



The Government of the Hong Kong
Special Administrative Region

WORKS BUREAU

Agreement No. CE 15/2000

Study on **CAD Standard** for Works Departments



Consultation Document

October 2001

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Introduction

The Use of CAD in Hong Kong

Computer Aided Drafting (CAD) systems are used to produce virtually all drawings related to construction in Hong Kong. CAD systems are used by Government Departments, client organisations, consultants, contractors and suppliers.

Most of these organisations have developed in-house standards to ensure data compatibility and uniform presentation of their drawings. These standards are usually developed to meet in-house requirements and do not take account of others' standards. This is an understandable approach as there are no common industry standards to follow. Some client organisations require those supplying drawings to provide them to the client's own standards. In many cases however such requirements are not specified.

Two main CAD systems are used in Hong Kong; they are AutoCAD and Microstation. Although data can be transferred between the systems, the small differences that exist in the many CAD standards being used mean that data transfers are very often not wholly successful. As a result, the benefits that would arise from a free flow of CAD data between parties involved in the whole life-cycle of a project are not realised.

The Use of CAD within Government

Most Hong Kong Government construction projects fall under the portfolio of those departments that come under the umbrella of the Works Bureau. These departments are:

- Architectural Services Department ^A
- Civil Engineering Department ^M
- Drainage Services Department ^M
- Electrical & Mechanical Services Department ^A
- Highways Department ^M
- Territory Development Department ^M
- Water Supplies Department ^A

Transport Department ^M, although not under the Works Bureau, is also involved in many Government construction projects.

Each of these departments runs a CAD system. There is a roughly equal split between those that use AutoCAD and those that use Microstation, which is indicated above by the letters ^A and ^M after the departments' names.

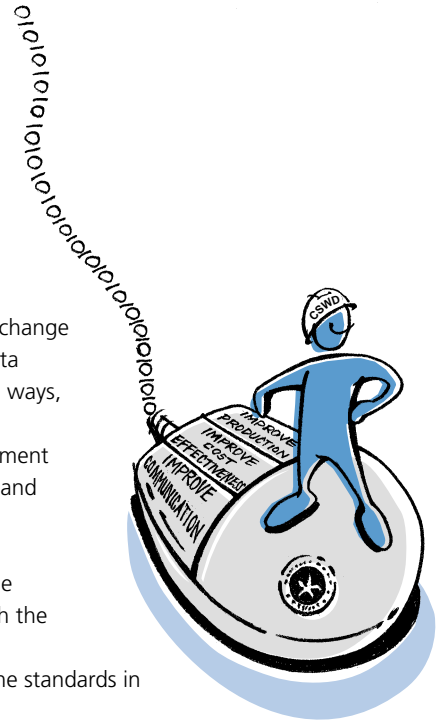
Each of the departments has developed its own CAD standards to suit its own needs. No one standard is better than another, they are just different. As a result, CAD data exchange between the departments is limited due to incompatibilities in the data.

The same incompatibilities of data and lack of a common, published set of CAD standards also prevent easy exchange of electronic drawings between the departments and their consultants, contractors and suppliers.

The Purpose of the CSWD Study

To overcome the differences in the departments' CAD standards, the Works Bureau has commissioned the 'CSWD Study'. CSWD stands for 'CAD Standard for Works Departments'.

The purpose of the CSWD Study is to align the Works Departments' CAD standards to produce a common set of standards that will be adopted by all the departments and to which their consultants, contractors and suppliers will be required to work. It is envisaged that the CSWD will become the "de-facto" CAD standard used in the Hong Kong construction industry.



The Objectives

The objectives of the CSWD Study are:

- (i) To set CAD standards that will facilitate CAD data exchange amongst the participating departments and other data providers. This will include CAD data exchange, both ways, between AutoCAD and Microstation.
- (ii) To standardise and rationalise the use of drawing element representations, information types, drawing settings and resources files.
- (iii) To facilitate the management of CAD Data.
- (iv) To improve drawing production efficiency through the specification of tools that will ensure compliance with the standards.
- (v) To make administrative arrangements for updating the standards in (i) to (iv) above.

The Study Deliverables

The output from the Study will be:

- (i) A set of documented CAD standards for use in AutoCAD and Microstation.
- (ii) Standard template and resource files for use in AutoCAD and Microstation.
- (iii) A set of files to assist in mapping the exchange of data between AutoCAD and Microstation.
- (iv) A database of drawing symbols.
- (v) A specification against which a 'Standard Interface' program will be developed. The Standard Interface will assist users in ensuring that their CAD work is carried out in accordance with the CSWD.
- (vi) Recommendations for the structure and function of an Administration Committee that will oversee the future maintenance and upgrading of the CSWD.

The Study Programme

The CSWD Study is being undertaken in five stages. They are:

- (i) Stage 1 - Base-lining (understanding and documenting the standards in use in the departments)
- (ii) Stage 2 - Functional Requirements (defining what the CSWD should do)
- (iii) Stage 3 - The Preliminary CSWD
- (iv) Stage 4 - Consultation
- (v) Stage 5 - Finalisation

The Study commenced in November 2000 and is scheduled to be complete by the end of 2001. Stages 1,2 and 3 have been completed and Stage 4 - Consultation is now underway.

The CSWD Consultant

The Consultant for the CSWD Study is Atkins China Ltd supported by Intergraph Hong Kong Limited.

The Consultation Exercise

Why Consult?

In that Government is the major initiator of construction projects in Hong Kong, the requirements that it develops for the structure and format of drawings supplied to it will affect Hong Kong's consultants, contractors and suppliers. Under the Study, organisations that will be affected by the CSWD have been grouped as 'Stakeholders'. The purpose of the Consultation Stage is:

- to introduce the CSWD to the Stakeholders;
- to secure support for the CSWD; and
- to obtain feedback on the CSWD, in particular the requirements and concerns of the Stakeholders.

The Consultation Document and Web Site

The purpose of this document is therefore to present the proposed CSWD to Stakeholders. The contents of this document, together with some sample drawings, can also be found on the Works Bureau's web site at www.wb.gov.hk/gov

Presentations

Presentations of the proposed standards will be made to Stakeholders. The presentations will cover and supplement the information given in this document and sample drawings will be displayed. The presentations will be held during the week beginning 30th October 2001 at the offices of:

Atkins China Ltd
15/F, Miramar Tower
132 Nathan Road
Tsim Sha Tsui
Kowloon

Please contact John Newby on 2972 1900 or e-mail jnewby@atkins-china.com.hk for more details. All are welcome.

Trials

Following the presentations, a trial of the standards will be undertaken. This will involve the participating departments and other organisations. Any Stakeholders that wish to take part in the trial should contact Atkins China Ltd.

Up to 50 users will take part in the trial — the envisaged distribution of these users is shown below. The trial will consist of two parts. The first will require users to produce some typical detail drawings to the standards.

The second part will comprise a data exchange trial, particularly of the Microstation / AutoCAD translation, whereby some background data will be passed to all participating organisations for the addition of their discipline-specific information. This additional data will then be distributed to all participants, who will be asked to combine it into a single drawing. In theory all of the resulting plots should be identical.

Organisation	No. of Users
Architectural Services Department	8
Civil Engineering Department	6
Drainage Services Department	6
Electrical & Mechanical Services Dept	2
Highways Department	8
Territory Development Department	2
Transport Department	2
Water Supplies Department	6
Other Stakeholders	10
Total	50

Feedback

Feedback from Stakeholders is welcomed. Comments, observations and suggestions should be sent to Atkins China Ltd at the address and contact details given above.

