

Construction drawing practice —

**Guide for the structuring and exchange
of CAD data**

CIC 01.100.30; 35.240.10

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee B/212, Tolerances, drawing practice, modular co-ordination, joints, project information, computer modelling, upon which the following bodies were represented:

- Architects' and Surveyors' Institute
- Association of County Councils
- British Institute of Architectural Technologists
- Chartered Institute of Building
- Chartered Institution of Building Services Engineers
- Construction Confederation
- Department of the Environment (Building Research Establishment)
- Institution of Civil Engineers
- Institution of Structural Engineers
- Royal Institute of British Architects
- Royal Institution of Chartered Surveyors
- Society of Chief Architects of Local Authorities

This British Standard, having been prepared under the direction of the Sector Board for Building and Civil Engineering, was published under the authority of the Standards Board and comes into effect on 15 August 1998

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Amendments issued since publication

Amd. No.	Date	Text affected

The following BSI references relate to the work on this standard:
Committee reference B/212
Draft for comment 96/109490 DC

ISBN 0 580 29514 1

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Foreword

This British standard has been prepared by Technical Committee B/212. It supersedes BS 1192-5:1990 which is withdrawn.

The changes incorporated in this new edition reflect the increased use of reference files and greater experience of CAD data management and exchange. It was prepared in parallel with ISO 13567 and recommends the use of a simpler, ISO compatible, layer naming and coding strategy. This minimizes the number of different layers used and reduces complexity when data are exchanged between different parties to a project.

A British Standard does not purport to include all necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 13 and a back cover.

Introduction

This guide to the structuring and exchange of CAD data has been compiled at a time of unprecedented change in the development and use of 2D and 3D CAD systems. These will soon be supplemented by the introduction of object oriented technology with the capability of representing all the information associated with a construction project and its constituent parts; defining relationships between parts and relationships between each part/activity and the project as a whole. At the same time, and in some cases in advance of the development of commercially available systems, the BS EN ISO 10303 series of standards for the exchange of product (STEP) modelling data are being developed to provide a neutral means of describing construction product data throughout its life-cycle, independent from any particular CAD software system.

When fully available, object-orientated programming, distributed databases and product modelling will not only enable the transfer of data to take place between all participants in the design and construction process, using different software systems, but will also form the basis for structuring and sharing component libraries, databases and archives.

This guide was written to accommodate a 4 digit element code which may not be compatible beyond level 2 with some of the newer classification systems, e.g. Uniclass [1]. Although the recommendations in this standard are primarily intended for users and managers of CAD systems, it is expected that developers of such systems will support the implementation of this standard. Guidance is given in annex A, on project organization and neutral format data exchange. Guidance on layer name fields and coding conventions for international projects is given in annex B.

1 Scope

This British Standard gives guidance and information on the structuring and exchange of data between CAD systems, widely used by the construction industry, to create 2D or 3D geometric models of construction projects in conjunction with the preparation of drawings.

This guide covers conceptual classes of information important to construction industry users, methods of structuring CAD data and recommends coding rules and conventions for naming model files, sub-models and layers. Guidance is also given on drawing annotation, presentation and the management and exchange of data between CAD users. An important use is also to structure data in component libraries produced by third parties.

This standard does not include guidance on the use of different data exchange file formats, the exchange of non-graphic data, structuring and exchange of data held as object classes and their instances, data structuring appropriate to specialist engineering analyses, or the definition and use of data entity parameters (parametrics).

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 1192-1:1984, *Construction drawing practice — Recommendations for general principles*.

BS 1192-3:1987, *Construction drawing practice — Recommendations for symbols and other graphic conventions*.

BS 1192-4:1984, *Construction drawing practice — Recommendations for landscape drawings*.

BS 6100-1-1.5.7, *Glossary of building and civil engineering terms — General and miscellaneous — Operations; associated plant and equipment — Drawings*.

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

NOTE The following terms defined in this standard are reproduced, the first time they appear in clauses 4 to 11, in bold type.

3.1

annotation

part of a drawing consisting of letters or numbers and, where relevant, associated graphic entities

3.2

attribute

trait, quality or characteristic of an entity

3.3

class

collective identity for entities which exhibit common behaviours and which have common attributes

3.4

clip

portion of a model file that has been copied and stored as a separate model file

3.5

database

organized collection of data that can be interpreted and operated on by computer

3.6

data structure

description of the way in which information is organized within a database

3.7**drawing definition**

specification of the content and composition of a particular drawing

3.8**entity**

information unit having uniform meaning and use

3.9**instance**

occurrence of an entity at a particular location and orientation within a model or sub-model

3.10**layer**

attribute of an entity used for identification commonly used to control visibility, and for the classification of entities within a model

3.11**model**

collection of model files and associated non-graphic information

3.12**model file**

computer file containing 2D or 3D graphic entities and any non-graphic data stored with them

3.13**nest**

hierarchical arrangement of entities or model files

3.14**object**

instance of a class of entities which has individual state and behaviour and unique identity

3.15**parameter**

attribute of an entity which affects its geometry, size or appearance when drawn

3.16**primitive**

entity which is a basic, indivisible, geometrical element used within computer modelling systems (e.g. a point, line or arc) which is not defined in terms of subordinate entities

3.17**reference**

instance of a model file

3.18**reference file**

model file associated with an active model file and containing information which can be viewed and interrogated but not immediately altered

3.19**schema**

structure within which information is organized in a database

3.20**style**

parameter affecting the appearance of a primitive

3.21**sub-model**

model included as an instance in another model

3.22**wildcarding**

text searching based on a template composed of characters which either appear in a specific position in the character sequence being sought, or are wildcard characters such as * or ?, reserved as place holders or selection delimiters

4 Relationship between drawings and CAD models

4.1 General

Most proprietary CAD systems used by architects, contractors, engineers and surveyors create, display, manipulate and alter graphic entities, store them in computer files as 2D or 3D graphical **models**, and output model data in formats appropriate to their intended use, typically as construction drawings. Together, these **model files** form a graphical **database** of project information.

CAD systems may also store, manipulate and output non-graphic data relating to graphic entities. However, at present, the **data structures** of most systems are not designed to record explicit information about the relationships and interdependencies that exist between parts of a project, or the parts and the whole.

Organizations tend to adopt one of two main approaches to project modelling for the production of drawings. They may:

- a) build up project data as a series of planar 2D models, typically relating to plans, sections, and elevations, by discipline and from these construct separate 3D models from which to produce perspective visualizations (see Figure 1); or
- b) adopt an approach more akin to product modelling, build a 3D model or models as assemblies of entities representing construction components, and assemble drawings incorporating 2D or 3D views of 3D model data (see Figure 2).

The choice of which approach or mix of approaches to adopt is likely to depend on individual project requirements and the capabilities of the CAD system or systems being used. Each organization should understand why they are adopting a particular approach in a project. Where CAD data is to be exchanged with other organizations, the approach adopted for the production of drawings may need to be altered to accommodate other members of the project team.