltration seeping at ... (OR from ... to ...) o'clock	67
IC	Start node type, inspection chamber, reference ...	90
ICF	Finish node type, inspection chamber, reference ...	90
ING	Ingress of soil	73
ING F	Ingress of fine material at ... (OR from ... to ...) o'clock ...% cross-sectional area loss	73
ING G	Ingress of gravel at ... (OR from ... to ...) o'clock ...% cross-sectional area loss	73
ING P	Ingress of peat at ... (OR from ... to ...) o'clock ...% cross-sectional area loss	73
ING S	Ingress of sand at ... (OR from ... to ...) o'clock ...% cross-sectional area loss	73
ING Z †	Ingress of soil, other at ... (OR from ... to ...) o'clock ...% cross-sectional area loss	73
JD*	Joint displaced	52
JD	Joint displaced ...mm	52
JD (L)	Joint displaced large	52
JD (M)	Joint displaced medium	52
JN	Junction at ... o'clock, diameter ...mm (or ...mm x ...mm)	80
JN C	Junction, closed at ... o'clock, diameter ...mm (or ...mm x ...mm)	80
JN O	*Junction, open at ... o'clock, diameter ...mm (or ...mm x ...mm)*	
JX	Junction defective at ... o'clock, diameter ...mm (or ...mm x ...mm)	81

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Code	Description	Page
JX B	**Junction defective, connecting pipe is blocked at ... o'clock, diameter ...mm (or ...mm x ...mm)**	**81**
JX D	**Junction defective, connecting pipe is damaged at ... o'clock, diameter ...mm (or ...mm x ...mm)**	**81**
JX G	*Junction defective, gap at ... o'clock, diameter ...mm (or ...mm x ...mm)*	
JX H	*Junction defective, partial gap at ... o'clock, diameter ...mm (or ...mm x ...mm)*	
JX P	**Junction defective, position incorrect at ... o'clock, diameter ...mm**	**81**
JX Z	**Defective junction, other at ... o'clock, diameter ...mm (or ...mm x ...mm)**	**81**
LC*	**Lining of drain/sewer changes**	**97**
LC + [Material code]	**Lining of drain/sewer changes to ... [material] at this point**	**97**
L D (Q/H/F *)	**Line of drain/sewer deviates down ...[quarter/half/full *]**	**79**
L L (Q/H/F *)	**Line of drain/sewer deviates left ...[quarter/half/full *]**	**79**
*L L D (Q/H/F *)*	*Line of drain/sewer deviates left and down ...[quarter/half/full *]*	
*L L U (Q/H/F *)*	*Line of drain/sewer deviates left and up ...[quarter/half/full *]*	
L R (Q/H/F *)	**Line of drain/sewer deviates right ...[quarter/half/full *]**	**79**
*L R D (Q/H/F *)*	*Line of drain/sewer deviates right and down ...[quarter/half/full *]*	
*L R U (Q/H/F *)*	*Line of drain/sewer deviates right and up ...[quarter/half/full *]*	
L U (Q/H/F *)	**Line of drain/sewer deviates up ...[quarter/half/full *]**	**79**
LH	**Start node type, lamphole, reference ...**	**90**
LHF	**Finish node type, lamphole, reference ...**	**90**
LX*	**Lining defect**	**85**
LX B	**Defective lining, blistered lining or internal bulge at ... (OR from ... to ...) o'clock**	**85**
LX C	**Defective lining, discolouration of the lining at ... (OR from ... to ...) o'clock**	**85**
LX CX	**Defective lining, lining defect at connection at ... (OR from ... to ...) o'clock**	**85**

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Code	Description	Page
LX D	Defective lining, lining detached at ... (OR from ... to ...) o'clock	85
LX E	Defective lining, defective end of lining at ... (OR from ... to ...) o'clock	85
LX EB	Defective lining, external bulge at ... (OR from ... to ...) o'clock	85
LX ES	Defective lining, end not sealed at ... (OR from ... to ...) o'clock	85
LX F	Defective lining, separated film from ... to ... o'clock	85
LX H	Defective lining, hole in lining at ... (OR from ... to ...) o'clock	85
LX R	Defective lining, resin missing at ... (OR from ... to ...) o'clock	85
LX S	Defective lining, crack or split in lining or weld failure at ... (OR from ... to ...) o'clock	85
LX S C	Defective lining, circumferential crack or split in lining or weld failure from ... to ... o'clock	85
LX S H	Defective lining, spiral crack or split in lining or weld failure from ... to ... o'clock	85
LX S L	Defective lining, longitudinal crack or split in lining or weld failure at ... o'clock	85
LX S M	Defective lining, complex crack or split in lining or weld failure from ... to ... o'clock	85
LX SF	Defective lining, lining appears soft at ... (OR from ... to ...) o'clock	85
LX SS	Defective lining, separated seam cover from ... to ... o'clock	85
LX W	*Defective lining, wrinkled*	
LX W C	Defective lining, circumferential wrinkled lining from ... to ... o'clock	85
LX W H	Defective lining, spiral wrinkled lining from ... to ... o'clock	85
LX W L	Defective lining, longitudinal wrinkled lining at ...o'clock	85
LX W M	Defective lining, complex (multiple) wrinkled lining from ... to ... o'clock	85
LX Z †	Defective lining, other lining defect at ... (OR from ... to ...) o'clock	85
MB	Missing bricks at ... (OR from ... to ...) o'clock	62
MB NV	*Missing bricks, nothing visible at ... (OR from ... to ...) o'clock*	
MB V	*Missing bricks, further layer of brickwork visible at ... (OR from ... to ...) o'clock*	
MC*	Material of drain/sewer changes	97
MC + [Material code]	Material of drain/sewer changes to ... [material] at this point from ... to ... o'clock	97
ME §	Hazardous atmosphere, methane [% or ppm]	101
MH	Start node type, manhole, reference ...	90
MHF	Finish node type, manhole, reference ...	90