Principles of CAD Practice

The CSWD are based on good CAD practice

This section contains a brief description of what is considered to be good CAD practice in the production of drawings, together with some definitions that arise from this, which are referred to later in the document. The CSWD have been developed to support these principles.

CAD is not just an electronic drawing board

The benefits of CAD will be limited if the CAD system is used simply as an electronic drawing board. This simple approach to using CAD sees drawings as single entities, each one unrelated to another and closely mimics traditional drawing office practice. Instead of using a sheet of drawing film, which gets more and more battered as time goes by, the drawing is held as a computer file. From time to time, clean paper copies are made using a plotter. The crucial thing in such a system is that each drawing corresponds to a separate computer file.



CAD is a tool for co-ordination

CAD can be much more than that. If used correctly it can be a powerful tool for co-ordinating a project and overcoming two fundamental problems that occur in both manual drafting and simple CAD systems used as a manual replacement; namely:

- Lack of edge-matching between sheets for projects that cannot be drawn on a single drawing, and
- Updating of background information issued by another discipline or other party.

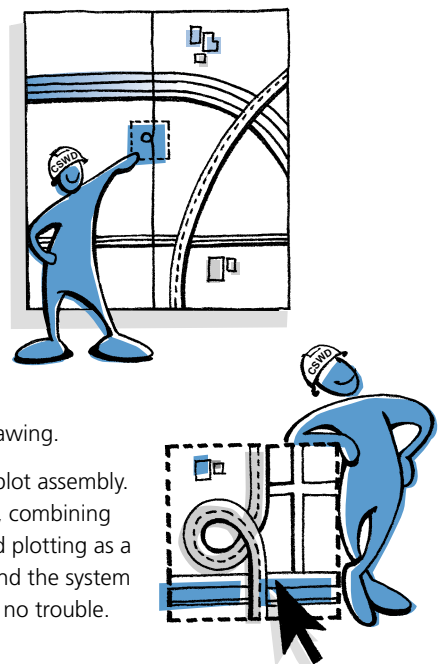
How can CAD be used to solve these problems?

An unlimited drawing size

The traditional drawing is limited by the size of the film and the size of the drawing board. CAD files are not so limited. They can represent drawings that are far too big to plot in one piece. A large building or site may therefore be drawn complete in one file and only split up into more useable areas when plotted. In this way drafting and design work is not hindered by sheet boundaries.

There is a slight difficulty in doing this. With the simple approach to CAD, the drawing frame, title and revision notes can be carried in the file and plotted with everything else. This is not possible if the plot is a proportion of a larger drawing.

The best solution is for the CAD system to provide features for plot assembly. A plot is made by selecting areas from any number of drawings, combining and positioning them (perhaps scaling and rotating as well), and plotting as a whole. The master drawings are not modified by this process, and the system remembers the composition and layout of the plot, so reissue is no trouble.



A Co-ordination Model

Once CAD files are used in this way then the concept of a 'drawing' in the traditional sense becomes less important. The computer file is now representing a large part of the building; perhaps an entire floor plan. It is beginning to be used as a co-ordination **model** of the project.

For the successful co-ordination of project data, it is essential that the data remains unique. Unique data will be maintained by referencing the model files and never copying their data.

Drawings are views of Model Files

Drawings are then produced in one of two ways:

- (i) The simplest and most common method is to build up the project data in a series of planar 2D models, typically relating to plans, sections and elevations, by discipline, and to generate the project drawings by referencing these model files.
- (ii) The approach being adopted by the latest CAD software is to build up the project data in a series of 3D models. Drawings are then generated from views of the 3D model.

The CAD model principle involves the structuring of the project CAD data into a series of model files and drawing files, which are then combined to form the project drawings.

Model Files

Model files are used to store all of the common project data either as 2D or 3D information. The majority of co-ordination work is carried out by combining the model files, through referencing, and establishing clashes etc. It is common practice to split model files up into discipline, categories and zones with the access status of the files being controlled.

The model files are then shared by all disciplines working on the project to co-ordinate and progress their part of the design in parallel with the overall design.

Drawing Files

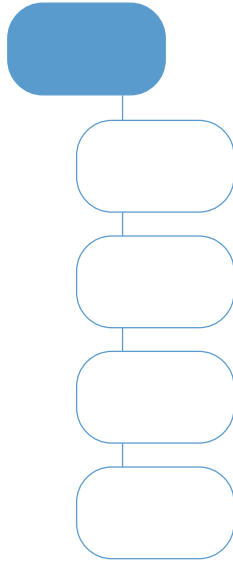
Drawing files are merely windows on the project model, which record the information necessary to create a specific drawing. Drawing files will contain very little data and little of the production work is carried out in drawing files. Typically they will store annotation e.g. drawing number, title, revision, notes, dimensions and any information which is unique to that particular drawing and is unlikely to be used elsewhere.

The information presented in the drawing file is constructed by referencing the project model files. The degree of information and the appearance of that information which is displayed in the project model files can be controlled for that particular drawing.

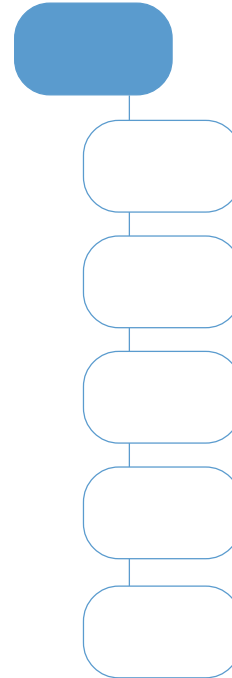
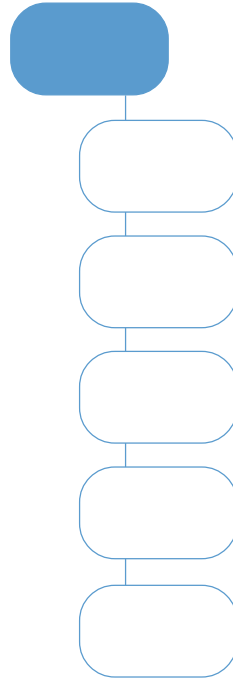
These good drawing practice principles are used as the basis for the recommendations made in BS 1192-5:1998 Construction Drawing Practice – Guide For The Structuring And Exchange Of CAD Data. The Standard is thorough and well thought out and has been used as the basis for many of the recommendations made in the CSWD Study.

The Proposed Standards

CSWD Data



Project Data



Description:

CSWD	Standard CSWD library and other files that are applicable to all projects will be stored in sub-folders under the 'CSWD' folder.
CSWD \ SI	The 'Standard Interface' program files will be stored in this sub-folder.
CSWD \ SYMBOLS	This sub-folder will hold the CSWD drawing symbols libraries.
CSWD \ RESOURCES	This sub-folder will store the CSWD resource files such as font files.
CSWD \ DX	This sub-folder will store the CSWD standard settings file and mapping files to be used for data exchange.
PROJECT#1 etc	Each project will be assigned a unique top-level folder that will be named using the project reference.
PROJECT#1 \ ADMIN	The Admin sub-folder will store standard files that are specific to the project e.g. drawing frames.
PROJECT#1 \ DRAWING	This sub-folder will store the project's current drawing files*.
PROJECT#1 \ MODEL	This sub-folder will store the project's current model files*.
PROJECT#1 \ INCOMING ^o	This directory will store incoming (from others) project drawing and model files.
PROJECT#1 \ REVISION	This directory is used to store previous revisions of files, if required.

