COMPUTER AIDED REHABILITATION OF SEWER NETWORKS
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Report D3

WP2 – Structural condition

Classification systems based on visual inspection

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1 Introduction

1.1 Information sources

This report is based on the knowledge of the cooperating partners. The following partners provided the necessary data, information:

SINTEF
Brno University of Technology
Cemagref
Dresden University of Technology
Aalborg University
WRc plc
CLABSA
CSIRO

The report is based on several national and international standards, guidelines etc. which are named in the **References** chapter.

The responsible partner for collecting and analysing the information was the Budapest University of Technology and Economics, Department of Sanitary and Environmental Engineering. Prof. Laszlo Somlyody head of Department and dr. Kalman Buzas supervised the work of the editors named on the front page.

1.2 Task description

Structural analysis of sewers is normally based on results from CCTV inspection. In Europe there are several systems currently being used for the classification of individual data from such investigations. A standard European code for the description of sewer damages has been developed and recommended to the member States. In general, the condition of sewers is classified according to its most severe damage or overall condition to determine the urgency of rehabilitation and calculate the cost of rehabilitation.

This task concerns the visual inspection (e.g. CCTV, man entry, mirrors, photographic camera) classification systems, of which a number of types are in use.

Major systems/standards in use in Europe as well as worldwide were to be identified. Each system is shortly described and a general comparison made; e.g. in terms of a matrix, depicting the features contained (e.g. types of pipes and pipe materials, manholes and other structures, private connectors, rehabilitated pipes and manholes, and etceteras) and what basic approaches are applied. The extent of use is indicated. I.e. if a method is used nationwide then the country in question is specified, if it is a more broadly used model, the broader geographic use is indicated. The status of the method is indicated, i.e. if it is a national/international standard, a regionally widely accepted method, or local, somewhat accepted method. For this

sub-task partners are asked to contribute with the national classification systems including a short resume in English.

A limited number of major systems (6) were identified based on use and applicability within Europe. These systems are – together with the EU system/standard (CEN standard) – included in the CARE-S prototype. The systems were thoroughly analyzed and compared to the EU standard. The comparison includes what types of damages are addressed, weighting of damages, other information regarding the sewer itself and the validity of the model to meet the needs of the rest of the work package for predicting the probability of asset failure.

In the early stage of the project we decided to construct a number of synthetic datasets based on end-user experiences of “typical” observation data scenarios. This task was moved to the rest of the work package.

In the early stage of the project we considered to produce a decision support flow-chart which can help to choose the best classification system or to tailor it to the local environment, but later we found better solution. This was implied by the selection of the CEN standard as the one common visual inspection system. Chapter **3 Selection of the classification system for the project** contains more detail about the solution.

Possible improvements to the classification systems were discussed and implemented.

2 Comparison of classification systems

Corresponding to the WP2 task description, we examined the major existing classification systems in Europe and in some other region. In order to make possible an objective comparison we produced a comparison matrix.
Each row of the comparison matrix is containing the information of one national or regional classification system. Each columns of the matrix shows one feature of the classification systems.
We could collect detailed information only about the classification systems using by the project partners. If we had no information, the cells in the matrix remained empty.
The final number of included systems is 15 from which 10 were thoroughly examined.
We specified those features for comparison which are relevant for the further purpose of the project. The final number of examined features is more then 20.
These features were selected from the short descriptions of the classification systems (**Appendix 1-10**). Descriptions were produced by the partners.
The comparison matrix was filled in by the partners.
The main purpose of producing this comparison matrix was to make possible of selection of the one classification system used for the CARE-S project. The miscellaneous result of the comparison was to highlight the weak points of the one selected classification system.

2.1 Review of condition classification systems

Country of origin	Code	Original title (i.e. in original language)	English title	Translations available (state languages)	Status (European standard / National standard / Guideline /	Applicable for manholes?	Does it provide a separate coding system for manholes?	Applicable for service connections?	Does it provide special a separate coding system for service	Applicable for rehabilitated pipes?	Does it provide a separate coding system for rehabilitated	Applicable for man-entry pipes?	Does it provide a separate coding system for man entry pipes?	Are photos included in the document to illustrate defects	No of codegroups relating to the fabric of the pipeline (based on EN13508 categories)	No. of codes relating to the operation of the pipeline (based on EN13508 categories)	No. of inventory codes of pipelines (based on EN13508 categories)	Number of other codes of pipelines (based on EN13508 categories)	No. of fields available to describe defects. (Please list the fields and the	Is the assessment of condition combined into the coding system?	Circumferential location	Region of use	Acceptance	How long has it been in use?	Latest version	Relation to other standards	Advantage
Australia	WSA 05-2002	Sewer Inspection Reporting	Sewer Inspection	-	guideline	yes	yes	yes	no	yes, for relined	yes	yes	no	yes	16	9	8	3	%,mm,m	no	clock reference (1-12)	Australia and New Zealand	100%	WSA05 replaces ACCEM	2002	easy conversion to or	closely aligned with EN13508
CEN members (22 countries)	EN13508-2:2002	Conditions of drain and sewer systems	Conditions of drain and sewer	English,French,German	european standard (ratified, not	yes	yes	yes	no	yes	no	yes	no	yes (colour)	16	8	5	7	2 fields(2 digits each) (% or mm)	no	clock reference (1-12)	international	wide (several countries)		2002		international cooproduction
Czech Republic	-	Optická inspekce (kanalizace	ATV-Advisory Note	English	recommendation	yes	yes	yes	no	yes	no	yes	no	no	9	1	4	2	1 field (% or mm or cm2)	no	up,down,left,right	CZ (national)	company level	since 1992		Based on the German	
Denmark	ISBN 87-7511-	TV-inspektion af	CCTV-Inspection of	English	guideline	yes	yes	yes	yes	yes	yes	yes	no	yes	8	6	4		1 field (class 1-3 or 1-4)	yes (1-3,1-4)	yes	national	widely used in Denmark	since 1986	1997		broad spectrum (e.g.
Finland	ISBN 952-5000-	Viemäreiden ja vesijohtojen	CCTV-inspection manual	-	standard																	national					
France		AGHTM - Commission	Recommendations for the	-	recommandation	yes	yes	yes	no	yes	no	yes	no	yes	9	4	0	1	2 fields (% or mm)	yes	clock reference (1-12)	national	widely used in France	since 1992	1999 (Defect pictures)	none	Designed to fast coding of most
Germany	ATV-M143-2	ATV-Merkblatt M143 Teil	ATV-Advisory Note	English	advisory note	yes	yes	yes	no	yes	no	yes	no	CD-ROM	9	1	4	2	1 field (% or mm or cm2)	no	up,down,left,right	national	international (Cz,Hu)	since 1991	2001		detailed descriptions
Hungary	-	Szennyvizcsatornak hibakatalog	Defect catalogue of sewers	German	draft guideline	no	no	yes	no	yes	no	yes	no	no	16	8	5	7	2 fields(2 digits each) (%	no	clock reference (1-12)	company level	company level	since 2002	2003	based on the EN standard	follows the EN standard
Netherlands	NEN 3399	Buitenrioleringen - Classificatie	Sewerage systems outside	-	standard																	national					
Nordic countries			Nordic National Annex to	-	standard																	international					
North America	NASSCO (Natio	Pipeline Assessment and	Pipeline Assessment and	-	standard	no	no	yes	no	yes	no	yes	no	yes	12	5	4	9	4 fields:(small,mediu	no	clock reference (from 1-	N America	In early stages of implemen	1 year	jún-02	Based on UK MSCC	Developed from a consensus
Norway	ISBN 82-414-0196-5	Rørinspeksjon med videokamer	CCTV inspection of	-	guideline	yes	no	yes	no	yes	no	yes	no	yes	6	5	4	2	1 field (degree 1-4)	yes (1-4)	clock reference (1-12)	national			1998		already used for mathematic
Spain	-	Manual bàsic per complimeta	Basic manual to fulfill	english	company internal rules	yes	yes	yes	yes	no	no	yes	yes	yes	18	11	3	6	1 field (%,mm,cm2)		clock reference (1-12)	company level	-	beginning	2002	-	specific for man-entry sewers
Sweden	ISSN 0347 1799	TV-inspektion av	CCTV inspection of	-	standard																	national					
Switzerland	VSA-Richtlinie	Unterhalt von Kanalisatio	VSA_Guideline, Maintena	German,French,Italian	standard																	national					
United Kingdom	ISBN 0-902156-89-6	Manual of Sewer Condition	Manual of Sewer Conditio	-	guideline	no	no	yes	no	yes	no	yes	no	yes	18	7	9	4	2 fields:% and mm	no	clock reference (from 1-	national plus North	Well accepted	for over 20 years	1993, new version	basis of Australian, North	has been in use for over 20 years

2.2 Comparison results detailed by features

The description of comparison results follows the order of columns of the comparison matrix.

Translation available (state languages)

Either original text or translation is available in most cases in English, which is quite usual in the technical world. This comparison feature does not exclude any classification system.

Status (European standard / National standard / Guideline / Advisory note)

The status of classification system is on a quite wide spectrum: guideline, standard, recommendation, advisory note, internal rules. Usually the formal status does not reach the level of the standard, but this is not meaning the low level of acceptance.

Applicable for manholes?

Almost every classification system has codes for manholes, except the Hungarian and the North American system. However we could not examine how detailed codes are available for manholes. This kind of defect codes can be rather differently detailed in each classification system. The pipe defect codes are usually more detailed then the manhole defect codes.

Does it provide a separate coding system for manholes?

Almost every classification system has separate coding system for manholes, except the Hungarian and the Norwegian. The reason of the Hungarian code is its early stage, while the Norwegian code includes the manholes defect codes integrated into one system. This comparison feature does not exclude any classification system.

Applicable for service connections?

All the examined classification systems are applicable for describe the defects of the service connections.

Does it provide special a separate coding system for service connections?

Only the Danish system is including separated codes for service connections which is providing more detailed description of that type of defects. In the point of view of the project the defects of the service connections are irrelevant.

Applicable for rehabilitated pipes?

All the systems can be used for rehabilitated pipes, except the Spanish system. However we could not examine how detailed codes are available for rehabilitated

pipes. This kind of defect codes can be rather differently detailed in each classification system. The importance of this feature is increasing because of the increasing number of rehabilitated pipes.

Does it provide a separate coding system for rehabilitated pipes?

Two systems are providing separate coding system for rehabilitated pipes: the Australian and the Danish ones. This feature means advantage of their application, because probably they can describe the defects more exactly.

Applicable for man-entry pipes?

All the systems are applicable for man-entry pipes, however their usefulness can be different. We could not examine so deeply the systems, to make difference between them based on this feature.

Does it provide a separate coding system for man-entry pipes?

Only the Spanish system is including separate coding system for man-entry pipes. The reason of using separate coding system is the high rate of that type pipes in Spain.

Are photos included in the document to illustrate defects?

Almost all the systems are including photos of defect types, except Czech and Hungarian ones. This is important feature regarding the application of the classification system.

No of code groups relating to the fabric of the pipeline (based on EN13508 categories)

This group of codes includes the most of the pipe defect codes. The classification system close to the CEN standard (Australia, UK, Hungary) are using the more detailed description of these defects.

No. of codes relating to the operation of the pipeline (based on EN13508 categories)

This group of codes includes the second most of the pipe defect codes. The classification system close to the CEN standard (Australia, UK, Hungary) are using the more detailed description of these defects.

No. of inventory codes of pipelines (based on EN13508 categories)

Almost all the classification systems are using the same amount (4-5) of codes for inventory purpose (4-5), except the Australian system (8).

Number of other codes of pipelines (based on EN13508 categories)

The number of other codes is rather different from country to country. It is mainly because of this non-exact category.

No. of fields available to describe defects. (Please list the fields and the units used)

Almost all the classification systems are using 1-2 fields for storing numerical values of defects. 2 fields are usually enough for description, but more is recommended. The numerical data is preferable for the further (computer) process of defect description.

Is the assessment of condition combined into the coding system?

Most of the classification systems are using a kind of assessment for the degree of condition. This is a point of using subjective elements in the recording process. Some system e.g. CEN standard are using always objective values [mm, m, % etc.] for the defect description. The latter method is preferable for the point of view of the project, because the construction of models of the pipe condition evaluation is the task of the further coming parts of the project.

Circumferential location

All the classification systems are using circumferential location except the German system, which is using only 4 directions. The precise location is important for the further process of defect data.

Region of use, Acceptance

The interpretation of these two features was mixed by the partners. That is why we deal with them together. Almost all the systems are national systems. Some of them are accepted by the neighbouring countries. Some of them are only used by certain companies. The CEN code has regional acceptance.

How long has it been in use?

Some of the classification systems were worked out more then 10 years ago, some of them are just introduced. Both of them have advantage and disadvantage. This number is not enough to exclude or prefer classification systems.

Latest version

All the systems has new version in the last few years, because of the new demands, devices, materials, technologies.

Relation to other standards

The main systems (CEN, UK, Germany) have significant impacts for other classification systems.

Advantage

That feature is different from system to system, that is why it will be discussed in the comparison results detailed by classification systems.

2.3 Comparison results detailed by classification systems

Australia

This system is closely aligned with the new EN13508, which makes possible easy conversion to the CEN standard. But it has also old roots to the traditional ACCEM

system, which results in a detailed defect description. The objective code is widely accepted not only in Australia. Only the Australian specifications means disadvantages for the project purposes as a common, selected system.

CEN members (22 countries)

Almost every feature of that system is the best for using by the project. The international cooperation of creation, the widely acceptance in Europe makes it preferable.

Czech Republic

The German like coding makes the system quite detailed, but gives the disadvantages of the German system too. The lack of photos is also weak point of it.

Denmark

Separated codes for service connections, for rehabilitated pipes, wide acceptance in Denmark are the advantages of this system, while the subjective grading into classes is not preferable for the project. The objective values are better for modelling purposes as we described this problem detailing the feature **"Is the assessment of condition combined into the coding system?"**.

France

The system was designed to fast coding of most frequent defects. The number of the defect codes and the other features are at average level.

Germany

The system is highly detailed and well accepted in central Europe. Because of the complex rules of the system the application is hard for computers. Disadvantage is the four directional locations of defects.

Hungary

The development of this system is at early stage, but the use of the CEN standard as a basis makes it up to date.

North America

The advantages of the system are the relative large number of defect codes, the enough fields for precise quantification, the strong basis (UK code). Disadvantage is its early stage of implementation.

Norway

The system is detailed at an average level regarding the number of defect codes and other features. The subjective degrees are not preferable for the project. The objective values are better for modelling purposes as we described this problem

detailing the feature **“Is the assessment of condition combined into the coding system?”.** However this kind of classification makes possible the construction of a clear damage class model, which is already embedded into this guideline.

Spain

The high number of defect codes, the separate coding system for manholes are the advantages of the system. While the beginning and company level of implementation, the only 1 field for quantification give the disadvantages of the system.

United Kingdom

The system is basing on long experiences. The number of codes is quite high. It has international acceptance. There is no problem translating to the CEN code, because of their common features. Only disadvantage is that not applicable for man-holes.

3 Selecting the classification system for the project

From the comparison of different classification systems and from other experiences of the project partners we all agreed to select the EN 13508 standard as a common system for the future tasks in the project.

Application of a general standard has several advantages and disadvantages. The main advantage of using one selected standard is of course in the field of application software development. The application programs can use data from any sources which keeps the rules of that standard.

The main problems emerging in case of using a general standard we have to deal with are as follows. We have already large amount of data in different coding systems which data we do not want to loose. The only solution is to work out translation methods to translate data from such systems to the general standard. In this chapter we analyse the problems of this translation.

There is a problem in the field of recording new sewer defects too. This is only partly important in the point of view of the project, because the models included in the project are using mainly already recorded data. But we should give a solution for the future recording too. In the early stage of the project we considered to produce a decision support flow-chart which can help to choose the best classification system or to tailor it to the local environment, but later we found better solution as follows.

The application of the EN13508 standard gives solution to both problems.

The different national demands on using the EN13508 standards are satisfied via the own rules of the standard. These are in the EN13508 chapter **5.4 national equivalent systems** and in **ANNEX A National equivalent coding system.** These rules define precisely how can keep the national users of the CEN system their traditional, familiar, national codes. The Hungarian coding system which is just introduced at the end-user gives an example of it.

4 Analysing of major classification systems

In order to use existing national data it is necessary to work out translation methods to translate data from national systems to the EN13508 standard. In this chapter we analyse the problems of this translation.

This chapter details the problems occurring during the translation process from the national code to the CEN code. The problems highlight the potential improvement points of the CEN system.

4.1 Australia

Appendix 11 contains the translation paradigm of translating the Australian code to the CEN code. The connection is one-to-one in most cases. The reason of this is based on the relationship between the two systems.

The appendix A of the WSA 05-2002 guideline describes the relationship between EN 13508 and this code as follows.

The Australian code first was published in June 1991 by Sidney Water Board on behalf of the Major Urban Water Authorities as an Australian industry standard. It was based very closely on the manual of Sewer Condition Classification (2nd Edition) WRc 1988 and the Sewer Rehabilitation Manual (2nd Edition) Wrc 1986. The use of the manual and the software led to substantial Australian standardization, recording and assessment of sewer defects, which, as a result of the WRc's influence, also generally conformed to internationally accepted practice.
The CEN standard is defining the mnemonics of defect types in alphabetic order, not preferring any human language for it. However the CEN standard allows for the national users to use their national mnemonics, except during the transfer process. Regarding this concept the recorded data should be in the format of the CEN standard.
The Australian Committee considered that in a number of cases European code ignore significant data. The committee considered that it was essential to be able to convert data to European equivalents, when required, and with 100% reliability. Accordingly this Australian Code has been designed with an augmented set of codes that preserve the data of interest, but which can be converted to EN13508 codes, when required, exactly as if the process had been in complete compliance with that standard at all stages. But whereas the European concept is that local mnemonic codes must be converted to exact CEN codes at each time of data transfer, the concept behind this Code is that in normal use the data will remain in traditional Australian codes, even during transfer, but be capable of exact conversion when required to interface with systems based on EN13508.
This concept allows for the operators to use their familiar codes.
In case of the header codes the Australian Codes are using exactly the CEN format, because the usage of the user friendly mnemonics has no advantage in internal storage.

The Australian guideline is including columns headed “EN” (EN 13508 code) which makes possible of easy transformation of Australian codes to CEN codes.
Some language specifications, character sets etc. are not used by the Australian guideline.

4.2 Denmark

Appendix 12 contains the translation paradigm of the Danish code to the CEN code. The connection is usually not one-to-one, which results in problems of the translations.

4.2.1 Translation problems of the CEN standard

4.2.1.1 Pipeline

CEN main code: Defective connection BAH
Problem : The degree of defect is not considered.
Solution: Possible extension point of the CEN standard. The quantification can be used for describing the defect: the intrusion, the width of the gap, the percentage of blockage etc.

CEN main code: Other obstacles BBE
Problem : Moved obstacle or obstacle which location changed is not considered.
Solution: Possible extension point of the CEN standard, but the current state of standard is enough for modelling purpose.

CEN main code: Point repair BCB
Problem : The degree of defect repaired is not considered.
Solution: Possible extension point of the CEN standard. The quantification can contain the area of repair.

CEN main code: Curvature of sewer BCC
Problem : The factory-made bending is not considered.
Solution: Possible extension point of the CEN standard. The difference between the factory-made bending and the later started failure can be important for modelling purpose.

4.2.1.2 Manhole or inspection chamber

CEN main code: Defective brickwork or masonry DAD
Problem :Longitudinal, circular or complex feature of defect is not considered.
Solution: Possible extension point of the CEN standard, but the current state of standard is enough for modelling purpose.

CEN main code: Missing mortar DAE
Problem :Longitudinal, circular or complex feature of defect is not considered.
Solution: Possible extension point of the CEN standard, but the current state of standard is enough for modelling purpose.

CEN main code: Defective connection DAH
Problem :The degree of defect is not considered.

Solution: Possible extension point of the CEN standard. The quantification can be used for describing the defect: the intrusion, the width of the gap, the percentage of blockage etc.

CEN main code: Other obstacles DBE
Problem :Moved obstacle or obstacle which location changed is not considered.
Solution: Possible extension point of the CEN standard, but the current state of standard is enough for modelling purpose.

CEN main code: Point repair DCB
Problem :The degree of defect repaired is not considered.
Solution: Possible extension point of the CEN standard. The quantification can contain the area of repair.

4.2.2 Translation problems of the Danish system

The following problems are highlighting the points where the Danish guideline is lower detailed then the CEN standard.

4.2.2.1 Pipeline

Problem : In case of translation from the Danish system to CEN standard there are some many-to-one connections:

RB4	→	*BADB*
	→	*BADD*
KO4	→	*BAFE*
	→	*BAFI*
FS	→	*BAJB*
	→	*BAJC*
AF	→	*BBCA*
	→	*BBCB*

Note: There are some other problematic connections. This direction of translation is not part of our task.
Solution: The solution is to process other parameters (e.g. material of pipe in case of KO4) during the translation.

4.2.2.2 Manhole or inspection chamber

Problem : In case of translation from the Danish system to CEN standard there are some many-to-one connections:

KO4	→	*DAFE*
	→	*DAFI*
FS	→	*DAJB*
	→	*DAJC*
AF	→	*DBCA*
	→	*DBCB*

Note: There are some of other problematic connections. This direction of translation is not part of our task.
Solution: The solution is to process other parameters (e.g. material of pipe in case of KO4) during the translation.

4.3 France

Appendix 13 contains the translation paradigm of the French system to the CEN system.

The AGHTM classification distinguishes 14 types of defects concerning the pipeline and 4 types of defects concerning the bottom of the manholes and inspection chambers, which are respectively detailed; translation problems are emphasised for each defect item.

There are several translation problems because of the relative large difference between the two systems.

4.3.1 Translation problems of the French system

- Except for the location of connections, AGHTM coding does not provide any clock face reference for the location of observations ;
- No special defect category is specified in AGHTM concerning brick or masonry sewers, which are supposed to be coded with the same category as sewers built with prefabricated pipe units ;
- AGHTM classification does not mention lining defect (BAK, DAK), defective repairs (BAL, DAL), weld failure (BAM, DAM), porous wall (BAN, DAN), soil visible through defect (BAO, DAO), void visible through defect (BAP, DAP), or presence of vermin (BBH, DBH) ;
- AGHTM classification does not mention inspection problems such as inspection abandoned (BDC, DDC), water level (BDD, DDD), flow in incoming pipe (BDE, DDE), atmosphere within the pipeline (BDF, DDF), or loss of vision (BDG, DDG) ;
- Concerning manholes and inspection chambers, AGHTM classification only deals with the bottom part of the work ;
- AGHTM classification is essentially defect oriented, without however distinguishing fabric and operation problems, whereas EN13508-2 allows also for a very complete inventory coding ;
- Generally speaking AGHTM classification appears to be much less detailed and precise than EN13508-2.

4.3.2 Translation problems of the CEN system

CEN main code: Fissure BAB
Problem : The surface crack (BABA) and crack (BABB) can be distinguished by CCTV? (the depth of the crack can be assessed?)
Solution: The CEN standard should be applied for any visual inspection, not only CCTV.

CEN main code: Break/Collapse BAC
Problem : The shape of break (BACA) is not considered.

Problem : The opening width of break (BACA) is not considered.
Problem : The diameter of punctual missing piece (BACB) is not considered.
Solution: Possible extension point of the CEN standard. The length of the break or collapse is not enough. Either width or area as a second quantification can be used to quantify more precisely.

CEN main code: Surface damage BAF
Problem : The CEN standard does not specify whether the damage is localised or generalised.
Solution: 12, 12 mean general location.

CEN main code: Intruding sealing material BAI
Problem : Loop is missing from the list of defects of sealing ring or other sealant.
Solution: Possible extension point of the standard, but the current state of CEN standard is enough for modelling purpose.

CEN main code: Lining defect BAK
Problem : The CEN standard does not specify whether the damage is localised or generalised.
Solution: 12, 12 mean general location.

CEN main code: Other obstacles BBE
Problem : Roots not intruding through a defect is not included in the characterisation list.
Solution: Possible extension point of the CEN standard, but the current state of the standard is enough for modelling purpose.

CEN main code: Infiltration BBF
Problem : The CEN standard does only consider the case of localised infiltration (with circumferential location reference.
Solution: 12, 12 mean general location.

CEN main code: Connection BCA
Problem : The CEN standard does not distinguish whether the inflow arrives perpendicular to or with the sewer current.
Solution: Possible extension point of the CEN standard, but the current state of the standard is enough for modelling purpose.
Problem : The CEN standard does not include direct connection by means of a connection chamber, which can be defective.
Solution: Possible extension point of the CEN standard, but the current state of the standard is enough for modelling purpose.

CEN main code: Channel DCI
Problem : The CEN standard does not specify if the channel is totally or only partially defective.
Solution: Possible extension point of the CEN standard.
Problem : The CEN standard does not specify the place and nature of defect. Invert (reduced width, step, pool), bench (low, high, excessive slope, insufficient slope)
Solution: Possible extension point of the CEN standard, but the current state of the standard is enough for modelling purpose.

Problem : New failure type: Punching at the end of a pipe unit
Solution: Possible extension point of the CEN standard, but BACB is enough for modelling purpose. Even in the point of view of AGHTM has light importance.

4.4 Germany

Appendix 14 contains the translation paradigm of the German system to the CEN system. Because of the large structural difference of the two systems, translation rules are not showing exact connection.

4.4.1 Translation problems of the CEN system

We examined the critical points of translation only from the ATV-M 143/2 code to the CEN standard. Three groups of problems were found:

Location of defect:
The EN 13508/2 gives only the absolute location from the start point of the inspection. The ATV-M 143/2 code determinates also the relative location of the problems like at the joint, at pipe connection.

Area of defect:
The CEN standard is quantifying the defects only in one-dimension. In several cases, the one-dimensional description is not enough, there is a need for more precise quantification.

Type of defect:
Defect starting from one point is not considered in the CEN code.

In the following samples the above mentioned problems are highlighted in certain translation cases.

CEN main code: Fissure BAB
Problem : Fissure at connection and fissure from one point is not considered.
Solution: Possible extension point of the CEN standard, but describing this failure as BAB or BAH is enough for modelling purpose.

CEN main code: Break/Collapse BAC
Problem : Break/collapse in the connection range is not considered.
Solution: Possible extension point of the CEN standard, but the current state of standard is enough for modelling purpose.
Problem : Only the length of the break/collapse can be given.
Solution: Possible extension of the CEN standard. The length of the break or collapse is not enough. Either width or area as a second quantification can be used to quantify more precisely.

4.4.2 Translation from the CEN to the German system

The system of the ATV-M 143/2 advisory note is quite different from any other examined classification system. This makes impossible the exact translation of the CEN codes to the ATV codes. Sometimes there are more then one solution, sometimes the translation is impossible. However this way of translation is not part of our task.

4.5 Norway

Appendix 15 contains the translation paradigm of the Norwegian system to the CEN system. The translation has average amount of problems concerning the examined national systems.

4.5.1 Translation problems of the CEN system

CEN main code: Defective connection BAH
Problem : The position of the incorrect connection (BAHA) is more detailed at grade 1-3.
Solution: The grade 1 is almost not used. The BAHA code is enough for modelling purpose.

CEN main code: Intruding sealing material BAI
Problem : The position of the sealing material can be given more precise then in the CEN standard.
Solution: When the seal is a ring, the quantification could mean the position of the hanging ring is.

CEN main code: Displaced joint BAJ
Problem : Grade (1-4) is used instead of distance.
Solution: Distance (angle) used by the CEN standard is better for modelling purpose.

CEN main code: Connection BCA
Problem : Failures in connection is not considered.
Solution: Possible extension point of the CEN standard, but the current state of standard is enough for modelling purpose.

CEN main code: Curvature of sewer BCC
Problem : Prefabricated bend and change of direction in socket pipe are not considered.
Solution: Possible extension point of the CEN standard. The difference between the prefabricated and the later started failure can be important for modelling purpose.

CEN main code: Water level BDD
Problem : The reason of change of filling is not considered.
Solution: Possible extension point of the CEN standard.

4.5.2 Translation from the CEN system to the Norwegian system

This direction of translation is not ambiguous. Of course there are defect types in the CEN which are not known for the Norwegian system e.g. defective brickwork or masonry, missing mortar. However this direction of the translation is not part our task.

4.6 United Kingdom

Appendix 16 contains the translation paradigm of the United Kingdom's system to the CEN system.
The national standard is very closely aligned with the CEN standard, there is almost no problem in translation.

4.6.1 Translation problems of the CEN system

CEN main code: Break/collapse BAC
Problem : Hole in sewer is not considered.
Solution: Possible extension point of the CEN standard. BACB is not enough for modelling purpose, because there is a difference between a crack and a hole. The length of the break or collapse is not enough. Either width or area or percentage can be used to quantify more precisely.

5 Recommendations to the CEN standard

Based on the translation problems the following improvements are recommended to the EN13508 standard. Because the standard already ratified, modification is only at a future modification stage can be done. Until then the present state of the standard can be used in the project.

5.1 Pipeline codes

CEN main code: Break/Collapse BAC
Problem : The shape of break (BACA) is not considered.
Problem : The opening width of break (BACA) is not considered.
Problem : The diameter of punctual missing piece (BACB) is not considered.
Problem : Hole in sewer is not considered.
Solution: Possible extension point of the CEN standard. The length of the break or collapse is not enough. BACB is not enough for modelling purpose, because there is a difference between a crack and a hole. Either width or area as a second quantification can be used to quantify more precisely.

CEN main code: Defective connection BAH
Problem : The degree of defect is not considered.
Solution: Possible extension point of the CEN standard. The quantification can be used for describing the defect: the intrusion, the width of the gap, the percentage of blockage etc.

CEN main code: Intruding sealing material BAI
Problem : The position of the sealing material can be given more precise then in the CEN standard.
Solution: When the seal is a ring, the quantification could mean the position of the hanging ring is.

5.2 Inventory codes

CEN main code: Point repair BCB
Problem : The degree of defect repaired is not considered.
Solution: Possible extension point of the CEN standard. The quantification can contain the area of repair.

CEN main code: Curvature of sewer BCC
Problem : The factory-made (prefabricated) bending is not considered.
Solution: Possible extension point of the CEN standard. The difference between the factory-made (prefabricated) bending and the later started failure can be important for modelling purpose.

5.3 Other codes

CEN main code: Water level BDD
Problem : The reason of change of filling is not considered.
Solution: Possible extension point of the CEN standard.

5.4 Manhole or inspection chamber codes

CEN main code: Defective connection DAH
Problem :The degree of defect is not considered.
Solution: Possible extension point of the CEN standard. The quantification can be used for describing the defect: the intrusion, the width of the gap, the percentage of blockage etc.

CEN main code: Point repair DCB
Problem :The degree of defect repaired is not considered.
Solution: Possible extension point of the CEN standard. The quantification can contain the area of repair.

CEN main code: Channel DCI
Problem : The CEN standard does not specify if the channel is totally or only partially defective.
Solution: Possible extension point of the CEN standard.

5.5 Rehabilitated pipes

Based on the Danish manual the extension of the EN13508 standard recommended at the next modification stage. The expectedly increasing percentage of rehabilitated pipes makes it necessary.

5.6 Man-entry pipes

In several European cities (e.g. in Spain, Hungary) the percentage of man-entry channels is more than 50%. In case of personal examination the assessing methods are different from the CCTV and different parameters can be recorded. This makes necessary to extend the EN13508 standard based e.g. the Spanish (or Austrian) results on that field.

5.7 The problem of fix lists

The CEN standard in most cases is using lists of options (A, B, …, Z) for characterization purpose. The problem occurs when the characterization of the defect is not included in the list. The solution is usually given by the option Z, which

means “other”. This is usually not an applicable parameter for a computer application. The software probable can not make further process, calculation with it, simply ignores it.

It is impossible to permit for the users to extend of the standard, because the standard would loose its essence.

Possible solutions:

- Instead of using letter “Z”, the letter of the characterization which is close to the real defect character can be used e.g. “B*” if character is similar to B.
- Instead of using letter “Z”, the letter of the characterizations which are close to the real defect character can be used e.g. “BD*” if character is similar to B and D.
- Instead of using letter “Z”, one or more value can be used e.g. in case of a material which is not included in the fix option list, the roughness or rigidity or both of the new material can be used

5.8 Insufficient slope

Based on information from the end-users, most of the blockages are occurring in the pipes where the slope is small, not enough. The exact value of the slope is important for hydraulic calculations too.

The following codes of the CEN standard are dealing with the slope:

BCC, ,A – curvature of the sewer, vertical, up
B – curvature of the sewer, vertical, down
BDD – water level
ACH – depth at start node below cover level

Problems:
To determine the slope along the pipe, we would need also the depth at the finish node. Of course we need exact heights of the cover levels (which is not part of the coding system). In practice the place of change of the above parameters not always exact. That can change from pipe unit to pipe unit. These causes all together make the determination of slope quite hard.

Solution:
The slope of the pipe is so essential, that the CEN standard should include an own code for, like material, diameter.

References

- Australian Conduit Condition Evaluation Manual, 2nd edition
- Conditions of drain and sewer systems outside buildings - Part 2: Visual inspection coding system, European Standard
- Optická inspekce (kanalizace)
- TV-inspektion af afløbsledninger: Standarddefinitioner og fotomanual. Dansk teknologisk Institut
- AGHTM - Commission Assainissement (1992). Manuel de recommandations techniques pour l'inspection télévisée des réseaux d'assainissement. TSM N°10bis, octobre 1992, 23p.
- AGHTM - Commission Assainissement (1999). Les ouvrages d'assainissement non visitables, ffiches pathognomoniques. TSM N°10, octobre 1999, p. 23-90.
- Recommandations pour la réhabilitation des réseaux d'assainissement: Partie A inspection télévisée, AGHTM, CD Rom édition 1998
- ATV-M 143/2 „Optische Inspektion – Inspektion, Instandhaltung, Sanierung und Erneuerung von Abwasserkanälen und –leitungen", Hennef, 1999
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- Systematic technical control and testing of water structures. Water and sewage works structures. Hungarian Standard MSZ21855-1. 2002
- Systematic technical control and testing of water structures. Pipelines. Hungarian Standard MSZ21855-2. 2002
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- Manual bàsic per complimetar la nova fitxa d'inspecció de tram
- Manual of Sewer Condition Classification, WRc
- Klaus-Peter Bölke „Kamalinspektion", Springer-Verlag 1996
- Klaus-Peter Bölke „Herausforderung Zustandsbeschreibung nach Codiersystem EN 13508-2", Wiener Mitteilungen, Band 182, S. I1-I23, 2003

Appendix 1 The Australian coding system

The Australian Code ('Sewer Inspection Reporting Code of Australia WSA 05-2002) details the condition assessment of sewer systems by internal inspection, status codification and consideration of external factors and other information. It is applicable to sewer and drain systems that operate under gravity, from the point of collection to the point of discharge to a treatment works or receiving water. The Code specifies a coding system for the description of the internal features of sewers, drains and access structures identified through visual inspection and establish a basis for consistency in the reporting of observations made during the inspection of sewers and stormwater drains. It attempts to set the framework for consistent communication between computer systems that generate the reports, analyse reports and manage asset management and GIS databases.

The codes in WSA 05 used to describe sewer condition bears a close resemblance to codes used in European code EN 13508. They define the same features and defects as the European equivalents, but the codes themselves are different as they are mnemonic in contrast to the generally alphabetic sequence applied in EN 13508, as shown in the following table.

Codes relating to structural integrity of sewers

Primary Property	**Australian Code**	**EN 13508 equivalent**	**Applies to**
Cracking	C	BAB	Pipe
Breaking	B	BAC	Pipe
Deformation	D	BAA	Pipe
Fracture	F	BAB	Pipe
Surface damage	S	BAF	Pipe
Collapse	X	BAC	Pipe
Secondary Property			
Longitudinal	L	A	Crack, break, fracture
Circumferential	C	B	Crack, break, fracture
Multiple	M	C	Crack, break, fracture
Vertical	V	A	Deformation
Horizontal	H	B	Deformation
Displaced	D	A	Break
Missing	M	B	Break

Apart from this difference in the code used, the Australian Code is closely aligned with the European Code. The same 'Clock Reference' circumferential location system is used in both Codes. In a number of places additional information that is appropriate for monitoring deterioration of sewers in Australian conditions, characterisation and quantification information in some Australian codes is more

comprehensive. For instance the term ‘Fissure’ in EN 13508 applies to cracks and fractures (BAB), whereas WSA 05 has separate codes for cracks (C) and fractures (F).

WSA 05 has the Australian codes and the equivalent EN 13508 in a tabular format to enable easy conversion of reports from one to the other. It is anticipated that commercial sewer reporting software will enable rapid conversion of reports from WSA 05 to EN 13508 equivalents.

Appendix 2: The CEN coding system

This is the draft version of the CEN standard dated June 2002.

Since then 2 more country became the member of CEN: Hungary and Slovakia, which means at present 22 countries.

Based on the information on the web-site www.cenorm.be the present state is "ratified", which means at a stage between ratification and publication.

EUROPEAN STANDARD
NORME EUROPEENNE
EUROPAISCHE NORM
June 2002
ICS

FINAL DRAFT

prEN 13508-2

English version

Conditions of drain and sewer systems outside buildings - Part 2: Visual inspection coding system

Condition des reseauz d'evacuation et d'assainissement ~ fexterieur des batiments - Partie 2: Sysieme de codage da finspection visuelle
Zustand von Entwässerungssysteme ausserhalb von Gebauden -Teil 2: Kodiersystem fur die optische Inspektion

This draft European Standard is submitted to CEN members for formal vote. It has been drawn up by the Technical Committee CEN/TC 165.
If this draft becomes a European Standard, CEN members are bound to comply with the CEWCENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.
This draft European Standard was established by CEN in three official versions (English, French. German). A version in any other language made by translation under the responsibility of a CEN member into ifs own language and notified to the Management Centre has the same status as the official versions.
CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.
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Ref. Nc. prEN t 3508-2:2002 E

Foreword

This document (prEN 13508-2:2002) has been prepared by Technical Committee CEN /TC 165 'Waste water engineering", the secretariat of which is held by DIN.
This document is currently submitted to the Formal Vote.
The Standard series EN 13508 ` Condition of drain and sewer systems outside buildings ' contains the following parts
- Part 1: General requirements
- Part 2: Visual inspection coding system

Other parts, dealing with other methods of inspection, can be added later.
In drafting this part of this European Standard account has been taken of other available standards, in particular EN 752 "Drain and sewer systems outside buildings"
To allow for the alteration of existing data and coding system software in accordance with this standard and training of inspection personnel a transition period is granted until (DAV + 36 month) for the withdrawal of conflicting national standards and the application of this standard.
Where there are existing inspection programmes to meet legal requirements commenced before the publication of this standard, it is permitted to complete such programmes using the original coding system.