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Code	Description	Page
MM	Mortar missing between ...mm and ...mm at ... (OR from ... to ...) o'clock	60
MM S	Mortar missing slight (between 5 mm and 15 mm) at ... (OR from ... to ...) o'clock	60
MM M	Mortar missing medium (between 15 mm and 50 mm) at ... (OR from ... to ...) o'clock	60
MM T	Mortar missing total (between 50 mm and 100 mm) at ... (OR from ... to ...) o'clock	60
OB*	Obstruction ...% cross-sectional area loss	74
OB B	Other obstacles, brick or masonry in invert at ... (OR from ... to ...) o'clock ...% cross-sectional area loss	74
OB C	Other obstacles through connection/junction at ...o'clock ...% cross-sectional area loss	74
OB I	Other obstacles protruding through wall at ... (OR from ... to ...) o'clock ...% cross-sectional area loss	74
OB J	*Other obstacles wedged in joint*	
OB M	Other obstacles, pipe material in invert at ... (OR from ... to ...) o'clock ...% cross-sectional area loss	74
OB P	Other obstacles, external pipe or cable at ...(OR from ... to ...) o'clock ...% cross-sectional area loss	74
OB S	Other obstacles built into structure from ... to ... o'clock ...% cross-sectional area loss	74
OB X	Other obstacles, other object in invert at ... (OR from ... to ...) o'clock ...% cross-sectional area loss	74
OB Z †	Other obstacles, other at (OR from ... to ...) o'clock ...% cross-sectional area loss	74
OC	Start node type, other special chamber, reference ...	90
OCF	Finish node type, other special chamber, reference ...	90
OD §	Hazardous atmosphere, oxygen deficiency [% or ppm]	101
OF	Start node type, outfall, reference ...	90
OFF	Finish node type, outfall, reference ...	90
OJ*	Open joint	53
OJ	Open joint ...mm	53
OJ (L)	Open joint large	53
OJ (M)	Open joint medium	53
OS	Start node type, oil separator, reference ...	90
OSF	Finish node type, oil separator, reference ...	90

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Code	Description	Page
PC	**Length of individual pipe forming drain/sewer changes at this point, new length ...mm**	**98**
PRC D	*No rain or snow*	
PRC R	*Rain*	
PRC S	*Melting snow/ice*	
PP	**Pipe material is porous at ... (OR from ... to ...) o'clock**	**90**
PVR	**Photograph volume reference new volume ...**	**99**
R*	**Roots**	**64**
R F	**Roots fine**	**64**
R M	**Roots mass ...% cross-sectional area loss**	**64**
R T	**Roots tap**	**64**
RE	**Start node type, rodding eye, reference ...**	**92**
REF	**Finish node type, rodding eye, reference ...**	**92**
REM	**General remark**	**102**
RG	**Start node type, running trap, reference...**	**90**
RGF	**Finish node type, running trap, reference...**	**90**
RP	*Point repair*	
RP C †	**Point repair, other repair to connection at ... (OR from ... to ...) o'clock**	**89**
RP H	**Point repair, hole repaired at ... (OR from ... to ...) o'clock**	**89**
RP I	**Point repair, injected mortar at ... (OR from ... to ...) o'clock**	**89**
RP L	**Point repair, localised lining from ...to ...o'clock**	**89**
RP R	**Point repair, pipe replaced from ...to ...o'clock**	**89**
RP S	**Point repair, other injected sealing material at ... (OR from ... to ...) o'clock**	**89**
RP T	**Point repair, localised lining of connection at .... o'clock**	**89**
RP Z †	**Point repair, other method at ... (OR from ... to ...) o'clock**	**89**
RX	*Defective repair*	
RX C	**Defective repair, crack in material at ... (OR from ... to ...) o'clock**	**88**
RX CC	*Defective repair, circumferential crack in material at ... (OR from ... to ...) o'clock*	
RX CL	*Defective repair, longitudinal crack in material at ... (OR from ... to ...) o'clock*	
RX CM	*Defective repair, complex crack in material at ... (OR from ... to ...) o'clock*	
RX CS	*Defective repair, spiral crack in material at ... (OR from ... to ...) o'clock*	

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Code	Description	Page
RX H	**Defective repair, hole in material at ... (OR from ... to ...) o'clock**	**88**
RX M	**Defective repair, part of wall missing at ... (OR from ... to ...) o'clock**	**88**
RX MR	**Defective repair, missing repair material at ... (OR from ... to ...) o'clock**	**88**
RX P	*Defective repair, defective patch sealing hole at ... (OR from ... to ...) o'clock*	
RX S	**Defective repair, separation from host pipe at ... (OR from ... to ...) o'clock, ...% cross-sectional area loss**	**88**
RX XM	**Defective repair, excess material obstruction at ... (OR from ... to ...) o'clock, ...% cross-sectional area loss**	**88**
RX Z †	**Defective repair, other at ... (OR from ... to ...) o'clock**	**88**
S*	**Surface damage**	**54**
S AM	*Missing aggregate at ... (OR from ... to ...) o'clock*	
S AM C	*Missing aggregate, chemical attack at ... (OR from ... to ...) o'clock*	
S AM CA	*Missing aggregate, chemical attack in upper part of pipe at ... (OR from ... to ...) o'clock*	
S AM CB	*Missing aggregate, chemical attack in lower part of pipe at ... (OR from ... to ...) o'clock*	
S AM M	*Missing aggregate, mechanical at ... (OR from ... to ...) o'clock*	
S AM O †	*Missing aggregate, other cause at ... (OR from ... to ...) o'clock*	
S AM Z	*Missing aggregate, cause not evident at ... (OR from ... to ...) o'clock*	
S AP	**Aggregate projecting from surface at ... (OR from ... to ...) o'clock**	**54**
S AP C	*Aggregate projecting, chemical attack at ... (OR from ... to ...) o'clock*	
S AP CA	*Aggregate projecting, chemical attack in upper part of pipe at ... (OR from ... to ...) o'clock*	
S AP CB	*Aggregate projecting, chemical attack in lower part of pipe at ... (OR from ... to ...) o'clock*	
S AP M	*Aggregate projecting, mechanical at ... (OR from ... to ...) o'clock*	
S AP O †	*Aggregate projecting, other cause at ... (OR from ... to ...) o'clock*	
S AP Z	*Aggregate projecting, cause not evident at ... (OR from ... to ...) o'clock*	
S AV	**Aggregate visible at ... (OR from ... to ...) o'clock**	**54**
S AV C	*Aggregate visible, chemical attack at ... (OR from ... to ...) o'clock*	
S AV CA	*Aggregate visible, chemical attack in upper part of pipe at ... (OR from ... to ...) o'clock*	
S AV CB	*Aggregate visible, chemical attack in lower part of pipe at ... (OR from ... to ...) o'clock*	
S AV M	*Aggregate visible, mechanical at ... (OR from ... to ...) o'clock*	