* It is recommended that model files and drawing files be split into the two folders as shown. However, in situations where reference links between the two types of files may be lost, then both types of file may be stored together in the DRAWING sub-folder.

^o Model and drawing files received from other parties should be stored together in the INCOMING folder in order to avoid links between the two types of files from being lost.

	AutoCAD	Microstation
File Type 2D/3D	Not Applicable	3D Microstation Design Files to be used (to avoid incompatibility between 3D and 2D files).
Units	Either Metres or Milimetres (dependent on type of drawing)	Either Metres or Millimetres (dependent on type of drawing)
Working Units	Default settings	Metres Drawings: Master Units m Sub Units mm Sub Units/Master Units 1000 Positional Units/Sub Units 1
		Millimetres Drawings: Master Units mm Sub Units – Sub Units/Master Units 1 Positional Units/Sub Units 1000
Global Origin	Default Settings	Default Global Origin X 2,147,483.648 Y 2,147,483.648 Z 2,147,483.648

File Naming Common to AutoCAD and Microstation

File Naming Convention for Drawing Files

It is recommended that Departments use their current file naming convention for drawing files, with the revision status appended to the end of the filename.

XXXXXX

Departments' current naming convention

A

Revision Status

File Naming Convention for Model Files

H_

Agent Responsible

P

View

HWAYMK

File ID reference

N

Status

If users' quality systems require previous versions of model files to be kept, copies of each version can be placed in the Revision directory with the revision status appended to the end of the file name, thus:

H_

P

HWAYMK

N

A

Revision Status

File Name Convention for other files e.g. Resource Files and Cell Libraries

T_

Agent Responsible

830_


Element (e.g. Traffic aids and markings)



Field	Characters	Recommended character codes
Agent responsible	2 (alphanumeric)	A_ = ArchSD AB B_ = ArchSD BSB C_ = CED D_ = DSD E_ = EMSD H_ = HyD M_ = TDD S_ = ArchSD SB T_ = TD W_ = WSD Consultants, Contractors, Suppliers to be assigned unique 2 character codes.
View	1 (alphabetic)	D = detail I = isometric P = plan S = section E = elevation
File ID reference	6 (alphanumeric)	User definable reference
Status	1 (alphabetic)	N = new work E = existing to remain R = remove T = temporary work W = whole project
Element	4 (numeric)	Based on the CSWD Element Coding Tables Refer to pages 18-24.
<p>Note: Underscore characters should be used to represent empty/unused characters.</p>		

Layer Naming Convention		
Layer Field	Characters	Recommended Character Codes
Agent responsible	2 (alphanumeric)	A_ = ArchSD AB B_ = ArchSD BSB C_ = CED D_ = DSD E_ = EMSD H_ = HyD M_ = TDD S_ = ArchSD SB T_ = TD W_ = WSD Consultants, Contractors, Suppliers to be assigned unique 2 character names.
Element	4 (numeric)	Based on the CSWD Element Coding Tables – Refer to Pages 18-24.
User Definable	1 (alphanumeric)	User definable alphanumeric character.

Note: Underscore characters should be used to represent empty/unused characters

Layer Assignment	AutoCAD	Microstation
	<p>AutoCAD layer assignment will follow the common convention of creating the relevant layers as and when they are required in accordance with the CSWD. No more than 63 layer names should be used per file (until this restriction in Microstation is removed in future versions)</p>	<p>Microstation levels shall be assigned layer names using the CSWD layer naming convention.</p> <p>Each layer name should be assigned to a separate level number e.g.</p> <p>Level 1 A_2111M Level 2 A_2112M Level 3 A_213_M</p> <p>The CSWD will not utilise the level number assignment function. If users have a level assignment system in place then this can be maintained.</p> <p>If not, then it is recommended that layers are assigned numbers in the order in which they are created e.g.</p> <p>Level 1 First layer created Level 2 Second layer created Level 3 Third layer created</p> <p>No more than 63 layer names should be used per file</p>

Lines	AutoCAD	Microstation
Line Thicknesses	0.13mm 0.18mm 0.25mm 0.35mm 0.50mm 0.70mm 1.00mm 2.00mm	0.13mm 0.18mm 0.25mm 0.35mm 0.50mm 0.70mm 1.00mm 2.00mm
Line Thickness Assignment	<p>It is recommended that line thickness is assigned by weight and not by colour.</p> <p>The recommended CSWD line thickness can be selected from the standard AutoCAD lineweight settings dialogue box</p>	<p>It is recommended that line thickness is assigned by weight and not by colour.</p> <p>Weight 0 = 0.13mm Weight 1 = 0.18mm Weight 2 = 0.25mm Weight 3 = 0.35mm Weight 4 = 0.50mm Weight 5 = 0.70mm Weight 6 = 1.00mm Weight 7 = 2.00mm</p>
Fonts	AutoCAD	Microstation
Standard English Font for Working Drawings	Romans Font	Font 3 (Engineering)
Standard Width	0.80	0.80 x Text Height
Standard Chinese Font for Working Drawings	<p>A standard font will be specified (style to be determined) It will:</p> <ul style="list-style-type: none"> > contain Standard Big-5 and HKSCS characters. > initially be to Big-5 coding scheme (Unicode version to be used once supported by Microstation). 	<p>A standard font will be specified (style to be determined) It will:</p> <ul style="list-style-type: none"> > contain Standard Big-5 and HKSCS characters. > initially be to Big-5 coding scheme (Unicode version to be used once supported by Microstation).
Standard Width Factor for Chinese Text	1.0	1.0 x Text Height
Colour Tables	AutoCAD	Microstation
Colour Table	The use of the default AutoCAD colour table is recommended.	<p>The addition of five grey scales to the default Microstation colour table is recommended. This will enable the AutoCAD and Microstation grey scales to be matched.</p> <p>GREY SCALE</p>  <p>250 251 252 253 254</p>

Plot Settings Common to AutoCAD and Microstation		
Paper Size	Format	Size (mm)
	A0 A1 A2 A3 A4 B0* B1	841 X 1189 594 X 841 420 X 594 297 X 420 210 X 297 1000 X 1414 707 X 1000
	* The use of B0 should be kept to a minimum as it exceeds the maximum plot size of most plotters.	
Line Thicknesses	AutoCAD	Microstation
	0.13mm 0.18mm 0.25mm 0.35mm 0.50mm 0.70mm 1.00mm 2.00mm	Weight 0 = 0.13mm Weight 1 = 0.18mm Weight 2 = 0.25mm Weight 3 = 0.35mm Weight 4 = 0.50mm Weight 5 = 0.70mm Weight 6 = 0.10mm Weight 7 = 2.00mm
Grey Scales	AutoCAD	Microstation
	<p>The default AutoCAD grey scales: Colours 8, 9, 250, 251, 252, 253, 254 and 255 will plot as grey scales.</p> <p>It is recommended that only colours 250-254 are utilised as grey scales under the CSWD.</p> <p>GREY SCALE</p>  <p>250 251 252 253 254</p>	<p>The following colours will plot as grey scales 8, 9, 14, 250, 251, 252, 253, 254.</p> <p>It is recommended that only colours 250-254 are utilised as grey scales under the CSWD.</p> <p>GREY SCALE</p>  <p>250 251 252 253 254</p>

In addition to the preceding standards, which are mandatory, the following are guidelines with respect to the application of the standards.