Introduction

In producing this draft standard, existing national coding systems have been reviewed. To preserve the link with existing data, TC165/WG22 has tried to ensure that there is an equivalent code, or combination of codes, for every observation recorded in an existing national system. This should allow existing data to be transferred to the new coding system.
At present the amount of detail recorded varies between countries. The choice of features to be recorded and the extent of detail to be included is left to the employing authority.
Before the standard can be fully applied, extensive retraining of operators and modification of software will be necessary.

1 Scope

This European Standard is applicable to the establishment of the condition of drain and sewer systems by inspection, status codification and consideration of external factors and other information.
It is applicable to drain and sewer systems, which operate essentially under gravity, from the point where the sewage leaves a building or roof drainage system, or enters a road gully, to the point where it is discharged into a treatment works or receiving water. Drains and sewers below buildings are included provided that they do not form part of the drainage system of the building.
This part of the European Standard specifies a coding system for the description of the internal condition of drains, sewers, manholes and inspection chambers identified through visual inspection. Where appropriate, it can also be used for pressure and vacuum systems in accordance with the requirements of the employing authority.
This part of the European Standard does not generally specify requirements for carrying out inspections.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).
EN 476;1997, *General requirements for components used in discharge pipes, drains and* sewers *for gravity systems.*
EN 752-1:1995, *Drain and sewer systems outside buildings-Part 1: Generalities and definitions.*
EN 752-5:1997, *Drain and sewer* systems *outside buildings - Part 5: Rehabilitation.*
ISO 8601, *Data elements and interchange formats - Information interchange - Representation of dates and* times.

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply:

NOTE These definitions are general terms. Other specific terms are defined in the text.

3.1 adjusting construction

part of a manhole or inspection chamber between the cover and frame and the shaft. This is used to adjust the level of the cover and frame to accord with the required surface level

3.2 backdrop manhole
manhole with a connection, by means of a vertical pipe, at or just above invert, from a drain or sewer at a higher level
[EN 752-1:1995]

3.3 benching near horizontal surface adjacent to the channel in a manhole or inspection chamber, or **a** large sewer

3.4 chamber part of a manhole or inspection chamber providing working space above the channel

3.5 chamber unit
component part of a manhole or inspection chamber manufactured as a single entity and intended to be joined with other chamber units

3.6 combined system
sewer system designed to carry both wastewater and surface water in the same pipeline(s) [EN 752-1:1995]

3.7 connection general term used for the location at which one pipeline joins another pipeline or a manhole or inspection chamber

3.8 drain pipeline, usually underground, designed to carry wastewater and/or surface water from a source to a sewer
[EN 752-1:1995]

3.9 drain system
network of pipelines and ancillary works that conveys wastewater and/or surface water to a cesspool, sewer system or other place of disposal
[EN 752-1:1995]

3.10 employing authority
organisation which owns or is responsible for the inspection of a drain or sewer system

3.11 exfiltration escape of flow from a drain or sewer system into surrounding ground [EN 752-1:1995]

3.12 gradient ratio between the vertical and the horizontal projections of a pipe length [EN 752-1:1995]

3.13 gravity system
drain or sewer system where flow is caused by the force of gravity and where the pipeline is designed normally to operate partially full
[EN 752-1:1995]

3.14 groundwater water present in the sub-surface strata (EN 752-1:1995]

3,15 infiltration ingress of groundwater into a drain or sewer system [EN 752-1:1995]

3.16 inspection chamber
chamber with a removable cover constructed on a drain or sewer that provides access from surface level only, but does not permit entry of a person
[EN 752-1:1995]

3.17 invert lowest point of the internal surface of the barrel of a pipe or channel at any cross section [EN 476:1997]

3.18 joint location at which the ends of two adjacent pipe units are joined together longitudinally

3.19 junction connection made using a prefabricated junction pipe unit

3.20 landing intermediate rest platform used to limit the height of a run of steps in a manhole

3.21 manhole chamber with a removable cover constructed on a drain or sewer to permit entry by personnel [EN 752-1:1995]

3.22 node manhole, inspection chamber, outfall, rodding eye or other significant intermediate point

3.23 outfall final length of pipeline from which sewage is discharged to a treatment works or receiving water (EN 752-1:1995]

3.24 pipe unit component part of a drain or sewer manufactured as a single entity and intended to be joined with other pipe units

3.25 pipeline assembly of pipes, fittings, masonry and insitu concrete units and joints between manholes or other structures.

3.26 pipeline length

continuous section of drain or sewer between two adjacent nodes

3.27 pipe unit length

length of a manufactured pipe unit used in the construction of a pipeline

3.28 ramp manhole

manhole with a steeply inclined pipe or channel from a drain or sewer at a higher level [EN 752-1:1995]

3.29 receiving water

any body of water such as the sea, a river, stream or lake as well as an aquifer into which drain or sewer system; discharge

[EN 752-1:1995]

3.30 rehabilitation all measures for restoring or upgrading the performance of existing drain and sewer systems [EN 752-1:1995]

3.31 repair rectification of local damage

[EN 752-5:1997]

3.32 rising main

pipe through which sewage is pumped [EN 752-1:1995J

3.33 sewage wastewater and/or surface water conveyed by a drain or sewer [EN 752-1:1995]

3.34 sewer pipeline or other construction

than one source [EN 752-1:1995]

usually underground, designed to carry wastewater and/or surface water from more

3.35 sewer system

network of pipelines and ancillary works which conveys wastewater and/or surface water from drains to a treatment works or other place of disposal

[EN 752-1:1995]

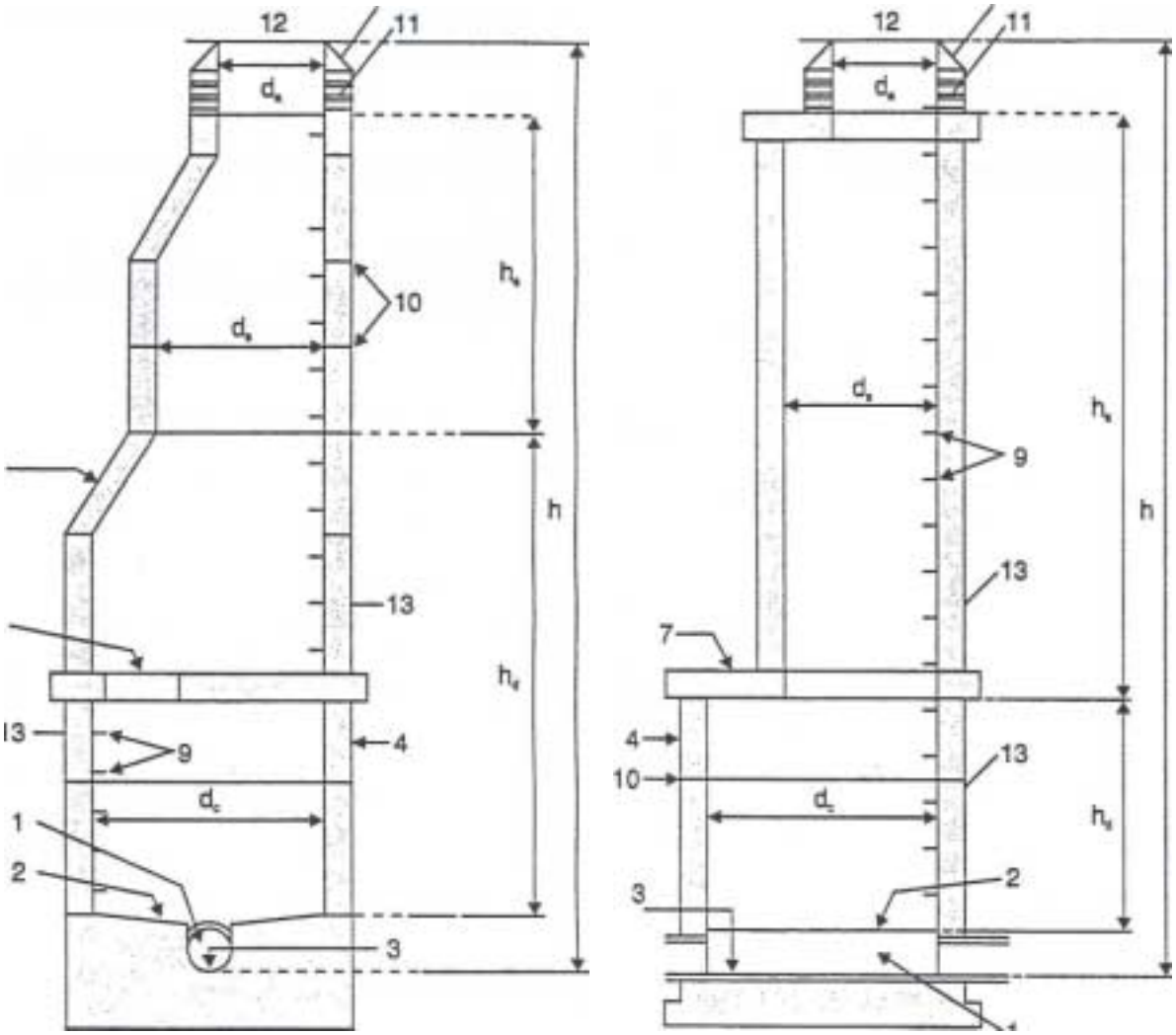
3.36 shaft upper part of a manhole or inspection chamber between the adjusting construction and the chamber

3.37 surface water

water from precipitation, which has not seeped into the ground and which is discharged to the drain or sewer system directly from the ground or from exterior building surfaces

3.38 taper part of manhole or inspection chamber where the cross sectional area changes gradually

3.39 wastewater water changed by use and discharged to a drain or sewer system (EN 752-1:1995]



Key

1	Channel	8	Manhole top (cover and frame)	h	Depth to invert
2	Benching	9	Step	h_s	Depth of shaft
3	Invert	10	Sealing material	h_s	Depth of shaft
4	Chamber unit	11	Adjusting construction	d_a	Access diameter/size
5	Taper	12	Cover level	d_s	Shaft diameter/size
6	Landing diameter/size	13	Manhole wall	d_c	Chamber
7	Reducing slab				

Figure 1 - Illustration of terms relating to manholes

4 Sources of additional information

This standard specifies a coding system for visual inspection of drain and sewer systems. For further guidance on the execution of visual inspection in various countries reference should be made to national documents until such time as fully comprehensive European Standards are available.
The documents listed in annex H contain details, which can be used in the framework of this part.

5 General

5.1 Purpose

EN 752-5 recommends the use of a uniform standard coding system to ensure that results from visual inspection can be compared. This part of this standard specifies a system, which can be used to objectively record the visual information from the inspection. it does not include methods for assessing the condition of the drain or sewer as this requires subjective judgements and the use of additional information.
The coded information can be used for one or more of the following purposes:
- to assess the performance deficiencies as part of the development of a rehabilitation plan (see EN 752-5:1997, clause 7);
- to provide information for use in the planning of maintenance activities, e.g. sewer cleaning programmes (see EN 752-7:1998, clause 6);.
- to investigate specific maintenance or operational problems (see EN 752-7:1998, clause 8);
- the recording of inventory data (see EN 752-5:1997, clause 7)

5.2 Methods

The visual inspection can be carried out in one of the following ways:
- inspection of the pipeline from within the pipeline;
- inspection of the pipeline from within the manhole or inspection chamber;
- inspection of the manhole or inspection chamber from within the manhole or inspection chamber;
- inspection of the manhole or inspection chamber from the surface.

Several inspection techniques can be used such as:
- remotely controlled CCTV camera;
- man entry;
- mirrors;
- photographic camera.

The personnel involved in inspection work shall be adequately trained in the inspection methods and in the coding system.
The inspection shall be carried out sufficiently slowly to enable ail features to be observed. Where a closed circuit television camera is used, the camera should only be moved along the pipe when the lens is pointing forward in the direction of the axis of the sewer**.**
The relevant authority can prescribe requirements regarding the health, safety and welfare of the public and/or personnel. The work should be carried out in accordance with EN 752-7:1998, clause 11.

5.3 The use of the coding system

The coding system specified in this European Standard for drains and sewers is described in clauses 6, 7 and 8. The coding system specified in this European Standard for manholes and inspection chambers is described in clauses 9, 10 and 11. Colour photographs showing examples of some observations are included to illustrate the use of the coding systems (see annex F and annex G).
Each observation is described by a main code comprising three letters and additional information. The first letter of the main code describes the application of the code (i.e. to a pipeline see clause 6 or to a manhole or inspection chamber see clause 10). The second letter indicates the type of code (see 8.1,2 and 11.1.2). The third letter determines the specific observation (see 8.1.3 and 11.1.3)**.**
Where different observation types occur at the same point then each defect or feature shall be coded separately
The defects, features and the general condition shall be coded in accordance with this standard and should be supported either with photographs or by a video recording.

5.4 National equivalent coding systems

The codes used in this standard are independent of any language. In order to make the codes more memorable or more compatible with existing systems, a list of national equivalent codes may be produced. Where these are produced, a table of equivalence should be included in a national annex to this standard. Only the language independent codes specified in this standard can be used with the electronic data transfer format described in annex B.
Rules for national equivalent coding systems are given in annex A.

5.5 Data transfer

The coded information is frequently transferred between databases. A recommended format for data transfer, using this coding system, is included in annex 8.

5.6 Information to be supplied by the employing authority

The coding systems are intended to provide a comprehensive choice of codes to allow the inspector to describe the drains, sewers, manholes or inspection chambers as required by the employing authority. The codes are only to be used as directed by the employing authority who may decide which features are to be recorded.
The employing authority should specify the following from the options available in this standard:

a) Header information
   - i) The coding system to be used for recording header information (e.g. national equivalent system or annex C or D)
   - ii) Which of the optional header information items is to be recorded (see 7.2 and 10.2)
   - iii) The reference points to be used for the longitudinal location in inspections of drains and sewers (see 8.1.7) and the vertical and circumferential location in manholes and inspection chambers (see 11.1.5 and 11.1.8).

b) The information about the individual observations.
   - i) Whether the coding system to be used is the system described in clause 8 or clause 11 of this standard or a specified national equivalent system in accordance with 5.4.

ii) The types of observations to be recorded. (These observations shall be recorded in accordance with the coding systems described in clause 8 and clause 11, or a national equivalent system in accordance with 5.4).

iii) The level of detail required in accordance with clause 8 and clause 11 - by specifying for each code:

- whether quantification information, longitudinal, vertical, circumferential location information, whether the fact that the observation is associated with a joint, is to be recorded;
- whether quantification information is to be recorded as a single value or as a band;
- if bands are to be used, the ranges of values be included in each band;
- the tolerances to be used for estimation and/or measurement of values.
-

6 Drains and sewers - Coding system

The coding system for drains and sewers comprises a series of codes which shall be used to describe the defects and features found in the drain or sewer. A separate report shall be prepared for each pipeline length: The information recorded is of two main types.

- Header information - relating to the pipeline as a whole. This is described in clause 7 and annex C. AII codes for these start with the letter A.
- Information about individual observations within the drain or sewer. This is described in clause 8. All codes for these start with the letter B.

7 Drains and sewers - Header information

7.1 Requirements

Header information is entered at the start of the inspection. The following information shall be recorded.

a) The pipeline length identification, by pipeline reference and/or the two node references. Alternatively, where the pipeline length is a lateral connected to another pipeline without a chamber, the node at the junction with the main pipeline may be defined using the reference of the main pipeline and the distance from the start.
b) The direction of the inspection.
c) A textual description of the location.
d) The coding system.
e) The longitudinal reference point (if recording longitudinal location).
f) The method of inspection.
g) The date of inspection.
h) Whether the drain or sewer was pre-cleaned.
i) Any other information required by the employing authority.

7.2 Other header information

Other information may include:

- type of location;
- name of employing authority;
- name of town, village, district or sewer system;

- land ownership.
- original coding system (where older data is converted)
- time of inspection;
- name of inspector;
- job reference;
- video storage details;
- photograph storage details;
- purpose of inspection;
- cross section;
- material;
- lining details;
- pipe unit length;
- depth to invert of upstream and downstream nodes ,
- type of drain or sewer (e.g. gravity sewer or rising main);
- type of effluent (e.g. wastewater or surface water);
- year of construction;
- strategic importance;
- precipitation;
- temperature;
- flow control measures;
- atmosphere within the pipeline.

Any changes to header information identified during the course of the inspection shall be recorded. A recommended coding system for the header information is given in annex C.
If the header information is coded in accordance with annex C, the recommended data transfer format described in annex B can be used.

8 Drains and sewers – Codes

8.1 Introduction

8.1.1 General

Each observation shall be recorded using a main code (see 8.1.2) that broadly describes the feature, together with the following additional information where required.

- Characterisation - up to two codes which describes the feature in more detail. (see 8.1.3)
- Quantification - up to two values which quantify the feature (see 8.1.4).
- Circumferential location - up to two clockface references which locate the position of the observation around the circumference (see 8.1.5).
- Joint - identifies when the observation is associated with a joint (see 8.1.6).
- Longitudinal location - the distance from the stated reference point including a method of recording observations which continue over a significant length (see 8.1.7).
- Photograph reference (see 8.1.8):
- Video reference (see 8.1.9).
- Remarks - text which describes aspects of the observation which cannot be described any other way. (see 8.1.10)

The employing authority may specify which observations are to be recorded and the amount of detail that is recorded for each observation (see 5.6).
An example of the record for a longitudinal crack at the top of the pipe 10.5 metres from the start point is shown in Table 1 (see 8.2).

Table 1

Main Code	Characterisation		Quantification	Circumferential location	Joint	Longitudinal location	Video ref.	Remarks
BA8	B	A		12		10.5	00:10:30	

An example of the record for a 100 mm diameter intruding lateral connection (intruding half of the diameter of the main pipe) 16.5 metres from the start point is shown in Table 2.

NOTE Two codes are necessary to describe the feature (see 8.2 and 8.4).

Table 2

Main Code	Characterisation		Quantification	Circumferential location	Joint	Longitudinal location	video ref.	Remarks
BCA	E	A	100	9		16.5	00:12:20	
BAG			50	9		16.5	00:12:20	

NOTE For clarity the photograph reference has not been included in these examples.

8.1.2 Main code

The main codes which are used to describe the observations are listed in 8.2 to 8.5 together with a description of the observation and the use of the code. No observation shall be recorded without using one of these codes.
For clarify these codes have been grouped under 4 headings and the second letter indicates the respective group:
- Codes relating to the fabric of the pipeline (codes BA),
- Codes relating to the operation of the pipeline (codes BB),
- Inventory codes (codes BC),
- Other Codes (codes BD).

This is entirely for editorial purposes and the headings should not be used to interpret or otherwise restrict the meaning of the codes.

8.1.3 Characterisation

Codes are given to further describe the observation. Up to two types of characterisation are given for each observation type. They shall be recorded in the order in which they are given.
When required by the employing authority, and where an observation cannot be observed (for example, if it is not possible to see corrosion in an uncleaned sewer) the code YY shall be used as a first characterisation code.
Only characterisation codes listed in this standard may be used.

8.1.4 Quantification

Up to two values shall be recorded as specified in 8.2 to 8.5.
Unless these clauses specify the use of the two quantification values differently, the two values may be used to record a band, by specifying the lower and upper limits (e.g. 10% to 15%).

8.1.5 Circumferential location

Where specified in 8.2 to 8.5, the position of the observation shall be recorded using the clockface reference. The clockface is determined from the angle subtended at the centre of the cross section (the point defined by half the height and half the width (see Figure 2) between the observation and the soffit of the pipeline.

Figure 2 - **Examples of definition of the centre of the cross section**

The clockface reference shall be determined by reference to Table 3.

An observation at the centre of the soffit of a sewer would therefore be described as being at 12 o'clock.

Where 8.2 to 8.5 require that the start and finish clockface references are given these shall be in the clockwise direction. Where 8.2 to 8.5 require only a single clockface reference this shall relate to the centre of the observation.

Where an observation is repeated around the circumference of the pipeline, at the same longitudinal location, each occurrence of the observation shall be coded separately.

Table 3-Values of clockface references

Angle (degrees)	Clockface reference
0 +/- 15	12
30 +/- 15	01
60 +/- 15	02
90 +/- 15	03
120 +/- 15	04
150 +/- 15	05
180 +/- 15	06
210 +/- 15	07
240 +/- 15	08
270 +/- 15	09
300 +/- 15	10
330 +/- 15	11
360 +/- 15	12

Examples of the use of clockface references are given in Figure 3.

Figure 3 - Examples of clockface references

8.1.6 Observation at joint

Where an observation occurs at a joint between two adjacent pipe units this shall be recorded using the code (A) where required.

8.1.7 Longitudinal location

The location of each observation shall be specified by stating the distance in metres from the reference point (see 7.1 e)). The reference point shall be one of the following.

a) The inside face of the wall of the starting node, (manhole, inspection chamber or outfall etc.) at the point where the drain or sewer passes through the wall.

b) The soffit of the end of the pipeline length inside the starting node. This will be the same point at described in a) above except where the pipe projects into the manhole.
c) The centre of the starting manhole or inspection chamber.
d) The midpoint of the incoming and outgoing pipes, measured along the channel.

Where observations continue over a length of more than 1 m, the start and finish of the observation shall be recorded separately, using a continuous observation code containing A (start) or B (finish) and a numeric label which identifies all references to the same observation

Measurements shall be recorded in metres to one decimal place.

8.1.8 Photograph reference

A reference to identify any still photographs or still computer images shall be recorded against an observation wherever a photograph is taken. If the photograph is of no coded feature the General photograph (BDA) code shall be used.

8.1.9 Video location reference

Where the inspection is recorded on video, a reference which allows the observation to be located on the video sequence shall be recorded. The method of locating used shall be stated in the header information in accordance with clause 7. Where a time based method is used, the time shall be recorded in accordance with ISO 8601 in a hh:mm as format.

8.1.10 Remarks

Where an observation cannot be fully described by a code, further details should be recorded in the remarks section. A remark should be as short and descriptive as possible.

8.2 Codes relating to the fabric of the pipeline

Table 4 - **Details of codes relating to the fabric of the pipeline**

Main Code	Additional information	Description
Deformation		
BAA		The cross sectional shape of the pipeline has been deformed from its original shape. The employing authority may specify whether this code is to be used either for flexible pipes only, or for pipes of all materials.
	Characterisation	The orientation of the deformation: - vertical (A) -the height of the pipe has been reduced - horizontal (B) - the width of the pipe has been reduced.
	Quantification	The percentage change in the dimension which reduces.
	Circumferential location	If the deformation is localised then the circumferential location should be recorded.
Fissure		
BAB		
	Characterisation 1	The nature of the fissure : - surface crack (A)-a crack only in the surface; - crack (B) - crack lines visible on the pipe wall, pieces still in place;

- fracture (C) - crack visibly open in a pipe wall, pieces still in place.

Characterisation 2 The orientation of the fissure:
- longitudinal (A) - A crack or fracture which is mainly parallel to the axis of the pipe;
- circumferential (B) - A crack or fracture which is mainly around the circumference of the pipe;
- complex (C) - A group of cracks or fractures which cannot be described as longitudinal or circumferential;
- helical (D).

Quantification The width of the fissure in millimetres.

Circumferential location The position should be recorded.

Break/Collapse
BAC

Characterisation The nature of the break or collapse:
- break (A) - pieces of pipe visibly displaced but not missing;
- missing (B) - missing pieces of wall;
- collapse (C) - complete loss of structural integrity.

Quantification The length of the break or collapse in millimetres where this is less than 1000 mm.
NOTE Where the length is longer than 1 m longitudinal locations of the start and finish of the break or collapse are recorded in accordance with 8.1.7.

Circumferential location The position should be recorded.

Defective brickwork or masonry
BAD Individual bricks or masonry units from the fabric of a brick or masonry drain or sewer have moved from their original position.

Characterisation 1 The extent of displacement:
- displaced (A) - bricks or masonry units still present but displaced from their original position.
- missing (B) - bricks or masonry units missing from their original position.
- dropped invert (C) - A section of the invert of a brick or masonry pipeline has dropped in relation to the walls leaving a gap of more than 20 mm.
- collapse (D)-complete loss of structural integrity.

Characterisation 2 Where bricks or masonry units are missing :
- another layer of brickwork or masonry visible (A) - though the hole left by the missing brickwork.
- nothing is visible (B) - It is not possible to determine what is exposed by the missing brickwork or masonry.

Where soil is visible, or a void is visible the codes BAO or BAP are also required.

Quantification For a dropped invert, the depth of drop in millimetres.

Circumferential location The position should be recorded.

Missing mortar
BAE All or part of the mortar from brickwork or masonry is missing.

Quantification The depth, in millimetres, from the surface of the brickwork or masonry to the surface of the mortar.

Circumferential location The position should be recorded.

Surface damage
BAF The surface of the pipeline has been damaged by chemical (including corrosion of metal pipes) or mechanical action.

Characterisation 1 The type of damage:
- increased roughness (A);
- spalling (break in away of small fragments from the surface of the fabric (B);
- visible aggregate (C);

- aggregate projecting from surface (D);
- missing aggregate (E);
- visible reinforcement (F);
- reinforcement projecting from surface (G);
- corroded reinforcement (H);
- missing wall (I);
- corrosion products on surface (J);
- other surface damage (Z) - further details should be recorded in the remarks section.

Characterisation 2 The cause of the damage:
- mechanical damage (A);
- chemical attack-general (e.g. corrosion of reinforcement) (B);
- chemical attack - biochemical attack due to sulphuric acid - damage above the water level (C).
- chemical attack - attack by wastewater - damage below the water level (D)
- cause not evident (E).

Circumferential location: The position should be recorded.

Intruding connection

BAG A connecting pipe projecting into the pipeline, obstructing the cross-sectional area. Where this code is used, the connection code BCA is also required.

Quantification: The length of the intrusion expressed as a percentage of the diameter or vertical dimension of the pipeline.

Circumferential location: The position of the centre of the connection should 6e recorded.

Defective connection

BAH A connection is defective. Where this code is used the connection code BCA is also required.

Characterisation: Type of defect:
- the position of the connection is incorrect (A);
- there is a gap between the end of connecting pipe and the main pipe (B);
- there is a partial gap (around part of the circumference of the connecting pipe) between the end of connecting pipe and the main pipe (C);
- the connecting pipe is damaged (D);
- the connecting pipe is blocked (E).
- other (Z) -further details should be recorded in the remarks section.

Circumferential location: The position of the centre of the connection, should be recorded.

Intruding sealing material

BAI All or part of the material used to seal a joint between two adjacent pipes is intruding into the pipeline.

Characterisation 1 The type of sealing material:
- sealing ring (A);
- other sealant (Z) - further details should be recorded in the remarks section.

Characterisation 2 Where the seal is a ring, record whether it is loop :
- visibly displaced but not intruding into the pipe (A);
- hanging but not broken (B) - lowest point above the horizontal centreline;
- hanging but not broken (C) - lowest point below the horizontal centreline;
- broken (D).

Quantification: Where the seal is not a ring, the reduction in cross sectional area expressed as a percentage.

Circumferential location: The position should be recorded.

Displaced joint

BAJ Adjacent pipes are displaced from their intended position in relation to each other. Longitudinal displacements of less than 10 mm shall not be recorded.

	Characterisation	The type of displacement: - longitudinal (A) -the pipes are displaced parallel to the line of the sewer; - radial (B)-the pipes are displaced in a direction at right angles to the line of the sewer; - angular (C) - the axes of the pipes are not parallel.
	Quantification	The quantification measured as: - for longitudinal displacement - the distance between the end of the spigot and the inside of the socket of the adjacent pipe in millimetres. - for radial displacement-the distance of displacement in millimetres. - for angular displacements - the angle of displacement between the axes of the two pipes in degrees.
	Circumferential location	The direction of radial or angular displacement around the wall of the sewer. For example a radial displacement which appears as a step up in the invert in the direction of inspection should be 12 o'clock and a step down should be 6 o'clock. Similarly an angular displacement for an increase in upward gradient or a decrease in downward gradient vertically should be 12 o'clock.

Lining defect

BAK		The lining of the pipeline is defective.
	Characterisation 1	The nature of the defect: - the lining of the pipeline has become detached (A). - discolouration of the lining (B); - defective end of lining (C); - wrinkled lining (D); - blistered lining (E); - other lining defect (Z) - details should be recorded in the remarks section.
	Characterisation 2	For wrinkled linings the orientation: - longitudinal (A) - wrinkling mainly parallel to the axis of the pipe; - circumferential (B) - wrinkling mainly around the circumference of the pipe; - complex (C).
	Quantification	The reduction in cross-sectional area, expressed as a percentage.
	Circumferential location	The position should be recorded.

Defective repair

BAL		A repair has been carried out on the drain or sewer which now has a defect. Where this code is used the point repair code BCB is also required.
	Characterisation	The type of defect: - part of the wall is missing (A); - a patch seating a hole deliberately made in the pipe wall has become defective (B); - other (Z) - further details shall be recorded in the remarks section.

Weld failure

BAM		A failure in a weld in the fabric of the pipeline.
	Characterisation	The orientation of the failure: - longitudinal (A) - A failure which is mainly parallel to the axis of the pipe; - circumferential (B) - A failure which is mainly around the circumference of the pipe; - helical (C).
	Circumferential location	For longitudinal failures record the position. For circumferential and helical failures record the start and finish points.

Porous pipe

BAN		The pipe material is seen to be porous (e.g. due to a manufacturing defect).
	Circumferential location	The position should be recorded.

Soil visible through defect

BAO	The soil outside the pipe is visible through a defect.

Void visible through defect

BAP A void outside the pipe is visible through a defect.

8.3 Codes relating to the operation of the pipeline

Table 5 - Details of codes relating to the operation of the pipeline

Main Code	Additional information	Description
Roots		
BBA		Roots of trees or other plants growing into the pipeline through joints, defects or connections.
	Characterisation	The type of root: - tap root (A); - independent fine roots (B); - complex mass of roots (C).
	Quantification	The reduction in cross-sectional area expressed as a percentage.
	Circumferential location	The position should be recorded.
Attached deposits		
BBB		Material attached to the wall of the pipeline.
	Characterisation	The type of material: - encrustation (A); - grease (B); I - fouling (C) (e.g. organisms attached to the wall of the pipe); - other (Z) - further details should be recorded in the remarks section.
	Quantification	The reduction in cross-sectional area expressed as a percentage.
	Circumferential location	The position should be recorded.
Settled deposits		
BBC		Deposited material in the invert of the pipeline.
	Characterisation	The type of material: - fine (A) (e.g. sand, silt); - coarse (B) (e.g. rubble, gravel); . - hard or compacted material (C) (e.g. concrete); - other (Z) - further details should be recorded in the remarks section.
	Quantification	The depth of the deposit, as a percentage of the vertical dimension of the pipeline.
	Circumferential location	The position should be recorded.
Ingress of soil		
BBD		Soil from the surrounding ground is intruding into the pipeline.
	Characterisation	The type of soil: - sand (A); - peat (B); - fine material (e.g. clay, silt) (C); - gravel (D); - other (Z) - further details should be recorded in the remarks section.
	Quantification	The reduction in cross sectional area expressed as a percentage.
	Circumferential location	The position of the soil around the wall of the sewer should be recorded.
Other obstacles		

BBE		Objects in the pipeline, obstructing the cross-sectional area. This code shall only be used where none of the other codes (BBA to BBD) are applicable.
	Characterisation	The description of the obstacle: - dislodged brick or masonry unit lying in invert (A); - pieces of broken pipe are lying in the invert (B); - another object lying in the invert (C); - protruding through the wall (D); - wedged in the joint (E); - entering through a connection/junction pipe (F); - external pipes or cables built through pipeline (G); - built into the structure (H).
	Quantification	The reduction in cross-sectional area expressed as a percentage.
	Circumferential location	The position should be recorded.
Infiltration		
BBF		The ingress of water through the wall of the pipe or through joints or defects.
	Characterisation	The extent of the flow: - sweating (A) -slow ingress of water- no visible drips; - dripping (B) - dripping in - not continuous flow; - flowing (C) - a continuous flow; - gushing (D)-entering under pressure.
	Circumferential location	The position of the point/area of entry should be recorded.
Exfiltration		
BBG		Visible leakage of flow out of the pipeline.
	Circumferential location	Where visible, the circumferential location.
Vermin		
BBH		Vermin actually observed.
	Characterisation 1	The type of animal: - rat (A); - cockroach (B); - other (Z) - further details should be recorded in the remarks section.
	Characterisation 2	The location of the vermin: - in the pipeline (A); - in a connection (B); - in an open joint (C); - other (Z) - further details should be recorded in the remarks section.
	Quantification	The number of animals observed at a single location.

8.4 Inventory codes

Table 6 - Details of inventory Codes

Main Code	Additional information	Description
Connection		
BCA		Another pipeline is connected to the pipeline being inspected. The employing authority may determine that where a connecting branch is equal to the size of the pipeline or where it is greater than a specified size, the location of a connection should be regarded as a node. It is assumed

that the majority of connections recorded using this code will be circular in section.

Characterisation 1 — The type of connection:
- junction (A) - a pipe unit with a prefabricated connection;
- saddle connection - drilled (B) - a connection made using a saddle fitting-hole made with a drill;
- saddle connection - chiselled (C) - a connection made using a saddle fitting - hole made with a chisel;
- plain connection - drilled (D) - a connection made without using any special fitting - hole made with a drill;
- plain connection - chiselled (E) - a connection made without using any special fitting - hole made with a hammer and chisel;
- connection other than a junction (F) (to be used where the detail necessary to classify the connection as either 8, C, D or E is not available).
- type of connection not evident (G).
- other type of connection (Z) - further details should be recorded inthe remarks section.

Characterisation 2 — A code to indicate whether the connection has been closed. This may indicate a junction provided during construction for future use, or it may indicate that the connection has been cut off. The method of coding is:
- connection open (A);
- connection closed (B).

Quantification 1 — The height of the connecting pipe in millimetres.

Quantification 2 — The width of the connection in millimetres if different from the height.

Circumferential location — The position of the centre of the connection should be recorded.

Remarks — For non-circular sections, the shape.

Point repair

BCB — A short section of drain or sewer has been repaired

Characterisation — The type of repair:
- pipe replaced (A);
- localised lining (B);
- injected mortar (C);
- other injected sealing material (D);
- hole repaired (E);
- other trenchless repair method (Z) - further details should be recorded in the remarks section.

Circumferential location — The position should be recorded.

Curvature of sewer

BCC — The route of the drain or sewer deviates. (To be used where the deviation does not involve angular displacement of joints between pipeline units.)

Characterisation 1 — The horizontal direction of the curvature:
- left (A);
- right (B).

Characterisation 2 — The vertical direction of the curvature:
- up (A);
- down (B).

Quantification — The total angle of deviation in degrees.

Start node type

BCD — Information about the node at the start of the inspection.

Characterisation — The type of node :
- manhole (A);
- inspection chamber (B);
- rodding eye (C);
- lamp hole (D);
- outfall (E);
- major connection without a manhole or inspection chamber (F);

		- other special chamber (Z) - further details should be recorded in the remarks section.
	Quantification 1	The node reference
	Quantification 2	The coordinates (grid reference) of the node.
Finish node		
BCE		Information about the node at the finish of the inspection
	Characterisation	The type of node: - manhole (A); - inspection chamber (B); - rodding eye (C); - lamp hole (D); - outfall (E); - major connection without a manhole or inspection chamber (F); - other special chamber (Z) - further details should be recorded in the remarks section.
	Quantification 1	The node reference.
	Quantification 2	The coordinates (grid reference) of the node.

Table 7- Details of other codes

Main Code	Additional information	Description
General photograph		
BDA		A still photograph has been taken to record the general condition of the drain or sewer and is not related to a particular feature (see 8.1.8).
	Circumferential location	The direction of the camera if the camera is not forward facing.
General remark		
BDB		A remark which cannot be included in any other way.
	Remark	The text of the remark
Inspection abandoned		
BDC		The inspection has been terminated before the intended finish node was reached. Where the reason is due to an obstruction this obstruction shall be coded separately using the appropriate main code.
	Characterisation	The reason for the termination: - obstruction (A); - high water level (B); - equipment failure (C); - other (Z) - further details should be recorded in the remarks section.
Water level		
BDD		The level of sewage above the invert of the drain or sewer.
	Characterisation	The sewage in the pipe is: - clear effluent (the invert is visible) (A); - turbid or discoloured effluent (B).
	Quantification	The level expressed as a percentage of the diameter or the vertical dimension.
Flow in incoming pipe		
BDE		Information about the flow in an incoming pipe. Where this is used the item for a connection (Code BCA) is also required.
	Characterisation 1	The flow in the incoming pipe is: - clear effluent (the invert is visible) (A); - turbid or discoloured effluent (B). If the flow in the incoming pipe is not visible because the water level in

		the main pipe is too high the characterisation code YY shall be used (See 8.1.3).
	Characterisation 2	The connecting pipe is: - wrongly connected because wastewater is observed discharging to a surface water drain or sewer (A); - wrongly connected because surface water is observed discharging to a wastewater drain or sewer (B); - not observed to be wrongly connected (C).
	Quantification	The water level in the connecting pipe, expressed as a percentage of the vertical dimension of the connecting pipe.
	Circumferential location	The position should be recorded.
Atmosphere within the pipeline		
BDF		A potentially hazardous atmosphere was encountered.
	Characterisation	The type of hazard detected as follows: - oxygen deficiency (A); - hydrogen sulphide (B); - methane (C); - other (Z) - further details should be recorded in the remarks section.
	Quantification 1	The percentage of the gas in the atmosphere, where this information is available.
	Quantification 2	Alternatively, the concentration of the gas in the atmosphere in ppm, where this information is available.
Loss of vision		
BDG		The view of the pipeline is obstructed.
	Characterisation	The reason for the obstruction: - camera is under water (A); - silt (B); - steam (C); - other (Z) - further details should be recorded in the remarks section.

9 Manholes and inspection chambers - Coding system

The coding system for manholes and inspection chambers is similar to that for drains and sewers. The details of coding are set out in 11.1. A separate report shall be prepared for each manhole or inspection chamber. The codes are of two main types.

- Header information - relating to the manhole or inspection chamber as a whole. This is described in clause 10 and annex D. Codes for these start with the letter C.
- Information about individual observations within the manhole or inspection chamber. This is described in clause 11. Codes for these start with the letter D.