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Code	Description	Page
S AV O †	*Aggregate visible, other cause at ... (OR from ... to ...) o'clock*	
S AV Z	*Aggregate visible, cause not evident at ... (OR from ... to ...) o'clock*	
S B	**Internal blister/bulge at ... (OR from ... to ...) o'clock**	**54**
S B C	*Internal blister or bulge, chemical attack at ... (OR from ... to ...) o'clock*	
S B CA	*Internal blister or bulge, chemical attack in upper part of pipe at ... (OR from ... to ...) o'clock*	
S B CB	*Internal blister or bulge, chemical attack in lower part of pipe at ... (OR from ... to ...) o'clock*	
S B M	*Internal blister or bulge, mechanical at ... (OR from ... to ...) o'clock*	
S B O †	*Internal blister or bulge, other cause at ... (OR from ... to ...) o'clock*	
S B Z	*Internal blister or bulge, cause not evident at ... (OR from ... to ...) o'clock*	
S CP	**Corrosion products at ... (OR from ... to ...) o'clock**	**54**
S CP C	*Corrosion products, chemical attack at ... (OR from ... to ...) o'clock*	
S CP CA	*Corrosion products, chemical attack in upper part of pipe at ... (OR from ... to ...) o'clock*	
S CP CB	*Corrosion products, chemical attack in lower part of pipe at ... (OR from ... to ...) o'clock*	
S CP M	*Corrosion products, mechanical at ... (OR from ... to ...) o'clock*	
S CP O †	*Corrosion products, other cause at ... (OR from ... to ...) o'clock*	
S CP Z	*Corrosion products, cause not evident at ... (OR from ... to ...) o'clock*	
S H	*Missing wall at ... (OR from ... to ...) o'clock*	
S H C	*Missing wall, chemical attack at ... (OR from ... to ...) o'clock*	
S H CA	*Missing wall, chemical attack in upper part of pipe at ... (OR from ... to ...) o'clock*	
S H CB	*Missing wall, chemical attack in lower part of pipe at ... (OR from ... to...) o'clock*	
S H M	*Missing wall, mechanical at ... (OR from ... to ...) o'clock*	
S H O †	*Missing wall, other cause at ... (OR from ... to ...) o'clock*	
S H Z	*Missing wall, cause not evident at ... (OR from ... to ...) o'clock*	
S RC	**Reinforcement corroded at ... (OR from ... to ...) o'clock**	**54**
S RC C	*Reinforcement corroded, chemical attack at ... (OR from ... to ...) o'clock*	
S RC CA	*Reinforcement corroded, chemical attack in upper part of pipe at ... (OR from ... to ...) o'clock*	
S RC CB	*Reinforcement corroded, chemical attack in lower part of pipe at ... (OR from ... to ...) o'clock*	

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Code	Description	Page
S RC M	*Reinforcement corroded, mechanical at ... (OR from ... to ...) o'clock*	
S RC O †	*Reinforcement corroded, other cause at ... (OR from ... to ...) o'clock*	
S RC Z	*Reinforcement corroded, cause not evident at ...(OR from ... to...) o'clock*	
S RP	**Reinforcement projecting from surface at ... (OR from ... to ...) o'clock**	**54**
S RP C	*Reinforcement projecting, chemical attack at ... (OR from ... to ...) o'clock*	
S RP CA	*Reinforcement projecting, chemical attack in upper part of pipe at ... (OR from ... to ...) o'clock*	
S RP CB	*Reinforcement projecting, chemical attack in lower part of pipe at ... (OR from ... to ...) o'clock*	
S RP M	*Reinforcement projecting, mechanical at ... (OR from ... to ...) o'clock*	
S RP O †	*Reinforcement projecting, other cause at ... (OR from ... to ...) o'clock*	
S RP Z	*Reinforcement projecting, cause not evident at ... (OR from ... to ...) o'clock*	
S RV	**Reinforcement visible at ... (OR from ... to ...) o'clock**	**54**
S RV C	*Reinforcement visible, chemical attack at ... (OR from ... to ...) o'clock*	
S RV CA	*Reinforcement visible, chemical attack in upper part of pipe at ... (OR from ... to ...) o'clock*	
S RV CB	*Reinforcement visible, chemical attack in lower part of pipe at ... (OR from ... to ...) o'clock*	
S RV M	*Reinforcement visible, mechanical at ... (OR from ... to ...) o'clock*	
S RV O †	*Reinforcement visible, other cause at ... (OR from ... to ...) o'clock*	
S RV Z	*Reinforcement visible, cause not evident at ... (OR from ... to ...) o'clock*	
S S	**Spalling at ... (OR from ... to ...) o'clock**	**54**
S S C	*Spalling, chemical attack at ... (OR from ... to ...) o'clock*	
S S CA	*Spalling, chemical attack in upper part of pipe at ... (OR from ... to ...) o'clock*	
S S CB	*Spalling, chemical attack in lower part of pipe at ... (OR from ... to ...) o'clock*	
S S M	*Spalling, mechanical at ... (OR from ... to ...) o'clock*	
S S O †	*Spalling, other cause at ... (OR from ... to ...) o'clock*	
S S Z	*Spalling, cause not evident at ... (OR from ... to ...) o'clock*	
S W	**Increased roughness at ... (OR from ... to ...) o'clock**	**54**
S W C	*Increased roughness, chemical attack at ... (OR from ... to ...) o'clock*	

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Code	Description	Page
S W CA	*Increased roughness, chemical attack in upper part of pipe at … (OR from … to …) o'clock*	
S W CB	*Increased roughness, chemical attack in lower part of pipe at … (OR from … to …) o'clock*	
S W M	*Increased roughness, mechanical at … (OR from … to …) o'clock*	
S W O †	*Increased roughness, other cause at … (OR from … to …) o'clock*	
S W Z	*Increased roughness, cause not evident at … (OR from … to …) o'clock*	
S Z †	**Other damage at … (OR from … to …) o'clock**	**54**
S Z C	*Other damage, chemical attack at … (OR from … to …) o'clock*	
S Z CA	*Other damage, chemical attack in upper part of pipe at … (OR from … to …) o'clock*	
S Z CB	*Other damage, chemical attack in lower part of pipe at … (OR from … to …) o'clock*	
S Z M	*Other damage, mechanical at … (OR from … to …) o'clock*	
S Z O †	*Other damage, other cause at … (OR from … to …) o'clock*	
S Z Z	*Other damage, cause not evident at … (OR from … to …) o'clock*	
SA †	**Survey abandoned**	**94**
SA EQ	*Survey abandoned due to equipment failure*	
SA OB	*Survey abandoned due to obstruction*	
SA WL	*Survey abandoned due to high water level*	
SA Z †	*Survey abandoned due to other reasons*	
SC *	**Dimensions of drain/sewer changes to …mm (OR …mm x …mm)**	**95**
SC + [Shape code]	**Shape and/or size of drain/sewer changes to [Shape] …mm (OR …mm x …mm)**	**95**
SK	**Start node type, soakaway, reference…**	**90**
SKF	**Finish node type, soakaway, reference…**	**90**
SO †	**Other sealant intruding at … (OR from … to …) o'clock, …% cross-sectional area loss**	**84**
SR	**Sealing ring intruding at … (OR from … to …) o'clock**	**84**
SR B	**Sealing ring, intruding and broken at (OR from … to …) o'clock**	**84**
SR HA	*Sealing ring, lowest point above centreline from … to … o'clock*	
SR HB	*Sealing ring, lowest point below centreline from … to … o'clock*	
SR N	*Sealing ring, visible but not intruding*	
SV	**Soil visible through defect**	**90**
V*	**Vermin**	**99**