Guidelines Common to AutoCAD and Microstation			
Paper Size	Format		Size (mm)
	A0		841 X 1189
	A1		594 X 841
	A2		420 X 594
	A3		297 X 420
	A4		210 X 297
	B0*		1000 X 1414
	B1		707 X 1000
	* The use of B0 should be kept to a minimum as it exceeds the maximum plot size of most plotters.		
Drawing Scales	<ul style="list-style-type: none"> > Scales should be whole numbers. > Odd scales should be avoided. > The number of scales on any one drawing should be kept to a minimum. > The scale shall be clearly identified under the title of each portion of the drawing. > The scale chosen shall be large enough to permit clear and easy interpretation of the information. > Where different scales are used for horizontal and vertical dimensions, such as on profiles, each scale shall be clearly indicated. 		
English Text Sizes	Text Height	Width Factor	Thickness (mm)
	2.0mm	0.80	0.25mm
	2.5mm	0.80	0.25mm
	3.5mm	0.80	0.35mm
	5.0mm	0.80	0.50mm
	7.0mm	0.80	0.70mm
	10.0mm	0.80	1.00mm
	20.0mm	0.80	2.00mm
Chinese Text Sizes	Text Height	Width Factor	Thickness (mm)
	3.00mm	1.00	0.25mm
	3.75mm	1.00	0.25mm
	5.25mm	1.00	0.35mm
	7.50mm	1.00	0.50mm
	10.50mm	1.00	0.70mm
	15.00mm	1.00	1.00mm
	30.00mm	1.00	2.00mm

AutoCAD Special Characters	Microstation Special Characters
<p>AutoCAD users should use the special characters available from the default ROMANS character map only.</p> <p>The following generic special characters can also be used.</p> <p>%%c for diameter symbol %%d for degrees symbol %%o for placing lines above text %%p for plus/minus symbol %%u for placing lines under text</p>	<p>Microstation users should use the special characters available from the default Font 3 (Engineering) only.</p>

Hardware	Intel-based computer with at least 32MB RAM*, 40MB Hard disk space and a display with resolution of at least of 800 x 600. Note: 32MB RAM is a minimum requirement as suggested by the CAD software vendors. It is considered that 128MB RAM is more practical.	
Operating System	Microsoft Windows 95 / 98 / NT / 2000 (Either Chinese or English versions)	
CAD Software	AutoCAD	Microstation
	AutoCAD 2000	Microstation SE or J

The Benefits of the CSWD

Some of the benefits that the CSWD will bring to the participating departments and to stakeholders are described in this section.

The CSWD will meet the demand for CAD Standards

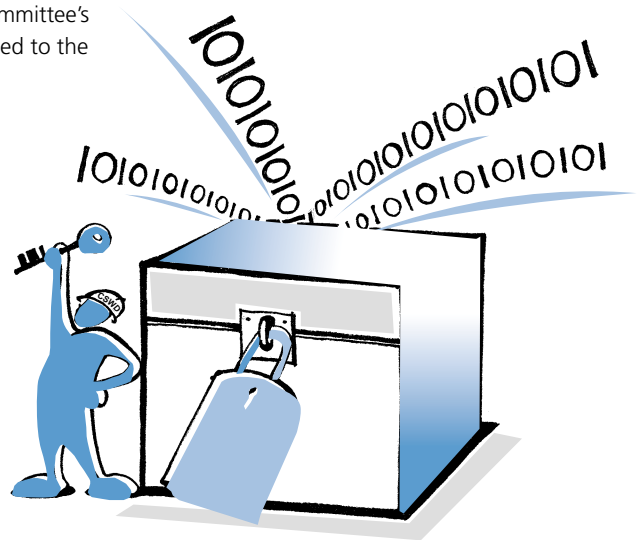
CAD is widely employed by the construction industry and has become the “tool of the trade” for drawing production. The communication of drawing information between Government and its consultants, contractors and suppliers will inevitably be in the form of CAD data. Demand for CAD drawings and hence a common CAD standard has increased substantially over recent years.

The CSWD will establish a communication platform for CAD data

The CSWD will meet the construction industry’s expectation that Government should take the lead in the formulation of CAD standards. The CSWD will establish a communication platform for CAD data, which is in line with the Construction Industry Review Committee’s recommendations contained in its report submitted to the Chief Executive in January 2001.

The CSWD will prevent data loss

The current situation, whereby many different CAD standards are used, results in information loss when data is transferred between parties. Data loss can typically occur through the use of different fonts and different line-styles. Incorrect transfer of Chinese text is also a common problem. The CSWD will minimise loss of data when transferred.



Environmental benefits



In order to avoid the problems that can occur through data loss due to different standards, hardcopy transfers are often used instead. It is the Government policy to promote environmental awareness and growing requirements for departments to minimise hard copies. This can effectively be achieved by asking consultants and contractors to submit drawings in digital form rather than in hardcopy. A common standard will facilitate data consistency and integrity in the exchange process and also enable efficient checking of drawings.

Improved Communication will result in better co-ordination

The CSWD will facilitate improved communications between the various parties involved in the construction industry. This increase in the amount of data transferred between disciplines and organisations will result in fewer errors due to poor translations, redraws of others’ data or even not having information available. This will all lead to improved co-ordination. When data can be properly structured and easily moved between disciplines then co-ordination will be greatly increased. The savings will not only come in the drawing office but also on site, where abortive work and delays due, for example, to clashes between services and structures, will be greatly reduced. The potential savings here are enormous.

CAD Data will be consistent throughout the life-cycle of a project

The ability to readily transfer data between the participating departments and the stakeholders, without effort-consuming post-processing will greatly encourage the re-use of the data throughout the life-cycle of a project. In practical terms, this means that graphic elements created in the early stages of a project will be re-used, without copying or being redrawn, through the whole life-cycle of the project, even through to facility management once the scheme is complete. This will not only provide benefits in terms of efficient drawing production but, more importantly, it will ensure greater accuracy as mistakes made in copying or recreating data will be avoided.

Data will be useable in other systems

The structuring of CAD data according to the proposed modified CI/SfB coding system together with an allowance for the addition of attribute data to the graphic elements will significantly increase the usefulness of the data for purposes such as quantities take-off and facility management. Efficiency increases in the work of associated disciplines such as quantity surveyors will result.

A structured library of drawing symbols will be provided

A comprehensive, rationalised and structured set of drawing symbols, covering all construction disciplines will be formed for use with the CSWD. The availability of these standard symbols will save time in users having to search for appropriate symbols or even create new symbols. In addition, confusion caused by the use of the same symbol for different elements or different symbols for the same element will be eradicated.

Improved efficiency will result from a common set of standards

While it is recognised that there will be a time and cost penalty in users familiarising themselves with the CSWD, once this initial hurdle is overcome then significant benefits will accrue. Users will not have to learn new standards for each Government project on which they work. Should CAD operators move between Government departments or other organisations then re-training will not be required.

