



National
Defence

Défense
nationale



DND CAD/BIM Standard

CETO (Construction Engineering Technical Order) C-98-002-CAD/FP-003 replacing obsolete CETO D-98-000-MIS/SF-003 Drawing Standards and Symbols.

Version 2.3

August 2012

OPI: DCAE 6

Canada 



August 2012

National Defence Headquarters
Major-General George R. Pearkes Building
101 Colonel By Drive
Ottawa, ON, K1A 0K2

For inquiries, please contact ADM(IE) DCAE 6
(613) 995-3269

The *DND CAD/BIM Standard* is the intellectual property of DND. Only pre-authorized use is permissible, and no one has the right to sell, rent, lease, or make profit from the standard.



Preface

This CAD/BIM Standard manual has been developed by ADM (IE) as an initiative to consolidate and update the existing *Guidelines and Conventions for the Production of Engineering and Architectural Drawings*.

A French version of this document is also available. If there is a discrepancy between the French document and the English document, the latter shall be considered correct.



Table of Contents

1	INTRODUCTION	6
1.1	Purpose.....	6
1.2	Scope.....	6
1.2.1	<i>Keeper of the CAD/BIM Standard</i>	7
1.2.2	<i>Revisions to this Document</i>	7
1.3	Terminology	7
1.4	Definitions	8
1.5	Acronyms	8
1.6	Legend	9
1.7	DND CAD/BIM Standard Companion Document Listing.....	10
2	GENERAL REQUIREMENTS.....	11
2.1	Bilingual Requirements.....	11
2.2	Metric Requirements.....	11
2.3	Revision Text	11
2.4	As-Built Requirements	11
2.5	GIS Requirements	11
2.5.1	<i>Closed Shapes</i>	11
2.5.2	<i>Coordinate System</i>	11
3	DRAWING NUMBER CONVENTION.....	12
3.1	Drawing Number	12
3.1.1	<i>Drawing Number Responsibilities</i>	12
3.1.2	<i>Drawing Number Breakdown</i>	13
3.1.3	<i>Job Number</i>	13
3.1.4	<i>Drawing Sheet Number</i>	14
3.2	Electronic File name	15
4	ELECTRONIC FILE STANDARD	16
4.1	Drawing Composition.....	16
4.1.1	<i>DND Border Set-up</i>	16
4.1.2	<i>Actual Size Requirement</i>	16
4.1.3	<i>Reference Files</i>	16
4.1.4	<i>One Design Per File</i>	16
4.1.5	<i>Layout Vs. Design Model Information</i>	16
4.1.6	<i>New, Demolition, and Existing Features</i>	17
4.2	Layer Standard	17
4.2.1	<i>DND Layer Name Structure</i>	17
4.2.2	<i>ByLayer</i>	19
4.2.3	<i>Layer Types</i>	19
4.3	Line Width	20
4.4	Colour	21
4.5	Line Types / Styles	21
4.6	Text Styles	22
4.7	Dimension Styles	23
5	DRAWING CONVENTIONS	25
5.1	Introduction	25
5.2	Drawing Border	25
5.2.1	<i>English & French Borders</i>	26
5.2.2	<i>Standard B1 Title block</i>	26
5.2.3	<i>Cover Sheet</i>	29
5.3	Drawing Scales	30
5.3.1	<i>Graphic Scale</i>	30



5.3.2	<i>Multiple Scale Requirements</i>	30
5.4	Section and Detail Identifiers	30
5.5	Abbreviations	30
5.6	Legend	30
APPENDIX A: PEN WIDTH & COLOUR ASSIGNMENTS		31
APPENDIX B: DND CUSTOM LINE STYLES.....		33
APPENDIX C: DND PREFERRED DRAWING SCALES & RESPECTIVE TEXT SIZE		38
APPENDIX D: DND SECTION & DETAIL IDENTIFIERS		39
APPENDIX E: TYPES OF WORK AND BUILDINGS.....		41



1 Introduction

Traditionally this Standard has focused on CAD and the requirements surrounding the graphics and drawing conventions in support of AEC project delivery. While the basic requirements involving CAD remain, it is important to introduce Building Information Modeling (BIM) support within the framework of the DND CAD Standard to suit AEC industry advances. This standard has been renamed the *DND CAD/BIM Standard Version 2.3*.