10 Manholes and inspection chambers - Header information

10.1 Requirements

Header information is entered at the start of each inspection. The following information shall be recorded.

a) The node identification of the manhole or inspection chamber.
b) Textual description of the location.
c) Type of node.
d) The coding system.
e) The vertical reference point (if recording vertical location).
f) The circumferential reference point.

g) The method of inspection.
h) The date of inspection.
i) Any other information required by the employing authority.

10.2 Other header information

Other information may include:
- type of location;
- name of employing authority;
- name of town, village, district or sewer system;
- land ownership;
- original coding system (if converted from another coding system);
- time of inspection;
- name of inspector;
- job reference;
- video image storage details;
- photograph image storage details;
- material;
- chamber unit length;
- type of effluent;
- year of construction
- access details;
- cover details;
- steps details;
- strategic importance;
- cleaning;
- precipitation ;
- temperature
- water level;
- flow control measures;
- atmosphere within the chamber;
- special hazards (e.g. syphons, sudden drops);
- pipe within a pipe;
- flap valves;
- barrier plates or beams.

Any changes to the header information identified during the course of the inspection shall be recorded. A recommended coding system for the header information is given in annex D.
If the header information is coded in accordance with annex D, the recommended data transfer format described in annex B can be used.

11 Manholes and inspection chambers - Codes

11.1 Introduction

11.1.1 General

Each observation shall be recorded using a main code (see 11.1.2) that broadly describes the feature, together with the following additional information where required.

- Characterisation - up to two codes which describes the feature in more detail (see 11.1.3).
- Quantification - up to two values which quantify the feature (see 11.1.4).

- Circumferential location - up to two clockface references which locate the position of the observation around the circumference (see 11.1.5).
- Joint - identifies when the observation is associated with a joint between two adjacent prefabricated units (see 11.1.6).
- The descriptive location - a code describing the part of the manhole or inspection chamber affected (e.g. chamber or benching) (see 11.1.7).
- The vertical location - the distance from the stated reference point, including a method of recording observations which continue over a significant length (see 11.1.8).
- Photograph reference (see 11.1.9).
- Video reference (see 11.1.10).
- Remarks - text which describes aspects of the observation which cannot be described any other way (see 11.1.11).

The employing authority may specify which observations are to be recorded and the amount of detail that is recorded for each observation (see 5.6).

An example of the record for a longitudinal crack at the circumferential reference point of the shaft of the manhole or inspection chamber, 1.5 metres from the vertical reference point, is shown in Table 8 (see 11.2):

Table 8

Main Code	Characterisation		Quantification	Circumferential location	Joint	Descriptive location	Vertical location	Video ref.	Remarks
DAB	B	A		12		C	1.5	00:10:30	

An example of the record for an 100 mm diameter intruding lateral connection to the chamber, (intruding 50 mm into the chamber) 2,25 metres from the vertical reference point is shown in Table 9.
NOTE Three codes are necessary to describe the feature (see 11.4 and 11.2).

Table 9

Main Code	Characterisation		Quantification		Circumferential location	Joint	Descriptive location	Vertical location	Video ref.	Remarks
DCA	E		<node>	<node> 9			F	2.25	00:12:20	
DCG	A	A	100		9		F	2.25	00:12:20	
DAG			50		9		F	2.25	00:12:20	

NOTE For clarity the photograph reference has not been included in these examples.

11.1.2 Main code

The main codes which are used to describe the observations are listed in 11.2 to 11.5, together with a description of the observation and the use of the code. No observation shall be recorded without using one of these codes.
For clarity these codes have been grouped under 4 headings and the second letter indicates the respective group:
- Codes relating to the fabric of the manhole or inspection chamber (codes DA..);
- Codes relating to the operation of the manhole or inspection chamber (codes DB..);
- inventory codes (codes DC..);
- Other codes. (codes DD..)

This is entirely for editorial purposes and the headings should not be used to interpret or otherwise restrict the meaning of the codes.

11.1.3 Characterisation

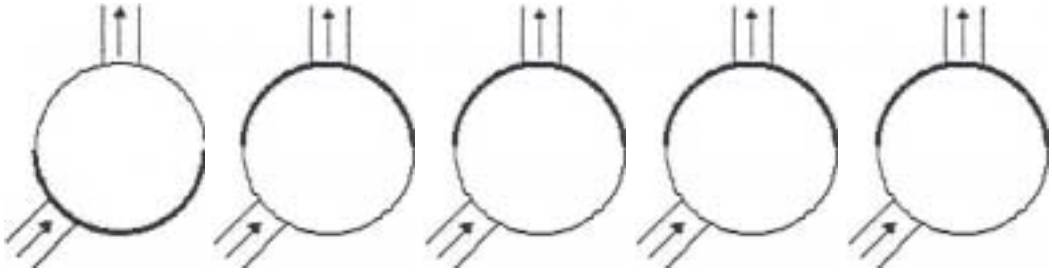
Codes are given to further describe the observation. Up to two types of characterisation are given for each observation type. They shall be recorded in the order in which they are given.
When required by the employing authority, and where an observation cannot be observed (for example if it is not possible to see corrosion in an uncleaned channel) the code YY shall be used as a first characterisation code.
Only characterisation codes listed in this standard may be used.

11.1.4 Quantification

Up to two values shall be recorded as specified in 11.2 to 11.5
Unless these clauses specify the use of the two quantification values differently, the two values may be used to record a band, by specifying the lower and upper limits (e.g. 10% to 15%).

11.1.5 Circumferential location

Where specified in 11.2 to 11.5, the position of the observation around the circumference of the manhole or inspection chamber shall be recorded using the clockface reference with reference to 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.
The clockface is determined from the angle subtended at the centre of the cross-section (the point defined by half the two horizontal dimensions of the cross section - see Figure 2) between the observation and the circumferential location of the lowest outgoing pipeline from the manhole or inspection chamber.
By defining the circumferential reference point, the employing authority determines whether the lowest outgoing pipeline is described as being at 6 o'clock or 12 o'clock (see 10 (t)). The circumferential reference point used shall be as stated in the header information as described in 10.1. Other details of the clockface reference system are as described in 8.1.5.
Examples of clockface references are given in Figure 4



Reference	6 o'clock	09 03	03 09	05 07	02 10	06
Point	12 o'clock	03 09	09 03	11 01	08 04	12

Figure 4 - Examples of clockface references in manholes and inspection chambers

Where an observation is repeated around the circumference of the manhole or inspection chamber at the same vertical location, each occurrence of the observation shall be coded separately.

11.1.6 Observation at joint

Where an observation occurs at a joint between two adjacent prefabricated chamber units this shall be recorded as using the code (A) where required.

11.1.7 Descriptive location

The location of the observation within the manhole or inspection chamber shall be recorded as follows (see Figure 1)

- Cover and frame (A);
- Adjusting construction (8);
- Shaft (C);
- Taper (D);
- Reducing slab (E);
- Chamber (F);
- Landing (G);
- Benching (H);
- Channel (I);
- Invert (J).

11.1.8 Vertical location

The location of each observation shall be specified by stating either:
- the distance from the vertical reference point,
- or the level related to an agreed national or local datum.

The reference point shall be specified in the header information and should be one of the following:
- the invert of the lowest outgoing pipeline in the manhole or inspection chamber;
- the top surface of the cover.

Measurements shall be recorded in metres to two decimal places.

Where observations continue *over* a distance of more than 1 m, the start and finish of the observation shall be recorded separately, using a continuous observation code containing A (start) or B (finish) and a numeric label which identifies all references to the same observation.

11.1.9 Photograph reference

A reference to identify any still photographs or still computer images shall be recorded against an observation wherever a photograph is taken. If the photograph is of no coded feature the General Photograph (DDA) code shall be used.

11.1.10 Video location reference

Where the inspection is recorded on video, a reference which allows the observation to be located on the video sequence shall be recorded. The method of locating used shall be stated in the header information in accordance with clause 10. Where a time based method is used, the time shall be recorded in accordance with ISO 8601 in a hh:mm as format.

11.1.11 Remarks

Where an observation cannot be fully described by a code, further details should be recorded in the remarks section. A remark should be as short and descriptive as possible.

11.2 Codes relating to the fabric of the manhole or inspection chamber

Table 10- Details of codes relating to the fabric of the manhole or inspection chamber

Main Code	Additional Information	Description
Deformation		
DAA		The cross sectional shape of the manhole or inspection chamber has been deformed from its original shape. This can either be associated with other defects such as fissure or in flexible materials it may occur on its own.
	Characterisation	Whether the deformation is: - General (A) - affecting a large proportion of the wall of the manhole or inspection chamber; - Localised (B) - affecting a relatively small proportion of the wall of the manhole or inspection chamber.
	Quantification	The maximum percentage change in the dimension which reduces.
	Circumferential location	If the deformation is localised, then the position should be recorded.
Fissure		
DAB		
	Characterisation 1	The nature of the fissure: - surface crack (A) - a crack only in the surface; - crack (B) - crack lines visible on the wall, pieces still in place ; - fracture (C) -crack visibly open in wall, pieces still in place
	Characterisation 2	The orientation of the fissure: - vertical (A); - horizontal (B); - complex (C) - A group of cracks or fractures which cannot be described as vertical or horizontal ; - inclined (D); - helical (E).
	Quantification	The width of the observation in millimetres.
	Circumferential location	The position should be recorded.
Break/Collapse		
DAC	Characterisation	The nature of the break or collapse: - break (A) - pieces of wall visibly displaced but not missing; - missing (B)-missing pieces of wall; - collapse (C)-complete loss of structural integrity.
	Quantification	The length of the break or collapse in millimetres, where this is less than 1000 mm. NOTE Where the length is longer than in vertical locations of the start and finish of the observation are recorded in accordance with 11.1.8.
	Circumferential location	The position should be recorded.
Defective brickwork or masonry		
DAD		Individual bricks or masonry units from the fabric of a brick or masonry chamber have moved from their original position.
	Characterisation 1	The extent of displacement:

- displaced (A) - bricks or masonry units still present but displaced from their original position.
- missing (B) -bricks or masonry units missing.
- collapse (C) - complete loss of structural integrity.

Characterisation 2 Where bricks or masonry units are missing:
- another layer of brickwork or masonry is visible (A).
- nothing is visible (B) - It is not possible to determine what is exposed by the missing brickwork or masonry.

Where the soil is visible, or a void is visible the code DAO or DAP are required.

Circumferential location The position should be recorded.

Missing mortar

DAE All or part of the mortar from brickwork or masonry is missing.

Quantification The depth, in millimetres, from the surface of the brickwork or masonry to the surface of the mortar.

Circumferential location T he position should be recorded.

Surface damage

DAF The surface of the manhole or inspection chamber has beer, damaged by chemical (including corrosion of metal) or mechanical action.

Characterisation 1 The type of damage:
- increased roughness (A);
- spalling (breaking away of small fragments from the surface of the fabric) (B)
- visible aggregate (C);
- aggregate projecting from surface(D);
- missing aggregate (E);
- visible reinforcement (F);
- reinforcement projecting from surface(G);
- corroded reinforcement (H);
- missing wall (I);
- corrosion products on surface (J);
- other surface damage (~ - further details should be recorded in the remarks section.

Characterisation 2 The cause of the damage:
- mechanical damage (A);
- chemical attack-general (e.g. corrosion of reinforcement) (B);
- chemical attack - biochemical attack due to sulfuric acid - damage above the water (C).
- chemical attack - attack by wastewater - damage below the water level (D).
- cause not evident (E).

Circumferential location The position should be recorded.

Intruding connection

DAG A connecting pipe projecting into the manhole or inspection chamber. Where this code is used the items for a connection (codes DCA and DCG) are also required.

Quantification The length of the intrusion in millimetres shall be recorded.

Circumferential location The position of the centre of the connection should be recorded.

Defective connection

DAH A connection is defective. Where this code is used the items for a connection
(codes DCA and DCG) are also required.

Characterisation The type of detect:
- the position of the connection is incorrect (A);
- there is a gap between the end of connecting pipe and the wall of the manhole or inspection chamber (B);

- there is a partial gap (around part of the circumference of the connecting pipe) between the end of connecting pipe and the wall of the manhole or inspection chamber (C);
- the connecting pipe is damaged (D);
- the connecting pipe is blocked (E).
- other (Z) -further details should be recorded in the remarks section.

Circumferential location: The position of the centre of the connection should be recorded.

Intruding sealing material

DAI All or part of the material used to seal a joint between two adjacent chamber units is intruding into the manhole or inspection chamber.

Characterisation 1: The type of sealing material:
- sealing ring (A);
- other sealant (Z) - further details should be recorded in the remarks section.

Characterisation 2: Where the seal is a ring, record whether it is a loop:
- visibly displaced but not intruding into the chamber(A);
- hanging but not broken(B);
- broken (C).

Quantification: Where the seal is not a ring, the reduction in cross sectional area expressed as a percentage.

Circumferential location: The position should be recorded.

Displaced joint

DAJ Adjacent manhole or inspection chamber units are displaced from their intended position in relation to each other.

Characterisation: The direction of the displacement:
- vertical (A)-the units are displaced vertically;
- horizontal (B) -the units are displaced horizontally ;
- angular (C) - the axes of the units are not parallel.

Quantification: For vertical and horizontal displacements, the length of the displacement in millimetres. For angular displacements the maximum length of the displacement-between the units in millimetres.

Circumferential location: The direction of horizontal or angular displacement around the wall of the manhole or inspection chamber, For horizontal displacements the position is to be recorded by viewing the step from above.

Lining defect

DAK The lining of the manhole or inspection chamber is defective.

Characterisation 1: The nature of the defect follows:
- the lining has become detached (A);
- discolouration of the lining (B);
  defective end of lining (C);
- wrinkled lining (D);
- blistered lining (E);
- other lining defect (Z) further details should be recorded in the remarks section.

Characterisation 2: For wrinkled linings the orientation:
- vertical (A);
- horizontal (B);
- complex (C).

Quantification: The extent of the projection in millimetres.

Circumferential location: The position should be recorded.

Defective repair

DAL A repair has been carried out on the manhole or inspection chamber which now has a defect. Where this code is used a point repair code DCB is also required.

Characterisation 1: The type of defect:
- part of the wall is missing (A);

		- a patch sealing a hole deliberately made in the pipe wall has become defective (B). - other (Z) - further details should be recorded in the remarks section.
	Circumferential location	The position should be recorded.
Weld failure		
DAM		A failure in a weld in the fabric of the manhole or inspection chamber.
	Characterisation	The orientation of the failure: - vertical (A); - horizontal (B); - inclined (C) - helical (D).
	Circumferential location	For vertical failures record the position. For horizontal, helical and inclined failures record the start and finish points.
Porous wall		
DAN		The material forming the wall is seen to be porous (e.g. due to a manufacturing defect).
	Circumferential location	The position should be recorded.
Soil visible through defect		
DAO		The soil outside the wall of the manhole or inspection chamber is visible through a defect.
Void visible through defect		
DAP		A void outside the wall of the manhole or inspection chamber is visible through a defect.
Defective step or ladder		
DAQ		There is a defect in a step, ladder or toe hole.
	Characterisation	The type of observation: - loose step (A); - step missing (B); - step corroded (C); - step bent (D); - plastic encapsulation of step is broken (E); - ladder handrail corroded (F); - ladder support loose (G); - ladder support missing (H); - ladder support corroded (I); - ladder runner corroded (J); - defective toe hole (K); - ether(Z) -further details should be recorded in the remarks section.
	Quantification	The number of steps or toe holes that are defective.
Defective cover and frame		
DAR		There is a defect in the cover and frame. Where there is more than one defect in the cover and frame the code shall be repeated.
	Characterisation	The type of observation: - cover broken (A); - rocking cover (B) - cover missing (C); - frame broken (D); - frame loose (E); - frame missing (F); - cover below surface level (G); - cover above surface level (H); - other (Z) -further details should be recorded in the remarks section.
	Quantification	Where the cover is above or below the surface the difference in levels, in millimetres.

11.3 Codes relating to the operation of the manhole or inspection chamber

Table 11 - Details of codes relating to the operation of the manhole or inspection chamber

Main Code	Additional information	Description
Roots		
DBA		Roots of trees or other plants growing into the manhole or inspection chamber through joints, defects or connections.
	Characterisation	The type of root: - tap root (A); - independent fine roots (B); - complex mass of roots (C).
	Circumferential location	The position should be recorded.
Attached deposits		
DBB		Material attached to wall of the manhole or inspection chamber.
	Characterisation	The type of material: - encrustation (A); - grease (B); - fouling (C) (e.g. organisms attached to the wall of the manhole or inspection chamber); - other (Z) -further details should be recorded in the remarks section.
	Quantification	The thickness of the deposits in millimetres.
	Circumferential location	The position should be recorded.
Settled deposits		
DBC		Deposited material in the invert or on the benching.
	Characterisation	Type of material: - fine (A) (e.g. sand, silt); - coarse (B) (e.g. rubble, gravel): - hard or compacted material (C) (e.g. concrete). - other (Z)-further details should be recorded in the remarks section.
	Quantification	The depth of the material in millimetres.
	Circumferential location	The position should be recorded.
Ingress of soil		
DBD		Soil from the surrounding ground is intruding into the manhole or Inspection chamber.
	Circumferential location	The position should be recorded.
Other obstacles		
DBE		Objects in the manhole or inspection chamber. This code shall only be used where none of the other codes DBA to DBD are applicable.
	Characterisation	The description of the obstacle: - dislodged brick or masonry unit lying in the invert (A); - pieces of broken pipe are lying in the invert (B); - another object lying in the invert (C); - protruding through the wall (D); - wedged in the joint (E); - entering through a connection/junction pipe (F); - external pipeline or cable built through structure (G);

		- built into the structure (H).
	Quantification	The maximum dimension of the obstacle in millimetres. '
	Circumferential location	The position should be recorded.
Infiltration		
DBF		The ingress of water through the wall of the manhole or inspection chamber or through joints or defects in the wall, benching or channel of the manhole or inspection chamber.
	Characterisation 1	The extent of the flow: - sweating (A) - slow ingress of water - no visible drips; - dripping (B) - dripping in - not continuous flow; - flowing (C) - a continuous flow; - gushing (D)-entering under pressure.
	Characterisation 2	The means of entry of the infiltration: - through wall of manhole or inspection chamber (A); - through the space between a connecting pipe and the wall of manhole or inspection chamber at the invert (B); - through the space between a connecting pipe and the wall of manhole or inspection chamber above benching (C). I
	Circumferential location	The position of the point/area of entry should be recorded.
Exfiltration		
DBG		Visible leakage of flow out of the manhole or inspection chamber.
Vermin		
DBH		Vermin actually observed.
	Characterisation ~	The type of animal: - rat (A); - cockroach (B); - other (Z) - further details should be recorded in the remarks section.
	Characterisation 2	The location of the vermin: - in the manhole or inspection chamber (A); - in a connection (B); - in an open joint (C); - other (Z) -further details should be recorded in the remarks section.
	Quantification	The numbers of animals observed at a single location.

11.4 Inventory codes

Table 12 - Details of inventory codes

Main Code	Additional information	Description
Connection type		
DCA		A pipeline has been connected to the manhole or inspection chamber. This code primarily records the method of connection. Where this code is used a connecting pipeline code (DCG) is a(so required.
	Characterisation	The type of connection; - connection in benching (A); - free drop into channel (B); - backdrop (C); - internal drop pipe (D); - ramp connection (E); - ventilation pipe (F); - other (Z) - further details should be recorded in the remarks section.
	Quantification 1	The pipeline reference of the connecting pipe.
	Quantification 2	The reference of the next node.
	Circumferential	The position of the centre of the connection should be recorded.

location

Point repair

DCB		A manhole or inspection chamber has been repaired.
	Characterisation	The type of repair: - part of the wall replaced (A); - localised lining (B); - injection of sealing material (C) - other (Z) -further details should be recorded in the remarks section.
	Circumferential location	The position should be recorded.

Note: Codes DCC to DCF are not used

Connecting pipeline

DCG		Details of a pipeline connecting to the manhole or inspection chamber.
	Characterisation 1	The shape: - circular (A); - rectangular (B); - egg shaped (C); - U - shape (D) - circular invert and flat top with parallel sides; - arch shaped (E) - circular soffit and flat invert with parallel sides; - oval (F) - circular invert and soffit (of equal diameter) with parallel sides; - local section defined by the employing authority (The employing authority may define a number of such codes all prefixed X) - other (Z) - further details should be recorded in the remarks section.
	Characterisation 2	W whether the connection is incoming or outgoing or has been sealed: - connection discharges into the manhole or inspection chamber (A); - connection discharges from the manhole or inspection chamber (B); - connection closed (C).
	Quantification 1	The height in millimetres of the incoming pipeline.
	Quantification 2	The width in millimetres of the incoming pipeline. Where both dimensions are the same (e.g. circle) this is left blank.
	Circumferential location	The position of the centre of the connection should be recorded.

Benching

DCH		This is used to record the position and condition of the benching.
	Characterisation	The following information: - benching defective (A); - benching not defective (B).

Channel

DC1		This is used to record the position, dimensions and condition of the channel.
	Characterisation	The following information: - channel defective (A); - channel not defective (B).
	Quantification 1	The width of the channel.
	Quantification 2	The height of the channel.

Safety chains/bars

DCJ		This is used to record the location and condition of safety chains/bars on the outgoing connections.
	Characterisation	The following information: - safety chain present with no defects (A); - safety chain missing (with evidence that one was provided) (B); - safety chain defective (C). - safety chain in position but coated with debris (D); - safety bar present with no defects (E); - safety bar missing (with evidence that one was provided) (F); - safety bar defective (G); - safety bar in position but coated with debris (H)..

Flow control

DCK		An overflow weir or other control device is present.
	Characterisation 1	The *type* of control: - weir (A); - syphon (B); - orifice plate (C); - vortex flow control (D); - gate valve (E); - float operated gate valve (F); - measuring flume (e.g. venturi) (G); - flap valve (H); - screens (I); - other (Z) -further details should be recorded in the remarks section.
	Characterisation 2	Device is to control: - continuation flow (A); - overflow (B).
	Circumferential location	The normal direction of flow across the control.

Sealed pipe through manhole

DCL		There is a sealed pipe through the manhole or inspection chamber. The connections to the manhole or inspection chamber joined to each end of the sealed pipe should be coded using DCA and DCG.
	Characterisation 1	There is: - no access to the pipe (A); - access is provided - cover in place (B); - access provided - cover missing (C).
	Characterisation 2	The sealed pipe is: - defective (A); - not defective (B).

Grit trap under cover

DCM		This is used to record the presence of a grit trap (bucket) under the cover.
	Characterisation	The following information: - trap present with no defects (A); - trap missing (with evidence that one was provided) (B); - trap defective (C).

Silt pit in invert

DCN		There is a silt pit in the invert of the manhole or inspection chamber,
	Characterisation	The following information: - pit not defective (A); - pit defective (B).

Cross section

DCO	Characterisation	The shape of the horizontal (plan) cross-section of the manhole or inspection chamber as follows: - circular (A); - rectangular (B); - local section - code to be specified by the employing authority and prefixed by an X (e.g. XA) - other (Z)-further details should be recorded in the remarks section.
	Quantification 1	The length of the section in millimetres.
	Quantification 2	The width of the section in millimetres. (Not required where both dimensions are the same - e.g. circle)

11.5 Other codes

Table 13 - Details of other codes

Main Code	Additional information	Description

General photograph

DDA		A still photograph has been taken to record the general condition of the manhole or inspection chamber and is not related to a particular feature.
	Circumferential location	The direction of the camera.

General remark

DDB		A remark which cannot be included in any other way.
	Remark	The text of the remark.

Inspection abandoned

DDC		The inspection has been terminated before the completion. Where the reason is due to an obstruction this observation shall be coded separately using the appropriate main code.
	Characterisation	The reason for the termination: - unable to lift cover (A) - obstruction (B); - high water level (C); - equipment failure (D); - other (Z) - details should be recorded in the remarks section.

Water level

DDD		The level of the sewage in the manhole or inspection chamber.

Flow in connecting pipe

DDE		Information about the flow in the connecting pipe Where this is used the item for a connection (codes DCA and DCG) is also required.
	Characterisation 1	The flow in the connecting pipe is: - clear effluent (A); - turbid or discoloured effluent (B); If the flow in the connecting pipe is not visible because the water level in the manhole or inspection chamber is too high, the characterisation code YY shall be used (see 11.1.3).
	Characterisation 2	The connecting pipe is: - wrongly connected because wastewater is observed discharging to a surface water drain or sewer system (A); - wrongly connected because surface water is observed discharging to a wastewater drain or sewer (B); - not observed to be wrongly connected (C).
	Quantification	The water level in the connecting pipeline, as a percentage of the vertical dimension of the pipe.
	Circumferential location	The position of the centre of the connection should be recorded.

Atmosphere within the chamber

DDF		A potentially hazardous atmosphere was encountered.
	Characterisation	The type of hazard detected: - oxygen deficiency (A); - hydrogen sulfide (B); - methane (C); - other (Z) -further details should be recorded in the remarks section.
	Quantification 1	The percentage of the gas in the atmosphere where this information is available.
	Quantification 2	Alliteratively, the concentration of the gas in ppm in the atmosphere where this information is available.

Loss of vision

DDG		The view of the manhole or inspection chamber is obstructed.
	Characterisation	The reason for the loss of vision : - camera is under water (A); - silt (B);

- steam (C);
- other (Z) -further details should be recorded in the remarks section.

12 Documentation

The format of the inspection documentation shall be specified by the employing authority. The information from the inspection can be passed to the employing authority in one or more ways including:
- A report comprising the coded data in tabular form (see annex E);
- A report comprising the coded data with textual descriptions of the codes in tabular form;
- The coded data in electronic format (see annex B);
- Photographs or fixed images of the observations;
- A video recording of the inspection;
- A graphical representation of the positions of the observations.

Information of the type of documentation used in different countries can be found in the sources listed in annex H.
Where electronic data transfer is to be used the data should be supplied in accordance with annex B.

Annex A (normative) National equivalent coding systems

A.1 Header information

National equivalent coding systems for header information shall be capable of ~being used to record the information required in 7.1 and 10.1. They should also be capable of being used to record such other information specified in 7.2 and 10.2 as is normally required by employing authorities in the relevant country.
It is recommended that national equivalent codes for header information should be directly equivalent to one or more of the codes specified in annexes C and D.

A.2 Codes

National equivalent coding systems shall conform to the following:

a) National equivalent codes for recording features shall be directly equivalent to one or more of the codes specified in clauses 8 or 11.
b) Where a feature is not normally required in a country, the code for it may be omitted from a national equivalent coding system.
c) Where an item of characterisation for a particular feature is not normally required in a country, it may be omitted from the national equivalent coding system.
d) Where quantification information for a particular feature is not normally required in a country, it may be omitted from the national equivalent coding system.
e) Where the national equivalent code includes the quantification it shall use the same system of measurement and the same units as specified for the equivalent code in clauses 8 or 11 of this standard.
f) A national equivalent code may specify that the quantification information is to be recorded in bands and may specify the limits of those bands, and how they are referenced.[1]
g) The method of measurement of longitudinal or vertical location in a national equivalent coding system shall use the same system of measurement and the same units as specified in 8.1 or 11.1 of this standard,
h) The method of measurement circumferential location in a national equivalent coding system shall use the same system of measurement and the same units as specified in 8.1 or 11.1 of this standard.

National equivalent coding systems may include tolerances for the measurement or estimation of quantification and/or location and may refer to bands, grades or classes.

Additional national codes, with no equivalent code in this standard, shall not be included in a national equivalent coding system.

[1] Bands are sometimes called classes of grades

Annex B (informative) Format for electronic transfer of coded data

B.1 Introduction

This annex describes the format which should be used for electronic transfer of coded data. It assumes that the inspection header information is coded in accordance with annex C or annex D.

B.2 General

The file format should be variable length terminated with a carriage control character. Items of data in a record are separated by a field separator specified in the file header information (see 8.3).
The data shall be in 8 bit characters in accordance with the appropriate part of ISO 8859 for the language used in the remarks.
Where one file contains data for more than one pipeline length inspection, or manhole or inspection chamber inspection, the data should be separated by a separator record comprising the characters #Z.

B.3 File header information

The first part of the data for a pipeline length inspection or a manhole or inspections chamber inspection should contain information about the format of the data. Each item of data should appear on a separate record. Each record should be prefixed with the character # followed by the identification code for the information, the = sign and the code for the data. The header information is described in Table B.1.

Table B.1 - Field identifier codes

Identification	Description	Example
#A1=	The character set by reference to the appropriate part of ISO 8859. This should be in the format ISO-8858-X, where X is the part number. Examples of character sets used for a number of European languages are given in Table B.2.	#A1=ISO-8859-1
#A2=	The language code. This is used to indicate the language in which the remarks are written. The language code shall be as specified in ISO 639:1988. The codes for some of the languages commonly used in CEN member and affiliate countries are reproduced in Table B.2. For other languages reference shall be made to ISO 639-2:1998.	#A2=sv
#A3=	The field separator. This is a single character used to separate the items of data in a record.	#A3=;
#A4=	Decimal point. The character used for the decimal point (either . or ,)	#A4=,
#A5=	The text surround character. This is used before and after text fields where text contains the field separator character.	#A5= -

An example of a file in this format is given in Figure B.1 to Figure B.3.

Table B.2-Language Codes for some European Languages

Language	Code	Examples of character set used
Albanian	sq	ISO 8859-1:1998
Basque	eu	ISO 8859-1:1998

Breton	br	ISO 8859-1:1998
Bulgarian	bg	ISO 8859-5:1999
Byelorussian	6e	ISO 8859-5:1999
Catalan	ca	ISO 8859-1:1998
Croatian	hr	ISO 8859-2:1999
Czech	cs	ISO 8859-2:1999
Danish	da	ISO 8859-1:1998
Dutch	nl	ISO 8859-1:1998
English	en	ISO 8859-1:1998
Estonian	et	ISO 8859-13:1998
Faroese	fo	ISO 8859-1:1998
Finnish	fi	ISO 8859-1:1998
French	fr	I50 8859-1:1998
Friesian	fy	ISO 8859-1:1998
Galician	gl	ISO 8859-1:1998
German	de	ISO 8859-1:1998
Greek	el	ISO 8859-7:1998
Greenlandic	kl	ISO 8859-1:1998
Hungarian	hu	ISO 8859-2:1999
Icelandic	Is	ISO 8859-1:1998
Irish	ga	ISO 8859-1:1998
Italian	It	ISO 8859-1:1998
Latvian	Iv	ISO 8859-13:1998
Lithuanian	It	ISO 8859-13:1998
Macedonian	mk	ISO 8859-5:1998
Norwegian	no	ISO 8859-1:1998
Polish	pl	ISO 8859-2:1999
Portuguese	pt	ISO 8859-1:1998
Romanian	ro	ISO 8859-2:1999
Russian	ru	ISO 8859-5:1999
Serbian	sr	ISO 8859-5:1999
Slovak	sk	ISO 8859-2:1999
Slovenian	sl	ISO 8859-2:1999
Spanish	es	ISO 8859-1:1998
Swedish	sv	ISO H859-1:1998
Turkish	tk	1S0 8859-1:1998
Ukrainian	uk	IS0 8859-1:1998
Welsh	c	ISO 8859-14:1998

B.4 Inspection header information

The second part of the data contains the inspection header information. Drain or sewer header information should be coded in accordance with annex C and manhole or inspection chamber information should be coded in accordance with annex D.
The information should be written in one or more records each preceded by a header definition record giving the content of the following record.
The header definition record should be made up as follows:

a) The identification code #B followed by a two digit integer number starting with 01 for the first header definition record. 02 for the next etc., followed by the = sign.
b) The language appropriate independent header codes as specified in annex C or annex D, each followed by the field separator.

The inspection header information relating to this record, follows in the next record, in the order given each item separated by the field separator.
An example of a file in this format is given in Figure B.1 to Figure 8.3.

B.5 Inspection data

The third part of the data is the inspection data. This should be coded in accordance with clause 8 or clause 11 as appropriate. Only the language independent codes should be used. The first record is a single inspection data definition record, which determines the order in which the items of data are given in the subsequent records.
The inspection data definition record is made up of the identification code #C= followed by the codes for the data items used listed in the order in which they appear in the subsequent records. Each code should be separated by the field separator character. The codes for the data items are given in Table B.3.

Table B.3 - **Inspection data field codes**

Code	Description
A	Main code
B	Characterisation 1
C	Characterisation 2
D	Quantification 1
E	Quantification 2
F	Remarks
G	Circumferential location 1
H	Circumferential location 2
I	Longitudinal or vertical location
J	Continuous defect code
K	Joint
L	Descriptive location field (for manholes or inspection chambers);
M	Photograph reference;
N	Video reference;

Each subsequent record should contain the data for only one observation.

An example of a file in this format is given in Figures B.1 to 8.3.

B.6 Examples

#A1=ISC-8859-1 #A2=de
#A3=, #A4=. #AS-_" #B01=AAD,AAF,AAB,AAJ,AAK,AAL,ABA,ABC
"SD1445/1012","SD1445/1013", "SD144511012","HauptstraBe",B,A,"EN13508-2:2001",A
#B02=ABE,ABF,ABK,ABJ,ABL,ABM,ACA,ACB,ACC,ACH,ACJ,ADA,ADE B,"1997-12-
23",B,B,A,'HAUPT.JPG",AE,450„A,2.S,A,A,55 #C=I,J,A, B,C, D, E, F,G, H,M, N
1.2„BCA,A,A,150„,09„"HA01. W MF",00:02:15 10.2„BAB,B,A„,"beschrankt",12„"HA02.W MF",00:05:30
51.2„BCE„,"SD1445/1013"„„„00:07:55
Figure B.1 - **Example of data transfer format** - **German language**

#A1=ISO-8859-1:1998 #A2=en
#A3=, #A4=. #AS-= #BOt=AAD,AAF,AAB,AAJ,AAK,AAL,ABA,ABC _,
"SD144511012","SD1445/1013", "SD1445/1012","High Street",B,A,"EN13508-2:2001",A
#B02=ABE,ABF,ABK,ABJ,ABL,ABM,ACA,ACB,ACC,ACH,ACJ,ADA,ADE B,"1997-12-
23",B,B,A,"HIGH.JPG",AE,450„A,2.5,A;A,55 #C=I,J,A,B,C,D,E,F,G,H,M,N
1.2„BCA,A,A,150„,09„"HI01. WMF",00:02:15 10.2„BAB,B,A„,"localised",12„"HI02.WMF",00:05:30
51.2„BCE„,"SD1445/1013"„„„00:07:55
Figure B.2 - **Example of data transfer format** - **English language**

#A1=ISO-8859-1:1998 #A2=fr
#A3=, #A4=. #A5--" #BOt=AAD,AAF,AAB,AAJ,AAK,AAL,ABA,ABC
"SD1445/1012" "SD1445/1013", "SD1445/1012","Grande Rue",B,A,"EN13508-2:2001",A
#B02=ABE,ABF,ABK,ABJ,ABL,ABM,ACA,ACB,ACC,ACH,ACJ,ADA,ADE B,"1997-12-
23",B,B,A,"GRANDE.JPG",AE,450„A,2.S,A,A,55 #C=I,J,A,B,C,D,E,F,G,H,M,N
1.2„BCA,A,A,150„,09„"G R01. **W** MF",00:02:15 10.2„BAB, B,A„,"localise",12„"GR02. W MF",00:05:30
51.2„BCE„,"SD1445/1013"„„„D0:07:55
Figure B.3 - Example of data transfer format - French language

Annex C (informative) Recommended system for coding of header information for drains and sewers

C.1 Introduction

These codes are used to describe information about the pipeline length as a whole.
C.2 Location of the inspection
The requirements of 7.1 (a) and (b) can be met either by:

a) recording a pipeline length reference (code AAA) and the start node coordinates (code AA8 or AAC);
b) recording the two node references (codes AAD and AAF) or node coordinates (codes and AAE and AAG) and the start node reference or start node coordinate (code AAB or AAC).
c) recording the details of the main pipeline using either methods (a) or (b) above, together with the longitudinal location, along the main pipeline, of the start point of the lateral pipeline and the circumferential location of that connection (codes AAH and AAI).

The requirements of 7.1 (c) can be met by recording the location (code AAJ).

Table C.1 -Codes for location of inspection

Code	Name	Description
AAA	Pipeline length reference (see 7.1 (a))	The pipeline length reference as specified by the employing authority.
AAB	Start node reference (see 7.1 (b))	The node reference of the start node as specified by the employing authority.
AAC	Start node coordinate (see 7.1 (b))	The grid reference (coordinates) of the start node.
AAD	Node 1 reference (see 7.1 (a))	The node reference of the first node as specified by the employing authority.
AAE	Node 1 node coordinate (see 7.1 (a))	The grid reference (coordinates) of the first node.
AAF	Node 2 reference- (see 7.1 (a))	The node reference of the second node as specified by the employing authority.
AAG	Node 2 node coordinate (see 7.1 (a))	The grid reference (coordinates) of the second node.
AAH	Longitudinal location of start of lateral (see 7.1 (a))	The longitudinal location, along the main pipeline, of the connection between the start of the lateral pipeline and the main pipeline in metres (see 8.1.7)
AAI	Circumferential location of start of lateral (see 7.1(a))	The circumferential location, around the main pipeline, of the connection between the start of the lateral pipeline and the main pipeline (see 8.1.5)
AAJ	Location	A description of the location of the sewer (e.g. street name).

	(see 7.1 (c))	
AAK	Direction of flow	The direction of flow as follows: - downstream (A) - the direction of inspection is in the same direction as the normal direction of the flow; - upstream (B) - the direction of the inspection is in the direction opposite to the normal direction of the flow. - not known (C) - the normal direction of flow is not known.
AAL	Location type	The type of location of the drain or sewer as follows: - in a road (A); - in a footway beside road (B); - in verge beside a road (C); - in other pedestrian area (D); - in field (E); - on property with buildings (F); - gardens (G); - under a permanent building (H); - woodland (I); - difficult access (e.g. motorway or operational railway land) (J); - under a waterway (K); - other (Z) - further details should be recorded using a general remark code (ADE) immediately following.
AAM	Employing authority	The name of the employing authority.
AAN	Town or village	The name of the town, village as specified-by the employing authority.
AAO	District	The name of the district as specified by the employing authority.
AAP	Name of sewer system	The name of the sewer system, or a sewer system reference as specified by the employing authority.
AAQ	Land ownership	The ownership of the land as: - public land (A); - private land (B); - not known (C).