Adherence with Standards will be made simple through a Standard Interface

It is intended to develop a Standard Interface under a subsequent activity to the CSWD Study. The purpose of the Standard Interface will be to cover all aspects of drawing production to the CSWD and be user-friendly, effective and efficient. The Standard Interface, which will be made available to all Stakeholders, will:

- (a) address the common drawing operations;
- (b) provide icons, menus and commands for invoking the operations in a user-friendly, effective and efficient manner;
- (c) ensure that its appearance and operation will be consistent across the CAD platforms used by Participating Departments.

The Standard Interface will therefore be a significant aid in helping to ensure that drawings are produced to the standards in an efficient way. The SI will help to produce drawings 'right first time' in terms of adherence to the standards, particularly for inexperienced users. It should be noted that the CSWD are not very different from the standards already in use in the departments and the industry as a whole.

Implementation and Administration

Programme for Implementation

It is intended to implement the CSWD within the Works Departments following the completion of the CSWD Study. The implementation will therefore commence at the end of 2001 and continue into 2002. The standards will be in full use by the middle of 2002.

The CSWD will become a Government Contractual Requirement

Government will issue a Technical Circular [WBTC] stating that the CSWD will become a future contractual requirement for all new design and construction projects. Project Briefs will refer to this Technical Circular.



The CSWD will be published on the Works Bureau Web Site

The CSWD will be published on the Works Bureau's web site. The purpose of the CSWD web site will be to:

- present the CAD standards;
- make template and other standard files available for download;
- make documentation available for download;
- provide a 'what's new' facility giving information on updates to the standards;
- provide users with an opportunity to give feedback, make suggestions and ask for help via a Message Board.

The CSWD will be upgraded and improved

It is recognised that the CSWD cannot be a fixed standard, but must take account of new versions of CAD software and also users' requirements. A CSWD Committee will be formed comprising managers and users from the Works Departments. It is envisaged that the Committee will also seek input from Stakeholders, either as permanent or ad-hoc members.

Terms of Reference of the CSWD Committee

The Terms of Reference of the CSWD Committee are proposed thus:

- to co-ordinate and apportion responsibilities for updating of the standard;
- to oversee the implementation of the standard;
- to monitor the feedback from users of the standard;
- to recommend CAD hardware and software upgrades;
- to make arrangements for promulgating revisions.

Element Coding

The CSWD require the categorisation of the elements that are contained within each file. This chapter contains details of the CSWD coding system that is to be used for categorising elements.

What are elements?

Elements are defined as: “The physical parts of construction and related works.” In addition, areas and spaces can be categorised as elements.

Why code elements?

One of the main objectives of the CSWD is to add intelligence to CAD data. In simple terms this means that lines that are drawn should be identifiable as the element that they represent, rather than just being lines. By being able to identify each element, then CAD data can be:

- easily manipulated;
- transferred to other software packages (e.g. analytical, design and measurement);
- enhanced by the addition of attribute data (facility management etc.)

Where is element coding used?

Element coding is used in the naming of:

- layers
- symbol libraries

It can also be used as part of the file ID reference of model files.

The CSWD Element Coding System

The CSWD Element Coding System is based on the international CI/SfB coding system. This coding system is already in use in Hong Kong by the Architectural Services Department and by the Housing Authority. The original SfB system has been modified for use in the CSWD by expanding the categories relating to infrastructure works. The coding system can be broken down into:

10	ELEMENT DIVISIONS	e.g. 6 - Electrical
100	MAIN CLASSES	e.g. 67 - Fire Services
1,000	CLASSES	e.g. 674 - Smoke detection and alarm system
10,000	SUB CLASSES (potentially)	

How to use the Element Coding System

The CSWD Element Coding Tables are given on pages 20 – 24. The tables are divided down to the 1,000 Classes of the system. Users are required to code elements at the Class level, i.e. to use a minimum of 3 digits. For example:

Coding will normally be by Class

Automatic Smoke Detection and Alarm Systems would be coded as	674_
Highway centre-lines would be coded as	811_
Straight stairs would be coded as	241_

The use of Grouped Classes is acceptable

It would be acceptable to code these three elements under their grouped category of:

Fire services	670_
Highways	810_
Stairs	240_

The decision whether to group or identify separately is left to the user and will depend on the amount of information being produced and the need for future manipulation.

The use of Sub Classes is at the user's discretion

An underscore is placed in the fourth digit position when only three digits are used, as specified in the Standards. If required, Classes can be further sub-divided, at the user's discretion into Sub Classes. In this case the fourth digit would be used. For example, users may wish to identify different types of seawall (956_) thus:

9561	Blockwork seawalls
9562	Wave absorbing seawalls
9563	Rock-faced sloping seawalls

Those classes that may require further sub-division into subclasses are shown with an asterisk* in the tables that follow.

The CSWD Element Coding system therefore provides flexibility as to the level of detail that is used.

CLASSES 000 – 099 : GENERAL	
000 – 009	VACANT
000	
001	
002	
003	
004	
005	
006	
007	
008	
009	
010 – 019	TITLES AND FRAMES
010	Titles and Frames ((Grouped))
011	Frame
012	Drawing Number
013	Drawing Title
014	Drawing creation information
015	QA data e.g. automatic time/date/filename ref.
016	Scale
017	Drafting Body
018	Copyright
019	
020 – 029	GRIDS
020	Grids (Grouped)
021	National grid
022	National grid text
023	Site grid
024	Site grid text
025	Building / structure grid
026	Building / structure grid text
027	Geodetic Datum
028	Setting Out Lines
029	
030 – 039	DIMENSIONS
030	Dimensions (Grouped)
031	Dimensions
032	Plan levels
033	Chainage
034	Setting out tables
035	Coordinates
036	
037	
038	
039	
040 – 049	TEXT (XXX1 ENGLISH, XXX2 CHINESE)
040	Text (Grouped)
041	Titles
042	Sizes
043	Descriptions
044	Notes
045	Schedules
046	Legends
047	
048	Reinforcement call-ups
049	Steelwork call-ups
050 – 059	GENERAL SYMBOLS
050	General Symbols (Grouped)
051	North point
052	Section, detail, elevation marks
053	Match lines / cut lines
054	Scale bars
055	Key Plan
056	
057	
058	
059	
060 – 069	HATCHING
060	Hatching (Grouped)
061	Hatching
062	Patterning
063	Fill tones
064	Highlighting
065	
066	
067	
068	
069	
070 – 079	REVISIONING
070	Revisoning (Grouped)
071	Revision clouds and marks
072	Revision box information
073	
074	
075	
076	
077	
078	
079	
080 – 089	TEMPORARY INFORMATION
080	Temporary Information (Grouped)
081	Construction lines
082	
083	
084	
085	Red-lining
086	
087	
088	
089	
090 – 099	VACANT
090	
091	
092	
093	
094	
095	
096	
097	
098	
099	