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Code	Description	Page
V C	*Vermin, cockroach*	
V C C	*Vermin, cockroach in connection*	
V C J	*Vermin, cockroach in open joint*	
V C P	*Vermin, cockroach in pipeline*	
V C Z †	*Vermin, cockroach other*	
V R	**Vermin, rat**	**99**
V R C	**Vermin, rats observed in connection**	**99**
V R J	**Vermin, rats observed in open joint**	**99**
V R P	*Vermin, rats observed in pipeline*	
V R Z †	**Vermin, rats observed other**	**99**
V Z †	*Other vermin, ...animals observed at a single location*	
V Z C †	*Vermin, other in connection*	
V Z J †	*Vermin, other in open joint*	
V Z P †	*Vermin, other in pipeline*	
V Z Z †	*Other vermin, other*	
VV	**Void visible through defect**	**90**
VVR	**Video volume reference new volume ...**	**98**
WL	**Water level ...% height/diameter**	**78**
WL C	**Clear water level ...% height/diameter**	**78**
WL CD	*Coloured water level ...% height/diameter*	
WL T	**Turbid water level ...% height/diameter**	**78**
WL TC	*Turbid and coloured water level ...% height/diameter*	
WR	**Start node type, Winser trap, reference...**	**90**
WRF	**Finish node type, Winser trap, reference...**	**90**
WX	*Weld failure*	
WX C	**Weld failure circumferential from ...to ...o'clock**	**88**
WX L	**Weld failure longitudinal at ...o'clock**	**88**
WX S	**Weld failure spiral from ...to ...o'clock**	**88**
XB	**Collapsed brickwork or masonry ...%**	**50**
XP	**Collapsed drain/sewer ...%**	**50**

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APPENDIX C ALPHABETICAL LIST OF MANHOLE AND INSPECTION CHAMBER CODES

This Appendix contains a complete list of codes contained in BS EN 13508-2:2003+A1:2011(E) including those not normally used in the UK (shown in italics).

Code	Description	Page
AJ	*Angled joint ...mm*	
B	**Broken manhole/inspection chamber at ... (OR from ... to ...) o'clock**	**116**
BE	**Benching not defective**	**125**
BE N	**No benching**	**125**
BE X	**Benching defective**	**125**
C	*Crack*	
C H	**Crack horizontal from ... to ... o'clock**	**115**
C IN	**Crack inclined from ... to ... o'clock**	**115**
C M	**Cracks multiple from ... to ... o'clock**	**115**
C R	**Crack radiates from ... o'clock**	**115**
C V	**Crack vertical at ... o'clock**	**115**
CH	**Channel not defective**	**125**
CH H	*Channel - not defective, channel has high point*	
CH L	*Channel - not defective, channel has low point*	
CH N	**No channel**	**125**
CH R	*Channel - not defective, channel narrows*	
CH W	*Channel - not defective, channel widens*	
CH X	**Channel defective**	**125**
CH X H	*Channel - defective, channel has high point*	
CH X L	*Channel - defective, channel has low point*	
CH X R	*Channel - defective, channel narrows*	
CH X W	*Channel - defective, channel widens*	
CH YY	**Channel not visible**	**125**
CN BD	**Connection, backdrop at ...o'clock ... from node...**	**121**
CN C	**Connection in benching at ...o'clock to/from node...**	**121**
CN C A	**Connection discharges across benching at ...o'clock to/from node...**	**121**

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Code	Description	Page
CN C C	**Connection discharges to channel in benching at ...o'clock to/from node...**	**121**
CN C R	**Connection discharges to ramp channel in benching at ...o'clock to/from node...**	**121**
CN C U	**Connection discharges to pipe under benching at ...o'clock to/from node...**	**121**
CN C Z †	**Connection discharges to another benching arrangement at ...o'clock to/from node...**	**121**
CN FD	**Connection, free drop into channel at ...o'clock from node...**	**121**
CN ID	**Connection, internal drop pipe at ...o'clock from node...**	**121**
CN RP	**Connection, ramp connection at ...o'clock from node...**	**121**
CN VP	**Connection, ventilation pipe at ...o'clock to/from node...**	**121**
CN Z †	**Connection, other at ...o'clock to/from node...**	**121**
CO FG	**Float operated gate valve at ...o'clock**	**126**
CO FG C	*Float operated gate valve on continuation flow at...o'clock*	
CO FG O	*Float operated gate valve on overflow at ...o'clock*	
CO FV	**Flap valve at ...o'clock**	**126**
CO FV C	*Flap valve on continuation flow at ...o'clock*	
CO FV O	*Flap valve on overflow at ...o'clock*	
CO G	**Gate valve at ...o'clock**	**126**
CO G C	*Gate valve on continuation flow at ...o'clock*	
CO G O	*Gate valve on overflow at ...o'clock*	
CO MF	**Measuring flume at ...o'clock**	**126**
CO MF C	*Measuring flume on continuation flow at ...o'clock*	
CO MF O	*Measuring flume on overflow at ...o'clock*	
CO O	**Orifice plate at ...o'clock**	**126**
CO O C	*Orifice plate on continuation flow at ...o'clock*	
CO O O	*Orifice plate on overflow at ...o'clock*	
CO SC	**Screens at ...o'clock**	**126**
CO SC C	*Screens on continuation flow at ...o'clock*	
CO SC O	*Screens on overflow at ...o'clock*	
CO SY	**Syphon at ...o'clock**	**126**
CO SY C	*Syphon on continuation flow at ...o'clock*	
CO SY O	*Syphon on overflow at ...o'clock*	

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Code	Description	Page
CO V	**Vortex flow control at ...o'clock**	**126**
CO V C	*Vortex flow control on continuation flow at ...o'clock*	
CO V O	*Vortex flow control on overflow at ...o'clock*	
CO W	**Weir at ...o'clock**	**126**
CO W C	*Weir on continuation flow at ...o'clock*	
CO W O	*Weir on overflow at ...o'clock*	
CO Z †	**Other flow control at ...o'clock**	**126**
CO Z C †	*Other flow control on continuation flow at ...o'clock*	
CO Z O †	*Other flow control on overflow at ...o'clock*	
CP	**Silt pit in invert, pit not defective**	**127**
CP X	**Silt pit in invert, pit defective**	**127**
CP YY	*Silt pit in invert not visible*	
CU	**Loss of vision**	**135**
CU D	**Loss of vision, silt**	**135**
CU S	**Loss of vision, steam** §	**135**
CU W	**Loss of vision, camera under water**	**135**
CU Z †	**Loss of vision, other**	**135**
CX	*Connection defective at ...o'clock*	
CX B (I)	**Connection defective, connecting pipe is blocked at ...o'clock (intruding ...mm)**	**124**
CX D (I)	**Connection defective, connecting pipe is damaged at ...o'clock (intruding ...mm)**	**124**
CX G (I)	*Connection defective, gap at ...o'clock (intruding ...mm)*	
CX H (I)	*Connection defective, partial gap at ...o'clock (intruding ...mm)*	
CX I	**Connection defective intruding ...mm at ...o'clock**	**124**
CX P (I)	**Connection defective, position incorrect at ...o'clock [intruding ...mm]**	**124**
CX Z (I) †	**Defective connection, other at ... o'clock (intruding ...mm)**	**124**
D	**Deformed (manhole) ...% change in dimension**	**117**
D L	*Deformed (manhole) Generally deformed (large area) ...%*	
D S	*Deformed (manhole) Locally deformed (small area) at ... (OR from ... to ...) o'clock*	
DB	**Displaced bricks at ... (OR from ... to ...) o'clock**	**118**
DE C	**Settled deposits hard or compacted at ... (OR from ... to ...) o'clock ...mm**	**120**