C.3 Inspection details

The requirements of 7.1 (d), (e), (f) and (g) can be met by recording the standard (Code ABA), the longitudinal reference point (code ABC), the method of inspection (code ABD) and the date of inspection (code ABE).

Table C.2 - Codes for inspection details

Code	Name	Description
ABA	Standard (see 7.1 (d))	The version of the standard used to record the data. This should be in the form EN 13508-2:2001.
ABB	Original coding system	Where the coding has been translated from an earlier version or from another system, the name of the original coding system.
ABC	Longitudinal reference point (see 7.1 (e))	The point of reference for the longitudinal location as follows (see 8.1.7): - the inside face of the wall of the starting node, (manhole, inspection chamber or outfall etc.) at the point where the drain or sewer passes through the wall (A); - the soffit of the end of the pipeline length inside the starting node (B). - the centre of the starting manhole or inspection chamber (C). - the midpoint of the incoming and outgoing pipes, measured along the channel

		(D). - other (Z) - further details should be recorded using a general remark code (ADE) immediately following.
ABD		Not used
ABE	Method of inspection (see 7.1 (f))	The method of access as follows: - direct inspection of drain or sewer by an inspector walking through the pipeline (A); - inspection by means of a remotely controlled television camera passed through the pipeline (8); - inspection from the manhole or inspection chamber only (C).
ABF	Date of inspection (see7.1 (g))	The calendar date of the inspection as specified in IS0 8601 using the CCYY-MM-DD format. (e.g. 1999-04-01 means in April 1999). Leading zeros should be included where necessary.
ABG	Time of inspection	The local time as specified in ISO 8601 using the hh:mm format. (,e.g. 14:41 means 1441 hrs, local time). Leading zeros shall be included where necessary.
ABH	Name of inspector	The name of the inspector and the name of the inspector's company.
ABI	Inspectors job reference	The inspector's job reference code.
ABJ	Employers job reference	The employer's job reference code.
ABK	Video image storage	The type of media used for storing images as follows: - VHS video cassette tape (A); - Video CD (B); - Other (Z) further details should be recorded using a general remark code (ADE) as the next code.
ABL	Photograph image storage	The type of media used for storing images as follows: - still photographs (A); - still computer images held on computer, details of format shall be recorded as a remark (B); - other (Z) further details should be recorded using a general remark code (ADE) as the next code.
ABM	Video image location system	For moving images, the method of recording the position on the tape or CD shall be recorded as follows: - the recording time in hours and minutes since the start of the tape (A); - a machine dependant numeric counter(B); - other (Z) - further details should be recorded using a general remark code (ADE) as the next code.
ABN	Photograph volume reference	The reference number of the film or CD. A unique reference for each photograph shall also be included in the feature codes where applicable (see clause 8.1.8).
ABO	Video volume reference	The reference number of the volume, film, tape or CD. A unique location reference for each observation is also recorded in the feature codes where applicable (see clause 8.1.9).
ABP	Purpose of inspection	The purpose of the inspection. - final control of new construction (A); - end of warranty period (B); - routine inspection of condition (C); - suspected structural problem (D); - suspected operational problem (E); - suspected infiltration problem (F);

		- final control of renovation or repair (G); - transfer of ownership (H); - investment planning (I); - sample survey (J); - other (Z) - further details should be recorded using a general remark code (ADE) as the next code.
ABQ	Anticipated length of inspection	The anticipated length of the inspection (So that this can be compared to the actual length if the inspection is abandoned).

C.4 Pipeline details

Table C.3 - Pipeline details codes

Code	Name	Description
ACA	Shape	The shape of the cross-section of the pipeline as follows: - circular (A); - rectangular (B); - egg shaped (C); - U - shape (D) circular invert and flat top with parallel sides; - arch shaped (E) circular soffit and flat invert with parallel sides; - oval (F) - circular invert and soffit (of equal diameter) with parallel sides; - local section code to be specified by the employing authority and prefixed by an X (e.g. XA) - other (Z) - further details should be recorded using a general remarks code (ADE) as the next code.
ACB	Height	The height of the section in millimetres.
ACC	Width	The width of the section in millimetres. (Not required where both dimensions are the same - e.g. circle)
ACD	Material	The material of the fabric of the sewer, in accordance with Table C.4. Where the pipeline has been lined the material recorded is the material of the original pipeline.
ACE	Lining Type	Where a pipeline has been lined, the method of lining as follows: - lining inserted during manufacture (A); - sprayed lining (B); - cured in place lining (C); - segmental linings (D); - lining with discrete pipes (E); - lining with continuous pipes (F); - close fit lining (G); - spirally wound lining (H); - other (Z) further details should be recorded using a general remarks code (ADE) as the next code.
ACF	Lining material	The lining material in accordance with Table C.4.
ACG	Pipe unit length	The length in millimetres of individual pipe units which comprise the pipeline. ~ Where the pipe is continuous (e.g. masonry or brickwork), this code is not used.
ACH	Depth	The depth of the invert of the pipeline below cover level at the start node in metres. (Indicative only - use clause 11 if information is to be used for asset inventory).
ACI	Type of sewer	The type of the drain or sewer as follows: - gravity drain or sewer (A);

		- rising main (B).
ACJ	Use of sewer	The use of the drain or sewer system as follows; - drain or sewer is designed to carry only wastewater (A); - drain or sewer is designed to carry only surface water (8); - combined drain or sewer (C); - trade effluent sewer (D); - culverted watercourse (E). - other (Z) - further information should be recorded using a general remark code (ADE) as the next code.
ACK	Strategic	An alpha-numeric code specified by the employing authority, describing how strategic the pipeline is to the system.
ACL	Cleaning (see Clause 7 (h)).	Whether the drain or sewer was cleaned prior to the inspection as follows: - the drain or sewer was cleaned prior to the inspection **(A);** - the drain or sewer was not cleaned prior to the inspection (B).
ACM	Year came into operation	The approximate year the drain or sewer came into operation either as a single year in CCYY format or as a range in CCYY-CCYY format (e.g. 1970-1979)

Table C.4-Codes for materials

Material	**Code**
Asbestos cement	AA
Bitumen	AB
Pitch fibre	AC
Brickwork	AD
Clay	AE
Cement mortar	AF
Concrete	AG
Reinforced concrete	AH
Sprayed concrete	AI
Concrete segments	AJ
Fibre cement	AK
Fibre reinforced plastics	AL
Cast iron	AM
Grey cast iron	AN
Ductile cast iron	AO
Steel	AP
Unidentified type of Iron or steel	AO
Masonry (coursed)	AR
Masonry (uncoursed)	AS
Epoxy	AT
Polyester	AU
Polyethylene	AV
Polypropylene	AW
PVC-U.	AX
Unidentified type of plastics.	AY
Unidentified material	AZ
Other-details should be recorded in the remarks section.	Z

C.5 Other information

Table C.5 - Codes for other information

Code	Name	Description
ADA	Precipitation	The precipitation as follows: - no precipitation (A); - rain (B); - melting snow or ice (C).
ADB	Temperature	The temperature either in Celsius or a code as follows: - temperature is above freezing (A); - temperature is below freezing (B).
ADC	Flow control measures	The measures taken to deal with the flow at the time of the inspection: - no measures taken (A); - flows have been blocked upstream (B); - flows partially blocked upstream (C); - other (Z) - further details should be recorded using a general remark code (ADE) as the next code.
ADE	General remark	A remark which cannot be included in any other way.

C.6 Changes to header information

Where any information specified in the header changes during the course of the inspection, the revised information shall be entered using the relevant code as described below, together with the longitudinal location of the point of change. These codes are in the same format as the observation codes specified in clause 8 and should be used in accordance with 8.1.

Table C.6 - Details of codes changing header information

Main Code	Additional Information	Description
Video volume reference		
AEA		Where the video volume number changes during the course of the inspection (e.g. a new video tape is started) (see 8.1.9).
	Quantification	The reference number of the volume, film, tape or CD. A unique location reference for each observation is also recorded in the feature codes where applicable.
Photograph volume reference		
AEB		Where the photograph volume number changes during the course of the inspection (e.g. a new film or CD is started) (see 8.1.8).
	Quantification	The reference number of the film or CD. A unique reference for each photograph shall also be included in the feature codes where applicable (see clause 8.1.6).
Cross section		
AEC	Characterisation	The shape of the cross-section of the pipeline: - circular (A); - rectangular (B); - egg shaped (C); - U - shape (D) - circular invert and flat top with parallel sides; - Arch shaped (E) - circular soffit and flat invert with parallel sides; - oval (F) - circular invert and soffit (of equal diameter) with parallel sides; - local section - code to be specified by the employing authority and prefixed by an X (e.g. XA) - other (Z) -further details should be recorded in the remarks section.
	Quantification 1	The height of the section in millimetres.
	Quantification 2	The width of the section in millimetres. (Not required where both dimensions are the same - e.g. circle)

Material		
AED	Characterisation	The material of the fabric of the sewer, in accordance with Table C.4. Where the pipeline has been lined the material recorded is the material of the original pipeline.
Lining		
AEE	Characterisation	Where a pipeline has been lined, the method of lining as follows: lining inserted during manufacture (A); sprayed lining (B); cured in place lining (C); segmental linings (D); lining with discrete-pipes (E); lining with continuous pipes (F); close fit lining (G); spirally wound lining (H); other (Z) -further details should be recorded in the remarks section.
	Characterisation 2	The lining material in accordance with Table C.4.
Pipe unit length		
AEF	Quantification	The length in millimetres of individual pipe units which comprise the pipeline. Where the pipe is continuous (e.g. masonry or brickwork), this code is not used.
Precipitation		
AEG	Characterisation	The precipitation as follows: - no precipitation (A); - rain (B); - melting snow or ice (C).

Annex D (informative) Recommended system for coding of header information for manholes and inspection chambers

D.1 Introduction

These codes are used to describe information about the manhole or inspection chamber as a whole,

D.2 Location of the inspection

The requirements of 10.1 (a) can be met either by recording a node reference (code CAA) or coordinates (code CAB).
The requirements of 10.1 (c) can be met by recording the type of node (code CAE).

Table D.1 - Codes for location of inspection

Code	Name	Description
CAA	Node reference (see 10.1 (a))	The node reference of the manhole or inspection chamber as specified by the employing authority.
CAB	Node coordinate (see 10.1 (a))	The grid reference (coordinates) of the node.
CAC to CAI are not used		
CAJ	Location (see 10.1 (b)j	A description of the location of the manhole or inspection chamber (e.g. street name).
CAK	Not used	
CAL	Location type	The type of location of the manhole or inspection chamber: - in a road (A). - in a footway beside road (B). - in verge beside a road (C). - in other pedestrian area (D). - in field (E). - on property with buildings (F); - gardens (G); - under a permanent building (H); - woodland (I); - difficult access (e.g. motorway or operational railway land) (J); under a waterway (K); - other (Z) - further details should be recorded using a general remark code (CDE) as the next code.
CAM	Employing authority	The name of the employing authority.
CAN	Town or village	The name of the town, village as specified by the employing authority.
CAO	District	The name of the district as specified by the employing authority.
CAP	Name of sewer system	The name of the sewer system, or a sewer system reference as specified by the employing authority.
CAO	Land ownership	The ownership of the land as: - public land (A); - private land (B);

		- not known (C).
CAE	Node type (see 10.1 (c))	The type of node: - manhole (A); - inspection chamber (B); - lamp hole (C); - outfall((D); - rodding eye (E); - a special type defined by the employing authority (The employing authority may define a number of codes prefixed by an X (e.g. XA)) - other special chamber (Z) - further details should be recorded using a general remark code (CDE) as the next code.

D.3 Inspection details

The requirements of 10.1 (d), (e), (f), (g) and (h) can be met by recording the standard (Code CBA), the vertical reference point (code CBC), the circumferential reference point (code CBD), the method of inspection (code CBE) and the date of inspection (code CBF).

Table D.2 - Codes for inspection details

Code	Name	Description
CBA	Standard (See 10.1 (d))	The version of the standard used to record the data. This should be in the form EN 13508-2:2001.
CBB	Original coding system	Where the coding has been translated from an earlier version or from another system, the name of the original coding system.
CBC	Vertical reference point (See 10.1 (e))	The point of reference for the vertical location: - invert of the lowest outgoing pipe (A); - cover(B); - national datum (C); - local datum (D) - other (Z) - further details should be recorded in using the general remarks code (CDE) as the next code.
CBD	Circumferential reference point (see 10.1 (f))	The point of reference for circumferential location: - lowest outgoing pipe is 12 o'clock (A); - lowest outgoing pipe is 6 o'clock (B); - other (Z) - further details should be recorded using the general remarks code (CDE) as the next code.
CBE	Method of inspection (see 10.1 (g))	The method of inspection: - direct inspection of manhole or inspection chamber by an inspector (A); - inspection by means of a remotely controlled television camera (B); - inspection from the surface only (C); - other (Z) - further details should be recorded using the general remarks code (CDE) as the next code.
CBF	Date of inspection (see 10.1 (h))	The calendar date of the inspection as specified in ISO 8601 using the CCYY-MM-DD format. (e.g. 1999-04-01 means 1st April 1999). Leading zeros should be included where necessary.
CBG	Time of inspection	The local time as specified in ISO 8601 using the hh:mm format. (e.g. 14:41 means 14;41hrs local time). Leading zeros shall be included where necessary.

CBH	Name of inspector	The name of the inspector and the name of the inspector's company.
CBI	Inspector's job reference	The Inspector's job reference code.
CHJ	Employer's job reference	The employer's job reference code
CBK	Video image storage	The type of media used for storing images: I - VHS video cassette tape (A); - video CD (B) the format shall be recorded in remark; - other (Z) further details should be recorded using the general remarks code (CDE) as the next code.
CBL	Photograph image storage	The type of media used for storing images: - still photographs (A); • - still computer images held on computer (B) - details of format shall be recorded as a remark ; - other (Z) - further details should be recorded using the general remarks code (CDE) as the next code.
CBM	Video image location system	For moving images, the method of recording the position on the tape or CD: - the recording time in hours and minutes since the start of the tape (A); - a machine dependant numeric counter (B); - other (Z) - further details should be recorded using the general remarks code (CDE) as the next code.
CBN	Photograph volume reference	The reference number of the film or CD. A unique reference for each photograph shall also be included in the feature codes where applicable (see clause 11.1.9).
CBO	Video volume reference	The reference number of the volume, film, tape or CD. A unique location reference for each observation is also recorded in the feature codes where applicable (see clause 11.1.9).
CBP	Purpose of inspection	The purpose of the inspection. - final control of new construction (A); - end of warranty period (B); - routine inspection of condition (C); - suspected structural problem (D); - suspected operational problem (E); - suspected infiltration problem (F); - final control of renovation or repair (G); - transfer of ownership (H); - investment planning (I); - sample survey (J); - other (Z) - further details should be recorded using a general remark code (CDE) as the next code.

D.4 Manhole or inspection chamber details

Table D3-Manhole or inspection chamber detail codes

Code	Name	Description
CCA	Shape of access	The shape of the opening (i.e. the most restrictive opening into the manhole or inspection chamber) as follows: - rectangular (A) - circular (B)

- triangular (C)
- oval(D) '
- hexagonal (E);
- octagonal (F);
- other (Z) - further details should be recorded using the general remarks code (CDE) as the next code.

CCB	Width of access	The width of the opening in millimetres.
CCC	Breadth of access	The breadth of the opening in millimetres.
CCD	Material	The material of the fabric of the manhole or inspection chamber in accordance with Table C.4. Where the pipeline has been lined the material recorded is the material of the original manhole or inspection chamber.

Codes CCE and CCF are not used.

CCG	Chamber unit length	The length in millimetres of individual prefabricated manhole or inspection chamber ring units which comprise the manhole or inspection chamber . (This code shall not be used for brickwork, masonry or insitu concrete chambers).

Codes CCH and CCI are not used

CCI	Use of sewer system	The type of the drain or sewer system shall be recorded: - the system is designed to carry only wastewater (A); - the system is designed to carry only surface water (B); - combined drain or sewer system (C). - the manhole or inspection chamber serves two systems one carrying wastewater, the other surface water (D); - not known (E).
CCK	Strategic	An alpha-numeric code, defined by the employing authority, describing how strategic the manhole or inspection chamber is to the system.
CCL	Cleaning	Whether the manhole or inspection chamber was cleaned prior to the inspection as follows: - the manhole or inspection chamber was cleaned prior to the inspection (A); - the manhole or inspection chamber was not cleaned prior to the inspection (B).
CCM	Year came into operation	The approximate year the manhole or inspection chamber came into operation either as a single year in CCYY format or as a range in CCYY-CCYY format (e.g. 1970-1979)
CCN	Shape of cover	The shape of the cover: - rectangular (A) - circular (B) - triangular (C) - oval (D) - hexagonal(E); - octagonal (F); - other (Z) - further details should be recorded using the general remarks code (CDE) as the next code.
CCO	Material of cover	The material in accordance with Table C.4.
CCP	W width of cover	The width of the cover in millimetres.
CCO	Breadth of cover	The breadth of the cover in millimetres.

CCR	Type of steps	The type of steps provided: single width steps (A) - steps wide enough for one foot; double width steps (B) -steps wide enough for two feet; ladder (C); toe holes (D); no provision (E); other (Z)-further details should be recorded using the general remarks code (CDE) as the next code.
CCS	Material of steps	The material from which the steps are made: - iron (A); - galvanised iron (B); - stainless steel (C); - plastic encapsulated metal (D); - plastic (D); - aluminium (E); - other (Z) - further details should be recorded using the general remarks code (CDE) as the next code.

D.5 Other information

Table D.4 - Codes for other information

Code	Name	Description
CDA	Precipitation	The precipitation: - no precipitation (A); - rain (B); - melting snow or ice (C).
CDB	Temperature	The temperature either in Celsius or a code: - temperature is above freezing (A); - temperature is below freezing (B).
CDC	Flow control measures	The measures taken to deal with the flow at the time of the inspection: - no measures taken (A); - flows have been blocked upstream (B); - flows partially blocked upstream (C). - other (Z) - further details should be recorded using the general remarks code (CDE) as the next code.
CDD	Atmosphere hazard	Where a potentially hazardous atmosphere was encountered, the type of detected: - oxygen deficiency (A); - hydrogen sulfide (B); - methane (C); - other flammable gas (D); - no hazardous atmosphere (E); - other (Z) - further details should be recorded using the general remarks code (CDE) as the next code.
CDE	General remark	A remark which cannot be included in any other way.

D.6 Changes to header information

Where any information specified in the header changes during the course of the inspection, the revised information shall be entered using the relevant code as described in below,

together with the vertical location of the point of change. These codes are in the same format as the observation codes specified in clause 11 and should be used in accordance with 11.1.

Table D.5 - **Details of codes for changing header information**

Main Code	Additional Information	Description
Video volume reference		
CEA	Quantification	The reference number of the volume, film, tape or CD. A unique location reference for each observation is also recorded in the feature codes where applicable (see 11.1.10).
Photograph volume reference		
CEB	Quantification	The reference number of the film or CD. A unique reference for each photograph shall also be included in the feature codes where applicable (see 11.1.9).
Material		
CED	Characterisation	The material of the fabric of the manhole or inspection chamber in accordance with Table C.4.
Chamber unit length		
CEE	Quantification	The length in millimetres of individual prefabricated manhole or inspection chamber ring units which comprise the manhole or inspection chamber. (This code shall not be used for brickwork, masonry or insitu concrete chambers).
Precipitation		
CEF	Characterisation	The precipitation: - no precipitation (A); - rain (B); - melting snow or ice (C).
Steps		
CEG	Characterisation 1	The type of steps provided: - single width steps (A) - steps wide enough for a single foot; - double width steps (B) steps wide enough for two feet; - ladder (C); - toe holes (D); - no provision (E); - other (Z) -further details should be recorded in the remarks section.
	Characterisation 2	The material from which the steps are made: iron (A); galvanised iron (B); stainless steel (C); plastic encapsulated metal (D); plastic (E); aluminium (F); other (Z) -further details should be recorded in the remarks section.

Appendix 3 The coding system of the Czech Republic

There is no obligatory standard for the sewer optical inspection in the Czech Republic at the moment. The companies and municipalities usually use translated German advisory note “ATV-M143, Teil 2” as non-obligatory standard. There is no official translation of this German standard and various companies use their own versions.

The Czech statutory undertaker *The Czech Chamber of Certified Engineers and Technicians* issued recommendation called “Sewer optical inspection, DOS-T 04.03.02.001“ within the frame of “Recommended technical standard I., file DOST.T. 1 – 21. 07/1998”.

The Czech experts are working on the proposal of obligatory standard “pr-EN 13508-1 Sewer and service connection conditions – general requirements“ which will be probably finished this year. Consequent standard EN 13508-2 will be available during 2004. These standards are prepared by Hydroproject joint-stock company.

There are about 40 – 50 CCTVs available in the Czech Republic (Rausch, Ibak, ITV, Elvia, IG).

Appendix 4 The coding system of Denmark

The Danish Institute of Technology published the first Danish manual on CCTV inspections in 1986. It has been revised several times since, and today the 4th edition published December 1997 is in use.

The manual is not an official national standard, but a manual of practice. In Denmark it is has historically been the case that best engineering practices are not formulated by the authorities but by the engineering community itself. This procedure has made it necessary that consensus exist on how to do things before putting it into writing, resulting in thorough debate prior to publication and consequently a wide acceptance when published. This is also valid for the Danish manual on CCTV inspections.

The manual is the backbone of the CCTV education and authorisation system. No Danish authority would accept inspections done by a company without such authorisation. The manual is interlinked with a database, also widely in use. The database includes sewer condition assessment based on the reported data. The value of CCTV inspections thus assessed and accumulated amounts to many billion Danish kroner. Today Denmark has well-functioning systems, which have been developed and adapted to the requirements of the Danish local authorities, which are also the owner of the sewerage infrastructure.

The manual does not tell how to assess if a sewer must be repaired or replace, it only catalogues the damages in the sewer. However, a Danish manual telling when to repair or replace does exist, and is in use.

Content of the manual
The manual consist of 4 parts, namely
1. Standard definition and photo manual for main sewers outside buildings
2. Reporting and coding sheet for manholes
3. Photo manual for connector sewer between buildings and the public main sewers
4. Standard definition and photo manual for rehabilitated sewers

This means that the Danish standard addresses all of the sewer system, and a broader spectrum than for example the draft of the European CEN standard that was sent to CEN members for enquiry spring 2002.

In the following text a resume/translation is given on the content of the 4 parts of the report. The translation follows the content of the manual, however, not everything has been translated.

1 Standard definition and photo manual for main sewers outside buildings

The goal of the manual is to secure a standardised assessment of the observations made by CCTV inspections.

The manual consists of standard definitions that describe the individual observations, as well as photos that illustrate how these observations may look when inspecting sewers.

All observations made by CCTV inspections are divided after the scale shown in Table 1. Observations are divided in the classes 0-4 where class 4 are those conditions in the pipeline that has the largest negative impact of the functioning of the pipeline

Every reported observation consists of a code of two letters (observation type) and a number (observation class).

Type is detected by straight ahead placed camera or by rotated camera.

Class is assessed by straight ahead positioned camera.

It can generally be difficult to estimate what class an observation must be placed in. Therefore the manual contains typical photos of observations in the classes 1-3, but not of class 4. In some cases borderline cases between classes are shown. This is the case for deformations, water, chiselled/drilled connections and change of direction.

Observations can be made as point observations or continuous observations.

Observations by CCTV inspection

Condition of the pipelines:			
	Fissures, cracks and fractures	RB	1-4
	Corrosion and erosion	KO	1-4
	Bad casting of the concrete “stone nests”	ST	1-3
	Deformations	DE	1-3
	Displaced joints	FS	1-4
	Open joints	ÅS	1-4
	Intruding sealing material	IS	1-3
	Point repairs	PR	0-3
Operation of the Pipelines:			
	Roots	RØ	1-3
	Infiltration	IN	1-3
	Sediments	AF/AL	1-3
	Attached deposits	UF	1-3

	Water	VA	%
	Obtrusions	FO	0-3
Special constructions:			
	Prefabricated connector pipe	GR	0-3
	Chiselled connection	PH	0-4
	Drilled connection	PB	0-4
	Change of direction of pipe	RE	0-3

Reporting and coding sheet for main pipelines outside buildings

The reporting sheet contains the following information:

- Report type
- Report number
- Operator
- Inspection car number
- Date
- Videotape number
- CD-rom number
- Who order the inspection
- Journal name
- Pipe material: Not known; Concrete, smooth; Concrete, normal; Concrete, rough; Plastic; PVC; PEH; PEM, Glass fibre; Epoxy; Polyester; GUP; Iron; Cast iron; Eternit; Clay (stone ware); Glassed clay (glassed stone ware); brick; other.
- System: Not known; wastewater; stormwater; combined system; drainage; other.
- Use: Not known; In use; temporarily plugged off; “Dead”; other.
- Weather: Not known; Dry weather; Rain; Snow; Snowmelt; other
- Age: The exact year of construction is given if known, if not then the following is used in the estimation: Not know; New (1-5 years); Old (older than 5 years; Established year #### or earlier; Established year #### or after; other.
- Year of construction (if know)
- ID
- Downstream or upstream. If the observation was made in the direction of flow or not.
- Collective report
- Stop
- Measured on terrain
- Difference between length measured above ground and in the sewer
- Video counter number
- Photo number
- Distance
- Dimension (inner dimension of pipe) and circular or egg-shaped
- Determination code
- Observations (individual observations)
- Observations (continuous observations)
- Circular position of observation
- Notes
- Documentation

- Change in pipe materials
- Percentage of damage (related to the subsequent assessment and not the observations themselves)
- Physical index (related to the subsequent assessment and not the observations themselves)
- Start and stop location
- Address
- Notes

2 Reporting and coding sheet for manholes

The quality of manholes are normally not assessed by TV inspections but by manual inspection, possibly documented by photos

The principles for reporting and coding of manholes are the same as for main pipes, so that the same coding, definitions, observation types and classes are used.

The reporting sheet contains the following information:

- Report type
- Report number
- Operator
- Inspection car number
- Date
- Videotape number
- CD-ROM number
- Who order the inspection
- Journal name
- System: Not known; wastewater; stormwater; combined system; drainage; other.
- Type: Not known; Manhole (9 subtypes are given); Structure (7 subtypes are given); Tank (4 subtypes are given); Point (6 subtypes are given); Basin; CSO structure; Pumping station; Inlet/outlet structure; Silttrap; other
- Weather: Not known; Dry weather; Rain; Snow; Snowmelt; other
- Use: Not known; In use; temporarily plugged off; “Dead”; other.

Regarding the manhole itself the following is registered

- Form: Not known; circular; quadratic; rectangular; other
- Dimension: Average inner dimension
- Material: Not known; Concrete ring; Plastic; Clay (stone ware); brick; Insitu cast concrete; concrete pipe; Prefabricated concrete; Plastic; PVC; PEH; Glass fibre; Eternit; Steel; Soil; other.
- Age: The exact year of construction is given if known, if not then the following is used in the estimation: Not know; New (1-5 years); Old (older than 5 years; Established year #### or earlier; Established year #### or after; other.
- Year of construction (if know)
- Pipes that goes down into the manhole

Regarding the state of the manhole the following can be registered:

- The general state of the manhole
- The general state of the channel
- The general state of the benching

Regarding the accessibility of the structure

- The placement of the structure
- The access ways
- The state of the access ways

Regarding the cover of the structure

- Type

- Material
- The state of the cover

General observations
- Coordinates
- Level of cover above sea level
- Level of invert of channel above sea level
- Water level
- Wetness of walls indicating the groundwater table (only possible in older manholes)

The state of connections is reported similarly to connections in main sewers.

3 Photo manual for connector sewer between buildings and the public main sewers and

This report covers connector sewers all the way to where they go into the buildings (see figure 1 on page 82 of the manual). The reporting and the inspection takes place in the same way as it does for main sewers, and this report is to be seen as an addendum to the that manual when connector sewers are to be investigated.

The report covers observations that are characteristic for inspections of small bore pipes, e.g. 100/110 mm and 150/160 mm.

The report also contains a photo catalogue, showing types of materials, prefabricated components, typical for new as well as old installations.

The content of the manual is:

Introduction: Observations and reporting
The state of the pipes: Displaced joints, Open joints
Operational condition: Water
Pipe materials and special fittings/constructions: Pipe materials; Special methods of connecting; Special constructions: Bents, Connection to main pipes; Ends; Special constructions; reductions.

Connections when changing from one pipe material/type/size to another

Reporting and coding sheet for connector pipes
The reporting sheet contains the following information:

- Report type
- Report number
- Operator
- Inspection car number
- Date
- Videotape number
- CD-rom number
- Who order the inspection
- Journal name
- Pipe material: Not known; Concrete, smooth; Concrete, normal; Concrete, rough; Plastic; PVC; PEH; PEM, Glass fibre; Epoxy; Polyester; GUP; Iron; Cast iron; Eternit; Clay (stone ware); Glassed clay (glassed stone ware); brick; other.
- System: Not known; wastewater; stormwater; combined system; drainage; other.
- Use: Not known; In use; temporarily plugged off; “Dead”; other.
- Weather: Not known; Dry weather; Rain; Snow; Snowmelt; other
- Age: The exact year of construction is given if known, if not then the following is used in the estimation: Not know; New (1-5 years); Old (older than 5 years; Established year #### or earlier; Established year #### or after; other.
- Year of construction (if know)
- ID

- Downstream or upstream. If the observation was made in the direction of flow or not.
-
- Collective report
- Stop
- Name of connector
- Attached to pipe/manhole
- Distance
- Circular position
- Type
- Collective report
- Stop
- Measured above ground
- Difference
- Video counter number
- Photo number
- Distance
- Dimension
- Determination code
- Observations
- Special constructions
- Continuous observation
- Percentage of damage (related to the subsequent assessment and not the observations themselves)
- Stretch from/to
- Change in material
- Address
- Notes

4 Standard definition and photo manual for rehabilitated sewers

This manual contains standard definitions and photo manual for rehabilitated sewers.

It is the first time that such a manual (in Denmark) has been made, and it has hence been difficult to get sufficient photo materials.

It is suggested to revise the manual when more material and experience is gained.

The state of the old pipe behind the lining is not taken into account. It is assumed that this has been covered by a previous CCTV inspection.

The following methods are of renovation are addressed: (I am not sure I am translating into the correct terms in English)

- Hose relining
- Tight relining
- Pipe bursting

15 different observations types for renovated pipes are given. Each observation is identified by two letters and a number, where 4 is the most serious damage.

For observations cracks/fissures, no class is given, as all cracks/fissures in rehabilitated pipes are serious damages. In stead a letter characterises the form of the damage.

- Operational conditions: Water; Infiltration; Deposition; Obstruction.
- Hose relining: Cracks/fissures; Deformation; Folds; Loose inner layer/material; Wrong colour; Cutting up of connections; Connection with transition profile; Connection of connector pipe; Leftovers from the work; Quality of the work at start/end;
- Tight relining: Cracks/fissures; Deformation; Cutting up of connections; Connection of connector pipe; Leftovers from the work; Quality of the work at start/end;
- Pipe bursting: Cracks/fissures; Deformation; Loose welding; Connection of connector pipe; Quality of the work at start/end;

Reporting and coding sheet for rehabilitated pipelines

The reporting sheet contains the following information:

- Report type
- Report number
- Operator
- Inspection car number
- Date
- Videotape number
- CD-rom number
- Who order the inspection
- Journal name

- Renovation method: Not known; Hose relining; Tight relining; Pipe bursting; Other
- System: Not known; wastewater; stormwater; combined system; drainage; other.
- Use: Not known; In use; temporarily plugged off; “Dead”; other.
- Weather: Not known; Dry weather; Rain; Snow; Snowmelt; other
- Age: The exact year of construction is given if known, if not then the following is used in the estimation: Not know; New (1-5 years); Old (older than 5 years; Established year #### or earlier; Established year #### or after; other.
- Year of construction (if know)
- ID
- Downstream or upstream. If the observation was made in the direction of flow or not.
- Collective report
- Stop
- Difference between length measured above ground and in the sewer
- Video counter number
- Photo number
- Distance
- Dimension (inner dimension of pipe)
- Determination code
- Observations (individual observations)
- Observations (continuous observations)
- Circular position of observation
- Notes
- Documentation
- Start and stop location
- Address
- Notes

Appendix 5 The coding system of France

AGHTM (Association Générale des Hygiénistes et Techniciens Municipaux = Hygienists and Municipal Technicians General Association) is a French Organisation dealing with technical aspects of urban infrastructure management, especially with those aspects impacting the Public Health and the quality of service of urban utilities. Concerning the classification and the coding of the various defects observable by CCTV-Inspection of sewer pipes, a recommendation manual was published in 1992 ("Manuel de recommandations techniques pour l'inspection télévisiée des réseaux d'assainissement", TSM n°10 bis, octobre 1992, 23 p.).

The AGHTM classification distinguishes 14 types of defects which are summarised in the following table.

Defect	**Definition**	**Characterisation**	**Quantification**
1. Crack	Limited fissure without displacement of wall pieces	Longitudinal Circumferential Complex	Length (m) Opening width (mm)
2. Fracture	Fissure with displacement of wall pieces	Longitudinal Circumferential Complex	Length (m) Opening width (mm)
3. Collapse	Destruction with obstruction	Total or partial	Length (m)
4. Perforation	Missing piece of wall	Punctual	Length (m) Diameter (mm)
5 Punching	Missing surface fragment	Punctual	Clock face reference
6. Deformation			
6.1 Cross sectional deformation			% of pipe diameter Height (mm) Length (m)
6.2 Longitudinal deformation			Important Very important
7. Defective jointing			
7.1 Radial displacement	Pipes displaced at right angle to the direction of the sewer		Clock face reference
7.2 Longitudinal displacement	Pipes displaced parallel to the direction of the sewer		Width (mm)
7.3 Angular displacement	Axes of the pipes not parallel		Clock face reference (1 to 12)
7.4 Punching at pipe head		Punctual	Light Important
7.5 Intruding sealing material		Hanging joint Broken joint	
7.6 Change in	Without manhole		

Defect	Definition	Characterisation	Quantification
diameter			
8. Infiltration	Ingress of water	Sweating Dripping Flowing	Clock face reference Length (m)
9. Exfiltration	Visible leakage out of pipe	Decreased flow	Clock face reference
10. Roots	Intrusion of roots		% of cross section
11. Obstacles	Presence of object	Intruding connection Settled deposits Other objects	% of cross section
12. Counter slope	Slope reversed	Pool of water	% of cross section Length (m)
13. Surface damage			
13.1 Abrasion	Mechanical cause		% of cross section Length (m)
13.2 Corrosion	Chemical or biochemical cause	Vault Invert	% of cross section Length (m)
13.3 Visible reinforcement		Punctual Generalised	Length (m) Just visible or projecting from the surface
13.4 Degraded surface	Breaking away of surface fragments	Partial Generalised	Length (m)

Appendix 6 The coding system of Germany

The CCTV has been used in Germany since 1958. The CCTV documentation had been constructed by the inspector in that time. This had the consequence that different concept had been used to describe the same phenomenon. The ATV (wastewater association) built a workgroup to solve this impossible situation. The result of this work has been a new system ATV-M 143/1-2.. This system was printed in 1989 and 1991. The main goal was to standard the code system used by describing the condition in the sewer system. However many different systems are used all over in Germany. The use of this difference systems have the comment that from most of the long time existing systems are not or just difficult to translate to the ATV code system.

The ATV-M 143/2. code systems details the condition assessment of sewer systems by internal inspection, status codification and consideration of external factors and other information. It is applicable to sewer and drain systems that operate under gravity (pressure, vacuum etc.), from the point of collection to the point of discharge to a treatment plant or recipient water.

Adaptation field:

- allocate troubles
- methodical review of sewer systems
- preparation of renovation works
- acceptance of renovation works
- acceptance before the end of the warranty period of renovation works
- acceptance of new-built part of the system.
- acceptance before the end of the warranty period of new-built part
- to give evidence

The structure of the ATV-M 143/2.:

Position in the COD system	1.	2.	3.	4.	
Condition group	X				
Condition specification		X			
Leakage details			X		
Location in the sewer				X	
Numerical part, or rather corrosion and mechanical attrition					nn

Code	X	X	X	X	
Free text	I	I			

1 Codes for drain and sewers

1st notation place: condition group

A	=	junction	L	=	displaced joint
B	=	pipe burst	R	=	fissure
C	=	corrosion	S	=	pipe connection
D	=	deformation	T	=	missing parts
F	=	wrong connection	U	=	visible leakage
H	=	Obstacle	V	=	mechanical attrition
K	=	sewer rehabilitation	W	=	other damage

2nd notation place: condition specification

A	=	Lining	O	=	outside, not reaching the sewer
B	=	curvature	P	=	root intruding
C	=	connection range	Q	=	radial
D	=	settling	R	=	fissure
E	=	intruding	S	=	sherd
F	=	compacted	T	=	collapse
G	=	packing intruding	U	=	barred
H	=	horizontal	V	=	vertical
I	=	encrustation	W	=	surface
K	=	clinker	X	=	fissures from one point
L	=	Axial	Z	=	crossing other lines
M	=	joint mortar	-	=	No other identification code appropriate
N	=	unprofessional implementation			

3rd notation place: leakage details

A	=	Visible exfiltration	G	=	Pebble stone

B	=	Soil in sight	M	=	visible infiltration with ingress of soil
D	=	Blocked	S	=	Sand
E	=	Visible infiltration	-	=	No details about leakage
F	=	Visible dampness			

4th notation place: Location in the sewer

A	=	Axial
F	=	Irregular inflow
G	=	Infiltration
H	=	Horizontal
L	=	left crossbar
O	=	Top
R	=	right crossbar
S	=	damming (water depth in cm)
U	=	Bottom
V	=	Vertical
-	=	whole section

2 Codes for manhole and works

1st notation place: condition group

A	=	Pipe joining	L	=	displaced joint
B	=	Break	R	=	Fissure
C	=	corrosion	S	=	Street inlet, connection of
D	=	deformation	T	=	missing parts
F	=	wrong connection	U	=	visible leakage
H	=	obstacle	V	=	mechanical attrition
K	=	sewer rehabilitation	W	=	other damage

2nd notation place: condition specification

A	=	Lining	O	=	outside, not reaching the sewer
B	=	hidden	P	=	root intruding
C	=	connection range	Q	=	radial
D	=	settling	R	=	fissure
E	=	intruding	S	=	sherd

F	=	compacted	T	=	collapse
G	=	packing intruding	U	=	barred
H	=	Horizontal	V	=	vertical
I	=	Encrustation	W	=	surface
K	=	Clinker	X	=	fissures from one point
L	=	Axial	Z	=	crossing other lines
M	=	joint mortar	-	=	no other identification code appropriate
N	=	unprofessional implementation			

3rd notation place: leakage details

A	=	visible exfiltration	G	=	Pebble stone
B	=	soil in sight	M	=	visible infiltration with ingress of soil
D	=	Blocked	S	=	Sand
E	=	visible infiltration	-	=	no details about leakage
F	=	visible dampness			

4th notation place: Parts of the works

A	=	outflow side (connecting pipe)
B	=	Benching (outflow side)
C	=	supporting ring
D	=	manhole cover
E	=	inflow side (connecting pipe)
F	=	Grit trap under cover
G	=	Channel
H	=	Neck of the manhole
I	=	manhole-ring
K	=	Cover
L	=	Ladder
M	=	Upper part of the manhole
N	=	Rail
P	=	Bottom
Q	=	Equipments
S	=	Step

T = Stair
V = Handrail
W = Wall
- = In the whole works

Appendix 7 The coding system of Hungary

In Hungary there is no standard for the visual inspection of the sewers. There is two standard on that field:
1. Systematic technical control and testing of water structures. Water and sewage works structures.
2. Systematic technical control and testing of water structures. Pipelines.