CLASSES 100 – 199 : GROUND, SUB-STRUCTURE	
100 – 109	VACANT
100	
101	
102	
103	
104	
105	
106	
107	
108	
109	
110 – 119	GROUND 160 – 169
110	Ground (Grouped)
111	Ground relief
112*	Geological boundaries and features
113	Ground composition
114	Ground water
115*	Instrumentation
116*	Ground Samples e.g. Boreholes/trialpits
117*	Settlement
118*	Geological Contours/Isopachs
119	Parts and accessories
120 – 129	EARTHWORKS
120	Earthworks (Grouped)
121	Ground profiling
122*	Ground treatment
123*	Dredging
124*	Filling
125*	Slopes
126	Berm
127	Trench
128	
129	Parts and accessories
130 – 139	FLOOR BEDS
130	Floor Beds (Grouped)
131	Hard surfaces e.g. ground floors
132	
133	
134	Soft surfaces e.g. planted, unplanted beds
135	
136	Ground underwater e.g. pools
137	
138	Other types of floor beds
139	Parts and accessories
140 – 149	TUNNELS
140	Tunnels (Grouped)
141	Tunnel walls
142	Tunnel lining
143	Portals
144	Cross-passages
145	Emergency passage
146	Shafts
147	Adits
148	
149	Parts and accessories
150 – 159	VACANT
150	
151	
152	
153	
154	
155	
156	
157	
158	
159	
160 – 169	RETAINING WALLS, FOUNDATIONS
160	Retaining Walls, Foundations (Grouped)
161	
162*	Retaining walls
163*	Water retaining elements e.g. dams, caissons
164*	Foundations not piled
165	
166	
167	
168	Other types of retaining foundation elements
169	Parts and accessories
170 – 179	PILE FOUNDATIONS
170	Pile Foundations (Grouped)
171	Sheet piling
172*	Replacement, in-situ formed pile foundations
173*	Displacement, pre-formed formed pile foundations
174	Small displacement
175	
176	
177	
178	Other types of pile foundations
179	Parts and accessories
180 – 189	OTHER SUBSTRUCTURE ELEMENTS
180	Other Substructure Elements (Grouped)
181	Underground Valve and Meter Chambers
182	
183	
184	Thrust Blocks
185	
186	
187	
188	
189	
190 – 199	PARTS & ACCESSORIES
190	Parts and Accessories (Grouped)
191	Blinding/ Screed
192	Waterproofing/Damp proofing
193	Insulation
194	Back fill
195	Formwork
196	Falsework/Scaffolding
197	Reinforcement
198	Mesh
199	

CLASSES 200 – 299 : STRUCTURE PRIMARY ELEMENTS, CARCASS	
200 – 209	VACANT
200	
201	
202	
203	
204	
205	
206	
207	
208	
209	
210 - 219	EXTERNAL WALLS
210	External Walls (Grouped)
211*	Loadbearing walls including cavity
212	
213*	Non-loadbearing walls
214	Curtain walls
215	
216*	Framing and cladding walls
217	
218	Other types of walls
219	Parts and accessories
220 - 229	INTERNAL WALLS, PARTITIONS
220	Internal Walls, Partitions (Grouped)
221*	Loadbearing internal walls
222	
223*	Non-loadbearing internal walls
224	Baffle walls
225	
226*	Framing and cladding
227	
228	Other types of internal walls
229	Parts and accessories
230 - 239	FLOORS, GALLERIES
230	Floors, Galleries (Grouped)
231	
232	Monolithic, slab floors
233	
234	Assembled, composite floors
235	
236	
237	Galleries, balconies
238	Other types of floors
239	Parts and accessories
240 - 249	STAIRS AND RAMPS
240	Stairs and Ramps (Grouped)
241	Straight stairs
242	
243	Dog leg stairs
244	Curved stairs
245	Other types of stairs e.g. open well, escape
246	Ladders, step irons, sliding poles
247	Ramps
248	Other types of vertical circulation
249	Parts and accessories
250 – 259	VACANT
250	
251	
252	
253	
254	
255	
256	
257	
258	
259	
260 – 269	VACANT
260	
261	
262	
263	
264	
265	
266	
267	
268	
269	
270 – 279	ROOFS
270	Roofs (Grouped)
271	Flat roof
272	Pitched roof
273	
274	Folded plate roofs
275	Other roofs by form e.g. dome, spires, cylindrical
276	Roofs by structure e.g. arch, vaulted, suspended
277	Cantilevered roofs, canopies
278	Other types of roofs e.g. gabled, retractable
279	Parts and accessories
280 – 289	BUILDING FRAMES, OTHER PRIM. ELEMENTS
280	Building Frames, other Primary Elements (Grouped)
281	
282	Column and beam frames
283	Column and slab frames
284	
285	
286	Space frames as building frames
287	Other building frames e.g. pin-jointed
288	Other types of primary elements e.g. shafts, chimneys
289	Parts and accessories
290 – 299	PARTS & ACCESSORIES
290	Parts and Accessories (Grouped)
291	Reinforcement
292	Steelwork
293	Cables/Post tensioned cables/Prestressed cables
294	Connection details
295	Fixing details
296	Joint details
297	Bearings
298	
299	