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Code	Description	Page
DE E	**Attached deposits, encrustation at ... (OR from ... to ...) o'clock ...mm**	**120**
DE F	**Attached deposits, fouling at ... (OR from ... to ...) o'clock ...mm**	**120**
DE G	**Attached deposits, grease at ... (OR from ... to ...) o'clock ...mm**	**120**
DE R	**Settled deposits coarse at ... (OR from ... to ...) o'clock ...mm**	**120**
DE S	**Settled deposits fine at ... (OR from ... to ...) o'clock ...mm**	**120**
DE X †	**Other settled deposits at ... (OR from ... to ...) o'clock ...mm**	**120**
DE Z †	**Other attached deposits at ... (OR from ... to ...) o'clock ...mm**	**120**
EX	**Exfiltration at ... (OR from ... to ...) o'clock**	**120**
F	*Fracture*	
F H	**Fracture horizontal from ... to ... o'clock**	**116**
F IN	**Fracture inclined from ... to ... o'clock**	**116**
F M	**Fractures multiple from ... to ... o'clock**	**116**
F R	**Fracture radiates from ... o'clock**	**116**
F V	**Fracture vertical at ... o'clock**	**116**
FW	**Flow from incoming pipe at ... o'clock ...% of the vertical dimension**	**135**
FW C	**Clear flow from incoming pipe, at ... o'clock ...% of the vertical dimension**	**135**
FW C N	*Flow from incoming pipe, clear, not observed wrong at ... o'clock*	
FW C S	**Wrong clear flow from incoming foul pipe, at ... o'clock ...% of the vertical dimension**	**135**
FW CD	*Coloured flow from incoming surface water pipe, turbid, at ... o'clock ...% of the vertical dimension*	
FW T	**Turbid flow from incoming pipe, at ... o'clock ...% of the vertical dimension**	**135**
FW T F	**Wrong turbid flow from incoming surface water pipe, at ... o'clock ...% of the vertical dimension**	**135**
FW T N	*Flow from incoming surface water pipe, turbid, not observed wrong, at ... o'clock ...% of the vertical dimension*	
FW TC	*Turbid and coloured flow from incoming surface water pipe, turbid, at ... o'clock ...% of the vertical dimension*	
FW YY	*Flow from incoming pipe at ... o'clock not visible*	
GP	**General photograph taken at this point at ... o'clock**	**134**
GT	*Grit trap under cover*	
GT M	*Grit trap under cover, trap missing*	
GT P	*Grit trap under cover, trap present with no defects*	

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Code	Description	Page
GT X	*Grit trap under cover, trap defective*	
GZ † §	**Hazardous atmosphere, other [% or ppm]**	**135**
H	**Hole in manhole/inspection chamber at ... (OR from ... to ...) o'clock**	**116**
HF	*Surface crack*	
HF H	*Surface crack horizontal from ... to ... o'clock*	
HF IN	*Surface crack inclined from ... to ... o'clock*	
HF M	*Surface cracks multiple from ... to ... o'clock*	
HF R	*Surface cracks radiating at ... o'clock*	
HF V	*Surface crack vertical at ... o'clock*	
HS §	**Hazardous atmosphere, hydrogen sulphide [% or ppm]**	**135**
I D	**Infiltration dripping at ... (OR from ... to ...) o'clock**	**120**
I D PI	*Infiltration dripping, space between connecting pipe and manhole at invert, at ... (OR from ... to ...) o'clock*	
I D PB	*Infiltration dripping, space between connecting pipe and manhole above benching, at ... (OR from ... to ...) o'clock*	
I D W	*Infiltration dripping, through wall of manhole/inspection chamber, at ... (OR from ... to ...) o'clock*	
I G	**Infiltration gushing at ... (OR from ... to ...) o'clock**	**120**
I G PI	*Infiltration gushing, space between connecting pipe and manhole at invert, at ... (OR from ... to ...) o'clock*	
I G PB	*Infiltration gushing, space between connecting pipe and manhole above benching, at ... (OR from ... to ...) o'clock*	
I G W	*Infiltration gushing, through wall of manhole/inspection chamber, at ... (OR from ... to ...) o'clock*	
I R	**Infiltration running at ... (OR from ... to ...) o'clock**	**120**
I R PI	*Infiltration running, space between connecting pipe and manhole at invert, at ... (OR from ... to ...) o'clock*	
I R PB	*Infiltration running, space between connecting pipe and manhole above benching, at ... (OR from ... to ...) o'clock*	
I R W	*Infiltration running, through wall of manhole/inspection chamber, at ... (OR from ... to ...) o'clock*	
I S	**Infiltration seeping at ... (OR from ... to ...) o'clock**	**120**
I S PI	*Infiltration seeping, space between connecting pipe and manhole at invert, at ... (OR from ... to ...) o'clock*	
I S PB	*Infiltration seeping, space between connecting pipe and manhole above benching, at ... (OR from ... to ...) o'clock*	