The practical use of any drawing or package of drawings within the **Department of National Defence (DND)** does not terminate with the construction of the facility, but continues over the life cycle of the facility. Therefore, all drawings produced for or by DND upon promulgation of this CETO shall conform to the standards herein.

All drawings produced as part of the final contract document package shall be completely computer-generated; manual revisions to existing drawings are not permitted.

This Standard supports AutoCAD, the de facto standard in the Canadian design industry. DND also provides support for MicroStation users on an ad hoc basis. Certain restrictions are made with the *DND CAD/BIM Standard*, with line types for example, to ensure smooth translations between these CAD systems.

1.1 PURPOSE

A set of exhaustive rules for preparing engineering drawings is not attainable. The intent of this document is to supply sufficient direction so that drawings can be presented in a consistent manner.

This document provides drawing standards to which final DND drawings shall adhere, regardless of the CAD system used.

Reasons to comply:

- Improve the clarity, consistency, and compatibility of the drawings that are submitted to DND regardless of CAD system
- Maximize interoperability of the digital drawing file between CAD systems
- Reduce the amount of rework or reconfigurations that are required when drawings are accepted
- Ensure ease and accuracy of siting data migration to GIS
- Improve the ability to create printable copies of electronic files that are received
- Reduce the need for re-submissions by consultants hired to assist DND

1.2 SCOPE

This document is designed to inform stakeholders of the graphic presentation requirements of the final design/contract drawing. It is not intended to cover any technical or CAD software-specific instructions on how to achieve the standards set out herein.



See the [DND CAD/BIM Standard Companion Document Listing](#) section in this document for a list of supporting documents that cover other areas of the standard.

1.2.1 Keeper of the CAD/BIM Standard

The Keeper of the *CAD/BIM Standard* is the CAD/BIM Chief, DCAE 6, who is responsible for maintaining the documents.

Contact Information

Mailing Address:

National Defence Headquarters
Major-General George R. Pearkes Building
101 Colonel By Drive
Ottawa, ON, K1A 0K2

Office Location:

180 Kent Street
Minto Building
Ottawa, ON (14-117)

Attention: John Hale, Chief CAD/BIM

DCAE 6

(613) 995-3269

john.hale@forces.gc.ca

Please refer all questions and comments to the above contact when required.

1.2.2 Revisions to this Document

It is recognized that the standard will evolve over time due to software changes and improved strategies. Any suggestions and corrections that may improve future releases should be submitted to the [Keeper of the CAD/BIM Standard](#).

1.3 TERMINOLOGY

In an effort to distinguish requirements from suggested guidelines, this standard uses the terminology defined below:

Table 1-1

SHALL	Expresses a requirement or order (i.e., the consultant must follow this condition to be compliant)
SHOULD	Expresses a recommendation (i.e., it is not mandatory, but strongly advised)
MAY	Expresses an option or that which is permissible (e.g., consultants may deliver projects in CAD or BIM)
CAN	Expresses possibility or capability (i.e., the option is practicable)



1.4 DEFINITIONS

Table 1-2

OUTSIDE	Project work that consists only of exterior items including external utilities, roads, survey information, etc.
INSIDE	Project work that consists only of interior building items including floor plans, internal utilities, furniture layouts, building elevations, and building structure.
SITING	Project work that consists of GIS information, such as site plans.
CIVIL	Project work that consists of civil engineering, such as road design, bridges, etc.
DESIGN MODELS	A model file contains elements or entities that represent the actual objects that are being drawn or designed (e.g., walls, doors, columns, sidewalks, pavement, curbs, etc.). This is referred to as Model Space in AutoCAD, and Design Model in MicroStation.
SHEET LAYOUTS	A model file used to assemble design model data, border graphics and annotation to compose the final plotted drawing. This is referred to as Paper Space in AutoCAD, and Sheet Model in MicroStation.
LAYERS	Classification system for graphics in the design/drawing file. Allows grouping of drawing components, which enables the user to turn items on and off, change colour, line width, and other properties as a group. The term Layer is used in AutoCAD whereas the term Level is used in MicroStation.