CLASSES 300 – 399 : SECONDARY ELEMENTS, COMPLETION OF STRUCTURE	
300 - 309	VACANT
300	
301	
302	
303	
304	
305	
306	
307	
308	
309	
310 - 319	SECONDARY ELEMENTS TO WALLS, Secondary Elements to Ext. Walls (Grouped)
310	
311	
312	
313*	Window/Door openings & parts to fill them
314	Window openings and windows
315*	Doorways, entrances, exits and doors
316	
317	Hatch openings and hatches to fill them
318	Others e.g. barred, louvred openings
319	Parts and accessories
320 - 329	SECONDARY ELEMENTS TO INTERNAL WALLS Secondary Elements to Internal Walls (Grouped)
320	
321	
322	
323*	Window/Door openings & parts to fill them
324	Window openings and windows
325*	Doorways, room divider openings
326	
327	Hatch openings, service voids
328	Others e.g. barred openings
329	Parts and accessories
330 - 339	SECONDARY ELEMENTS TO FLOORS Secondary Elements to Floors (Grouped)
330	
331	Secondary suspended floors
332	Secondary floor beds
333	Plinths
334	
335	Floor openings e.g. trap doorways
336	
337	
338	Others e.g. barred openings
339	Parts and accessories
340 - 349	SECONDARY ELEMENTS TO STAIRS & RAMPS Secondary Elements to Stairs & Ramps (Grouped)
340	
341	Balustrades
342	Handrails
343	Guide rails
344	
345	
346	
347	
348	
349	Parts and accessories
350 – 359	SUSPENDED CEILINGS Suspended Ceilings (Grouped)
350	
351	Jointless suspended ceilings
352	Louvred suspended ceilings
353	Ceiling openings and parts to fill them
354	
355	
356	
357	
358	Others e.g. ceiling walkways
359	Parts and accessories
360 – 369	VACANT
360	
361	
362	
363	
364	
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366	
367	
368	
369	
370 – 379	SECONDARY ELEMENTS TO ROOFS Secondary Elements to Roofs (Grouped)
370	
371	
372	
373	
374	Window/door openings & parts to fill them
375	Window openings e.g. roof lights, sky lights
376	Doorways e.g. trap door, access trap
377	Roof eaves, parapets and balustrades
378	
379	Others e.g. walkways Parts and accessories
380 – 389	OTHER SECONDARY ELEMENTS Other Secondary Elements (Grouped)
380	
381	
382	
383	
384	
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386	
387	
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389	
390 – 399	PARTS & ACCESSORIES Parts and Accessories (Grouped)
390	
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CLASSES 400 - 499 : FINISHES TO STRUCTURE	
400 – 409	VACANT
400	
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408	
409	
410 – 419	FINISHES TO EXTERNAL WALLS
410	External Walls (Grouped)
411*	Applied finishes
412*	Paint/Decoration
413*	Rendering
414	
415	
416*	Fitted finishes
417*	Cladding
418*	Tiles
419	
420 – 429	FINISHES TO INTERNAL WALLS
420	Finishes to Internal Walls (Grouped)
421*	Applied finishes
422*	Paint/Decoration
423*	Plaster
424	
425	
426*	Fitted finishes
427*	Cladding
428*	Tiles
429	Skirting
430 – 439	FINISHES TO FLOORS
430	Finishes to Floors (Grouped)
431*	Applied finishes
432*	Paint/Decoration
433	Non slip finish
434	Screed
435*	Fitted finishes
436*	Tiles
437	Carpet
438	
439	
440 – 449	FINISHES TO STAIRS AND RAMPS
440	Finishes to Stairs and Ramps (Grouped)
441*	Applied finishes
442*	Paint/Decoration
443	Non slip finish
444	
445*	Fitted finishes
446	Stair nosing
447	Non slip nosing strip
448	Carpet
449	
450 – 459	FINISHES TO CEILINGS
450	Finishes to Ceilings (Grouped)
451*	Applied finishes
452*	Paint/Decoration
453*	Plaster
454	
455*	Fitted finishes
456*	Cladding
457*	Tiles
458	
459	
460 – 469	VACANT
460	
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462	
463	
464	
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466	
467	
468	
469	
470 – 479	FINISHES TO ROOFS
470	Finishes to Roofs (Grouped)
471*	Applied finishes
472*	Paint/Decoration
473	Screed
474	
475*	Fitted finishes
476*	Cladding
477*	Tiles
478	
479	
480 – 489	OTHER FINISHES TO STRUCTURE
480	Other Finishes to Structure (Grouped)
481*	Featured Finishes
482*	Decorations
483	
484	
485	
486	
487	
488	
489	
490 – 499	PARTS AND ACCESSORIES
490	Parts and Accessories (Grouped)
491	
492	
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CLASSES 500 - 599 : SERVICES, MAINLY PIPED, DUCTED	
500 – 509	VACANT
500	
501	551*
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504	
505	
506	
507	
508	
509	
510 – 519	WATER SUPPLY – EXTERNAL
510	Water Supply External (Grouped)
511	Fresh water supply
512	Cooling water supply
513	Salt water supply
514	Raw water supply
515	
516	
517	
518	
519	Parts and accessories
520 – 529	WASTE DISPOSAL, DRAINAGE
520	Waste Disposal Drainage (Grouped)
521*	Refuse, rubbish, garbage disposal
522*	Gaseous waste
523*	Sewage disposal foul drainage
524*	Petrol, chemical wastes
525	Natural water drainage
526	Internal drainage (above ground drainage)
527	Below ground drainage including storage
528*	Other types of waste disposal, drainage
529	Parts and accessories
530 – 539	LIQUIDS SUPPLY
530	Liquids Supply (Grouped)
531	Cold water
532	Flushing water
533	Hot water from common supply
534	Steam
535	Hot water from individual appliance
536*	Other water supply services
537*	Petrol, oil
538*	Other types of liquid supply
539	Parts and accessories
540 – 549	GASES SUPPLY
540	Gases Supply (Grouped)
541*	Fuel gas, combustible gas supply
542*	Vapour supply
543*	Air supply
544*	Other gas supply
545*	Vacuum supply
546	
547	
548*	Other types of gases supply
549	Parts and accessories
550 – 559	SPACE COOLING
550*	Space Cooling (Grouped)
551*	Central refrigeration
552	
553	
554	
555*	Local refrigeration
556	
557	
558	Other types of space cooling services
559	Parts and accessories
560 – 569	SPACE HEATING
560	Space Heating (Grouped)
561*	Heating by power source
562	Communal heating
563	Central heating
564	Hot water, steam distribution
565	Warm air distribution
566	Electrical distribution
567*	Other types of central heating
568*	Other types of space heating services
569	Parts and accessories
570 – 579	AIR CONDITIONING, VENTILATION
570	Air Conditioning, Ventilation & Fire Services (Grouped)
571	Central air conditioning
572	Air heating only
573	Local air conditioning
574	Air heating only
575	Air treatment
576	Mechanical ventilation services
577	Unit ventilation
578*	Other types of air conditioning
579	Parts and accessories
580 – 589	FIRE PROTECTION IN GENERAL & FIRE SERVICES OTHER THAN ELECTRICAL
580	Fire Protection in General & Fire Services other than Electrical (Grouped)
581*	Fire hydrant
582*	Portable equipment e.g. extinguishers
583*	Fixed Equipment e.g. hose pipes
584	Sprinkler/deluge system – water
585	Sprinkler/deluge system – chemical
586	Pressurisation system
587	Smoke extraction system
588	
589	Parts and accessories
590 – 599	PARTS & ACCESSORIES
590	Parts and Accessories (Grouped)
591	
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CLASSES 600 – 699 : SERVICES, MAINLY ELECTRICAL	
600 – 609	VACANT
600	
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610 – 619	ELECTRICITY SUPPLY
610	Electricity Supply (Grouped)
611	Radial distribution
612	Ring main distribution
613	Rising main distribution
614	
615	
616	Public mains supply
617	Privately generated supply
618*	Other types of electrical supply services
619	Parts and accessories
620 – 629	POWER
620	Power (Grouped)
621	High voltage system
622	Medium voltage system
623	Low voltage system
624	
625	Uninterruptible power supply
626	Battery power systems
627	Power subcircuit
628	Power trunking/conduit
629	Parts and accessories
630 – 639	LIGHTING
630	Lighting (Grouped)
631	General lighting
632	Local lighting
633	Emergency lighting
634	Street lighting
635*	Airfield lighting
636	Floodlighting
637	Waterproof lighting
638*	Other types of lighting services
639	Parts and accessories
640 – 649	COMMUNICATIONS
640	Communications (Grouped)
641*	Visual including audio-visual
642	
643*	Audio
644*	Signals other than visual or audio
645	Synchronous clocks
646	SCADA
647	
648*	Other types of communications services
649	Parts and accessories
650 – 659	VACANT
650	
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660 – 669	TRANSPORT
660	Transport (Grouped)
661	Lifts
662*	Other types of internal lifts, hoists
663	Travelling cradles
664	Escalators
665*	Conveyors/Travelators
666*	Cable car, Gondola, Chair lift
667	Cranes
668*	Other types of transport services
669	Parts and accessories
670 – 679	FIRE SERVICES ELECTRICAL
670	Fire Services Electrical (Grouped)
671	Audio/Visual fire alert system
672	Automatic fire detection and alarm system
673	Automatic heat detection and alarm system
674	Automatic smoke detection and alarm system
675	Manual fire alert system
676	Automatic leakage detection and alarm system
677	
678	
679	
680 – 689	SECURITY, CONTROL, OTHER SERVICES
680	Security, Control, Other Services (Grouped)
681	
682	Security services
683	
684	
685	
686*	Other security protection services
687	Control services –process/monitoring
688*	Other types of security, control services
689	Parts and accessories
690 – 699	PARTS & ACCESSORIES
690	Parts and Accessories (Grouped)
691	
692	
693	Earthing Protection
694	Lightning protection
695	
696	
697	
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CLASSES 700 – 799 : FITTINGS, FURNITURE AND EQUIPMENT (FFE)	
700 – 709	VACANT
700	
701	
702	
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706	
707	
708	
709	
710 – 719	CIRCULATION FFE
710	Circulation FFE (Grouped)
711	Signs, symbols
712	Display fittings
713	Access fittings
714	Bollard/Cone/Barrier
715	Turnstiles
716	Flag
717	
718*	Other types of circulation fittings
719	Parts and accessories
720 – 729	REST, WORK FFE
720	Rest, Work FFE (Grouped)
721	Rest fittings
722	Fittings for relaxation
723	Work fittings
724	
725	
726	Benches, tables, seating, chairs
727	
728*	Other types of rest, work fittings
729	Parts and accessories
730 – 739	CULINARY FFE
730	Culinary FFE (Grouped)
731	Culinary work fittings
732	Sink, disposal units, washing up machines
733	
734	Culinary processing, cooking fittings
735	Culinary storage fittings
736	
737	Bar/Food counters, dining tables, seating
738*	Other types of culinary, catering fittings
739	Parts and accessories
740 – 749	SANITARY FFE
740	Sanitary FFE (Grouped)
741	Sanitary suites
742	Washing fittings
743	Drying fittings
744	Disposal fittings
745	
746	
747	Supply fittings
748*	Other types of sanitary, hygiene fittings
749	Parts and accessories
750 – 759	CLEANING FFE
750	Cleaning FFE (Grouped)
751	Washing fittings
752	
753	Drying fittings
754	Pressing, Ironing fittings
755	
756	
757	
758*	Other types of cleaning, maintenance fittings
759	Parts and accessories
760 – 769	STORAGE, SCREENING FFE
760	Storage, Screening FFE (Grouped)
761	Composite storage fittings
762	Cupboards fittings
763	Drawers fittings
764	Shelving, racking fittings
765	Suspended storage fittings
766	Storage fittings with additional facility
767	Screening fittings
768*	Other types of storage, screening fittings
769	Parts and accessories
770 – 779	SPECIAL ACTIVITY FFE
770	Special Activity FFE (Grouped)
771	Gymnasia/physical training facilities
772	Fighting sports facilities
773	One-to-one sports facilities e.g. squash
774	Bowling alleys
775	Athletics facilities
776	Racing facilities
777	Team ball games facilities
778	Equestrian facilities
779	Air sports facilities
780 – 789	OTHER FFE
780	Other FFE (Grouped)
781	
782	
783	Soft furnishings including upholstery
784	
785	
786	Works of art
787	
788	
789	
790 – 799	PARTS AND ACCESSORIES
790	Parts and Accessories (Grouped)
791	
792	Waste/Litter/Rubbish Bin
793	
794	
795	
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797	
798	
799	