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Code	Description	Page
I S W	*Infiltration seeping, through wall of manhole/inspection chamber, at ... (OR from ... to ...) o'clock*	
ING	**Ingress of soil at ... (OR from ... to ...) o'clock**	**121**
JD *	**Displaced joint, horizontal**	**117**
JD	**Displaced joint, horizontal ...mm**	**117**
LX	*Lining observation*	
LX B	**Defective lining, blistered or internal bulge of lining at ... (OR from ... to ...) o'clock**	**127**
LX C	**Defective lining, discolouration of the lining at ... (OR from ... to ...) o'clock**	**127**
LX CX	**Defective lining, lining defect at connection at ... (OR from ... to ...) o'clock**	**127**
LX D	**Defective lining, lining detached at ... (OR from ... to ...) o'clock**	**127**
LX E	**Defective lining, defective end of lining at ... (OR from ... to ...) o'clock**	**127**
LX EB	**Defective lining, external bulge at ... (OR from ... to ...) o'clock**	**127**
LX ES	**Defective lining, end not sealed at ... (OR from ... to ...) o'clock**	**127**
LX F	**Defective lining, separated film from ... to ... o'clock**	**127**
LX H	**Defective lining, hole in lining at ... (OR from ... to ...) o'clock**	**127**
LX R	**Defective lining, resin missing at ... (OR from ... to ...) o'clock**	**127**
LX S	**Defective lining, crack or split in lining or weld failure at ... (OR from ... to ...) o'clock**	**127**
LX S H	*Defective lining, horizontal crack or split in lining or weld failure from ... to ... o'clock*	
LX S M	*Defective lining, complex crack or split in lining or weld failure from ... to ... o'clock*	
LX S S	*Defective lining, spiral crack or split in lining or weld failure from ... to ... o'clock*	
LX S V	*Defective lining, vertical crack or split in lining or weld failure at ... o'clock*	
LX SF	**Defective lining, lining appears soft at ... (OR from ... to ...) o'clock**	**127**
LX SS	**Defective lining, separated seam cover from ... to ... o'clock**	**127**
LX SS H	*Defective lining, horizontal separated seam cover from ... to ... o'clock*	
LX SS M	*Defective lining, multiple separated seam cover from ... to ... o'clock*	
LX SS S	*Defective lining, spiral separated seam cover from ... to ... o'clock*	
LX SS V	*Defective lining, vertical separated seam cover at ... o'clock*	
LX W H	**Defective lining, horizontal wrinkled lining at ... o'clock**	**127**
LX W M	**Defective lining, multiple wrinkled lining from ... to ... o'clock**	**127**

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Code	Description	Page
LX W S	**Defective lining, spiral wrinkled lining from ... to ... o'clock**	**127**
LX W V	**Defective lining, vertical wrinkled lining at ... o'clock**	**127**
LX Z †	**Defective lining, other at ... (OR from ... to ...) o'clock**	**127**
MB	**Missing bricks at ... (OR from ... to ...) o'clock**	**118**
MB NV	*Missing bricks, nothing visible at ... (OR from ... to ...) o'clock*	
MB V	*Missing bricks, further layer of brickwork visible at ... (OR from ... to ...) o'clock*	
MC + [Material code]	**Material change to new material**	**133**
ME §	**Hazardous atmosphere, methane [% or ppm]**	**135**
MM	**Mortar missing between ...mm and ...mm at ... (OR from ... to ...) o'clock**	**118**
OB B	**Other obstacles, brick or masonry at ... (OR from ... to ...) o'clock ...mm**	**121**
OB C	**Other obstacles through connection/junction at ... o'clock ...mm**	**121**
OB I	**Other obstacles protruding through wall at ... (OR from ... to ...) o'clock ...mm**	**121**
OB J	*Other obstacles wedged in joint ...mm*	
OB M	**Other obstacles, pipe material at ... (OR from ... to ...) o'clock ...mm**	**121**
OB P	**Other obstacles, external pipe or cable from ... to ... o'clock ...mm**	**121**
OB S	**Other obstacles built into structure from ... to ... o'clock ...mm**	**121**
OB X	**Other obstacles, other object at ... (OR from ... to ...) o'clock ...mm**	**121**
OB Z †	**Other obstacles, other from ... to ... o'clock ...mm**	**121**
OD §	**Hazardous atmosphere, oxygen deficiency [% or ppm]**	**135**
OJ *	**Displaced joint, vertical**	**117**
OJ	**Displaced joint, vertical ...mm**	**117**
PC	**Manhole/inspection chamber ring unit length changes at this point, new length ...mm**	**133**
PJ + [Shape code]	**Connecting pipeline [shape] ...mm height x ...mm wide at ... o'clock**	**124**
PJ + [Shape code] C	*Closed local section defined by employing authority - ... connecting pipe ...mm height x ...mm wide at ... o'clock*	
PJ + [Shape code] I	*Incoming local section defined by employing authority - ... connecting pipe...mm height x ...mm wide at ... o'clock*	

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Code	Description	Page
PJ + [Shape code] O	*Outgoing local section defined by employing authority - … connecting pipe…mm height x …mm wide at … o'clock*	
PP	**Chamber material is porous at ... (OR from … to …) o'clock**	**129**
PRC D	*No rain or snow*	
PRC R	*Rain*	
PRC S	*Melting snow/ice*	
PVR	**Photograph volume reference new volume …**	**133**
R F	**Roots fine**	**119**
R M	**Roots mass, … % cross-sectional area loss**	**119**
R T	**Roots tap**	**119**
REM	**General remark**	**134**
RP C	**Point repair, other repair to connection at … (OR from … to …) o'clock**	**129**
RP H	**Point repair, hole repaired at … o'clock**	**129**
RP I	**Point repair, Injection of sealing material at ... (OR from … to …) o'clock**	**129**
RP L	**Point repair, localised lining of manhole/chamber from … to … o'clock**	**129**
RP R	**Point repair, part of the wall replaced from … to … o'clock**	**129**
RP T	**Point repair, localised lining of connection at … o'clock**	**129**
RP Z †	**Point repair, other at ... (OR from … to …) o'clock**	**129**
RX	*Defective repair*	
RX C	**Defective, repair, crack, in repair material at … (OR from … to …) o'clock**	**128**
RX H	**Defective repair, hole in repair material at … (OR from … to …) o'clock**	**128**
RX M	**Defective repair, part of wall missing at ... (OR from … to …) o'clock**	**128**
RX MR	**Defective repair, missing repair material at … (OR from … to …) o'clock**	**128**
RX P	*Defective repair, defective patch sealing hole at … (OR from … to …) o'clock*	
RX S	**Defective repair, separation from host wall at … (OR from … to …) o'clock, …% cross-sectional area loss**	**128**
RX XM	**Defective repair, excess material obstruction at … (OR from … to …) o'clock, …% cross-sectional area loss**	**128**
RX Z †	**Defective repair, other at ... (OR from … to …) o'clock**	**128**