The application of these standards is not obligatory. The standard does not include the recording process of defects.

The wastewater companies are usually using CCTV devices from Germany for pipe inspection. The German influence is rather strong in the field of the application software, which are usually based on the German ATV advisory note. The result of this situation is the application of several company level used coding system in Hungary.

The end-user of Budapest (Budapest Municipal Sewerage Company Limited) is just revising its coding system.
The coding system is 100% compatible with CEN standard.
In order to assess the importance of the defect so called auxiliary information is recorded instead of quantification. This means the using of bands instead of using exact values. The CEN standard allows it, see **Appendix 2 The CEN standard, Annex A, A2 Codes, f.**
Some Hungarian defect type directly equivalent to more of the codes of CEN, as the CEN standard allows it, see **Appendix 2 The CEN standard, Annex A, A2 Codes, a.**
Not all the CEN features and characterization are included in the Budapest code, as the as the CEN standard allows it, see **Appendix 2 The CEN standard, Annex A, A2 Codes, b and c.**
Some of the codes are revised in the CEN standard and the Budapest code is including the older ones, but of course that can be changed easy, when the CEN standard officially published.

Sample page from the Budapest code

CODE	POSITION1	POSITION2	TEXT	AUXILIARY	DIMENSION	ERROR CLASS	MEASURED OBJECT
2. Obstacles							reduction in cross-section
Settled deposit (hard)				<=5	%	5	
				<=15	%	4	
BBCC			compacted material	<=30	%	3	
				<=50	%	2	
				>50	%	1	
Settled deposit (fine)				<=5	%	5	
				<=15	%	4	
BBCA			fine material (e.g. sand, silt)	<=30	%	3	
				<=50	%	2	
				>50	%	1	
BBCB			coarse (e.g. gravel)	<=5	%	5	
				<=15	%	4	
				<=30	%	3	
				<=50	%	2	
				>50	%	1	
Intruding obstacle							
				<=5	%	5	
BBFC			intruding obstacle	<=15	%	4	
				<=30	%	3	
				<=50	%	2	
				>50	%	1	
BBFC/BBI			intruding obstacle, visible infiltration	0-50	%	2	
				>50	%	1	
BBFC/BBHB			intruding obstacle, visible infiltration (dripping)	0-50	%	2	
				>50	%	1	
BBFC/BBHC			intruding obstacle, visible infiltration (flowing)	0-50	%	2	
				>50	%	1	
BBFC/BPA/BBHB			intruding obstacle, visible infiltration (gushing)	0-50	%	2	
				>50	%	1	

Appendix 8 The coding system of Norway

1 Introduction

1.1 History of Norwegian TV inspection

The association “Pipe-inspection Norway” was founded in 1994. The motivation behind was a need for coordination, coursing, cooperation, etc. for all parts involved in pipe inspection. There is no record of history before the foundation of this organisation, but there is no doubt that it has contributed enormously to improve quality in all aspects concerning pipe inspection.

Today, “Pipe-inspection Norway” has 43 members from municipalities and private companies.

1.2 Current use of TV insp. in Norway

There are approx. 450 municipalities in Norway. Their sizes range widely in area and population, from less than 800 persons to more than 500000 persons.

CCTV inspection is primarily used for specific problem pipes in order to find out how to solve the problem, and evaluate which renovation technique is the most suitable. CCTV is also used to check the quality of new pipes, or to inspect a pipe after having applied a renovation technique.

Except for the largest municipalities, few use CCTV systematically as a strategic planning tool.

It is up to each municipality to decide how to use the collected inspection data. There is no legislation on how or how often to inspect, and there is no authority gathering information from the municipalities.

1.3 Methods used for sewer inspection

The methods that have traditionally been used depend on the equipment the local contractor possesses. Little development of new equipment has been carried out in Norway.

Up to date, most inspections are registered on VHS tape and as a paper report (see app. C). A format for exchange of digital data is defined, but unfortunately, digital data exchange from the contractor to the municipality has proven to be very difficult.

This has made CCTV inspection data difficult to access, and this is part of the reason why it is not used much for strategic planning.

More and more contractors and municipalities are replacing their old VHS recording systems with digital ones, and the new possibilities with this equipment is likely to improve CCTV inspection in Norway.

2 The Norwegian Manual on CCTV Inspections

The standardisation system for pipe inspection in Norway is described in the three NORVAR (Norwegian association for water and wastewater works) reports:

- 76/1997: Dataflyt, klassifisering av avlopsledninger (Data flow, classification of sewers)
- 83/1998: Rorinspeksjon med videokamera, Veiledning/rapportering, hovedledninger-stikkledninger-avlopskummer (Pipe inspection with video camera, guidelines/reporting, main pipes, service connections, manholes)
- 129/2003: Rorinspeksjon med videokamera, Veiledning/rapportering, hovedvannledninger (Pipe inspection with video camera, guidelines/reporting, main water pipes)

These reports, following two reports from 1995 on pipe inspection, are written in cooperation with Rorinspeksjon Norge (Pipe Inspection Norway), and are not considered as standards, but rather as a manual of practise (guidelines). 76/1997 will most likely be revised by the end of 2003.

The reports are summarised in the following subchapters.

2.1 Report 83/1998, "Pipe inspection with video camera, guidelines/reporting, main pipes, service connections, manholes"

Illustrations from 83/1998 are presented on picture **"Pipe inspection of sewers, Observation classes and degree of fault."** This report gives an overview of equipment, procedures, influenced parts, etc. Five main reasons for pipe inspection are:

1. Finding location of malfunctioning points leading to operational problems
2. Strategic state monitoring for planning and prioritisation
3. Detailed planning of rehabilitation
4. Quality control of new pipes
5. Monitoring of important pipes and problem pipes

7 points to remember for good inspection are:

1. Distance (Inspection starts in the manhole centre, distance accuracy should be $\pm$ 0.5 m).
2. Pipe dimension (must be measured at the start and at the end).
3. Camera placement (the camera should be in the centre of the pipe).

4. Good visibility (the lens should be clean during inspection. If the visibility is reduced caused to fog/steam, the inspection should be postponed).
5. Illumination (should be sufficient for sharp quality of photo).
6. Quality of video tape (recordings with poor quality should be erased, and the section re-inspected).
7. Reporting (map showing inspected pipes, report according to the manual, VHS tape with comments).

Proposal for a report form is shown on picture **Sheet for manual report of pipe inspection**. All information for a pipe inspection is translated from Norwegian. Please notice that the Norwegian system uses 4 degrees/classes in addition to 0, no fault. Observations are hence divided in the classes 0-4 where class 1 is the best and 4 is the worst condition.

Every reported observation consists of a code of two letters (observation type) and a number (observation class). This is shown on picture **Sheet for manual report of pipe inspection**.

For a change in degree of pipe filling, a comment should be made on the observers view on which of the three reasons causes the change:

1. Pipe sagging
2. Hydraulic jump due to downstream pipe
3. Sediments

The report must contain the following information:

- ✓ Administrative (name of company ordering the inspection and carrying out the inspection, date, ID number of disc/tape, weather, report page nr)
- ✓ Address (location of inspection, map reference, from manhole ID to manhole ID)
- ✓ Pipe information (new pipe/operating pipe, flushed/not flushed, with or counter current inspection, sewer/storm water/combined, dimension, material)
- ✓ Observations (distance, fault type and degree, see picture **Sheet for manual report of pipe inspection**)
- ✓ Comments (comments from the observer)

The report contains a form for manual report (picture **Sheet for manual report of pipe inspection**) and a description of format for exchange of digital data.

A proposal for a form for placing an order for pipe inspection is given, and also a proposal for a contract/agreement for a particular inspection job.

The same classification system is used for main pipes, service connections, and manholes. Manholes are visually inspected, and a system for registration of manholes is given (called manhole card). This system registers all data on the manhole, and can also contain inspection data (form is presented). Forms are also presented for inspection of main pipes and service connections.

A report should be produced for one pipe only. In other words, manholes, except unknown manholes, should not be denoted on the report sheet. If the pipe inspection is recorded digitally, the recording should end where the pipe ends. The reason for this is that data, also recordings, should be linked to one pipe only, as this will make data more accessible for later strategic planning use.
An example of an observation data print from observation software is shown on picture **Sheet for digital report of pipe inspection**.

2.2 Report 76/1997, "Data flow, classification of sewers"

This report shows an approach to using the pipe inspection data as a planning tool. Based on the inspection data retrieved using 83/1998, two values are mathematically calculated. These values are:

- ✓ Sd, operational pipe state
- ✓ Sm, technical pipe state

The different pipe faults that may occur, are given a weight for each degree (1-4). The weights vary in the range 0-12. The number of each observed fault, respectively the length of the failure (in meter), and degree are multiplied with the weight. The results are added up, and divided by pipe length (in meter). The faults that affect Sm and Sd values are:

- ✓ Sd: Joint misalignment, joint displacement, visual seal, root intrusion, infiltration, encrustation, pipeline intrusion
- ✓ Sm: Crack formation, corrosion/wear, and deformation

while the formulae for calculating these values are:

**indices are given in appendix B*

$$S_m = \frac{100 \cdot \left(\sum_{SR,KO,DF} weight \cdot amount \right)}{Total\ \ pipe\ length}$$

$$S_d = \frac{100 \cdot \left(\sum_{LS,TS,SP,RØ,IS,UB,IR} weight \cdot amount \right)}{Total\ \ pipe\ length}$$

Junctions, obstacles, change of direction, re-dimensioning and change of material have no impact on the Sd and Sm values, and neither does the slope of the pipe or change in degree of filling.

The further classification divides the Sd and Sm values in these groups:

Class	**Sm and Sd value range**
Very good	0-5
Good	5-10
Poor	10-30
Very Poor	30-70
Useless	70 <

The “Damage class” for a given pipe is then decided by the higher of the two values Sd (operational pipe state) or Sm (technical pipe state).

The municipalities who use this assessment system tend to make their own classification. In practice, pipes with a Sm or Sd value up to 30 are in fairly good condition.

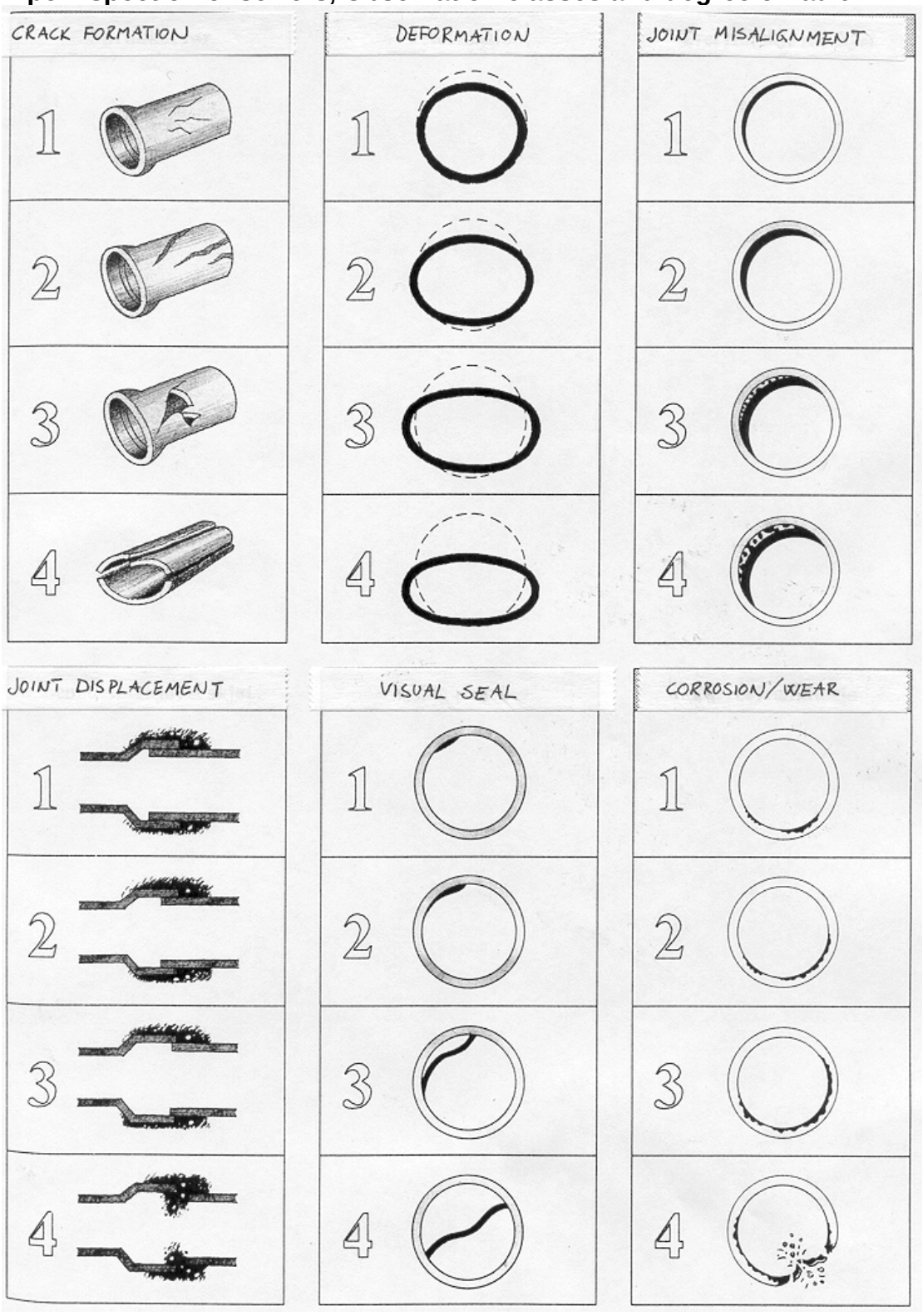
2.3 Report 129/2003, “Pipe inspection with video camera, guidelines/reporting, main water pipes”

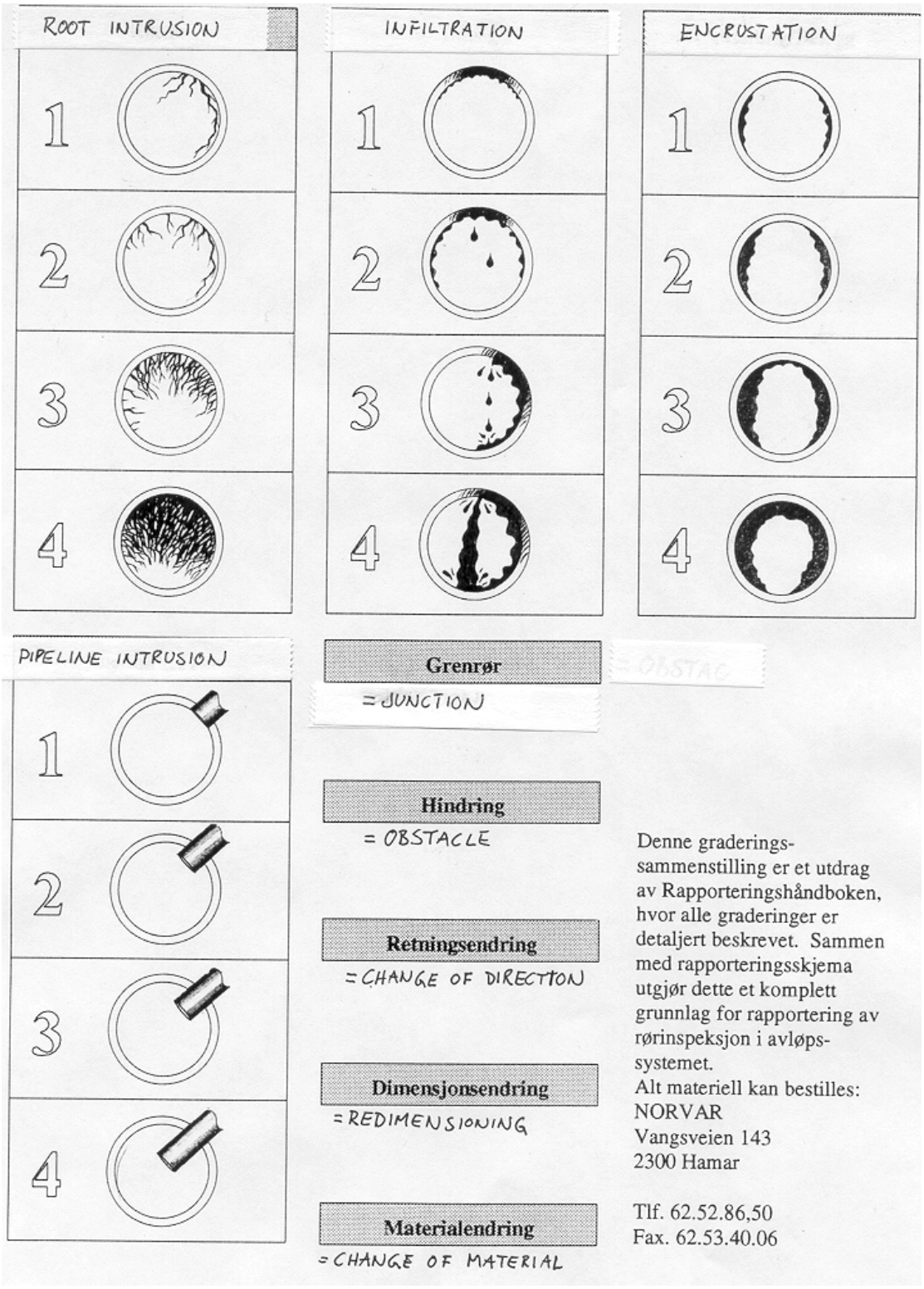
The water mains in Norway are ageing, and many will be replaced or renovated in the years to come. The need for pipe inspection of these pipes is therefore increasing, and the operators are facing a challenge since their experience is mainly on sewer inspection. This report describes the different pipe materials used, and different renovation techniques. The need and use for control before and after a renovation is described. Many of the observed faults are different for water pipes than for sewers, and the correct annotation is given for parts, pipes, faults, etc. A listing is not given in this short description of the report, as it concerns pressure pipes. If necessary, please contact SINTEF for more information on this report.

A photo collection from pipe inspection of different corrosion types, encrustation, repairs, renovation techniques, etc. is given in the report.

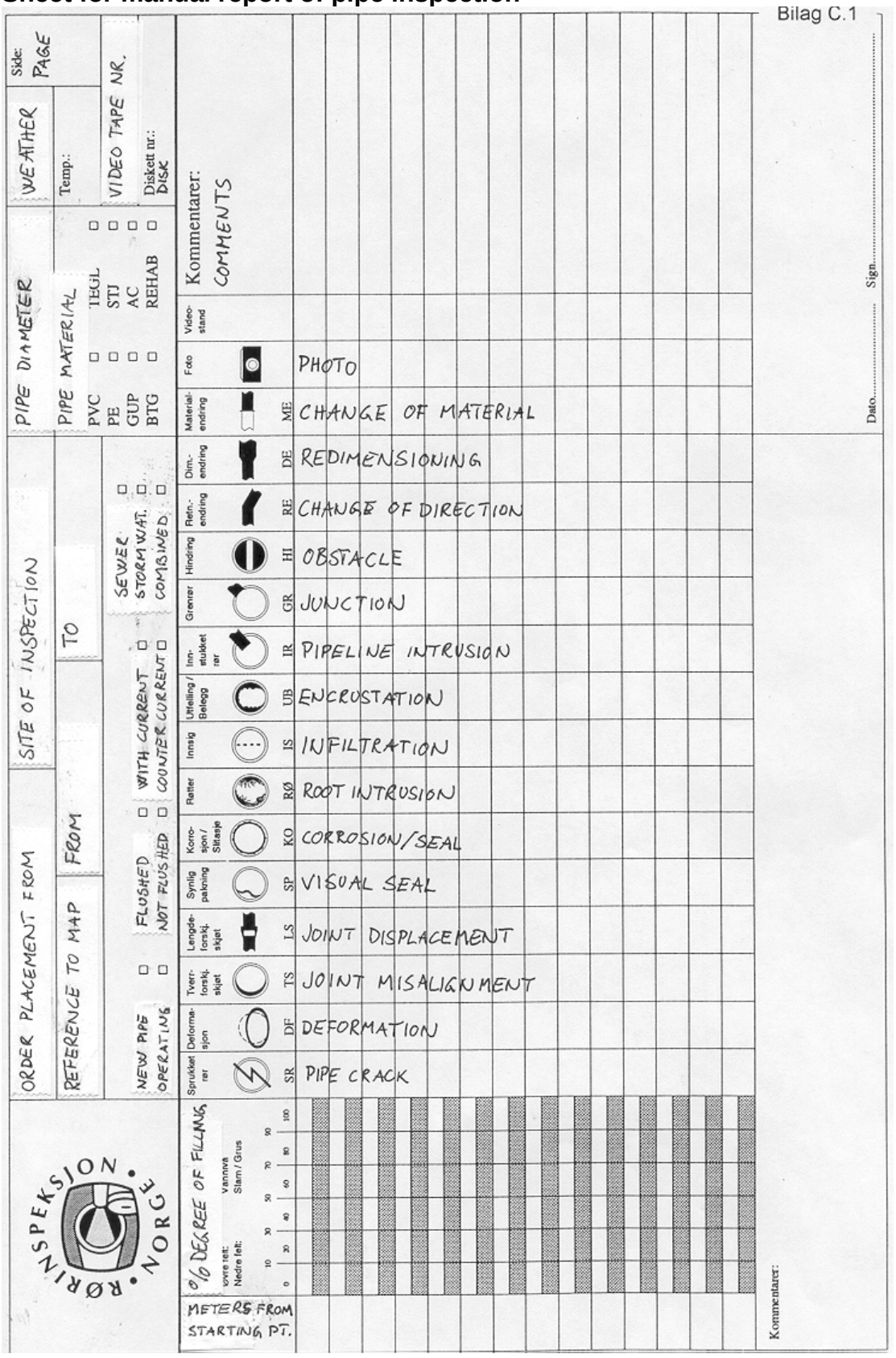
Tables of pipe diameters with wall thickness for different pressure classes is given for cast iron, steel and asbestos cement pressure pipes.

Pipe inspection of sewers, Observation classes and degree of fault

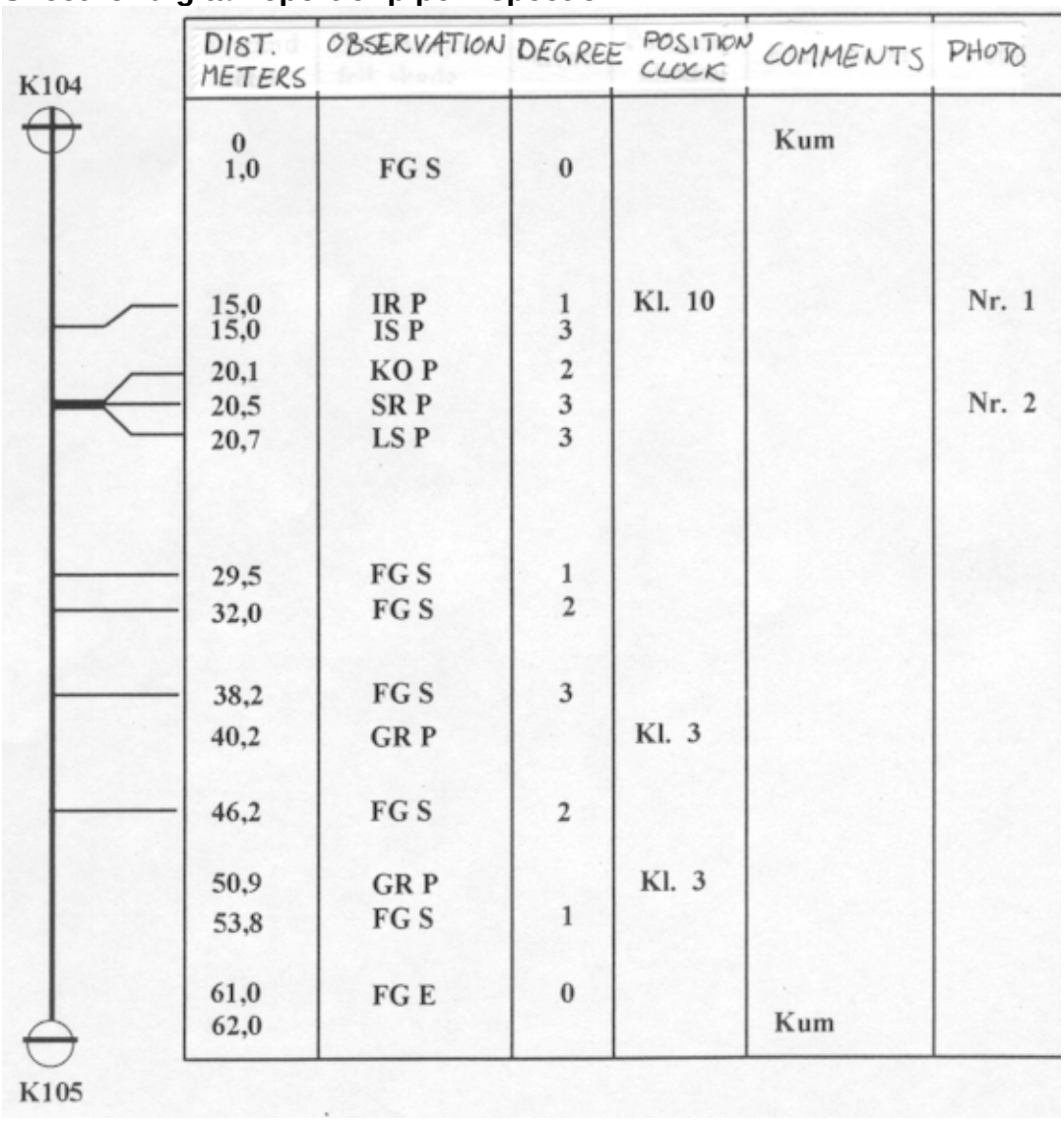



ROOT INTRUSION
1
2
3
4
INFILTRATION
1
2
3
4
ENCRUSTATION
1
2
3
4
PIPELINE INTRUSION
1
2
3
4
Grenrør
= JUNCTION
Hindring
= OBSTACLE
Retningsendring
= CHANGE OF DIRECTION
Dimensjonsendring
= REDIMENSIONING
Materialendring
= CHANGE OF MATERIAL
Denne graderings-sammenstilling er et utdrag av Rapporteringshåndboken, hvor alle graderinger er detaljert beskrevet. Sammen med rapporteringsskjema utgjør dette et komplett grunnlag for rapportering av rørinspeksjon i avløps-systemet.
Alt materiell kan bestilles:
NORVAR
Vangsveien 143
2300 Hamar
Tlf. 62.52.86,50
Fax. 62.53.40.06

Sheet for manual report of pipe inspection



Sheet for digital report of pipe inspection



DIST. METERS	OBSERVATION	DEGREE	POSITION CLOCK	COMMENTS	PHOTO
0				Kum	
1,0	FG S	0			
15,0	IR P	1	Kl. 10		Nr. 1
15,0	IS P	3			
20,1	KO P	2			
20,5	SR P	3			Nr. 2
20,7	LS P	3			
29,5	FG S	1			
32,0	FG S	2			
38,2	FG S	3			
40,2	GR P		Kl. 3		
46,2	FG S	2			
50,9	GR P		Kl. 3		
53,8	FG S	1			
61,0	FG E	0			
62,0				Kum	

Appendix 9 The coding system of Spain

1 CCTV codes for no man-entry sewers

Following, we list only the serious damages codes used by CLABSA in CCTV inspections done in Barcelona sewer network. The total list makes 152 codes. Besides there are several codes describing minor defects, connections and operations with CCTV.

3	Breaks
5	Obstacle
12	Defective joint
20	Intrusive roots
22	Section moved
23	Longitudinal fissure in ceiling
29	Section failure
31	Concrete intrusion
32	Urban service
33	Concrete/mortar intruded
34	Wasted/eroded material
38	Inflow
40	Deformed section
41	Longitudinal crack right
42	Longitudinal crack left
43	Multidirectional crack
44	Longitudinal crack in invert
47	Circumferential/transversal crack
64	Moved tube
67	Broken tube and repair
68	Broken tube
71	Intrusive concrete in invert
73	Pipe collapsed
75	Broken invert
76	Wasted tube
81	Radial crack
83	Deformation
87	Wasted invert
88	Fractured walls
89	No invert
90	Bricks missing
97	Soil obstructs fully the section
101	Deformed tube
103	Cracked walls
104	Wasted section
109	Urban service crossing the section
111	Missing invert in ovoid section
112	Service pipe

113	Collapsed invert
115	Longitudinal fissure in ceiling repaired
117	Service cables
118	Concrete missing in the low part of the wall
121	Broken and repaired section
123	Broken wall
125	Completely obtruded conduit
137	Piece of pipe fallen
138	Pipe on invert
141	Broken central channel
142	Wasted central channel
145	Detached rib-loc
151	Local break in vault

2 Man-entry sewers

This chapter intends to describe the symbols used to represent the different pathologies that can be found in man-entry sewers, evaluating also the gravity of the pathology. CLABSA has a “file card” for field inspections of man-entry sewers, quite complete from their point of view, that is in process of implementation among their operatives and inspectors, that is presented in the following pages. However, up to now they only used a simplified inspection card system.

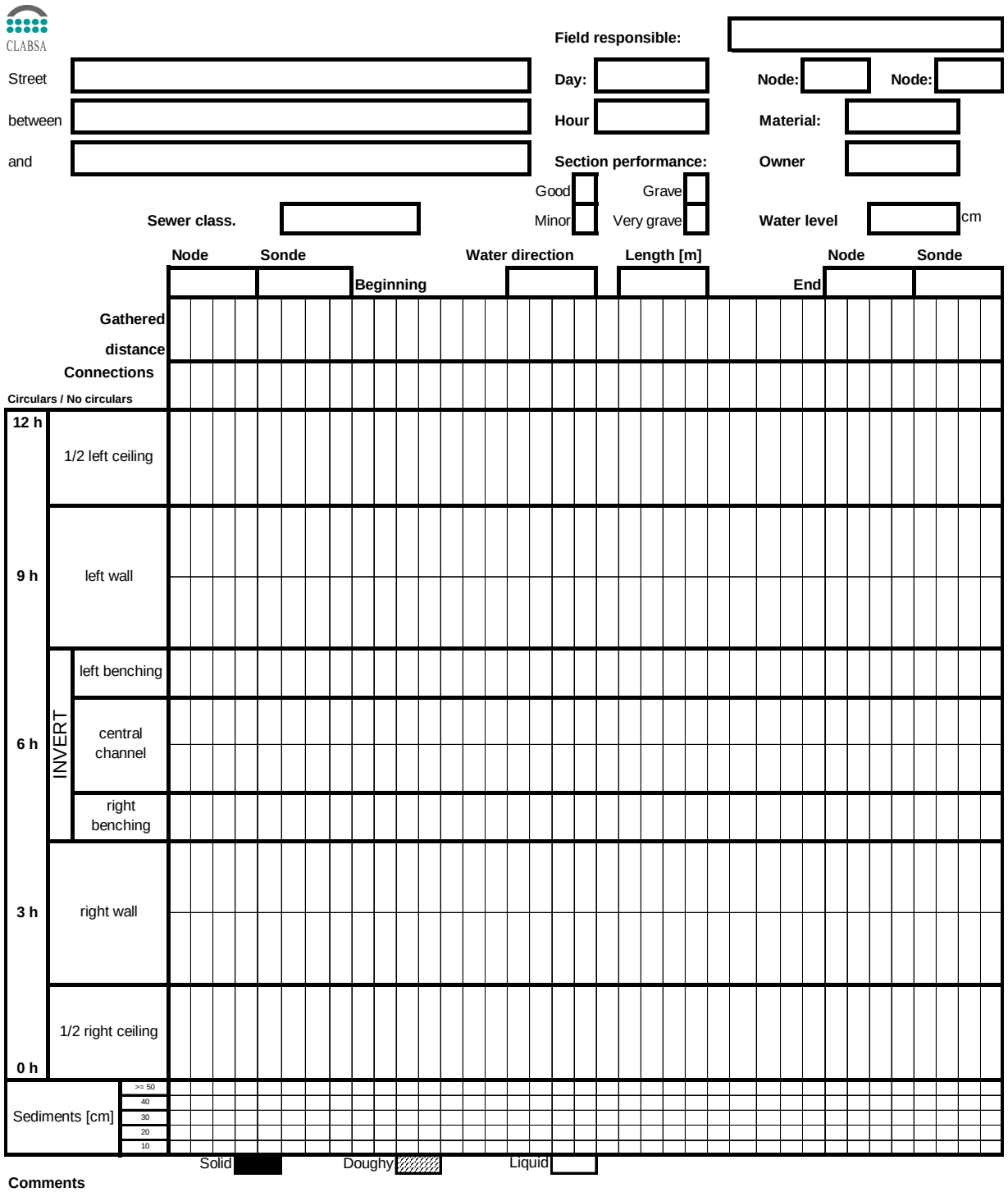
The simplified inspection card classifies the damages in tree classes (surface, collapse and fissure) and in two categories (minor or grave), locating them in the part of the sewer affected. When there’s no damage, the sewer is classified as “in good conditions”. The scheme is as follows:

	Central channel		**benching**		**walls**		**Ceiling/vault**	
Surface damage	**minor**	**grave**	minor	grave	minor	grave	minor	grave
Collapses	minor	grave	minor	grave	minor	grave	minor	grave
Fissures	minor	grave	minor	grave	minor	grave	minor	grave

Note: a minor fissure is a crack, a grave fissure is a fracture.

Their data exists all over the man-entry visited network (75%) with this simplified classification system. Defectives go linked with the length of the whole section. Also, there are points called “rehabilitation points”, that are classified in function of the urgency degree (level 1-2-3), providing also the length of the defect.

2.1 Field card model



Comments

Location sketch

Cross section

Materials key

PL Unknown plastic
RB spirally wound PVC (Rib-l
PVC PVC
PE Polythene
PRFV Fibreglass reinforced pc
F Concrete
GR Sandstone
RJ Masonry
MP Stonework

Description:

General data:

Inputs provided by GIS:

- Nodes.
- Owner.

Rest of input should be filled in by inspectors, on the following way:

- Field responsible.
- Day.
- Hour.
- Streets.
- Material: can be selected one or combined codes (e.g.: F – RJ) (codes come from Spanish words)

  PL: Unknown plastic
  RB: spirally wound PVC (Rib-loc)
  PVC: smooth PVC
  PE: Polythene
  PRFV: Fibreglass reinforced polyester
  F: Concrete
  GR: Sandstone
  RJ: Masonry
  MP: Stonework

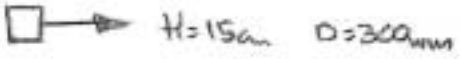
- Water level: Height of waste water level measured form the lowest point of the invert.
- Sewer classification: select one of the following codes

  "1": Unitary sewer "2". Lateral connection
  "3": Interceptor sewer "4": Port network (private owner)
  "5": Storm water sewer "6": Pumped network
  "7": Vacuum network "8": Out of service network

- Section performance: General performance level of visited length. Classes are: GOOD, MINOR DEFECTS, GRAVE, VERY GRAVE.
- Beginning node / end node: in the inspection way.
- Beginning sonde / end sonde: Vertical distance. If node is a manhole, distance between invert and top
- Length: of visited section.
- Water direction: Arrow in the same way or opposite to inspection.

Grid incidence:

- Gathered distances. Distance from beginning to have the location of connections and pathologies.
- Connections:. For each one of them, give diameter or cross section (D), and sonar (H) measured form deepest point of invert to lowest point of connection. Kind of connection represented as follows:

Wastewater connection: 

Gutter connection (gallery): 

Gutter connection (tubular): 

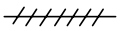
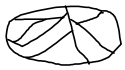
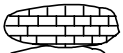
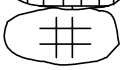
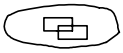
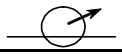
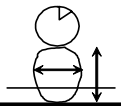
- Side: Connection side to sewer is represented in the grid.
- Special cases: If connection is out of order , add an “A”; if it’s dry, but cannot be sure if it’s out of order, add an “S”:

- Faulty connections: In this case, add an “X” in the symbol. Then a pathologies key, explained latter, is needed.
- Faults or pathologies: Explained in the next chapter.