CLASSES 800 – 899 : TRANSPORT INFRASTRUCTURE	
800 – 809	GROUND SURVEY 800 Ground Survey (Grouped) 801 Survey control 802 Elevation Contours 803 Spot levels 804 805 806 807 808 Military Cable 809
810 – 819	HIGHWAYS 810 Highways (Grouped) 811 Centre-lines 812 Setting out lines 813 Carriageway edges 814 Shoulders 815 Verges 816 Footpaths 817 Cycle-tracks 818 Paved area 819 Parts and accessories
820 – 829	STREET FURNITURE 820 Street Furniture (Grouped) 821 Safety features / Railing / Barriers 822 Weigh bridge 823 Toll gate 824 Speed humps 825 Vehicle stops 826 827 828 829 Parts and accessories
830 – 839	TRAFFIC AIDS & MARKINGS 830 Traffic Aids & Markings (Grouped) 831 Traffic signs 832 Markings 833 Directional signs 834 Traffic signals and equipment 835 Cats eyes/Reflective studs 836 Traffic Bollards 837 838 839 Parts and accessories
840 – 849	RAILWAYS 840 Railways (Grouped) 841 Centre-lines 842 Setting out lines 843 Trackwork 844 Trackform 845 Tramways 846 847 848 Safety features / Railing / Barriers 849 Parts and accessories
850 – 859	BRIDGES 850 Bridges (Grouped) 851 Abutment 852 Anchor Block 853 Column 854 Pier 855 Tower 856 Deck 857 Parapet 858 Cable Support Systems 859 Parts and accessories
860 – 869	GROUND SURFACE – AIRFIELDS 860 Ground Surface – Airfields (Grouped) 861 Centre-lines, setting out lines 862 Pavement edges 863 Shoulders 864 Pavement jointing 865 866 867 868 869 Parts and accessories
870-879	VACANT 870 871 872 873 874 875 876 877 878 879
880-889	VACANT 880 881 882 883 884 885 886 887 888 889
890 – 899	TRANSPORT INFR. PARTS & ACCESSORIES 890 Parts and Accessories (Grouped) 891 Reinforcement 892 Steelwork 893 Post tensioned cables/Prestressed cables 894 Connection details 895 Fixing details 896 Joint details 897 Bearings 898 899



CLASSES 900 – 999 : EXTERNAL WORKS	
900 – 909	SITE PREPARATION 900 Site Preparation (Grouped) 901 Clearing/demolition 902 Sign Board 903 904 905 906 907 908 909 Parts and accessories
910 – 919	BOUNDARIES & ENCLOSURES 910 Boundaries & Enclosures (Grouped) 911 Gazettal limits 912 Planning boundaries 913 Lot/Land allocation boundaries 914 Site boundaries 915 Works areas 916 Hoardings / fences / gates 917* Reserves 918* Swept paths / kinematic envelopes 919 Parts and accessories
920 – 929	SURFACE WATER DRAINAGE 920 Surface Water Drainage (Grouped) 921 River/Stream/Ditch 922 Culvert/Channel/Catchwater/Nullah 923 Aqueduct 924 Pipe 925 Drain 926 Manhole 927 Catchpit 928 Pump 929 Parts and accessories
930 – 939	SEWERAGE 930 Sewerage (Grouped) 931 Pipe 932 Manhole 933 Sewer 934 Sewerage tank/Septic tank/Cesspools 935 Outfall 936 937 Sewage treatment plant 938 939 Parts and accessories
940 – 949	DUCTING (EXTERNAL) 940 Ducting (Grouped) 941 Ducts 942 Access chambers 943 Protective surround 944 945 946 947 948 949
950 – 959	MARINE WORKS 950 Marine Works (Grouped) 951 Bathymetric survey 952 Seabed contours 953 Breakwater 954 Dolphin 955 Floating jetty 956 Seawalls 957 Moorings / buoys 958 Fendering 959 Parts and accessories
960 – 969	MARINE FURNITURE 960 Marine Furniture (Grouped) 961 Notice board 962 Bollard 963 Handrail 964 Pillar box 965 Refuse containment room 966 Seawall block 967 Wave detector block 968 Tetrapod 969
970 – 979	STRUCTURES IN EXTERNAL WORKS 970 Structures in External Works (Grouped) 971 Building outlines 972 Underground building outlines 973 Pylons/Antenna/Masts 974 975 Utility connection points 976 977 978* Noise barriers 979 Parts and accessories
980 – 989	LANDSCAPING 980 Landscaping (Grouped) 981* Hard landscaping 982* Soft landscaping 983* Features eg. Sculptures / water features 984* Landscaping structures e.g. shade structure 985 986 987* Sports facilities 988 989
990 – 999	EXTERNAL WORKS PARTS & ACCESSORIES 990 Parts and Accessories (Grouped) 991 992 993 994 995 996 997 998 999