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Code	Description	Page
S*	**Surface damage**	**118**
S AM	*Missing aggregate at ... (OR from ... to...) o'clock*	
S AM C	*Missing aggregate, chemical attack at ... (OR from ... to...) o'clock*	
S AM CA	*Missing aggregate, chemical attack in upper part of channel or above at ... (OR from ... to...) o'clock*	
S AM CB	*Missing aggregate, chemical attack in lower part of channel at ... (OR from ... to ...) o'clock*	
S AM M	*Missing aggregate, mechanical at ... (OR from ... to ...) o'clock*	
S AM O †	*Missing aggregate, other cause at ... (OR from ... to ...) o'clock*	
S AM Z	*Missing aggregate, cause not evident at ... (OR from ... to ...) o'clock*	
S AP	**Aggregate projecting from surface at ... (OR from ... to ...) o'clock**	**118**
S AP C	*Aggregate projecting, chemical attack at ... (OR from ... to ...) o'clock*	
S AP CA	*Aggregate projecting, chemical attack in upper part of channel or above at ... (OR from ... to ...) o'clock*	
S AP CB	*Aggregate projecting, chemical attack in lower part of channel at ... (OR from ... to ...) o'clock*	
S AP M	*Aggregate projecting, mechanical at ... (OR from ... to ...) o'clock*	
S AP O †	*Aggregate projecting, other cause at ... (OR from ... to ...) o'clock*	
S AP Z	*Aggregate projecting, cause not evident at ... (OR from ... to ...) o'clock*	
S AV	**Aggregate visible at ... (OR from ... to ...) o'clock**	**118**
S AV C	*Aggregate visible, chemical attack at ... (OR from ... to ...) o'clock*	
S AV CA	*Aggregate visible, chemical attack in upper part of channel or above at ... (OR from ... to ...) o'clock*	
S AV CB	*Aggregate visible, chemical attack in lower part of channel at ... (OR from ... to ...) o'clock*	
S AV M	*Aggregate visible, mechanical at ... (OR from ... to ...) o'clock*	
S AV O †	*Aggregate visible, other cause at ... (OR from ... to ...) o'clock*	
S AV Z	*Aggregate visible, cause not evident at ... (OR from ... to ...) o'clock*	
S B	**Blistering (internal bulge) at ... (OR from ... to ...) o'clock**	**118**
S B C	*Internal blister or bulge, chemical attack at ... (OR from ... to ...) o'clock*	
S B CA	*Internal blister or bulge, chemical attack in upper part of channel or above at ... (OR from ... to ...) o'clock*	
S B CB	*Internal blister or bulge, chemical attack in lower part of channel at ... (OR from ... to ...) o'clock*	
S B M	*Internal blister or bulge, mechanical at ... (OR from ... to ...) o'clock*	
S B O †	*Internal blister or bulge, other cause at ... (OR from ... to ...) o'clock*	

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Code	Description	Page
S B Z	*Internal blister or bulge, cause not evident at ... (OR from ... to ...) o'clock*	
S CP	**Corrosion products at ... (OR from ... to ...) o'clock**	**118**
S CP C	*Corrosion products, chemical attack at ... (OR from ... to ...) o'clock*	
S CP CA	*Corrosion products, chemical attack in upper part of channel or above at ... (OR from ... to ...) o'clock*	
S CP CB	*Corrosion products, chemical attack in lower part of channel at ... (OR from ... to ...) o'clock*	
S CP M	*Corrosion products, mechanical at ... (OR from ... to ...) o'clock*	
S CP O †	*Corrosion products, other cause at ... (OR from ... to ...) o'clock*	
S CP Z	*Corrosion products, cause not evident at ... (OR from ... to ...) o'clock*	
S H	*Missing wall at ... (OR from ... to ...) o'clock*	
S H C	*Missing wall, chemical attack at ... (OR from ... to ...) o'clock*	
S H CA	*Missing wall, chemical attack in upper part of channel or above at ... (OR from ... to ...) o'clock*	
S H CB	*Missing wall, chemical attack in lower part of channel at ... (OR from ... to ...) o'clock*	
S H M	*Missing wall, mechanical at ... (OR from ... to ...) o'clock*	
S H O †	*Missing wall, other cause at ... (OR from ... to ...) o'clock*	
S H Z	*Missing wall, cause not evident at ... (OR from ... to ...) o'clock*	
S RC	**Reinforcement corroded at ... (OR from ... to ...) o'clock**	**118**
S RC C	*Reinforcement corroded, chemical attack at ... (OR from ... to ...) o'clock*	
S RC CA	*Reinforcement corroded, chemical attack in upper part of channel or above at ... (OR from ... to ...) o'clock*	
S RC CB	*Reinforcement corroded, chemical attack in lower part of channel at ... (OR from ... to ...) o'clock*	
S RC M	*Reinforcement corroded, mechanical at ... (OR from ... to ...) o'clock*	
S RC O †	*Reinforcement corroded, other cause at ... (OR from ... to ...) o'clock*	
S RC Z	*Reinforcement corroded, cause not evident at ... (OR from ... to ...) o'clock*	
S RP	**Reinforcement projecting from surface at ... (OR from ... to ...) o'clock**	**118**
S RP C	*Reinforcement projecting, chemical attack at ... (OR from ... to ...) o'clock*	
S RP CA	*Reinforcement projecting, chemical attack in upper part of channel or above at ... (OR from ... to ...) o'clock*	

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Code	Description	Page
S RP CB	*Reinforcement projecting, chemical attack in lower part of channel at … (OR from … to …) o'clock*	
S RP M	*Reinforcement projecting, mechanical at … (OR from … to …) o'clock*	
S RP O †	*Reinforcement projecting, other cause at … (OR from … to …) o'clock*	
S RP Z	*Reinforcement projecting, cause not evident at … (OR from … to …) o'clock*	
S RV	**Reinforcement visible at … (OR from … to …) o'clock**	**118**
S RV C	*Reinforcement visible, chemical attack at … (OR from … to …) o'clock*	
S RV CA	*Reinforcement visible, chemical attack in upper part of channel or above at … (OR from … to …) o'clock*	
S RV CB	*Reinforcement visible, chemical attack in lower part of channel at … (OR from … to …) o'clock*	
S RV M	*Reinforcement visible, mechanical at … (OR from … to …) o'clock*	
S RV O †	*Reinforcement visible, other cause at … (OR from … to …) o'clock*	
S RV Z	*Reinforcement visible, cause not evident at … (OR from … to …) o'clock*	
S S	**Spalling at … (OR from … to …) o'clock**	**118**
S S C	*Spalling, chemical attack at … (OR from … to …) o'clock*	
S S CA	*Spalling, chemical attack in upper part of channel or above at … (OR from … to …) o'clock*	
S S CB	*Spalling, chemical attack in lower part of channel at … (OR from … to …) o'clock*	
S S M	*Spalling, mechanical at … (OR from … to …) o'clock*	
S S O †	*Spalling, other cause at … (OR from … to …) o'clock*	
S S Z	*Spalling, cause not evident at … (OR from … to …) o'clock*	
S W	**Increased roughness at … (OR from … to …) o'clock**	**118**
S W C	*Increased roughness, chemical attack at … (OR from … to …) o'clock*	
S W CA	*Increased roughness, chemical attack in upper part of channel or above at … (OR from … to …) o'clock*	
S W CB	*Increased roughness, chemical attack in lower part of channel at … (OR from … to …) o'clock*	
S W M	*Increased roughness, mechanical at … (OR from … to …) o'clock*	
S W O †	*Increased roughness, other cause at … (OR from … to …) o'clock*	
S W Z	*Increased roughness, cause not evident at … (OR from … to …) o'clock*	
S Z †	**Other damage at … (OR from … to …) o'clock**	**118**
S Z C	*Other damage, chemical attack at … (OR from … to …) o'clock*	