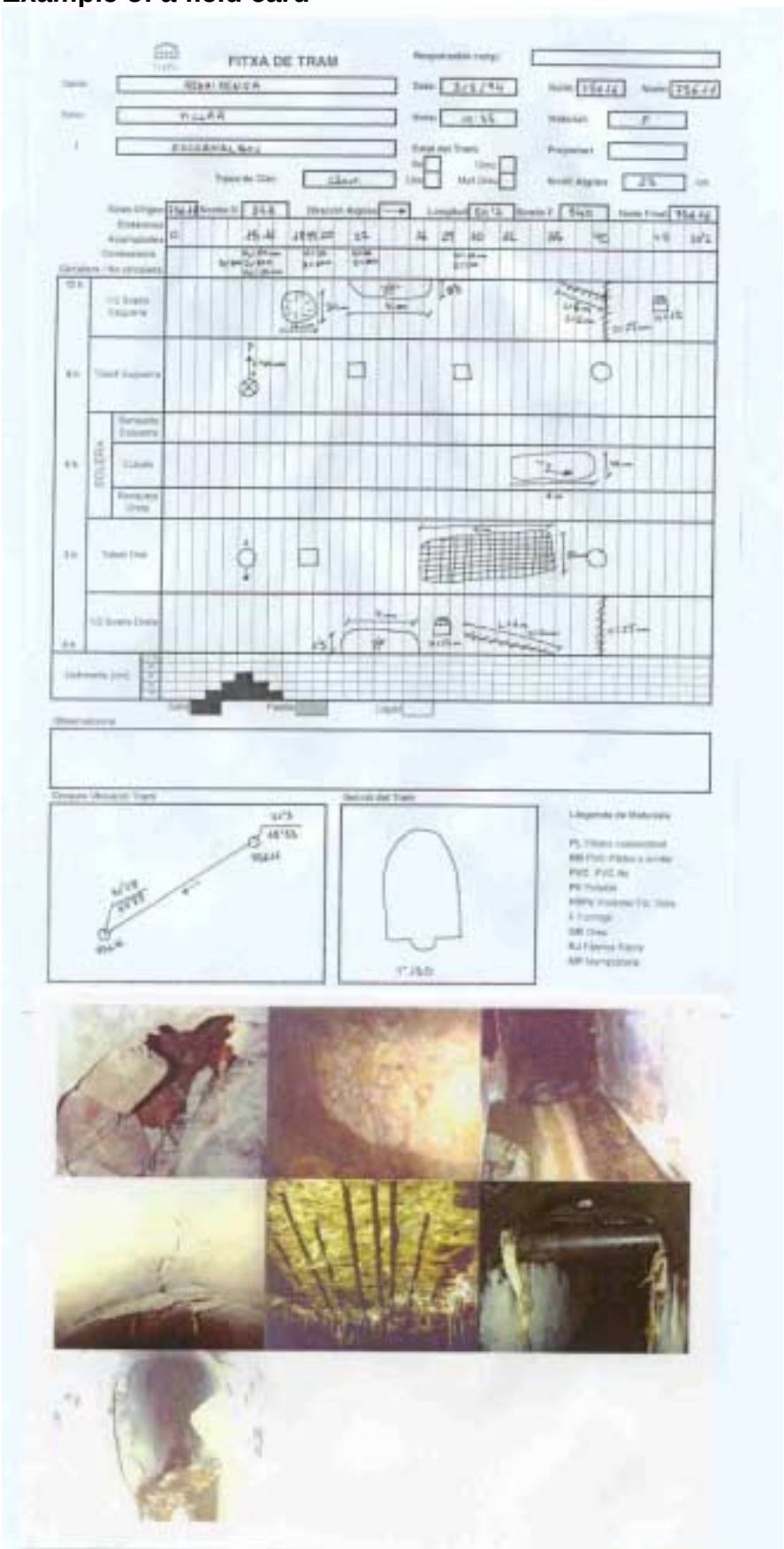
Boxes down in the field card:

- Comments: Free format to write observations that can’t be set anywhere else
- Location sketch; of visited length
- Cross section: sketch of sewer cross section, with marked measured.

2.2 Pathologies key

BRIEF DESCRIPTION	CODE or ICON	CHARACTERISTIC DATA				
		Geom.	FIELD 1	FIELD 2	FIELD 3	FIELD 4
INTRUDING						
Summer intruding the vault		Point	Free height (H)	Sewer length (L < 5 m)		
Urban service crosses the sewer		Point	Free height (H)	Service diameter		
Wall or pillar intruding the sewer		Point	Free width (H)	Sewer length (L < 5 m)		
Roots		Point	Kind (tree, plant)			
CRACKS						
Structural lineal crack		Line	Lenght (L)	Gap (O)	Degree (minor/grave)	
Surface cracking		Area	Area (L x A)	% affected (5, 25, 50, 75, 100 %)		
LINING DAMAGE						
Missing invert aggregate		Area	Area (L x A)			
Missing mortar		Area	Area (L x A)			
Visible reinforcement		Area	Area (L x A)			
FRACTURES						
Linear structural fracture		Line	Length (L)	Gap (O)	Degree (minor/grave)	Relative displacement (D)
Dislogged masonry		Area	Area (L xA)			
Bore, hole or gap in the structure		Area	Area (L xA)			
WATERTIGHTNESS						
Infiltration		Area	Area (L x A)	Degree (sweating / dripping / flowing)		
Exfiltration		Line	Length (L)			
DEFORMATION						
Local deformation		Point				
Global deformation		Line	Deformed height (H)	Deformed width (A)	Affected length (L)	
COLLAPSE						
Partial or total collapse		Line	Free height (H)	Free width (A)	Affected length (L)	
EROSION						
Mechanic erosion		Area	Area (L x A)	Degree (minor / grave/ total)		
Chemical attack		Area	Area (L x A)	Degree (minor / grave/ total)		
DISPLACED JOINTS						
Defective joint		Line	Gap (O)	Relative displacement (D)	Missing mortar? (Y/N)	
Sealing ring hanging		Point				

Example of a field card



Appendix 10 The coding system of the United Kingdom

The UK National Sewer Classification system is described in detail in the Manual of Sewer Condition Classification (MSCC) 3rd Edition 1993. The system has been in use now for over 20 years subject to some refinements. The structure of the system can be seen from the attached coding sheet.

Information about the survey and the location of the pipe etc. is recorded in the header data.

Each observation is recorded as a line of the sheet with the distance from the start, the video time. The position of the observation around the circumference of the pipe is described using the clockface positions. The observation is described using a code (list of codes attached) with dimensions being added where appropriate in the Diameter/Dimension columns and the Intrusion columns.

The MSCC, as one of the oldest systems in use has been the basis for a number of other systems including the Australian Conduit Condition Evaluation Manual and the North American Pipe Condition Assessment Program (PACP) which was produced by one of my colleagues in collaboration with NASSCO a trade association in the USA.

The UK were full participants in the development of EN13508-2 (the Secretary to CEN/TC165/WG22 which produced EN13508-2 is from WRc plc) and so there are equivalent codes in the EN for every code in the MSCC. A new edition of the MSCC is being prepared which will become the UK National Equivalent System under the EN.

Standard coding form

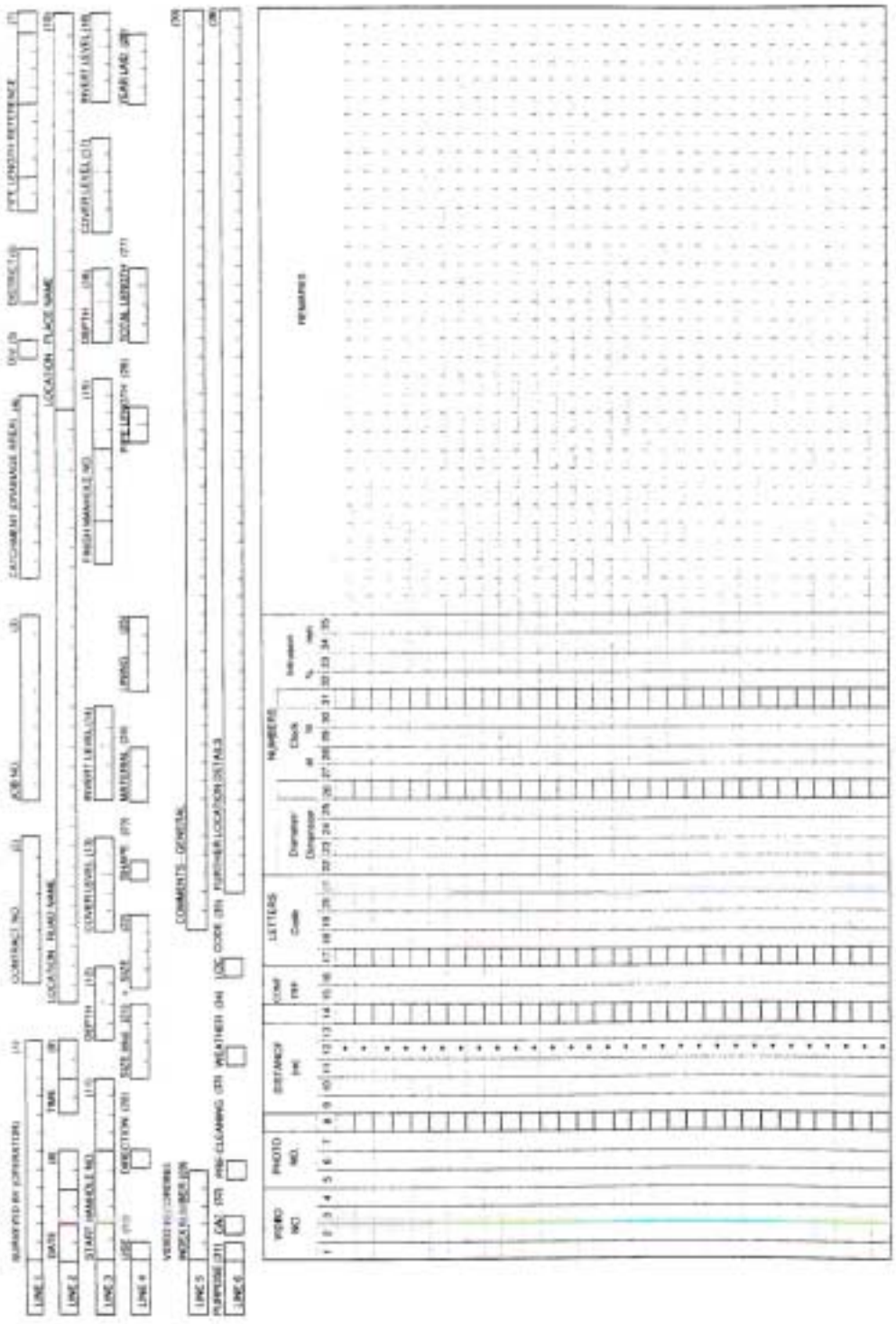


Figure 1 - Standard coding form

Index 1 - Sewer condition codes

Index 1 (continued)

Appendix 11 Translation of the Australian code to the CEN code

Drains and sewers

The circumferential location is registered as a 'clock rotation' for each observation.

European Standard EN 13508		Australian Standard WSA 05	
Main Code	**Characterisation**	**Main Code**	**Characterisation**
BAA (deformation)		D (cross sectional shape - deformation)	
1	A. Vertical		V Vertical flattening
	B. Horizontal		H Horizontal flattening
Quantification	The percentage change in the dimension which reduces	Quantification	The percentage change in the diameter
BAB (fissure)		C (Cracking)	
1.	A. Surface crack	1	L. Longitudinal
	B. Wall Crack		C. Circular
			S. Complex
			4. Multiple/complex
2.	A. Longitudinal	2	1. Surface crack
	B. Circumferential		2. Wall Crack
	C. Complex		
	D. Helical	Quantification	The width of the fissure
Quantification	The width of the fissure	F (Fracture but retains original shape)	
			L. Longitudinal
			C. Circular
			S. Complex
			4. Multiple/complex
		Quantification	Width of fracture
BAC (break/collapse)		B (Breaks, separate pieces)	
	A. Break		D All pieces present but displaced
	B. Missing		M Some pieces missing pieces
	C. Collapse		E Exceptional - piece of pipe missing
Quantification	The length of the break or collapse	Quantification	The length of the break
		X (Collapse)	
			Sewer has collapsed
		Quantification	The length affected

BAD (defective brickwork or masonry)	
1.	A. Displaced
	B. Missing
	C. Dropped invert
	D. Collapse
2.	A. Another layer is visible
	B. Nothing is visible
Quantification	For C: the depth of drop

DB (Displaced bricks)	
	Moved but still present
	I. Moved inwards
	O. Moved outwards
MB (Missing bricks)	
	V Another layer of bricks visible
	NV Nothing visible though missing bric
Quantification	Length of displacement
DI (Dropped invert)	
Quantification	Length of drop
BCM (Brickwork misaligned)	
Quantification	Length of displacement or length of dro
XB (Brick sewer collapsed)	
Quantification	Visible length affected

BAE (missing mortar)	
	All or part of the mortar from brickwork or masonry is missing
Quantification	The depth from the surface of the brickwork or masonry to the surface of the mortar

MM (Missing motar)	
	S Depth of MM <15 mm
	M Depth of mm 15 - 50 mm
	T Depth of MM > 50 mm
Quantification	---

BAF (surface damage)	
1.	A. Increased roughness
	B. Spalling
	C. Visible aggregate
	D. Aggregate projecting from surface
	E. Missing aggregate
	F. Visible reinforcement
	G. Reinforcement projecting from surface
	H. Corroded reinforcement
	I. Missing wall
	J. Corrosion products on surface
	Z. Other
2.	A. Mechanical damage
	B. Chemical attack -general
	C. Chemical attack -biochemical attack
	D. Chemical attack -attack by wastewater
	E. Cause not evident
Quantification	None

S (Surface damage)	
	W. Increased roughness
	S. Spalling
	AV. Visible aggregate
	AP. Aggregate projecting from surface
	AM. Missing aggregate
	RC. Reinforcement visible and corroded
	CP. Corrosion products on surface
	H. Hole in wall
	WS Staining on wall
	T twinkling/sparkling (H_2S corrosion)
	Z. Other
Quantification	None

BAG (intruding connection)		CI (Intruding connection)	
	A connecting pipe projecting into the pipe-line, obstructing the cross-sectional area		S Intusion < 10% of ID M Intusion > 10% < 25% of ID L Intusion > 25% of ID
Quantification	The length of the intrusion expressed as a percentage of the diameter or vertical dimen-sion of the pipeline	Quantification	The length of the intrusion expressed as a percentage of the diameter or vertical dimen-sion of the pipeline

BAH (defective connection)		CX (Defective connection)	
	A. Position of the connection is incorrect		P. Position of the connection is incorrect
	B. Gap between the end of connecting pipe and the main pipe C. Partial gap between the end of connecting pipe and the main pipe		G. Gap between the end of connecting pipe and the main pipe H. Partial gap between the end of connecting pipe and the main pipe
	D. Connecting pipe is damaged		D. Connecting pipe is damaged
	E. Connecting pipe is blocked		B. Connecting pipe is blocked
	Z. Other		SR Some tree roots, not affecting flow
			BR Bad tree roots, affecting flow
Quantification	None	Quantification	S minor problem M Moderate problem M Major problem -immediate attention

BAI (intruding sealing material)		JI (Joining material - seal- intrusion)	
1.	A. Sealing ring	1.	R. Sealing ring
	Z. Other sealant		Z. Other sealant
2.	A. Visibly displaced but not intruding	2.	N. Visibly displaced but not intruding
	B. Hanging but not broken - lowest point above horizontal centreline		HH. Hanging but not broken - lowest point above horizontal centreline
	C. Hanging but not broken - lowest point below horizontal centreline		HL. Hanging but not broken - lowest point below horizontal centreline
	D. Broken		B. Broken ring
			L. Loop inside pipe
Quantification	Where the seal is not a ring: the reduction in cross sectional area	Quantification	Where the seal is not a ring: the reduction in cross sectional area

BAJ (displaced joint)		BAJ (Displaced joint)	
1	A. Longitudinal	1	L. Longitudinal
	B. Radial		R. Radial
	C. Angular		A. Angular
Quantification	Distance or angel of the displacement	Quantification	Distance or angel of the displacement

BAK (lining defect)		PL (Lining defect)	
1.	A. Lining of the pipeline is detached	1.	D. Lining of the pipeline is detached
	B. Discolouration of the lining		C. Discolouration of the lining
	C. Defective end of lining		E. Defective end of lining
	D. Wrinkled lining		W. Wrinkled lining
	E. Blistered lining		B. Blistered lining
	Z. Other		WD Lining weld defective
			RC Re-establishment of connection defective
			L Water leak from behind lining
			R Tree roots from behind lining
			SJ Spiral liner joints separated
			PW Poor workmanship
			Z. Other
2.	A. Longitudinal	2.	L. Longitudinal wrinkling
	B. Circumferential		C. Circumferential wrinkling
	C. Complex		M. Multiple/Complex wrinkling
Quantification	The reduction in cross-sectional area	Quantification	The reduction in cross-sectional area

BAL (defective repair)		RX (Defective repair)	
	A. Part of the wall is missing		M. Major gaps, part of the wall is missing
	B. A patch sealing a hole deliberately made		P. A patch sealing a hole deliberately made
	in the pipe wall has become defective		in the pipe wall has become defective
	Z. Other		B Bellies, - irregular line and grade
			Z. Other
Quantification	None	Quantification	None

BAM (weld failure)		W (Weld defect)	
	A. Longitudinal		L. Longitudinal
	B. Circumferential		C. Circumferential
	C. Helical		H. Helical
Quantification	None	Quantification	Record X if bead intusion is >5 mm for ≤ 200 mm ID & >10 mm for ≥ 200 mm ID

BAN (porous pipe)		PP (Porous pipe)	
	The pipe material is seen to be porous		The pipe material is seen to be porous
Quantification	None	Quantification	Record circumf. location of porous area

BAO (soil visible through defect)		SV (Soil visible through defect)	
	The soil outside the pipe is visible through a defect		The soil outside the pipe is visible through a defect
Quantification	None	Quantification	None

BAP (void visible through defect)		VV (void visible through defect)	
	The void outside the pipe is visible through a defect		The void outside the pipe is visible through a defect
Quantification	None	Quantification	None

BBA (roots)		R (Tree roots)	
	A. Tap root	1	T. Tap root
	B. Independent fine roots		F. Independent fine roots
	C. Complex mass of roots		M. Complex mass of roots
		2	R If cut recently
Quantification	Reduction of the cross-sectional area	Quantification	Reduction of the cross-sectional area

BBB (attached deposits)		DE (deposits on the wall)	
	A. Encrustation		F Fouling
	B. Grease		G. Grease
	C. Fouling		E. Encrustation
	Z. Other		W. Other maretial
Quantification	Reduction of the cross-sectional area	Quantification	Reduction of the cross-sectional area

BBC (settled deposits)		DE (deposits on the invert)	
	A. Fine		S Sediment fine -sand, silt
	B. Coarse		R Sediment coarse -gravel, rubble
	C. Hard or compacted material		C Sediment hard or compacted - concrete
	Z. Other		Z Other
Quantification	The depth of the deposit as a percentage	Quantification	The depth of the deposit as a percentage

BBD (ingress of soil)		ING (Ingress of soil)	
	A. Sand		S. Sand non-cohesive
	B. Peat		F. clay - cohesive
	C. Fine material		G Granular, -bedding material
	D. Gravel		Z Other
	Z. Other		
Quantification	Reduction of the cross-sectional area	Quantification	Reduction of the cross-sectional area

BBE (other obstacles)		OB (Obstructions)	
	A. Dislodged brick or masonry unit		B. Dislodged brick or masonry unit
	B. Pieces of broken pipe		M. Pieces of broken pipe
	C. Another object lying in the invert		Z. Another object lying in the invert
	D. Protruding through the wall		I. Protruding through the wall
	E. Wedged in the joint		J. Wedged in the joint

	F. Entering through connection/junction pipe		C. Entering through connection/junction pipe
	G. External pipes or cables built through the pipeline		P. External pipes or cables built through the pipeline
	H. Built into the structure		S. Built into the structure
Quantification	Reduction of the cross-sectional area	Quantification	1.Reduction of the cross-sectional area
			2. Severity of defect. Record "H"

BBF (infiltration)		I (Infiltration)	
	A. Sweating		S. Sweating
	B. Dripping		D. Dripping
	C. Flowing		R. Running
	D. Gushing		G. Gushing
Quantification	None	Quantification	Clock ref. and extent of defect

BBG (exfiltration)		EX (Exfiltration)	
	Visible leakage of flow out of the pipeline		Visible leakage of flow out of the pipeline
Quantification	None	Quantification	Clock ref. and extent of defect

BBH (vermin)		V (Vermin)	
1.	A. Rat	1.	R. Rodent
	B. Cockroach		Z. Other
	Z. Other		
2.	A. In the pipeline	2.	S. In the sewer
	B. In a connection		C. In a connection
	C. In an open joint		J. In an open joint
	Z. Other		Z. Other
Quantification	The number of animals	Quantification	The number of vermin

BCA (connection)		CN (Connection)	
1.	A. Junction		Through a hole formed on original sewer
	B. Saddle connection - drilled		G. Good workmanship
	C. Saddle connection - chiselled		P Poor workmanship
	D. Plain connection - drilled		O Open connection
	E. Plain connection -chiselled		C Closed connection
	F. Connection other than a junction	JN (Junction)	
	G. Type of connection not evident		O Open connection
	Z. Other		C Closed connection
2.	A. Connection open		Intrusion less than 10%
	B. Connection closed	CI (Intruding connection)	
			S Intrusion ≤ 10% of ID

			M Intrusion >10% to < 25% of ID
			L Intrusion ≥ 10% of ID
Quantification	None	Quantification	Clock ref. of the centre of connection

BCB (point repair)		RP (Point repair)	
	A. Pipe replaced		R. Pipe replaced
	B. Localised lining		L. Localised lining
	C. Injected mortar		I. Injected mortar
	D. Other injected sealing material		S. Other injected sealing material
	E. Hole repaired		H. Hole repaired
	Z. Other		IC Installation of an internal lip
			Z. Other
Quantification	None	Quantification	None

BCC (curvature of sewer)		L (Line of sewer deviates)	
1.	A. Left		L. Left
	B. Right		R. Right
2.	A. Up		U. Up
	B. Down		D. Down
Quantification	The total angle of deviation	Quantification	The total angle of deviation

BCD (start node type)		ST (Start node)	
	A. Manhole		MH Maintenance hole
	B. Inspection chamber		MS Maintenance shaft
	C. Rodding eye		RE Rodding eye
	D. Lamp hole		IO Inspection opening
	E. Outfall		LH Lamp hole
	F. Major connection without a manhole or inspection chamber		O Outfall
			F. Major connection without access struct.
	Z. Other		VD Vertical drop
			DE Dead end
			J Junction or connection with other sewer
			Z. Other
Quantification	The node reference	Quantification	

BCE (finish node)	
	A. Manhole
	B. Inspection chamber
	C. Rodding eye
	D. Lamp hole
	E. Outfall
	F. Major connection without a manhole or inspection chamber
	Z. Other
Quantification	The node reference

BDA (general photograph)	
	A still photograph has been taken to record the general condition of the drain or sewer
Quantification	The direction of the camera

GP (General photograph)	
1	A still photograph has been taken to record the general condition of the drain or sewer
2	L Camera pointing to left of direct. of trav. R Camera pointing to right of direct. of trav F Camera pointing in direction of travel L Camera pointing against direction of trav U Camera pointing up D Camera pointing down H Camera pointing horizontally approx.
Quantification	The direction of the camera

BDB (general remark)	
	A remark which cannot be included in any other way
Quantification	None

GC (general comment)	
	A remark which cannot be included in any other way
Quantification	None

BDC (inspection abandoned)	
	A. Obstruction
	B. High water level
	C. Equipment failure
	Z. Other
Quantification	None

SA (Inspection -Survey- abandoned)	
	OB Obstruction
	HW High water level
	EF Equipment failure
	D Other
Quantification	None

BDD (water level)	
	A. Clear effluent
	B. Turbid or discoloured effluent
Quantification	The level expressed as a percentage of the diameter or the vertical dimension

WL (Water -sewage- level)	
	C Clear effluent
	T Turbid or discoloured effluent
Quantification	The depth expressed as a percentage of the diameter or the vertical dimension

BDE (flow in incoming pipe)		BDE (flow in incoming pipe)	
1.	A. Clear effluent	1.	A. Clear effluent
	B. Turbid or discoloured effluent		B. Turbid or discoloured effluent
2.	A. Wrongly connected because wastewater is observed discharging to a surface water drain or sewer	2.	A. Wrongly connected because wastewater is observed discharging to a surface water drain or sewer
	B. Wrongly connected because surface water is observed discharging to a wastewater drain or sewer		B. Wrongly connected because surface water is observed discharging to a wastewater drain or sewer
	C. Not observed to be wrongly connected		C. Not observed to be wrongly connected
Quantification	The water level in the connecting pipe	Quantification	The water level in the connecting pipe

BDF (atmosphere within the pipeline)	
	A. Oxygen deficiency
	B. Hydrogen sulfide
	C. Methane
	Z. Other
Quantification	The percentage of the gas in the atmosphere

BDG (loss of vision)	
	A. Camera is under water
	B. Silt
	C. Steam
	Z. Other
Quantification	None

Appendix 12 Translation of the Danish code to the CEN code

Drains and sewers

The circumferential location is registered for each observation.
In the Danish "TV-inspection of sewers" the quantification is registered as a note whereas in the European standard the quantification is registered in a field for quantification.

Tv-inspektion af afløbsledninger (Danish Manual)		**English translation of the Danish Manual**		**European Standard**	
Observations type	**Observationsklasse**	**Observation type**	**Observation class**	**Main Code**	**Characterisation**
DE (deformation)		DE (deformation)		BAA (deformation)	
					A. Vertical
					B. Horizontal
	1. Mindre end 5 % af rørdiameteren		1. Less than 5 % of the pipe diameter	Quantification	The percentage change in the dimension
	2. 5-15 % af rørdiameteren		2. 5-15 % of the pipe diameter		which reduces
	3. Større end 15 % af rørdiameteren		3. More than 15 % of the pipe diameter		
Bemærkninger	Nøjagtig angivelse af deformationen i %	Notes	The precise deformation as a percentage		
RB (revner/brud)		RB (cracks/breaks)		BAB (fissure)	
	1. Skår, afskalninger, små udfældninger m.m.		1. Fragment, spalling, precipitation etc.	1.	A. Surface crack
	2. Brudlinier er synlige på rørvæggen		2. Line of fractures visible on the pipe wall		B. Crack
	3. Brudstykker der dækker op til 4 timer		3. Fragments covering until 4 hours		C. Fracture
	4. Brudstykker der dækker mere end 4 timer		4. Fragments covering more than 4 hours		
Bemærkninger	L. Langsgående	Notes	L. Longitudinal	2.	A. Longitudinal
	C. Cirkulære		C. Circular		B. Circumferential
	S. Sammensatte		S. Complex		C. Complex
					D. Helical
				Quantification	The width of the fissure

RB (revner/brud)	
	3. Brudstykker der dækker op til 4 timer
	4. Brudstykker der dækker mere end 4 timer
Bemærkninger	L. Langsgående
	C. Cirkulær
	S. Sammensat

RB (cracks/breaks)	
	3. Fragments covering until 4 hours
	4. Fragments covering more than 4 hours
Notes	L. Longitudinal
	C. Circular
	S. Complex

BAC (break/collapse)	
	A. Break
	B. Missing
	C. Collapse
Quantification	The length of the break or collapse

RB (revner/brud)	
	3. Brudstykker der dækker op til 4 timer
	4. Brudstykker der dækker mere end 4 timer
	4. Brudstykker der dækker mere end 4 timer
Bemærkninger	L. Langsgående
	C. Cirkulær
	S. Sammensat

RB (cracks/breaks)	
	3. Fragments covering until 4 hours
	4. Fragments covering more than 4 hours
	4. Fragments covering more than 4 hours
Notes	L. Longitudinal
	C. Circular
	S. Complex

BAD (defective brickwork or masonry)	
1.	A. Displaced
	B. Missing
	C. Dropped invert
	D. Collapse
2.	A. Another layer is visible
	B. Nothing is visible
Quantification	For C: the depth of drop

RB (revner/brud)	
	1. Skår, afskalninger, små udfældninger m.m.
Bemærkninger	L. Langsgående
	C. Cirkulær
	S. Sammensat

RB (cracks/breaks)	
	1. Fragment, spalling, precipitation etc.
Notes	L. Longitudinal
	C. Circular
	S. Complex

BAE (missing mortar)	
	All or part of the mortar from brickwork or masonry is missing
Quantification	The depth from the surface of the brickwork or masonry to the surface of the mortar

KO (korrosion/erosion)	
	1. En begyndende frilægning af sten
	2. Stenmaterialet er tydeligt frilagt
	3. Stenmaterialet er meget frilagt
	4. Dele af ledningen er korroderet væk
	4. Dele af ledningen er korroderet væk
Bemærkning	Ingen

KO (corrosion/erosion)	
	1. Starting free placement of stones
	2. The stone material is free placed
	3. The stone material is very free placed
	4. Parts of the pipe is corroded off
	4. Parts of the pipe is corroded off
Notes	None

BAF (surface damage)	
1.	A. Increased roughness
	B. Spalling
	C. Visible aggregate
	D. Aggregate projecting from surface
	E. Missing aggregate
	F. Visible reinforcement
	G. Reinforcement projecting from surface
	H. Corroded reinforcement
	I. Missing wall
	J. Corrosion products on surface
	Z. Other
2.	A. Mechanical damage
	B. Chemical attack -general
	C. Chemical attack -biochemical attack
	D. Chemical attack -attack by wastewater
	E. Cause not evident
Quantificati	None

PH (påhugning)/ PB (påboring)	
	0. Indragning højest 3 % af hovedledningen
	1. Indragning mindre end 10 %
	2. Indragning på 10-20 %
	3. Indragning større end 20 %
Bemærkning	Der angives "ind" hvis påhugningen/
	påboringen rager ind i hovedledningen

PH (chiselled) / PB (drilled)	
	0. The intrusion is less than 3 % of the pipe
	1. The intrusion is less than 10 %
	2. The intrusion is 10-20 %
	3. The intrusion is more than 20 %
Notes	"in" is noted if the chiselling / drilling is
	intruding the main pipe

BAG (intruding connection)	
	A connecting pipe projecting into the pipe-
	line, obstructing the cross-sectional area
Quantificati	The length of the intrusion expressed as a
	percentage of the diameter or vertical dimen-
	sion of the pipeline

PH (påhugning)/ PB (påboring)	
	4. Stikledningen og hovedledningen når ikke sammen
	1. Lidt defekt
	2. Middel defekt
	3. Meget defekt
Bemærkninger	Ingen

PH (chiselled) / PB (drilled)	
	4. The connecting pipe and the main pipe do not connect
	1. Small defect
	2. Mean defect
	3. Large defect
Notes	None

BAH (defective connection)	
	A. Position of the connection is incorrect
	B. Gap between the end of connecting pipe and the main pipe
	C. Partial gap between the end of connecting pipe and the main pipe
	D. Connecting pipe is damaged
	E. Connecting pipe is blocked
	Z. Other
Quantificati	None

IS (indhængende samlingsmateriale)	
	1. Materiale kun synligt i samlingen
	2. Materialet synligt over vandret centerlinie
	3. Materialet synligt under vandret centerlinie
Bemærkninger	Ingen

IS (intruding sealing material)	
	1. Material only visible in the joint
	2. The material is visible above the horizontal centreline
	3. The material is visible below the horizontal centreline
Notes	

BAI (intruding sealing material)	
1.	A. Sealing ring
	Z. Other sealant
2.	A. Visibly displaced but not intruding
	B. Hanging but not broken
	- lowest point above horizontal centreline
	C. Hanging but not broken
	- lowest point below horizontal centreline
	D. Broken
Quantificati	Where the seal is not a ring:
	the reduction in cross sectional area

FS (forskudt samling) / ÅS (åben samling)	
	ÅS (åben samling)
	FS (forskudt samling)
	FS (forskudt samling)

FS (displaced joint) / ÅS (open joint)	
	ÅS (open joint)
	FS (displaced joint)
	FS (displaced joint)

BAJ (displaced joint)	
	A. Longitudinal
	B. Radial
	C. Angular

	1. Mindre end 1/2 godstykkelse			1. Less than 1/2 of the wall thickness		Quantification	Distance or angel of the displacement
	2. Mellem 1/2 og 1/1 godstykkelse			2. Between 1/2 and 1/1of the wall thickness			
	3. Mellem 1/1 og 2/1 godstykkelse			3. Between 1/1 and 2/1 of the wall thickness			
	4. Større end 2/1 godstykkelse			4. More than 2/1 of the wall thickness			
Bemærkning	Ingen		Notes	None			

BAK (lining defect)		
	1.	A. Lining of the pipeline is detached
		B. Discolouration of the lining
		C. Defective end of lining
		D. Wrinkled lining
		E. Blistered lining
		Z. Other
	2.	A. Longitudinal
		B. Circumferential
		C. Complex
Quantification		The reduction in cross-sectional area

BAL (defective repair)	
	A. Part of the wall is missing
	B. A patch sealing a hole deliberately made
	in the pipe wall has become defective
	Z. Other
Quantification	None

BAM (weld failure)	
	A. Longitudinal

	B. Circumferential
	C. Helical
Quantificati	None

ST (støbefejl/stenreder)	
	1. Udstrækning mindre end 2 timer
	2. Udstrækning mellem 2 og 6 timer
	3. Udstrækning større end 6 timer
Bemærknin	Ingen

ST (casting defect / nests of stone)	
	1. Extent less than 2 hours
	2. Extent between 2 and 6 hours
	3. Extent more than 6 hours
Notes	None

BAN (porous pipe)	
	The pipe material is seen to be porous
Quantificati	None

BAO (soil visible through defect)	
	The soil outside the pipe is visible through a defect
Quantificati	None

BAP (void visible through defect)	
	The void outside the pipe is visible through a defect
Quantificati	None

RØ (rødder)	
	1. Enkelte rodtråde
	2. Større samlinger af rødder
	3. Rodklumper
Bemærknin	Reduktion af tværsnitsarealet

RØ (roots)	
	1. Single roots
	2. Larger accumulation of roots
	3. Complex mass of roots
Notes	Reduction of the cross-sectional area

BBA (roots)	
	A. Tap root
	B. Independent fine roots
	C. Complex mass of roots
Quantificati	Reduction of the cross-sectional area

UF (udfældning)	
	1. Lille
	2. Middel
	3. Stor
Bemærkning	Reduktion af tværsnitsarealet

UF (precipitation)	
	1. Small
	2. Mean
	3. Large
Notes	Reduction of the cross-sectional area

BBB (attached deposits)	
	A. Encrustation
	B. Grease
	C. Fouling
	Z. Other
Quantificati	Reduction of the cross-sectional area

AF (aflejring løs) / AL (aflejring fastsiddende)	
	AL (aflejring løs)
	AL (aflejring løs)
	AF (aflejring fastsiddende)
	1. Lille
	2. Middel
	3. Stor
Bemærkning	Reduktion af tværsnitsarealet

AF (loose deposit) / AL (stuck deposit)	
	AF (loose deposit)
	AF (loose deposit)
	AL (fixed deposit)
	1. Small
	2. Mean
	3. Large
Notes	Reduction of the cross-sectional area

BBC (settled deposits)	
	A. Fine
	B. Coarse
	C. Hard or compacted material
	Z. Other
Quantificati	The depth of the deposit as a percentage

BBD (ingress of soil)	
	A. Sand
	B. Peat
	C. Fine material
	D. Gravel
	Z. Other
Quantificati	Reduction of the cross-sectional area

FO (forhindring)	
Bemærkning	Type forhindring
	0. Forhindring fjernet
	1. Forhindringen befinder sig fortsat i ledningen, men har ændret placering
	2. Forhindringen er intakt på samme sted og har lille indflydelse på ledningens drift
	3. Forhindringen er intakt på samme sted og har stor indflydelse på ledningens drift

FO (obstacles)	
Notes	Type of obstacle
	0. Obstacle moved
	1. The obstacle is still in the pipe but the location is changed
	2. The obstacle is intact at the same location and it has a small influence on the function of the pipe
	3. The obstacle is intact at the same location and it has large influence on the function of the pipe

BBE (other obstacles)	
	A. Dislodged brick or masonry unit
	B. Pieces of broken pipe
	C. Another object lying in the invert
	D. Protruding through the wall
	E. Wedged in the joint
	F. Entering through connection/junction pipe
	G. External pipes or cables built through the pipeline
	H. Built into the structure
Quantificati	Reduction of the cross-sectional area

IN (indsivning)	
	1. Vand siver eller drypper ind
	2. Vand løber kontinuert ind
	3. Vand løber voldsomt ind
Bemærkning	Ingen

IN (infiltration)	
	1. Sweating or dripping
	2. Flowing
	3. Gushing
Notes	None

BBF (infiltration)	
	A. Sweating
	B. Dripping
	C. Flowing
	D. Gushing
Quantificati	None

BBG (exfiltration)	
	Visible leakage of flow out of the pipeline
Quantificatio	None

BBH (vermin)	
1.	A. Rat
	B. Cockroach
	Z. Other
2.	A. In the pipeline
	B. In a connection
	C. In an open joint
	Z. Other
Quantificatio	The number of animals

GR(grenrør) / PH(påhugning) / PB(påboring)	
	GR(grenrør)
	0. Korrekt gren
	1. Lidt defekt gren
	2. Middel defekt gren
	3. Meget defekt gren
	PB(påboring)
	0. Korrekt gren/indragning højest 3%
	1. Lidt defekt gren
	Indragning mindre end 10%
	2. Middel defekt gren/indragning 10-20%
	3. Meget defekt gren
	Indragning større end 20%

GR (branch pipe) / PH (chiselled) / PB (drilled)	
	GR (branch pipe)
	0. Correct branch
	1. Small defect
	2. Mean defect
	3. Large defect
	PB (drilled)
	0. Correct branch
	1. Small defect
	Intrusion less than 10%
	2. Mean defect/intrusion 10-20%
	3. Large defect
	Intrusion more than 20%

BCA (connection)	
1.	A. Junction
	B. Saddle connection - drilled

	4. Stikledning og hovedledning når ikke sammen			4. The connection and the main pipe do not connect			
	PH(påhugning)			PH (chiselled)			C. Saddle connection - chiselled
	0. Korrekt gren/indragning højest 3%			0. Correct branch			
	1. Lidt defekt gren Indragning mindre end 10%			1. Small defect Intrusion less than 10%			
	2. Middel defekt gren/indragning 10-20%			2. Mean defect/intrusion 10-20%			
	3. Meget defekt gren Indragning større end 20%			3. Large defect Intrusion more than 20%			
	4. Stikledning og hovedledning når ikke sammen			4. The connection and the main pipe do not connect			
	PB(påboring)			PB (drilled)			D. Plain connection - drilled
	PH(påhugning)			PH (chiselled)			E. Plain connection -chiselled
							F. Connection other than a junction
							G. Type of connection not evident
							Z. Other
						2.	A. Connection open
							B. Connection closed
Bemærknin	Ingen		Notes	None		Quantificati	None

PR (punktreparation)			PR (point repair)			BCB (point repair)	
Bemærknin	Type punktreperation		Notes	Type of point repair			A. Pipe replaced
							B. Localised lining
							C. Injected mortar
							D. Other injected sealing material
	0. Korrekt udført punktreparation			0. Correct point repair			E. Hole repaired
							Z. Other
	1. Lidt defekt punktreparation			1. Small defect point repair		Quantificati	None
	2. Middel defekt punktreparation			2. Mean defect point repair			
	3. Meget defekt punktreparation			3. Very defect point repair			