1.5 ACRONYMS

Table 1-3



ADM(IE)	Assistant Deputy Minister Infrastructure and Environment
AIA	American Institute of Architects
DND	Department of National Defence
AE	Architect Engineer
AEC	Architectural, Engineering, and Construction
CAD	Computer Aided Design
CETO	Construction Engineering Technical Orders
GIS	Geographic Information System
ISO	International Organization for Standardization
SI	International System of Units
N/A	not applicable



1.6 LEGEND

The following symbols are used throughout this document.

Table 1-4


Symbols	Definition
	Important note
	Reference to information found in another document or manual



1.7 DND CAD/BIM STANDARD COMPANION DOCUMENT LISTING

Table 1-5

Document Name	Description
<i>DND CAD/BIM Standard</i> C-98-002-CAD/FP-003	Document that prescribes general requirements and drawing convention standards
Annex A: Layers C-98-002-CAD/FP-004	Listing of DND Standard Layers and abbreviations
Annex B: Symbols C-98-002-CAD/FP-005	Listing of DND Standard Symbols for reference
Annex C: DND Location Codes C-98-002-CAD/FP-009	Listing of DND Location Codes, which form part of the DND Drawing Number naming convention.
Annex D: Change Request Form	Form completed to track change requests
Tool Kit Documents	
Annex E: Tool Kit Guide for AutoCAD C-98-002-CAD/FP-006	Document covering all aspects of working with the DND Standard using AutoCAD software
Annex F: Tool Kit Guide for Civil 3D	Document covering all aspects of working with the DND Standard using Civil 3D software
Annex G: Tool Kit Guide for Revit	Document covering all aspects of working with the DND Standard using Revit software
Annex H: Interim BIM Project Guide	Document introducing submission requirements for BIM projects
Annex I: Menu Manager Content	Listing of Menu Manager menus and content for reference.

 See the “What’s New” document to review changes to standard documentation and delivered DND software since the last release.

 **Some or all *DND CAD/BIM Standard* documents can be accessed in PDF format from one of the following web addresses:**

DND Personnel Only:

http://admie.ottawa-hull.mil.ca/dgme/DCAE/CAD_Standards/cad_std_and_guidelines_e.asp

Public Website:

<http://www.acsnb.com/dnd>



2 General Requirements

2.1 BILINGUAL REQUIREMENTS

Ensure that where bilingual documents are required, drawings are prepared to allow application of notes, titles, etc., in both official languages without compromising drawing clarity.

2.2 METRIC REQUIREMENTS

All drawings detailing construction engineering, architectural, and related works for DND facilities shall be prepared using the International System of Units (SI). Units for linear dimensioning are restricted to the metre (m) and the millimetre (mm). Whole numbers will indicate millimetres [e.g., the coordinate (600,1250) is referenced in millimetres], and decimal expressions to three places of decimals will indicate metres [e.g., the coordinate (1.200, 25.000) is referenced in metres].

For AutoCAD format drawings, "Insertion Scale" & "Length" parameters of the drawing units shall be set accordingly.

In certain applications, the "NPS" designation is used to describe the size of piping and appurtenances. This is acceptable provided current manufacturing standards for the items concerned have not been converted from imperial to metric units.

2.3 REVISION TEXT

Where applicable, red-line, bubble or revision clouds shall be used to denote all changed items on the drawings. Where applicable, these revisions shall be called out by a reference to the title block (utilizing a number enclosed in a triangle to reference date, description, etc.).

2.4 AS-BUILT REQUIREMENTS

Upon completion of the project, final project drawings (all disciplines) shall be updated to "As-Built" status by the consultant/contractor responsible for the work. Final "As-Built" drawings shall be both hard copy and native digital files.

2.5 GIS REQUIREMENTS

2.5.1 Closed Shapes

All shapes drawn shall be "closed shapes" and all symbols shall conform to the *CAD/BIM Standard* by having a **graphic point at the point of origin**. This is particularly important for siting as it ensures that data migration to GIS can be performed correctly.