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Code	Description	Page
S Z CA	*Other damage, chemical attack in upper part of channel or above at … (OR from … to …) o'clock*	
S Z CB	*Other damage, chemical attack in lower part of channel at … (OR from … to …) o'clock*	
S Z M	*Other damage, mechanical at … (OR from … to …) o'clock*	
S Z O †	*Other damage, other cause at … (OR from … to …) o'clock*	
S Z Z	*Other damage, cause not evident at …(OR from … to…) o'clock*	
SA †	**Survey abandoned**	**132**
SA EQ	*Survey abandoned due to equipment failure*	
SA OB	*Survey abandoned due to obstruction*	
SA UTL	*Survey abandoned, unable to lift cover*	
SA WL	*Survey abandoned due to high water level*	
SA Z †	*Survey abandoned due to other reasons*	
SC C	**Cross-section of chamber circular new diameter …mm**	**132**
SC R	**Cross-section of chamber rectangular new size …mm x …mm**	**132**
SC + [Shape code]	**Cross-section of chamber [new shape], new size …mm x …mm**	**132**
SC Z †	**Cross-section of chamber other new size … mm x … mm**	**132**
SFB	**Safety bar present with no defects**	**126**
SFB D	**Safety bar in position but coated with debris**	**126**
SFB M	**Safety bar missing**	**126**
SFB X	**Safety bar defective**	**126**
SFC	**Safety chain present with no defects**	**126**
SFC D	**Safety chain in position but coated with debris**	**126**
SFC M	**Safety chain missing**	**126**
SFC X	**Safety chain defective**	**126**
SO †	**Other sealant intruding at ... (OR from … to …) o'clock**	**127**
SP	*Other sewer/drain through manhole*	
SP C	**Other sewer/drain through manhole, access cover in place**	**127**
SP C X	**Defective other sewer/drain through manhole, access cover in place**	**127**
SP M	**Other sewer/drain through manhole, access cover missing**	**127**
SP M X	**Defective other sewer/drain through manhole, access cover missing**	**127**
SP N	**Other sewer/drain through manhole, no access to the pipe**	**127**
SP N X	**Defective other sewer/drain through manhole, no access to the pipe**	**127**

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Code	Description	Page
SR	**Sealing ring intruding at ... (OR from ... to ...) o'clock**	**127**
SR B	*Sealing ring, broken at ... (OR from ...to ...) o'clock*	
SR H	*Sealing ring, intruding not broken at ... (OR from ...to ...) o'clock*	
SR N	**Sealing ring, not intruding**	**127**
ST D	*Double width steps*	
ST D AL	*Double width steps, aluminium*	
ST D GV	*Double width steps, galvanised iron*	
ST D IR	*Double width steps, iron*	
ST D PL	*Double width steps, plastic*	
ST D PM	*Double width steps, metal encapsulated in plastic*	
ST D SS	*Double width steps, stainless steel*	
ST D Z †	*Double width steps, other*	
ST L	*Ladder*	
ST L AL	*Ladder, aluminium*	
ST L GV	*Ladder, galvanised iron*	
ST L IR	*Ladder, iron*	
ST L PL	*Ladder, plastic*	
ST L PM	*Ladder, metal encapsulated in plastic*	
ST L SS	*Ladder, stainless steel*	
ST L Z †	*Ladder, other*	
ST N	*No provision for access*	
ST S	*Single width steps*	
ST S AL	*Single width steps, aluminium*	
ST S GV	*Single width steps, galvanised iron*	
ST S IR	*Single width steps, iron*	
ST S PL	*Single width steps, plastic*	
ST S PM	*Single width steps, metal encapsulated in plastic*	
ST S SS	*Single width steps, stainless steel*	
ST S Z †	*Single width steps, other*	
ST T	*Toe holes*	
ST Z †	*Other*	
SV	**Soil visible through defect**	**129**
SX	*Defective step or ladder*	

† Additional information to be provided in the Remarks column.
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§ If ppm is recorded then it should be placed in the mm column.

Code	Description	Page
SX B	**Defective step or ladder, ...steps bent**	**129**
SX C	**Defective step or ladder, ...steps corroded**	**129**
SX H	**Defective step or ladder, ladder handrail corroded**	**129**
SX L	**Defective step or ladder, ...steps loose**	**129**
SX M	**Defective step or ladder, ...steps missing**	**129**
SX P	**Defective step or ladder, plastic encapsulation of step is broken on ...steps**	**129**
SX RC	**Defective step or ladder, ladder runner corroded on ...steps**	**129**
SX SC	**Defective step or ladder, ladder support corroded**	**129**
SX SL	**Defective step or ladder, ladder support loose**	**129**
SX SM	**Defective step or ladder, ladder support missing**	**129**
SX T	**Defective step or ladder, toe holes defective**	**129**
SX Z †	**Defective step or ladder, other, ...steps**	**129**
TX	*Defective cover or frame*	
TX CB	**Defective cover or frame, cover broken**	**130**
TX CD	**Defective cover or frame, cover below surface level, ...mm**	**130**
TX CM	**Defective cover or frame, cover missing**	**130**
TX CR	**Defective cover or frame, rocking cover**	**130**
TX CU	**Defective cover or frame, cover above surface level, ...mm**	**130**
TX FB	**Defective cover or frame, frame broken**	**130**
TX FL	**Defective cover or frame, frame loose**	**130**
TX FM	**Defective cover or frame, frame missing**	**130**
TX Z †	**Defective cover or frame, other**	**130**
V	*Vermin*	
V C	*Vermin, cockroach*	
V C C	*Vermin, cockroach observed in connection*	
V C J	*Vermin, cockroach observed in open joint*	
V C P	*Vermin, cockroach observed in manhole or inspection chamber*	
V C Z †	*Vermin, cockroach other*	
V R	**Vermin, rat**	**133**
V R C	**Vermin, rat observed in connection**	**133**
V R J	**Vermin, rat observed in open joint**	**133**
V R P	**Vermin, rat observed in manhole or inspection chamber**	**133**

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Code	Description	Page
V R Z †	**Vermin, rat observed other**	**133**
V Z	*Other vermin*	
V Z C †	*Vermin, other observed in connection*	
V Z J †	*Vermin, other observed in open joint*	
V Z P †	*Vermin, other observed in manhole or inspection chamber*	
V Z Z †	*Other vermin, other observed*	
VV	**Void visible through defect**	**129**
VVR	**Video volume reference new volume ...**	**133**
WL	**Water level**	**134**
WL C	**Water level – water clear**	**134**
WL T	**Water level – water turbid**	**134**
WX	*Weld failure*	
WX H	**Weld failure, horizontal from ... to ... o'clock**	**128**
WX IN	**Weld failure, inclined from ... to ... o'clock**	**128**
WX V	**Weld failure, vertical at ... o'clock**	**128**
XB	**Collapse due to defective brickwork or masonry ...%**	**117**
XP	**Collapse ...%**	**117**

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§ If ppm is recorded then it should be placed in the mm column.

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