RE (retningsændring)	
Bemærkning	Bøjningens vinkel angives
	0. Fabriksfremstillet bøjning
	1. Retningsændring mindre end 10°
	2. Retningsændring på 10-20°
	3. Retningsændring større end 20°

RE (change of direction)	
Notes	The angel of the bending
	0. Factory-made bending
	1. Change of direction less than 10°
	2. Change of direction between 10 and 20°
	3. Change of direction more than 20°

BCC (curvature of sewer)	
1.	A. Left
	B. Right
2.	A. Up
	B. Down
Quantificati	The total angle of deviation

BCD (start node type)	
	A. Manhole
	B. Inspection chamber
	C. Rodding eye
	D. Lamp hole
	E. Outfall
	F. Major connection without a manhole or inspection chamber
	Z. Other
Quantificati	The node reference

BCE (finish node)	
	A. Manhole
	B. Inspection chamber
	C. Rodding eye
	D. Lamp hole
	E. Outfall
	F. Major connection without a manhole or inspection chamber

	Z. Other
Quantificati	The node reference

BDA (general photograph)	
	A still photograph has been taken to record the general condition of the drain or sewer
Quantificati	The direction of the camera

BDB (general remark)	
	A remark which cannot be included in any other way
Quantificati	None

BDC (inspection abandoned)	
	A. Obstruction
	B. High water level
	C. Equipment failure
	Z. Other
Quantificati	None

VA (vand)	
	Vandstanden registreres som % af rørdiameteren
Bemærknin	Ingen

VA (water)	
	The water level expressed as a percentage of the pipe diameter
Notes	None

BDD (water level)	
	A. Clear effluent
	B. Turbid or discoloured effluent
Quantificati	The level expressed as a percentage of the diameter or the vertical dimension

BDE (flow in incoming pipe)	
1.	A. Clear effluent
	B. Turbid or discoloured effluent
2.	A. Wrongly connected because wastewater is observed discharging to a surface water drain or sewer
	B. Wrongly connected because surface water is observed discharging to a wastewater drain or sewer
	C. Not observed to be wrongly connected
Quantificati	The water level in the connecting pipe

BDF (atmosphere within the pipeline)	
	A. Oxygen deficiency
	B. Hydrogen sulfide
	C. Methane
	Z. Other
Quantificati	The percentage of the gas in the atmosphere

BDG (loss of vision)	
	A. Camera is under water
	B. Silt
	C. Steam
	Z. Other
Quantificati	None

Strømpeforing / Stram foring / Rørsprængning

RB (revner/brud)	
	A. Brud ved stik
	B. Cirkulært brud på en lige rørstrækning
	C. Langsgående brud på en lige rørstrækning
	D. Sammensatte brud
	E. Brud ved tilslutning af brønd
	F. Fejlopskæring af stik
Bemærkninger	Ingen

RB (cracks/breaks)	
	A. Break at the connection
	B. Circular break at a straight pipeline
	C. Longitudinal break at a stright pipeline
	D. Complex break
	E. Break at the connection of a manhole
	F. Error cut of a connection line
Notes	None

DE (deformation)	
	1. Mindre end 5 % af rørdiameteren
	2. 5-15 % af rørdiameteren
	3. Større end 15 % af rørdiameteren
Bemærkninger	Det angives hvad deformationen skyldes

DE (deformation)	
	1. Less than 5 % of the pipe diameter
	2. 5-15 % of the pipe diameter
	3. More than 15 % of the pipe diameter
Notes	The cause of the deformation

FL (folder)	
	1. Små folder eller rynker
	2. Større folder over vandret centerlinie
	3. Større folder under vandret centerlinie
Bemærkninger	L. Langsgående
	C. Cirkulære
	S. Sammensatte

FL (fold)	
	1. Small folds or wrinkles
	2. Larger folds above the centerline
	3. Larger folds below the centerline
Notes	L. Longitudinal
	C. Circular
	S. Complex

LI (løs inderfolie)	
	1. Små strimler eller løse områder
	2. Strimler og løse områder over vandret centerlinie
	3. Strimler og løse områder under vandret centerlinie
Bemærkninger	Ingen

LI (loose inner foil)	
	1. Small strips or loose areas
	2. Strips or loose areas above the horizontal centerline
	3. Strips or loose areas below the horizontal centerline
Notes	None

MI (misfarvning)	
	1. Udstrækning mindre end 2 timer
	2. Udstrækning mellem 2 og 6 timer
	3. Udstrækning større end 6 timer
Bemærkninger	Ingen

MI (discolouring)	
	1. Extent less than 2 hours
	2. Extent between 2 and 6 hours
	3. Extent more than 6 hours
Notes	None

OS (opskæring af stik)	
	0. Korrekt opskåret stik uden trævler
	1. Ujævn opskæring med små trævler
	2. Små affræsninger af det gamle rørmateriale Indragende stik er ikke fræset af Stikket er ikke skåret ordentlig op over vandret centerlinie
	3. Store affræsninger af det gamle rørmateriale 10% af stikkets åbning ved bunden er ikke skåret op Stikket er ikke skåret ordentlig op under vandret centerlinie
Bemærkninger	Dimension og yderligere oplysninger

OS (cut of connection)	
	0. Correct cut of connection without shreds
	1. Uneven cut with small shreds
	2. Small mill offs of the old pipe material Intruding connection is not milled of The connection is not cut up correctly above the horizontal centerline
	2. Large mill offs of the old pipe material 10 % of the opening of the connection at the bottom is not cut up The connection is not cut up correctly below the horizontal centerline
Notes	The dimension and further information

OP (tilslutning med overgangsprofil)	
	0. Korrekt tilslutning
	1. Lidt defekt
	2. Middel defekt
	3. Meget defekt
Bemærkninger	Dimension og yderligere oplysninger

OP (connection with transitional profile)	
	0. Correct connection
	1. Small defect
	2. Mean defect
	3. Large defect
Notes	The dimension and further information

TS (tilslutning af stik)	
	0. Korrekt tilslutning
	1. Lidt defekt
	2. Middel defekt
	3. Meget defekt
Bemærkninger	Dimension og yderligere oplysninger

TS (connection of picks)	
	0. Correct connection
	1. Small defect
	2. Mean defect
	3. Large defect
Notes	The dimension and further information

RU (rester fra arbejdets udførelse)	
	0. Rest fjernet
	1. Resterne befinder sig fortsat i ledningen men har ændret placering
	2. Resterne er intakt på samme sted og har lille indflydelse på ledningens drift
	3. Resterne er intakt på samme sted og har stor indflydelse på ledningens drift
Bemærkninger	Type rester

RU (rests from the work)	
	0. Rest moved
	1. The rest is still in the pipe but the location is changed
	2. The rest is intact at the same location and it has a small influence on the function of the pipe
	3. The rest is intact at the same location and it has large influence on the function of the pipe
Notes	Type of rest

SS (kvalitet af arbejdet ved start/slut)	
	0. Korrekt udført
	1. Lidt defekt
	2. Middel defekt
	3. Meget defekt
Bemærkninger	Årsagen til bedømmelsen

SS (the quality of the work at start/end)	
	0. Correct performed
	1. Small defect
	2. Mean defect
	3. Large defect
Notes	The reason of the judgment

Manhole or inspection chamber

The circumferential location is registered for each observation.

In the Danish "TV-inspection of sewers" the quantification is registered as a note whereas in the European standard the quantification is registered in a field for quantification.

Tv-inspektion af afløbsledninger (Danish Manual)		English translation of the Danish Manual		European Stan	
Observatio type	**Observationsklasse**	**Observatio type**	**Observation class**	**Main Code**	**Ch**
DE (deformation)		DE (deformation)		DAA (deforma	
	3. Større end 15 % af rørdiameteren		1. Less than 5 % of the pipe diameter		A.
	1. Mindre end 5 % af rørdiameteren		2. 5-15 % of the pipe diameter		B.
	2. 5-15 % af rørdiameteren		3. More than 15 % of the pipe diameter		
Bemærknin	Nøjagtig angivelse af deformationen i %	Notes	The precise deformation as a percentage	Quantificati	Th
					dir
RB (revner/brud)		RB (cracks/breaks)		DAB (fissure)	
	1. Skår, afskalninger, små udfældninger m.m.		1. Fragment, spalling, precipitation etc.	1.	A.
	2. Brudlinier er synlige på rørvæggen		2. Line of fractures visible on the pipe wall		B.
	3. Brudstykker der dækker op til 4 timer		3. Fragments covering until 4 hours		C.
	4. Brudstykker der dækker mere end 4 timer		4. Fragments covering more than 4 hours		
Bemærknin	L. Langsgående	Notes	L. Longitudinal	2.	A.
	C. Cirkulære		C. Circular		B.
	S. Sammensatte		S. Complex		C.
					D.
					E.
				Quantificati	Th

Appendix 12 Translation of the Danish code to the CEN code

RB (revner/brud)	
	3. Brudstykker der dækker op til 4 timer
	4. Brudstykker der dækker mere end 4 timer
Bemærkning	L. Langsgående
	C. Cirkulær
	S. Sammensat

RB (cracks/breaks)	
	3. Fragments covering until 4 hours
	4. Fragments covering more than 4 hours
Notes	L. Longitudinal
	C. Circular
	S. Complex

DAC (break/colla	
	A. br
	B. mi
	C. co
Quantificati	The l

RB (revner/brud)	
	3. Brudstykker der dækker op til 4 timer
	4. Brudstykker der dækker mere end 4 timer
	4. Brudstykker der dækker mere end 4 timer
Bemærkning	L. Langsgående
	C. Cirkulær
	S. Sammensat

RB (cracks/breaks)	
	3. Fragments covering until 4 hours
	4. Fragments covering more than 4 hours
	4. Fragments covering more than 4 hours
Notes	L. Longitudinal
	C. Circular
	S. Complex

DAD (defective b	
1.	A. Di
	B. M
	C. Co
2.	A. A
	B. No
Quantificati	None

RB (revner/brud)	
	1. Skår, afskalninger, små udfældninger m.m.
Bemærkning	L. Langsgående
	C. Cirkulær
	S. Sammensat

RB (cracks/breaks)	
	1. Fragment, spalling, precipitation etc.
Notes	L. Longitudinal
	C. Circular
	S. Complex

DAE (missing mo	
	All o
	maso
Quantificati	The c
	or ma

KO (korrosion/erosion)	
	1. En begyndende frilægning af sten
	2. Stenmaterialet er tydeligt frilagt

KO (corrosion/erosion)	
	1. Starting free placement of stones
	2. The stone material is free placed

DAF (surface dar	
1.	A. In
	B. Sp
	C. Vis

	3. Stenmaterialet er meget frilagt		3. The stone material is very free placed		D. Ag
	4. Dele af ledningen er korroderet væk		4. Parts of the pipe is corroded off		E. Mis
					F. Visi
					G. Rei
					H. Cor
	4. Dele af ledningen er korroderet væk		4. Parts of the pipe is corroded off		I. Mis
					J. Cor
					Z. Oth
				2.	A. Me
					B. Che
					C. Che
					D. Che
					E. Cau
Bemærkning	Ingen	Notes	None	Quantificati	None

PH (påhugning)/ PB (påboring)		PH (chiselled) / PB (drilled)		DAG (intruding co	
					A con
					line, o
	0. Indragning højest 3 % af hovedledningen		0. The intrusion is less than 3 % of the pipe	Quantificati	The le
	1. Indragning mindre end 10 %		1. The intrusion is less than 10 %		record
	2. Indragning på 10-20 %		2. The intrusion is 10-20 %		
	3. Indragning større end 20 %		3. The intrusion is more than 20 %		
Bemærkning	Der angives "ind" hvis påhugningen/	Notes	"in" is noted if the chiselling / drilling is		
	påboringen rager ind i hovedledningen		intruding the main pipe		

PH (påhugning)/ PB (påboring)		PH (chiselled) / PB (drilled)		DAH (defective co	
					A. Pos
	4. Stikledningen og hovedledningen når ikke sammen		4. The connecting pipe and the main pipe do not connect		B. Gap and

							C
	1. Lidt defekt			1. Small defect			D
	2. Middel defekt			2. Mean defect			
	3. Meget defekt			3. Large defect			
							E
							Z
Bemærkning	Ingen		Notes	None		Quantificati	N

IS (indhængende samlingsmateriale)			IS (intruding sealing material)			DAI (intrudin	
						1.	A
							Z
	1. Materiale kun synligt i samlingen			1. Material only visible in the joint		2.	A
	2. Materialet synligt over vandret centerlinie			2. The material is visible above the horizontal centreline			B
	3. Materialet synligt under vandret centerlinie			3. The material is visible below the horizontal centreline			
							C
Bemærkning	Ingen		Notes			Quantificati	V
							tl

FS (forskudt samling) / ÅS (åben samling)			FS (displaced joint) / ÅS (open joint)			DAJ (displac	
	ÅS (åben samling)			ÅS (open joint)			A
	FS (forskudt samling)			FS (displaced joint)			B
	FS (forskudt samling)			FS (displaced joint)			C
	1. Mindre end 1/2 godstykkelse			1. Less than 1/2 of the wall thickness		Quantificati	D
	2. Mellem 1/2 og 1/1 godstykkelse			2. Between 1/2 and 1/1of the wall thickness			
	3. Mellem 1/1 og 2/1 godstykkelse			3. Between 1/1 and 2/1 of the wall thickness			
	4. Større end 2/1 godstykkelse			4. More than 2/1 of the wall thickness			

Bemærkning	Ingen

Notes	None

DAK (lining defect)	
1.	A. Lining of the pipeline is detache
	B. Discolouration of the lining
	C. Defective end of lining
	D. Wrinkled lining
	E. Blistered lining
	Z. Other
2.	A. Vertical
	B. Horizontal
	C. Complex
Quantificati	The extent of the projection

DAL (defective repair)	
	A. Part of the wall is missing
	B. A patch sealing a hole deliberate
	in the pipe wall has become defe
	Z. Other
Quantificati	None

DAM (weld failure)	
	A. Vertical
	B. Horizontal
	C. Inclined
	D. Helical
Quantificati	None

Appendix 12 Translation of the Danish code to the CEN code

ST (støbefejl/stenreder)	
	1. Udstrækning mindre end 2 timer
	2. Udstrækning mellem 2 og 6 timer
	3. Udstrækning større end 6 timer
Bemærknin	Ingen

ST (casting defect / nests of stone)	
	1. Extent less than 2 hours
	2. Extent between 2 and 6 hours
	3. Extent more than 6 hours
Notes	None

DAN (porous pipe)	
	The material
	porous
Quantificati	None

DAO (soil visible through	
	The soil outs
	inspection ch
Quantificati	None

DAP (void visible throug	
	The void out
	inspection ch
Quantificati	None

DAQ (defective step or la	
	A. Loose ste
	B. Step missi
	C. Step corro
	D. Step bent
	E. Plastic enc
	F. Ladder har
	G. Ladder sup
	H. Ladder su
	I. Ladder sup
	J. Ladder run
	K. Defective

	Z. Other
Quantificati	The number of steps or toe holes that are defective
DAR (defective cover and frame)	
	A. Cover broken
	B. Rocking cover
	C. Cover missing
	D. Frame broken
	E. Frame loose
	F. Frame missing
	G. Cover below surface level
	H. Cover above surface level
	Z. Other
Quantificati	For G and H: the difference in level is noted
DAR (defective cover and frame)	
	A. Cover broken
	B. Rocking cover
	C. Cover missing
	D. Frame broken
	E. Frame loose
	F. Frame missing
	G. Cover below surface level
	H. Cover above surface level
	Z. Other
Quantificati	For G and H: the difference in level is noted

Appendix 12 Translation of the Danish code to the CEN code

RØ (rødder)	
	1. Enkelte rodtråde
	2. Større samlinger af rødder
	3. Rodklumper
Bemærkning	Reduktion af tværsnitsarealet

RØ (roots)	
	1. Single roots
	2. Larger accumulation of roots
	3. Complex mass of roots
Notes	Reduction of the cross-sectional area

DBA (roots)	
	A. Tap root
	B. Independe
	C. Complex m
Quantificati	None

UF (udfældning)	
	1. Lille
	2. Middel
	3. Stor
Bemærkning	Reduktion af tværsnitsarealet

UF (precipitation)	
	1. Small
	2. Mean
	3. Large
Notes	Reduction of the cross-sectional area

DBB (attached deposits)	
	A. Encrustati
	B. Grease
	C. Fouling
	Z. Other
Quantificati	The thicknes

AF (aflejring løs) / AL (aflejring fastsiddende)	
	AL (aflejring løs)
	AL (aflejring løs)
	AF (aflejring fastsiddende)
	1. Lille
	2. Middel
	3. Stor
Bemærkning	Reduktion af tværsnitsarealet

AF (loose deposit) / AL (stuck deposit)	
	AF (loose deposit)
	AF (loose deposit)
	AL (fixed deposit)
	1. Small
	2. Mean
	3. Large
Notes	Reduction of the cross-sectional area

DBC (settled deposits)	
	A. Fine
	B. Coarse
	C. Hard or co
	Z. Other
Quantificati	The depth of

						DBD (ingress	
							S
							in
							cl
						Quantificati	N
FO (forhindring)			FO (obstacles)			DBE (other ob	
Bemærkning	Type forhindring		Notes	Type of obstacle			A
							B
							C
							D
							E
							F
							G
							H
	0. Forhindring fjernet			0. Obstacle moved		Quantificati	T
	1. Forhindringen befinder sig fortsat i ledningen, men har ændret placering			1. The obstacle is still in the pipe but the location is changed			
	2. Forhindringen er intakt på samme sted og har lille indflydelse på ledningens drift			2. The obstacle is intact at the same location and it has a small influence on the function of the pipe			
	3. Forhindringen er intakt på samme sted og har stor indflydelse på ledningens drift			3. The obstacle is intact at the same location and it has large influence on the function of the pipe			
IN (indsivning)			IN (infiltration)			DBF (infiltrati	
	1. Vand siver eller drypper ind			1. Sweating or dripping		1.	A
							B

	2. Vand løber kontinuert ind			2. Flowing			C. Flowing
	3. Vand løber voldsomt ind			3. Gushing			D. Gushing
						2.	A. Through the wall
							B. Through the space between a co
							pipe and the wall of manhole at the
							C. Through the space between a co
							pipe and the wall of manhole above
Bemærknin	Ingen		Notes	None		Quantificati	None

DBG (exfiltration)	
	Visible leakage of flow out of the m
	or inspection chamber
Quantificati	None

DBH (vermin)	
1.	A. Rat
	B. Cockroach
	Z. Other
2.	A. In the manhole or inspection ch
	B. In a connection
	C. In an open joint
	Z. Other
Quantificati	The number of animals

DCA (connection type)	
	A. Connection in benching
	B. Free drop into channel
	C. Backdrop

	D. Internal drop pi
	E. Ramp connectio
	F. Ventilation pipe
	Z. other
Quantificati	None

PR (punktreparation)	
Bemærknin	Type punktreparation
	0. Korrekt udført punktreparation
	1. Lidt defekt punktreparation
	2. Middel defekt punktreparation
	3. Meget defekt punktreparation

PR (point repair)	
Notes	Type of point repair
	0. Correct point repair
	1. Small defect point repair
	2. Mean defect point repair
	3. Very defect point repair

DCB (point repair)	
	A. Part of the wall
	B. Localised lining
	C. Injection of sea
	Z. Other
Quantificati	None

DCG (connecting pipeline	
1.	A. Circular
	B. Rectangular
	C. Egg shaped
	D. U-shape
	E. Arch shaped
	F. Oval
	G. Local section d
	employing authori
	Z. Other
2.	A. Connection dis
	or inspection char
	B. Connection dis
	or inspection char

	C. Connection closed
Quantificati	Height of the incoming pipe
DCH (benching)	
	A. Benching defective
	B. Benching not defective
Quantificati	None
DCI (channel)	
	A. Channel defective
	B. Channel not defective
Quantificati	The width/height of the channel
DCJ (safety chains/bars)	
	A. Safety chain present with no defects
	B. Safety chain missing
	C. Safety chain defective
	D. Safety chain in the position but coated with debris
	E. Safety bar present with no defects
	F. Safety bar missing
	G. Safety bar defective
	H. Safety bar in the position but coated with debris
Quantificati	None

DCK (flow control)	
1.	A. Weir
	B. Syphon
	C. Orifice plate
	D. Vortex flow control
	E. Gate valve
	F. Float operated gate valve
	G. Measuring flume
	H. Flap valve
	I. Screens
	Z. Other
2.	A. Continuation flow
	B. Overflow
Quantificati	The normal direction of flow across the control

DCL (sealed pipe through manhole	
1.	A. No access to the pipe
	B. Access provided - cover in place
	C. Access provided - cover missing
2.	A. Defective
	B. Not defective
Quantificati	None

DCM (grit trap under cover)	
	A. Tap present with no defects
	B. Tap missing
	C. Tap defective

Quantificati	None
DCN (silt pit in invert)	
	A. Pit not defective
	B. Pit defective
Quantificati	None
DCO (cross section)	
	A. Circular
	B. Rectangular
	C. Local section
	Z. Other
Quantificati	The length/width of the section
DDA (general photograph)	
	A still photograph has been taken to record
	the general condition
Quantificati	The direction of the camera
DDB (general remark)	
	A remark which cannot be included in any
	other way
Quantificati	None
DDC (inspection abandoned)	
	A. Unable to lift cover
	B. Obstruction
	C. High water level

	D. Equipment failure
	Z. Other
Quantificati	None

VA (vand)	
	Vandstanden registreres
Bemærk	Ingen

VA (water)	
	The water level in the manhole or inspection chamber
Notes	None

BDD (water level)	
	The level of the sewage in the manhole or inspection chamber
Quantificati	None

DDE (flow in connecting pipe)	
1.	A. Clear effluent
	B. Turbid or discoloured effluent
2.	A. Wrongly connected because wastew is observed discharging to a surface water drain or sewer
	B. Wrongly connected because surface water is observed discharging to a wastewater drain or sewer
	C. Not observed to be wrongly connecte
Quantificati	The water level in the connecting pipe

DDF (atmosphere within the chamber)	
	A. Oxygen deficiency
	B. Hydrogen sulfide
	C. Methane
	Z. Other
Quantificati	The percentage of the gas in the atmosp

DDG (loss of vision)	
	A. Camera is under water
	B. Silt
	C. Steam
	Z. Other
Quantificati	None

Appendix 13 Translation of the French code to the CEN code

Pipeline

1. Crack

Definition: Limited fissure without displacement of wall pieces

Characterisation → EN13508-2	Quantification
Longitudinal → BABBA or BABCA * Circumferential → BABBB or BABCB * Complex → BABBC or BABCC *	Length (m) ** Fissure width (mm)

- * wrt quantification of fissure width
- ** *cf.* continuous observation coding in EN13508-2

Remarks:

- surface crack (BABA) and crack (BABB) are not distinguished in AGHTM (can the depth of a crack be assessed by CCTV ?) ;
- helical fissure (BABBD or BABCD) not considered in AGHTM.

2. Fracture

Definition: Break with displacement of wall pieces

Characterisation → EN13508-2	Quantification
Longitudinal → BACA * Circumferential → BACA * Complex → BACA *	Length (m) ** Opening width (mm) ***

- * fracture shape not considered in EN13508-2
- ** *cf.* continuous observation coding in EN13508-2
- *** not considered in EN13508-2

3. Collapse

Definition: Destruction with obstruction

Characterisation → EN13508-2	Quantification
Partial →BACB Total → BACC	Length (m) *

- * *cf.* continuous observation coding in EN13508-2

4. Perforation

Definition: Missing piece of wall

Characterisation → EN13508-2	Quantification
Punctual → BACB	Length (mm) Diameter (mm) *

- * not considered in EN13508-2

5.Punctual deformation *

Definition: Punctual deformation of the pipe wall without perforation nor loss of water tightness (only plastic and asbestos-cement pipes concerned)

Characterisation → EN13508-2	Quantification
Punctual → BAAA or BAAB *	None

- * punctual defect affecting the vertical or horizontal dimension of the section

6. Deformation

Definition: sectional (ovalisation) or longitudinal generalised deformation

Characterisation → EN13508-2	**Quantification**
Sectional → BAAA or BAAB * Longitudinal → BCCA or BCCB	Length (m) ** % diameter or height (mm)*

- * EN13508-2 considers sectional deformation either in height (vertical) or width (horizontal) reduction (mm)
- ** *cf.* continuous observation coding in EN13508-2

7. Defective joining

7.1 Radial shift

Definition: adjacent pipe units are shifted in a direction at right angles to the line of the sewer.

Characterisation → EN13508-2	**Quantification**
Vertical → BAJB * Lateral → BAJB *	Mild: < 10 mm or 5 % section ** Severe: > 10 mm or 5 % section **

- * EN13508-2 provides the circumferential location
- ** EN13508-2 provides the radial displacement (mm)

7.2 Insufficient fit

Definition: adjacent pipe units insufficiently fit in a direction parallel to the line of the sewer.

Characterisation → EN13508-2	**Quantification**
Longitudinal → BAJA	Displacement (mm)

7.3.Gap at joint

Definition: gap between adjacent pipe units, which are displaced in a direction parallel to the line of the sewer.

Characterisation → EN13508-2	**Quantification**
Longitudinal → BAJA *	Partial or total *

- * EN13508-2 provides the longitudinal displacement (mm); the depth of the socket must thus be known to distinguish between insufficient fit and gap.

7.4. Angular displacement

Definition: the axes of adjacent pipe units are not parallel.

Characterisation → EN13508-2	**Quantification**
Vertical → BAJC * Horizontal → BAJC *	Angle (degrees)

- * EN13508-2 provides the circumferential location

7.5 Punching at end *

Definition: punching at the end of a pipe unit.

Characterisation → EN13508-2	Quantification
Punctual →	Mild or severe

- * not considered in EN13508-2

7.6 Intruding sealing ring

Definition: all or part of a sealing ring intruding into the pipeline

Characterisation → EN13508-2	Quantification
Hanging → BAIAB or BAIAC * Broken → BAIAD Loop → **	***

- * AGHTM does not distinguish whether the lowest point of the ring hangs above or below the horizontal centreline.
- ** not considered in EN13508-2.

7.7 Intruding sealing abutment *

Definition: all or part of a sealing abutment intruding into the pipeline

Characterisation → EN13508-2	Quantification
Hanging → BAIZB or BAIZC ** Broken → BAIZD Loop → ***	****

- * EN13508-2 provides the code BAIZ for all other sealing materials not a ring.
- ** AGHTM does not distinguish whether the lowest point of the abutment hangs above or below the horizontal centreline.
- *** not considered in EN13508-2
- **** EN13508-2 provides the cross sectional reduction (%), whereas AGTM dos not provide any quantification.

7.8 Change in diameter

Definition: adjacent pipe units have different diameters without being connected by means of a junction chamber.

AGHTM does not provide characterisation nor quantification, whereas EN13508-2 does even not consider this design defect.

8. Infiltration

Definition: ingress of water into the pipeline

Characterisation → EN13508-2	Quantification
Sweating → BBFA Dripping → BBFB Flowing → BBFC * or BBFD **	Mild or Severe Gushing ** Localised or generalised ***

- * no pressure
- ** under pressure
- *** EN13508-2 does only consider the case of localised infiltration (with circum location reference)

9. Exfiltration

Definition: flow of water out of the pipeline

Characterisation → EN13508-2	Quantification

Flow reduction → BBG	Severe or very severe *

- * no quantification in EN13508-2

10. Ingress of soil or roots

Definition: soil from the surrounding ground or roots are intruding into the pipeline through a defect, structural or not.

Characterisation → EN13508-2	**Quantification**
Direct observation → BBA * or BBD **	Cross sectional area reduction (%)

- * roots intruding through a defect
- ** ingress of soil through a defect ; AGHTM does not specify the type of soil elements

11. Other obstacles

Definition: presence of any obstacle that obstruct the cross sectional area.

Characterisation → EN13508-2	**Quantification**
Attached deposits → BBB * Settled deposits → BBC * Roots not intruding through a defect → BBE ** Intruding connection → BAG *** Other objects → BBE ****	Cross sectional area reduction (%)

- AGHTM does not consider the case when the connection is blocked (BAHE)
- * AGHTM does not specify the type of material
- ** not specified in EN13508-2
- *** EN13508-2 quantify the reduction in vertical dimension or diameter
- **** EN13508-2 distinguishes divers objects (BBEA-H)

12. Counter slope

Definition: localised inversion of the pipeline slope.

Characterisation → EN13508-2	**Quantification**
Pool → BDD *	Length (m) ** Pool depth (% cross sectional area)

- * AGHTM does not specify if effluent is clear or turbid
- ** *cf.* continuous observation coding in EN13508-2

13. Surface damage

13.1 Abrasion

Definition: surface damage due to mechanical attack.

Characterisation → EN13508-2	**Quantification**
→ BAF_A *	Length (m) ** % cross sectional area

- * AGHTM does not specify the change in the surface appearance, except in what concerns reinforcement
- ** *cf.* continuous observation coding in EN13508-2

13.2 Corrosion

Definition: surface damage due to chemical or biochemical attack.

Characterisation → EN13508-2	Quantification
Total → BAF_B * Vault only → BAF_C * Invert only → BAF_D *	Length (m) ** % cross sectional area

- * AGHTM does not specify the change in the surface appearance, except in what concerns reinforcement
- ** *cf.* continuous observation coding in EN13508-2

13.3 Visible reinforcement

Definition: surface damage making the reinforcement visible.

Characterisation → EN13508-2	Quantification
Localised or generalised * → BAFF or BAFG **	Length (m) *** Visible or projecting from the surface

- * EN13508-2 does not specify whether the damage is localised or generalised
- ** whether reinforcement are only visible or projecting from the surface
- *** *cf.* continuous observation coding in EN13508-2

13.4 Deteriorated coating

Definition: deterioration of the inside coating of a metal or concrete pipe.

Characterisation → EN13508-2	Quantification
Localised or generalised * → BAF or BAK **	Length (m) ***

- * EN13508-2 does not specify whether the damage is localised or generalised
- ** depending on the type of coating, not specified in AGHTM
- *** *cf.* continuous observation coding in EN13508-2

14. Defective connection

14.1 Intruding connection

Definition: connecting pipe projecting into the pipeline.

Characterisation → EN13508-2	Quantification
Perpendicular → BAG+BCA* With the current → BAG+BCA* Against the current → BAG+BAHA+BCA	Connection diameter (mm) % intrusion wrt sewer diameter

- * EN13508-2 does not distinguish whether the inflow arrives perpendicular to or with the sewer current.

14.2 Plain connection

Definition: connection made without using any special fitting.

Characterisation → EN13508-2	Quantification
Perpendicular → BCAD or BCAE* With the current → BCAD or BCAE* Against the current → BAHA+(BCAD or BCAE)	Connection diameter (mm) % intrusion wrt sewer diameter

- * EN13508-2 does not distinguish whether the inflow arrives perpendicular to or with the sewer current.

14.3 Defective fitting

Definition: connection fitting displaced or in bad condition.

Characterisation → EN13508-2	Quantification
Perpendicular → BAHD+(BCAA or BCAB or BCAC)* With the current → BAHD+(BCAA or BCAB or BCAC)* Against the current → BAHA+BAHD+(BCAA or BCAB or BCAC)	Connection diameter (mm) % intrusion wrt sewer diameter

- * EN13508-2 does not distinguish whether the inflow arrives perpendicular to or with the sewer current.

14.4 Lack of water tightness at connection

Definition: infiltration observed around the connection.

Characterisation → EN13508-2	Quantification
None → BAHB or BAHC*	Slight or important

- whether the gap between the end of the connecting pipe and the main pipe is total or only partial.

14.5 Defective connection chamber

Definition: direct connection by means of a connection chamber, which is defective.

Characterisation → EN13508-2	Quantification
Location of the connection chamber: On top of the sewer → * Integrated to the sewer → *	Dimension of the chamber

- * EN13508-2 does not account for a connection by means of a connection chamber (only code BCAF available by default) ; neither the location of the chamber wrt the sewer, nor its condition can be recorded.

Bottom part of manholes and inspection chambers

1. Missing invert

Characterisation → EN13508-2	Quantification
Totally missing → DCIA* Partially missing → DCIA*	

- *EN13508-2 does not specify if the channel is totally or only partially defective

2. Invert with a defective shape

Characterisation → EN13508-2	Quantification
Width reduced → DCIA* Presence of a step → DCIA* Presence of a pool → DCIA*	

- *EN13508-2 does not specify the nature of the defect

3. Defective benching

Characterisation → EN13508-2	Quantification
Too low → DCHA* Too high → DCHA*	

Excessive slope → DCHA*	> 15 %
Insufficient slope → DCHA*	< 15 %

- *EN13508-2 does not specify the nature of the defect

4. Defective connection with the sewer

Characterisation → EN13508-2	**Quantification**
Cf. 7. in part A → (…)+DCA+DCG	

Appendix 14 Translation of the German code to the CEN code

Drains and sewers

ATV-DVWK-Regelwerk ATV-M 143, Teil 2					ATV-DVWK-Regelwerk ATV-M 143, Teil 2					European Standard	
1. Stelle: Zustandsgruppe	2. Stelle: Zustandsausprägung	3. Stelle Undichtigkeitsangaben	4. Stelle Lage im Profil, sonstiges	numerischer Teil	1st notation condition group	2. Stelle: condition specification	3. Stelle leakage details	4. Stelle location in the sewer	numerical part	Main Code	Characterisation
D (Deformation)	-	-	L,O,R,U,-	nn	D (deformation)	-	-	L,O,R,U,-	nn	BAA	
								O.. Top			A. Vertical
			O.. Oben					U.. Bottom			B. Horizontal
			U.. Unten					L.. Left crossbar		Quantificat	The percentage change in the dimension
			L.. Linker Kämpfer					R.. Right crossbar			which reduces
			R.. Rechter Kämpfer								
R (Riß)	C,L,Q,S,X	A,B,E,F,M,-	L,O,R,U,-	nn	R (fissure)	C,L,Q,S,X	A,B,E,F,M,-	L,O,R,U,-	nn	BAB (fissure)	
	C.. Verbindung	A.. Sichtbarer Wasseraustritt	O.. Oben			C.. Connection	A.. Visible exfiltratio	O.. Top		2.	A. Longitudinal
	L.. Längs-, Axial-	B.. Boden sichtbar	U.. Unten			L.. Axial	B.. Soil in sight	U.. Bottom			B. Circumferential
	Q.. Quer-, Radial	E.. Eindringendes Wasser sichtbar	L.. Linker Kämpfer			Q.. Radial	E.. Visible infiltratio	L.. Left crossbar			C. Complex
	S.. Scherbe	F.. Feuchtigkeit sichtbar	R.. Rechter Kämpfer			S.. Sherd	F.. Visible dampnes	R.. Right crossbar			D. Helical
	X..Risse, von einem Punkt ausgehend	M.. Eindringendes Wasser sichtbar mit Bodeneintrag				X..fissures from one poir	M..visible infiltration with ingress of soil			Quantificat	The width of the fissure
		- .. Keine Angaben zur Undichtigkeit möglich					- .. No details about leakage				
B (Rohrbruch, Roh	A,C,S,T,W	A,B,E,F,M,-	L,O,R,U,-	nn	B (pipe burst)	A,C,S,T,W	A,B,E,F,M,-	L,O,R,U,-	nn	BAC (break/collapse)	
	A.. Auskleidung	A.. Sichtbarer Wasseraustritt	O.. Oben			A.. Lining	A.. Visible exfiltratio	O.. Top		Quantificat	The length of the break or collapse
	C.. Verbindungsbereich	B.. Boden sichtbar	U.. Unten			C.. Connection range	B.. Soil in sight	U.. Bottom			
	S.. Scherbe	E.. Eindringendes Wasser sichtbar	L.. Linker Kämpfer			S.. Sherd	E.. Visible infiltratio	L.. Left crossbar			
	W.. Wandung	F.. Feuchtigkeit sichtbar	R.. Rechter Kämpfer			W.. Surface	F.. Visible dampnes	R.. Right crossbar			
		M.. Eindringendes Wasser sichtbar mit Bodeneintrag					M..visible infiltration with ingress of soil				
		- .. Keine Angaben zur Undichtigkeit möglich					- .. No details about leakage				
T (Fehlende Teile)	K	A,B,E,F,M,-	L,O,R,U,-	nn	T (missing parts)	K	A,B,E,F,M,-	L,O,R,U,-	nn	BAD (defective brickwork or masonry)	
	K.. Klinker	A.. Sichtbarer Wasseraustritt	O.. Oben			K.. Clinker	A.. Visible exfiltratio	O.. Top		1.	A. Displaced
		B.. Boden sichtbar	U.. Unten				B.. Soil in sight	U.. Bottom			B. Missing
		E.. Eindringendes Wasser sichtbar	L.. Linker Kämpfer				E.. Visible infiltratio	L.. Left crossbar			
		F.. Feuchtigkeit sichtbar	R.. Rechter Kämpfer				F.. Visible dampnes	R.. Right crossbar			C. Dropped invert
		M.. Eindringendes Wasser sichtbar mit Bodeneintrag					M..visible infiltration with ingress of soil				D. Collapse
		- .. Keine Angaben zur Undichtigkeit möglich					- .. No details about leakage			2.	A. Another layer is visible

C (Korrosio	-,C,K,M	A,B,E,F,M,-	L,O,R,U,-	11,12,13,21,22,32,33
	- .. Wenn kein anderes Kürzel zutrifft	A.. Sichtbarer Wasseraustritt	O.. Oben	11.. Zuschlag sichtbar
	C.. Verbindung	B.. Boden sichtbar	U.. Unten	12.. Zuschlag ragt heraus
	K.. Klinker	E.. Eindringendes Wasser sichtbar	L.. Linker K	13.. Zuschlag ist herausgefallen
	M.. Fugenmörtel	F.. Feuchtigkeit sichtbar	R.. Rechter	21.. Bewehrung sichtbar, korrodiert
		M.. Eindringendes Wasser sichtbar mit Bodeneintrag		22.. Bewehrung fehlt teilweise oder ragt heraus
		- .. Keine Angaben zur Undichtigkeit möglich		32.. Fugenmörtel fehlt teilweise (CEN BAE)
				33.. Fugenmörtel fehlt ganz (CEN BAE)