2.5.2 Coordinate System

The project manager will provide additional instructions for siting project requirements related to coordinate system, geodetic datum and global origin, as this information is unique to each base (client).



3 Drawing Number Convention

3.1 DRAWING NUMBER

Contract and other non-standard drawings shall be numbered with the combination of the **Job Number** and the **Drawing Sheet Number**. See Table 3-1.

See [Appendix E](#) for numbering sketches, site records, and standard drawings.

Using as an example **H-B9-9501/3-601B**, the drawing number has the following parts:

Table 3-1: Part of Drawing Number

Job Number	Drawing Sheet Number
H-B9-9501/3	601B

Figure 3-1: Sample of Drawing Number in the Title block

DRAWN DESSINÉ X.X.		PROJ MGR GEST PROJ X.X.
CHECKED VÉRIFIÉ X.X.		DES MGR GEST CONC X.X.
COORDINATION X.X.		FIRE INCENDIE X.X.
WBS NO. NO. SRT XXXXXXXXXX	PF NO. NO. DP XXXXXXXXXX	
DWG. NO. NO. DESSIN		H-B9-9501/3 - 601 - B

3.1.1 Drawing Number Responsibilities

H-B9-9501/3-601B

Job numbers are issued by DND Headquarters, Command, or Base via the project manager assigned to the project. The number assigned should be checked with the base (the client) to ensure that it is correct.

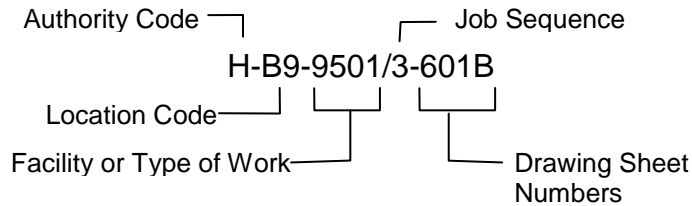
H-B9-9501/3-601B

Drawing Sheet Numbers are the responsibility of the consultant or designer developing the project.



3.1.2 Drawing Number Breakdown

Using as an example **H-B9-9501/3-601B**, the job number and the drawing sheet number have the following parts:



3.1.3 Job Number

Job Number H-B9-9501/3 is broken down as follows:

Authority Code

H-B9-9501/3-601B

The authority code is a letter signifying the design agency responsible for the production of the drawing.

Table 3-2: Authority Codes

Code	Description
H	Headquarters
C	Command
L	Local (base)

Location Code

H-**B9**-9501/3-601B

The location code is a combined letter and number system that represents the site, establishment or base at which the building or service is located.

See **Annex C: DND Location Codes**.

Facility or Type of Work

H-B9-**9501**/3-601B

The first two digits indicate the type of work or facility, and the second two digits represent a specified standard design for a work or facility.

See [Appendix E](#) for a list of codes for type of work or facility.



Job Sequence Number

H-B9-9501/**3**-601B

This number indicates subsequent projects involving the same work or building.

3.1.4 Drawing Sheet Number

Drawing sheet number **601B** is broken down as follows:

Table 3-3: Drawing Sheet Number Breakdown

Trade Number	Sequential Number	Bilingual Indicator
6	01	B

Trade Number

H-B9-9501/3-**6**01B

DND utilizes the following trade (discipline) codes to identify drawings by trade and provide a standard sequence within the final submission.

Table 3-4: Trade Codes

Trade Code	Description
0	Cover sheet and very small projects where two or more disciplines appear on the same drawing shall use 0 as the trade identifier of the drawing number.
1	Siting
2	Structural
3	Architectural
4	Mechanical
5	Electrical
6	Civil
7	Communication
8	Fire Safety/Security
9	Interior Design

Sequential Number

H-B9-9501/3-6**01**B

The following digits are the sequential numbers identifying the sheet for the accompanying trade number.

Each trade sequential number is to have 2 digits and begin with 01. For example, the first drawing in a Siting series is 101 and the first drawing in a Civil series is 601. See Table 3-5.