C (corrosion)	-,C,K,M	A,B,E,F,M,-	L,O,R,U,-	11,12,13,21,22,32,33
	- .. No other identification code appro	A.. Visible exfiltration	O.. Top	11.. Visible addition
	C.. Connection range	B.. Soil in sight	U.. Bottom	12.. Intruding addition
	K.. clinker	E.. Visible infiltration	L.. Left cros	13.. Missing addition
	M.. Joint mortar	F.. Visible dampness	R.. Right cr	21.. Visible reinforcement, corrode
		M..visible infiltration with ingress of soil		22.. Partial missing or intruding reinforcement
		- .. No details about leakage		32.. Partial missing joint mortar (CEN BAE)
				33.. Missing joint mortar (CEN BAE)

BAE (missing mortar)	
	All or part of the mortar from brickwork or masonry is missing
Quantificat	The depth from the surface of the brickwork or masonry to the surface of the mortar

BAF (surface damage)	
1.	A. Increased roughness
	B. Spalling
	C. Visible aggregate
	D. Aggregate projecting from surface
	E. Missing aggregate
	F. Visible reinforcement
	G. Reinforcement projecting from surface
	H. Corroded reinforcement
	I. Missing wall
	J. Corrosion products on surface
	Z. Other
2.	A. Mechanical damage
	B. Chemical attack -general
	C. Chemical attack -biochemical attack
	D. Chemical attack -attack by wastewater
	E. Cause not evident
Quantificat	None

S (Stutzen)	E	A,B,E,F,M,-	L,O,R,U,-	nn
	E.. Einragend	A.. Sichtbarer Wasseraustritt	O.. Oben	Einragtiefe in cm
		B.. Boden sichtbar	U.. Unten	
		E.. Eindringendes Wasser sichtbar	L.. Linker Kämpfer	
		F.. Feuchtigkeit sichtbar	R.. Rechter Kämpfer	
		M.. Eindringendes Wasser sichtbar mit Bodeneintrag		
		- .. Keine Angaben zur Undichtigkeit möglich		

S (connection	E	A,B,E,F,M,-	L,O,R,U,-	nn
	E.. Intruding	A.. Visible exfiltration	O.. Top	length of intrusion in cm
		B.. Soil in sight	U.. Bottom	
		E.. Visible infiltration	L.. Left crossbar	
		F.. Visible dampness	R.. Right crossbar	
		M..visible infiltration with ingress of soil		
		- .. No details about leakage		

BAG (intruding connection)	
	A connecting pipe projecting into the pipe-line, obstructing the cross-sectional area
Quantificat	The length of the intrusion expressed as a percentage of the diameter or vertical dimen-sion of the pipeline

S (Stutzen)	-,N,O,P,R,U	A,B,D,E,F,M,-	L,O,R,U,-	nn	S (connection piece)	-,N,O,P,R,U	A,B,D,E,F,M,-	L,O,R,U,-	nn	BAH (defective connection)	
A (Anschluß)	-, N,P,R,U	A,B,D,E,F,M,-	L,O,R,U,-	nn	A (junction)	-, N,P,R,U	A,B,D,E,F,M,-	L,O,R,U,-	nn		A. Position of the connection is incorrect
	-.. Wenn kein anderes Kürzel zutrit	A.. Sichtbarer Wasseraustritt	O.. Oben	Risse im Stutzen/Abzweig in cm		- .. No other identification code appl	A.. Visible exfiltration	O.. Top	fissures in the connection piece resp.im Stutzen/Abzweig in c		B. Gap between the end of connecting pipe
	O.. Außen, zurückliegend	B.. Boden sichtbar	U.. Unten	Wurzeleinwuchs durch Stutzen/Abzweig		O.. outside, not reaching the sewer	B.. Soil in sight	U.. Bottom	Wurzeleinwuchs durch Stutzen/Abzweig in %		and the main pipe
	P.. Wurzeleinwuchs	D.. Verstopft	L.. Linker Kämpfer			P.. Rott intruding	D.. Blocked	L.. Left crossbar			C. Partial gap between the end of
	R.. Riß	E.. Eindringendes Wasser sichtbar	R.. Rechter Kämpfer			R.. Fissure	E.. Visible infiltration	R.. Right crossbar			connecting pipe and the main pipe
	U.. Verschlossen	F.. Feuchtigkeit sichtbar				U.. Barred	F.. Visible dampness				D. Connecting pipe is damaged
		M.. Eindringendes Wasser sichtbar mit Bodeneintrag					M..visible infiltration with ingress of soil				
		- .. Keine Angaben zur Undichtigkeit möglich					- .. No details about leakage				
											E. Connecting pipe is blocked
											Z. Other
										Quantification	None

H (Hindernis	M,G	A,B,E,F,M,-	L,O,R,U,-	nn	H (obstacle)	M,G	A,B,E,F,M,-	L,O,R,U,-	nn	BAI (intruding sealing material)	
	M.. Fugenmörtel	A.. Sichtbarer Wasseraustritt	O.. Oben	%		M.. Joint mortar	A.. Visible exfiltration	O.. Top	%	1.	A. Sealing ring
	G.. Dichtung einragend	B.. Boden sichtbar	U.. Unten			G.. Packing intruding	B.. Soil in sight	U.. Bottom			Z. Other sealant
		E.. Eindringendes Wasser sichtbar	L.. Linker Kämpfer				E.. Visible infiltration	L.. Left crossbar		2.	A. Visibly displaced but not intruding
		F.. Feuchtigkeit sichtbar	R.. Rechter Kämpfer				F.. Visible dampness	R.. Right crossbar			B. Hanging but not broken
		M.. Eindringendes Wasser sichtbar mit Bodeneintrag					M..visible infiltration with ingress of soil				- lowest point above horizontal centreline
		- .. Keine Angaben zur Undichtigkeit möglich					- .. No details about leakage				C. Hanging but not broken
											- lowest point below horizontal centreline
											D. Broken
										Quantification	Where the seal is not a ring:
											the reduction in cross sectional area

L (Lageabweic	B,H,L,V	A,B,E,F,M,-	L,O,R,U,-	nn	L (displaced joint)	B,H,L,V	A,B,E,F,M,-	L,O,R,U,-	nn	BAJ (displaced joint)	
	B.. Ausbiegung	A.. Sichtbarer Wasseraustritt	O.. Oben	cm		B.. Curvature	A.. Visible exfiltration	O.. Top	cm		A. Longitudinal
	H.. Horizontal	B.. Boden sichtbar	U.. Unten			H.. Horizontal	B.. Soil in sight	U.. Bottom			B. Radial
	L.. Längs-, Axial-	E.. Eindringendes Wasser sichtbar	L.. Linker Kämpfer			L.. Axial	E.. Visible infiltration	L.. Left crossbar			C. Angular
	V..Vertikal	F.. Feuchtigkeit sichtbar	R.. Rechter Kämpfer			V..Vertikal	F.. Visible dampness	R.. Right crossbar		Quantification	Distance or angel of the displacement
		M.. Eindringendes Wasser sichtbar mit Bodeneintrag					M..visible infiltration with ingress of soil				
		- .. Keine Angaben zur Undichtigkeit möglich					- .. No details about leakage				

K (Kanalsanierungsmaßnahmen)	N	-	L,O,R,U,-	-		K (sewer rehabilitation)	N	-	L,O,R,U,-	-		
	N.. Nicht fachgerecht au		O.. Oben				N.. Not professional completed		O.. Top			
			U.. Unten						U.. Bottom			
			L.. Linker Kämpfer						L.. Left crossbar			
			R.. Rechter Kämpfer						R.. Right crossbar			
W (Sonstige Schäden)	-	-	F,G,S	nn		W (miscellaneous dama	-	-	F,G,S	nn		
			F.. Schmutzfänger						F.. Gully trap			
			G.. Gerinne, Sohle						G.. Chute, invert			
			S..Steigeisen						S..step iron			

BAK (lining defect)	
1.	A. Lining of the pipeline is detached
	B. Discolouration of the lining
	C. Defective end of lining
	D. Wrinkled lining
	E. Blistered lining
	Z. Other
2.	A. Longitudinal
	B. Circumferential
	C. Complex
Quantificati	The reduction in cross-sectional area

BAL (defective repair)	
	A. Part of the wall is missing
	B. A patch sealing a hole deliberately made
	in the pipe wall has become defective
	Z. Other
Quantificati	None

BAM (weld failure)	
	A. Longitudinal
	B. Circumferential
	C. Helical
Quantificati	None

BAN (porous pipe)	
	The pipe material is seen to be porous
Quantificati	None

BAO (soil visible through defect)	
	The soil outside the pipe is visible through
	a defect
Quantificati	None

kein einzelnes Kürzel an 1.Stelle, bei allen Schäden an 2.Stelle B.				

no 1st position code, 2nd position : B				

BAP (void visible through defect)	
	The void outside the pipe is visible through a defect
Quantificat	None

kein einzelnes Kürzel an 1.Stelle, bei allen Schäden an 2.Stelle P.				

no 1st position code, 2nd position : P				

BBA (roots)	
	A. Tap root
	B. Independent fine roots
	C. Complex mass of roots
Quantificat	Reduction of the cross-sectional area

H (Hindern	I	E,F,-	L,O,R,U,-	nn
	I.. Inkrustration	E.. Eindringendes Wasser sichtabr	O.. Oben	%
		F.. Feuchtigkeit sichtbar	U.. Unten	
			L.. Linker Kämpfer	
			R.. Rechter Kämpfer	

H (obstacle	I	E,F,-	L,O,R,U,-	nn
	I.. Incrustra	E.. Visible infiltration	O.. Top	%
		F.. Visible dampness	U.. Bottom	
			L.. Left crossbar	
			R.. Right crossbar	

BBB (attached deposits)	
	A. Encrustation
	B. Grease
	C. Fouling
	Z. Other
Quantificat	Reduction of the cross-sectional area

H (Hindern	D,F	A,B,E,F,M,-	L,O,R,U,-	nn
	D.. Sedimentation	A.. Sichtbarer Wasseraustritt	O.. Oben	%
	F.. Verfestigt	B.. Boden sichtbar	U.. Unten	
		E.. Eindringendes Wasser sichtbar	L.. Linker Kämpfer	
		F.. Feuchtigkeit sichtbar	R.. Rechter Kämpfer	
		M.. Eindringendes Wasser sichtbar mit Bodeneintrag		
		- .. Keine Angaben zur Undichtigkeit möglich		

H (obstacle	D,F	A,B,E,F,M,-	L,O,R,U,-	nn
	D.. Sedimen	A.. Visible exfiltration	O.. Top	%
	F.. Compact	B.. Soil in sight	U.. Bottom	
		E.. Visible infiltration	L.. Left crossbar	
		F.. Visible dampness	R.. Right crossbar	
		M..visible infiltration with ingress of soil		
		- .. No details about leakage		

BBC (settled deposits)	
	A. Fine
	B. Coarse
	C. Hard or compacted material
	Z. Other
Quantificat	The depth of the deposit as a percentage

kein Kürzel an 1. Stelle, bei allen Schäden mit aufgeführt an 2. Stelle: M				

no 1st position code, 2nd position : M				

BBD (ingress of soil)	
	A. Sand
	B. Peat
	C. Fine material
	D. Gravel
	Z. Other
Quantificat	Reduction of the cross-sectional area

H (Hindernisse)	-,E,KS,Z	A,B,E,F,M,-	L,O,R,U,H,V,-	nn
	E.. Einragend	A.. Sichtbarer Wasseraustritt	O.. Oben	%
	K.. Klinker	B.. Boden sichtbar	U.. Unten	
	S.. Scherbe	E.. Eindringendes Wasser sichtbar	L.. Linker Kämpfer	
	Z.. Kreuzung von sonstigen Leitung	F.. Feuchtigkeit sichtbar	R.. Rechter Kämpfer	
	-.. Wenn kein anderes Kürzel zutriff	M.. Eindringendes Wasser sichtbar mit Bod	H.. Horizontal	
		- .. Keine Angaben zur Undichtigkeit möglic	V.. Vertikal	

H (obstacle	-,E,KS,Z	A,B,E,F,M,-	L,O,R,U,H,V,-	nn
	E.. Intruding	A.. Visible exfiltration	O.. Top	%
	K.. Clinker	B.. Soil in sight	U.. Bottom	
	S.. Sherd	E.. Visible infiltration	L.. Left crossbar	
	Z.. Crossing other lines	F.. Visible dampness	R.. Right crossbar	
	- .. No other identification code ap	M..visible infiltration with ingre	H.. Horizontal	
		- .. No details about leakage	V.. Vertical	

BBE (other obstacles)	
	A. Dislodged brick or masonry unit
	B. Pieces of broken pipe
	C. Another object lying in the invert
	D. Protruding through the wall
	E. Wedged in the joint
	F. Entering through connection/junction pipe
	G. External pipes or cables built through the pipeline
	H. Built into the structure
Quantificat	Reduction of the cross-sectional area

U (sichtbare Undichtigkeiten)	A, C, W	A,E,F,M,-	L,O,R,U,-	nn
	A.. Auskleidung	A.. Sichtbarer Wasseraustritt	O.. Oben	-
	C.. Verbindungsbereich	E.. Eindringendes Wasser sichtbar	U.. Unten	
	W.. Wandung	F.. Feuchtigkeit sichtbar	L.. Linker Kämpfer	
		M.. Eindringendes Wasser sichtbar mit Bod	R.. Rechter Kämpfer	
		- .. Keine Angaben zur Undichtigkeit möglich		
kein eigenes Kürzel an 1. Stelle für Infiltration, an 2. Stelle: E,F,M				
kein eigenes Kürzel an 1. Stelle für Exfiltration, an 2. Stelle: A				

U (sichtbar	A, C, W	A,E,F,M,-	L,O,R,U,-	nn
	A.. Lining	A.. Visible exfiltration	O.. Top	-
	C.. Connection range	E.. Visible infiltration	U.. Bottom	
	W.. Surface	F.. Visible dampness	L.. Left crossbar	
		M..visible infiltration with ingre	R.. Right crossbar	
		- .. No details about leakage		
no 1st position code, 2nd position: E,F,M				
no 1st position code, 2nd position: A				

BBF (infiltration)	
	A. Sweating
	B. Dripping
	C. Flowing
	D. Gushing
Quantificat	None

BBG (exfiltration)	
	Visible leakage of flow out of the pipeline
Quantificat	None

S (Stutzen)	-	-	L,O,R,U,-	-
A (Anschluß)			L,O,R,U,-	
			O.. Oben	
			U.. Unten	
			L.. Linker Kämpfer	
			R.. Rechter Kämpfer	

S (connecti	-	-	L,O,R,U,-	-
A (junction)			L,O,R,U,-	
			O.. Top	
			U.. Bottom	
			L.. Left crossbar	
			R.. Right crossbar	

BBH (vermin)	
1.	A. Rat
	B. Cockroach
	Z. Other
2.	A. In the pipeline
	B. In a connection
	C. In an open joint
	Z. Other
Quantificati	The number of animals

BCA (connection)	
1.	A. Junction
	B. Saddle connection - drilled
	C. Saddle connection - chiselled
	D. Plain connection - drilled
	E. Plain connection -chiselled
	F. Connection other than a junction
	G. Type of connection not evident
	Z. Other
2.	A. Connection open
	B. Connection closed
Quantificati	None

K (Kanalsanierungsmaßnahmen)	-	-	L,O,R,U,-	-
			O.. Oben	
			U.. Unten	
			L.. Linker Kämpfer	
			R.. Rechter Kämpfer	

K (sewer rehabilitation)	-	-	L,O,R,U,-	-
			O.. Top	
			U.. Bottom	
			L.. Left crossbar	
			R.. Right crossbar	

BCB (point repair)	
	A. Pipe replaced
	B. Localised lining
	C. Injected mortar
	D. Other injected sealing material
	E. Hole repaired
	Z. Other
Quantificati	None

BCC (curvature of sewer)	
1.	A. Left
	B. Right
2.	A. Up
	B. Down
Quantificati	The total angle of deviation

BCD (start node type)	
	A. Manhole
	B. Inspection chamber
	C. Rodding eye
	D. Lamp hole
	E. Outfall
	F. Major connection without a manhole or inspection chamber
	Z. Other
Quantificati	The node reference

BCE (finish node)	
	A. Manhole
	B. Inspection chamber
	C. Rodding eye
	D. Lamp hole
	E. Outfall
	F. Major connection without a manhole or inspection chamber
	Z. Other
Quantificati	The node reference

F (Fehlanschluss)	-	-	L,O,R,U,-	-
			O.. Oben	
			U.. Unten	
			L.. Linker Kämpfer	
			R.. Rechter Kämpfer	

F (wrong connection)	-	-	L,O,R,U,-	-
			O.. Top	
			U.. Bottom	
			L.. Left crossbar	
			R.. Right crossbar	

BDA (general photograph)	
	A still photograph has been taken to record the general condition of the drain or sewer
Quantificati	The direction of the camera

BDB (general remark)	
	A remark which cannot be included in any other way
Quantificati	None

BDC (inspection abandoned)	
	A. Obstruction
	B. High water level
	C. Equipment failure
	Z. Other
Quantificati	None

BDD (water level)	
	A. Clear effluent
	B. Turbid or discoloured effluent
Quantificati	The level expressed as a percentage of the diameter or the vertical dimension

BDE (flow in incoming pipe)	
1.	A. Clear effluent
	B. Turbid or discoloured effluent
2.	A. Wrongly connected because wastewater is observed discharging to a surface water drain or sewer
	B. Wrongly connected because surface water is observed discharging to a wastewater drain or sewer
	C. Not observed to be wrongly connected
Quantificati	The water level in the connecting pipe

F (Fehlanschluss)	-	-	L,O,R,U,-	-
			O.. Oben	
			U.. Unten	
			L.. Linker Kämpfer	
			R.. Rechter Kämpfer	

F (wrong co	-	-	L,O,R,U,-	-
			O.. Top	
			U.. Bottom	
			L.. Left crossbar	
			R.. Right crossbar	

BDE (flow in incoming pipe)	
1.	A. Clear effluent
	B. Turbid or discoloured effluent
2.	A. Wrongly connected because wastewater is observed discharging to a surface water drain or sewer
	B. Wrongly connected because surface water is observed discharging to a wastewater drain or sewer
	C. Not observed to be wrongly connected
Quantificat	The water level in the connecting pipe

BDF (atmosphere within the pipeline)	
	A. Oxygen deficiency
	B. Hydrogen sulfide
	C. Methane
	Z. Other
Quantificat	The percentage of the gas in the atmosphere

BDG (loss of vision)	
	A. Camera is under water
	B. Silt
	C. Steam
	Z. Other
Quantificat	None

V (Mechanischer Verschleiß)	-,C	A,B,E,F,M,-	L,O,R,U,-	11,12,13,21,22,32,33
		A.. Sichtbarer Wasseraustritt	O.. Oben	11.. Zuschlag sichtbar
		B.. Boden sichtbar	U.. Unten	12.. Zuschlag ragt heraus
		E.. Eindringendes Wasser sichtbar	L.. Linker K	13.. Zuschlag ist herausgefallen
		F.. Feuchtigkeit sichtbar	R.. Rechter	21.. Bewehrung sichtbar, korrodiert
		M.. Eindringendes Wasser sichtbar mit Bodeneintrag		22.. Bewehrung fehlt teilweise oder ragt heraus
		- .. Keine Angaben zur Undichtigkeit möglich		32.. Fugenmörtel fehlt teilweise (CEN BAE)
				33.. Fugenmörtel fehlt ganz (CEN BAE)

V (mechani	-,C	A,B,E,F,M,-	L,O,R,U,-	11,12,13,21,22,32,33
		A.. Visible exfiltrat	O.. Top	11.. Visible addition
		B.. Soil in sight	U.. Bottom	12.. Intruding addition
		E.. Visible infiltrati	L.. Left cros	13.. Missing addition
		F.. Visible dampne	R.. Right cr	21.. Visible reinforcement, corrode
		M..visible infiltration with ing		22.. Partial missing or intruding reinforcement
		- .. No details about leakage		32.. Partial missing joint mortar (CEN BAE)
				33.. Missing joint mortar (CEN BAE)

Appendix 15 Translation of the Norwegian code to the CEN code

Drains and Sewers

The circumferential location has to be noted (under "Commentary" in the Norwegian system), grades very from 0 - 4; 0 meaning there is no fault.
The degree of pipe filling has to be stated as a percentage in the Norwegian system (see FG) and reported data has to be linked to one pipe only.

English translation of the Norwegian system		European Standard	
Observatio type	**Observation class**	**Main Code**	**Characterisation**
DF Deformation		BAA (deformation)	
Grade	1. less than 5% of pipe diameter		A. Vertical
	2. 5 - 15%		B. Horizontal
	3. 15 - 30%	Quantificat	The percentage change in the dimension
	4. more than 30%		which reduces
Commentar	punct deformation in flexible pipes		
SR Crack Formation		BAB (fissure)	
Grade	1. Surface crack	1.	A. Surface crack
	2. Open crack		B. Crack
			C. Fracture
Commentar	specify direction of crack as	2.	A. Longitudinal
	Longitudinal, Circumferential etc.		B. Circumferential
			C. Complex
			D. Helical
		Quantificat	The width of the fissure
SR Crack Formation		BAC (break/collapse)	
Grade	3. Break		A. Break
			B. Missing
	4. Collapse		C. Collapse
Commentar	specify direction of crack as	Quantificat	The length of the break or collapse
	Longitudinal, Circumferential etc.		
		BAD (defective brickwork or masonry)	
		1.	A. Displaced
			B. Missing
			C. Dropped invert
			D. Collapse
		2.	A. Another layer is visible
			B. Nothing is visible
		Quantificat	For C: the depth of drop
		BAE (missing mortar)	
			All or part of the mortar from brickwork or masonry is missing
		Quantificat	The depth from the surface of the brickwork or masonry to the surface of the mortar

KO Corrosion/Wear	
Grade	1.Increased roughness
	2.Visible aggregate
	3. Visible reinforcement
	4. Missing wall
Commentary	

BAF (surface damage)	
1.	A. Increased roughness
	B. Spalling
	C. Visible aggregate
	D. Aggregate projecting from surface
	E. Missing aggregate
	F. Visible reinforcement
	G. Reinforcement projecting from surface
	H. Corroded reinforcement
	I. Missing wall
	J. Corrosion products on surface
	Z. Other
2.	A. Mechanical damage
	B. Chemical attack -general
	C. Chemical attack -biochemical attack
	D. Chemical attack -attack by wastewater
	E. Cause not evident
Quantificat	None

IR Pipeline Intrusion	
Grade	1.doesn't touch cross-sectional area
	2. affects less than 15% cross-sect. area
	3. affects 15 - 30% cross-sect. area
	4. affects more than 30% cross-sect. area
Commentar	state damage in point of connection separately

BAG (intruding connection)	
	A connecting pipe projecting into the pipe-line, obstructing the cross-sectional area
Quantificat	The length of the intrusion expressed as a percentage of the diameter or vertical dimen-sion of the pipeline

LS Joint diplacement	
The two ends of pipes at a connection have changed their longitudinal position	
Grade	1. slight displacement (this grade is not used as most connections show a little displacement)
	2. Noticable displacement
	3.Ends are very displaced but still in touch
	4. Gap between the ends of the pipes soil is visible
Commentary	

BAH (defective connection)	
	A. Position of the connection is incorrect
	B. Gap between the end of connecting pipe and the main pipe
	C. Partial gap between the end of connecting pipe and the main pipe
	D. Connecting pipe is damaged
	E. Connecting pipe is blocked
	Z. Other
Quantificat	None

SP Visible Seal	
Sealing material observed within pipe	

BAI (intruding sealing material)	
1.	A. Sealing ring
	Z. Other sealant

1. Tap root	
2. Independent fine roots	
3. Net of roots	
4. Complex mass of roots	

BBA (roots)	
	A. Tap root
	B. Independent fine roots
	C. Complex mass of roots
Quantificati	Reduction of the cross-sectional area

1. affect less than 5% of diam.	
2. affect 5 - 15% of diameter	
3. affect 15 - 30% of diameter	
4.affect more than 30 % of diameter	

BBB (attached deposits)	
	A. Encrustation
	B. Grease
	C. Fouling
	Z. Other
Quantificati	Reduction of the cross-sectional area

BBC (settled deposits)	
	A. Fine
	B. Coarse
	C. Hard or compacted material
	Z. Other
Quantificati	The depth of the deposit as a percentage

BBD (ingress of soil)	
	A. Sand
	B. Peat
	C. Fine material
	D. Gravel
	Z. Other
Quantificati	Reduction of the cross-sectional area

longitudinal location	
define type and size of obstacle	

BBE (other obstacles)	
	A. Dislodged brick or masonry unit
	B. Pieces of broken pipe

1. up to the half wall thickness is visible
2. up to the whole wall thickness is visible
3. the whole wall thickness and a bit soil visible
4. the whole wall thickness and much soil visible

BAJ (displaced joint)	
	A. Longitudinal
	B. Radial
	C. Angular
Quantificati	Distance or angel of the displacement

BAK (lining defect)	
1.	A. Lining of the pipeline is detached
	B. Discolouration of the lining
	C. Defective end of lining
	D. Wrinkled lining
	E. Blistered lining
	Z. Other
2.	A. Longitudinal
	B. Circumferential
	C. Complex
Quantificati	The reduction in cross-sectional area

BAL (defective repair)	
	A. Part of the wall is missing
	B. A patch sealing a hole deliberately made
	in the pipe wall has become defective
	Z. Other
Quantificati	None

BAM (weld failure)	
	A. Longitudinal
	B. Circumferential
	C. Helical
Quantificati	None

BAN (porous pipe)	
	The pipe material is seen to be porous
Quantificati	None

IS Infiltration	
Grade	1. Sweating
	2. Dripping
	3. Flowing
	4. Gushing
Commentary	

BBF (infiltration)	
	A. Sweating
	B. Dripping
	C. Flowing
	D. Gushing
Quantification	None

BBG (exfiltration)	
	Visible leakage of flow out of the pipeline
Quantification	None

BBH (vermin)	
1.	A. Rat
	B. Cockroach
	Z. Other
2.	A. In the pipeline
	B. In a connection
	C. In an open joint
	Z. Other
Quantification	The number of animals

GR Junction	
Prefabricated junction that connects a pipe to the main pipe	
Record	Longitudinal Location
	Circumferential location
	Failures in connection
Commentary	state damages in connection separately

BCA (connection)	
1.	A. Junction
	B. Saddle connection - drilled
	C. Saddle connection - chiselled
	D. Plain connection - drilled
	E. Plain connection -chiselled
	F. Connection other than a junction
	G. Type of connection not evident
	Z. Other
2.	A. Connection open
	B. Connection closed
Quantification	None

BCB (point repair)	
	A. Pipe replaced
	B. Localised lining
	C. Injected mortar
	D. Other injected sealing material
	E. Hole repaired
	Z. Other
Quantification	None

RE Change of Direction	
Pipe's centreline differs from the straightline	
between manholes	

BCC (curvature of sewer)	
1.	A. Left
	B. Right

BCD (start node type)	
	A. Manhole
	B. Inspection chamber
	C. Rodding eye
	D. Lamp hole
	E. Outfall
	F. Major connection without a manhole or inspection chamber
	Z. Other
Quantification	The node reference

BCE (finish node)	
	A. Manhole
	B. Inspection chamber
	C. Rodding eye
	D. Lamp hole
	E. Outfall
	F. Major connection without a manhole or inspection chamber
	Z. Other
Quantification	The node reference

BDA (general photograph)	
	A still photograph has been taken to record the general condition of the drain or sewer
Quantification	The direction of the camera

BDB (general remark)	
	A remark which cannot be included in any other way
Quantification	None

BDC (inspection abandoned)	
	A. Obstruction
	B. High water level
	C. Equipment failure
	Z. Other
Quantification	None

FG Degree of filling	
The amount of water or sediments in the pipe	
record	0%
	10%
	20%
	30%
	40%
	50%
	60%
	70%
	80%

BDD (water level)	
	A. Clear effluent
	B. Turbid or discoloured effluent
Quantification	The level expressed as a percentage of the diameter or the vertical dimension

BDE (flow in incoming pipe)	
1.	A. Clear effluent
	B. Turbid or discoloured effluent
2.	A. Wrongly connected because wastewater is observed discharging to a surface water drain or sewer
	B. Wrongly connected because surface water is observed discharging to a wastewater drain or sewer
	C. Not observed to be wrongly connected
Quantification	The water level in the connecting pipe

BDF (atmosphere within the pipeline)	
	A. Oxygen deficiency
	B. Hydrogen sulfide
	C. Methane
	Z. Other
Quantification	The percentage of the gas in the atmosphere

BDG (loss of vision)	
	A. Camera is under water
	B. Silt
	C. Steam
	Z. Other
Quantification	None

DE Change of Dimension	
Record	Longitudinal Location
	Design
Commentary	possibly comment on design

ME Change of Material	
Record	Longitudinal Location
	Design/Material
Commentary	possibly comment on design

Appendix 16 Translation of the UK code to the CEN code

Manual of sewer condition classification										prEN 13508-2					
Code	Definition	Clock		Intrusion		Dimension	Remarks	MSCC Page		Code	Name/Item	Character -isation			Qu
		at	to	%	mm							1	2	1	
B	Broken pipe at ... (OR from ... to ...) o'clock	n1	(n2)				Piped sewers only	25		BAC	Break/collapse	A			
BR	Branch major	n1	n2			n3	If non circular other dimensions will be recorded in remarks	54		BCA	Connection	Z		n3	
CC	Crack circumferential from ... to ... o'clock	n1	n2					19		BAB	Fissure - crack - circumferential	B	B		
CL	Crack longitudinal at ... o'clock	n1						19		BAB	Fissure - crack - longitudinal	B	A		
CM	Cracks multiple from ... to ... o'clock	n1	n2					19		BAB	Fissure - crack - complex	B	C		
CN	Connection at ... o'clock, diameter ...mm	n1				n2		52		BCA	Connection	F		n2	
CNI	Connection at ... o'clock, diameter ...mm, intrustion ...mm	n1			n3	n4		52	Two	BCA	Connection	F		n4	
									Codes	BAG	Intruding connection			n3/dia	
CU	Camera under water							59		BDG	Loss of vision	A			
CX	Connection defective at ... o'clock, diameter ...mm	n1				n3		52	Two	BCA	Connection	F		n3	
									Codes	BAH	Defective connection	Blank			
CXI	Connection defective at ... o'clock, diameter ...mm, intrusion ...mm	n1			n3	n4		52	Use	BCA	Connection	Blank		n4	
									Three	BAG	Intruding connection			%	
									Codes	BAH	Defective connection	Blank			
D	Deformed sewer ...%			n1				27		BAA	Deformation	Blank		n1	
DV	Deformed sewer vertical...%			n1				27		BAA	Deformation - vertical	A		n1	
DH	Deformed sewer horizontal...%			n1				27		BAA	Deformation horizontal	B		n1	
DB	Displaced bricks at ... (OR from ... to ...) o'clock	n1	(n2)					36		BAD	Defective brickwork - displaced	A			
DC	Dimension of sewer changes, new dimension ...mm					n1	Other dimension is in remarks	55		AEC	Cross section	Blank		n1	
DE	Debris ...% cross-sectional area loss			n1				45		BBC	Settled deposits - coarse	B		formu	
DEG	Debris grease ...% cross-sectional area loss	n1	n2	n3				45		BBB	Attached deposits - grease	B		n3	
DES	Debris silt ...% cross-sectional area loss			n1				45		BBC	Settled deposits - silt	A		formu	
DI	Dropped invert, gap ...mm				n1			38		BAD	Defective brickwork - dropped invert	C		n1	
EH	Encrustation heavy from ... to ... o'clock ...% cross-sectional area loss	n1	n2	n3				43		BBB	Attached deposits - encrustation	A		n3	
EL	Encrustation light from ... to ... o'clock	n1	n2					43		BBB	Attached deposits - encrustation	A		0	
EM	Encrustation medium from ... to ... o'clock ...% cross-sectional area loss	n1	n2	n3				43		BBB	Attached deposits - encrustation	A		n3	
ESL	Scale light ...% cross-sectional area loss from ... to ... o'clock	n1	n2						see	BBB	Attached deposits - other	Z		0	
									note	BBC	Settled deposits - hard or compacted	C		0	
										BAF	Surface damage - corrosion products on surface	J			
ESH	Scale heavy from ... to ... o'clock ...%	n1	n2	n3					see	BBB?	Attached deposits - other	Z		n3	
									note	BBC	Settled deposits - hard or compacted	C		n3	
										BAF	Surface damage - corrosion products on surface	J			
ESM	Scale medium ...% cross-sectional area loss from ... to ... o'clock	n1	n2	n3					see	BBB?	Attached deposits - other	Z		n3	
									note	BBC	Settled deposits - hard or compacted	C		n3	
										BAF	Surface damage - corrosion products on surface	J			
FC	Fracture circumferential from ... to ... o'clock	n1	n2					22		BAB	Fissure - fracture - circumferential	C	B		
FL	Fracture longitudinal at ... o'clock	n1						22		BAB	Fissure - fracture - longitudinal	C	A		
FM	Fractures multiple from ... to ... o'clock	n1	n2					22		BAB	Fissure - fracture - multiple	C	C		
GO	General observation at this point							59		BDB	General remark				
GP	General photograph number ... taken at this point							59		BDA	General photograph				
H	Hole in sewer at ... (OR from ... to ...) o'clock	n1	(n2)					26		BAC	Break/collapse - missing	B		n1	
ID	Infiltration dripper at ... (OR from ... to ...) o'clock	n1	(n2)					41		BBF	Infiltration - dripping	B			
IG	Infiltration gusher at ... (OR from ... to ...) o'clock	n1	(n2)					41		BBF	Infiltration - gushing	D			
IR	Infiltration runner at ... (OR from ... to ...) o'clock	n1	(n2)					41		BBF	Infiltration - flowing	C			
IS	Infiltration seeper at ... (OR from ... to ...) o'clock	n1	(n2)					41		BBF	Infiltration - sweating	A			
JDL	Joint displaced large (Displacement > 1.5 * wall thickness)							30		BAJ	Displaced joint - radial	B		1.5 x	
JDM	Joint displaced medium (Displacement 1.0 - 1.5 * wall thickness)							30		BAJ	Displaced joint - radial	B		1 x f1	
JDS	Joint displaced slight (Displacement < 1.0 * wall thickness)							30		BAJ	Displaced joint - radial	B		0	
JN	Junction at ... o'clock, diameter ...mm	n1				n3		50		BCA	Connection - junction	A		n3	
JX	Junction defective at ... o'clock, diameter ...mm	n1				n3		51	Two	BCA	Connection - junction	A		n3	
									codes	BAH	Defective connection	Blank			
LC	Lining of sewer changes/starts/finishes at this point							56		AEE	Lining	Blank		n1	
LD	Line of sewer deviates down							48		BCC	Curvature - down		B		
LL	Line of sewer deviates left							48		BCC	Curvature - left	A			
LN	Lining defect at ... (OR from ... to ...) o'clock	n1	(n2)					54		BAK	Lining defect	Blank			
LR	Line of sewer deviates right							48		BCC	Curvature - right	B			
LU	Line of sewer deviates up							48		BCC	Curvature - up		A		
MB	Missing bricks at ... (OR from ... to ...) o'clock	n1	(n2)					37		BAD	Defective brickwork - missing	B	Blank		
MC	Material of sewer changes at this point						Details	57		AED	Material	n1			
									Codes	BAA	Deformation	Blank		n1	

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Manual of sewer condition classification										prEN 13508-2					
Code	Definition	Clock		Intrusion		Dimension	Remarks	MSCC Page		Code	Name/Item	Character -isation		C	
		at	to	%	mm							1	2	1	
MH	Manhole/node						Node reference	55		BCE	Finish Node	A		Nod refe	
MM	Mortar missing medium at ... (OR from ... to ...) o'clock	n1	(n2)					35		BAE	Missing mortar			15	
MS	Mortar missing surface at ... (OR from ... to ...) o'clock	n1	(n2)					35		BAE	Missing mortar			0	
MT	Mortar missing total at ... (OR from ... to ...) o'clock	n1	(n2)					35		BAE	Missing mortar			50	
OB	Obstruction ...% height/diameter loss			n1				47		BBE	Obstacles	see note		f1	
OJL	Open joint large (Displacement > 1.5 x wall thickness)							31		BAJ	Displaced joint - longitudinal	A		1.5	
OJM	Open joint medium (Displacement 1.0 - 1.5 x wall thickness)							31		BAJ	Displaced joint - longitudinal	A		1 x	
OJS	Open joint slight (Displacement < 1.0 x wall thickness)							31		BAJ	Displaced joint - longitudinal	A		0	
PC	Length of pipe forming sewer changes at this point, new length ...mm					n1		58		AEF	Pipe unit length			n1	
RF	Roots fine							39		BBA	Roots - independant fine	B			
RM	Roots mass ...% cross-sectional area loss			n1				39		BBA	Roots - mass	C		n1	
RT	Roots tap							39		BBA	Roots - tap	A			
SA	Survey abandoned						Remarks required	55		BDC	Inspection abandoned	see note			
SC	Shape of sewer changes at this point						Remarks required	56		AEC	Cross section	n1		n2	
SSL	Surface damage, spalling large at ... (OR from ... to ...) o'clock	n1 /	n2					32		BAF	Surface damage - Visible reinforcement	See note	E		
SSM	Surface damage, spalling medium at ... (OR from ... to ...) o'clock	n1 /	n2					32		BAF	Surface damage - Aggregate visible	see note	E		
SSS	Surface damage, spalling slight at ... (OR from ... to ...) o'clock	n1 /	n2					32		BAF	Surface damage - Increased roughness	A	E		
SS	Surface damage, spalling at ... (OR from ... to ...) o'clock									BAF	Surface damage	A	A		
SWL	Surface damage, wear large at ... (OR from ... to ...) o'clock	n1 /	n2					32		BAF	Surface damage - Mechanical damage	See note	A		
SWM	Surface damage, wear medium at ... (OR from ... to ...) o'clock	n1 /	n2					32		BAF	Surface damage - Mechanical damage	See note	A		
SWS	Surface damage, wear slight at ... (OR from ... to ...) o'clock	n1 /	n2					32		BAF	Surface damage - Mechanical damage	A	A		
SW	Surface damage, wear at ... (OR from ... to ...) o'clock									BAF	Surface damage	A	A		
V	Vermin (rats and mice)							58		BBH	Vermin	A	Blank		
WL	Water level ...% height/diameter			n1				48		BDD	Water level			f1	
X	Sewer collapsed ...% cross-sectional area loss			n1				28	Two	BAC	Collapse	C		n1	
									Codes	BAA	Deformation	Blank		n1	