Table 3-5: Sequential Number Values

Code Value	Description
01	First Drawing in the series
02	Second Drawing in the series
03	Third Drawing in the series
- - - Continued to 99 as necessary - - -	

- ✎ **For large projects, where a trade sequence is expected to exceed 99 drawings, the sequential number shall have 3 digits beginning with 001. For example, the first drawing in an Architectural series is 3001.**

Bilingual Indicator

H-B9-9501/3-601**B**

Drawings shall be produced in both official languages. When both languages appear on the same sheet, the letter '**B**' shall follow the drawing number, indicating a bilingual drawing.

Where there is too much detail for this method to be practicable, separate English and French drawings shall be prepared. Although both sheets will show the same drawing number, the English only sheet will have no Bilingual Indicator and the French only sheet will be identified by the letter '**F**' placed immediately after the drawing sheet number.

Table 3-6: Bilingual Indicator Values

Code Value	Description
B	Drawing is bilingual
F	Drawing is French

3.2 ELECTRONIC FILE NAME

The electronic drawing file name is the same as the [Drawing Number](#) in the title block except it includes the file extension.

- ✎ **No slashes are allowed in file names; they need to be replaced with hyphens.**

For example, for Drawing Number **H-B9-9501/3-601B**, the drawing filename is **H-B9-9501-3-601B.dgn** or **H-B9-9501-3-601B.dwg**



4 Electronic File Standard

The information in this section covers the computer-based standards of the final DND drawing. See the accompanying guides for system-specific requirements, instructions, and information on how to comply with the DND standard.

4.1 DRAWING COMPOSITION

The following describes the drawing set-up and composition of the final drawings.

4.1.1 DND Border Set-up

- All final DND drawings shall use one of DND's Standard borders (**see Tables 5.1 and 5.2**).
- Borders can be placed as an **external reference or as a block**.
- Border blocks shall not be exploded.
- Borders can be placed in or referenced to the sheet layout. Borders shall not be scaled in a sheet layout. The scaling of the design should occur through scaled reference or viewport attachments.
- All layout viewport scales shall be locked when submitted.
- Borders should be initially set up using a DND template.

4.1.2 Actual Size Requirement

All drawing information shall be drawn true scale (1:1). That is, if a roadway segment is 100 metres long, the line drawn to represent it shall also be 100 metres long.

4.1.3 Reference Files

External reference files shall only be used during design development. All external reference files shall be bound within the final delivered electronic drawing file.

4.1.4 One Design Per File

Each drawing in a drawing set shall reside in separate electronic files. It is not acceptable for a single drawing file to contain 601, 602, 603, etc.

Multiple sheet layouts should be used to plot the same information with different sized borders, etc., but NOT to create separate drawings of the drawing set (e.g., drawings that would normally have separate drawing numbers such as: H-B9-9501/3-601B).

4.1.5 Layout Vs. Design Model Information

The following rules shall be used when determining where information should reside:

- Only items that are not graphically linked to objects in the design model shall appear in sheet layout (e.g., borders, title blocks, general notes, titles, legends, notes to computer operators that are not to be printed).
- All notes directly linked to the design should be placed in the design model (e.g., leaders, dimensions, and labels).



- All design information shall be placed in the design model (e.g., buildings, doors, column grids, dimensions, names, etc.).

4.1.6 New, Demolition, and Existing Features

In situations where you need to show existing design items in combination with items that are new, to be demolished, or relocated, it is preferred to have the existing design items subdued to appear as background information. This is achieved by making existing items appear grey and lightened; all other content is displayed normally or emphasized through bolding.

The following are acceptable options on how new, demolition, relocated and existing design items should be organized in the file.

Option 1: Prior to drawing a new design, move all demolition items to the demolition layers provided. Create a new layer for all existing items (e.g., A_EXST) and move all existing features to this layer. Use the provided layers for the NEW design items.

Option 2: For situations where separate design layers are needed to show new and existing construction, the standard layer naming convention shall be used for NEW and EXISTING. A status suffix of “**_NEW**” shall be placed at the end of the layer name for NEW items (e.g., A_WALL_NEW). A suffix of “**_EXST**” shall be placed at the end of the layer name for EXISTING items (e.g., A_WALL_EXST).

Option 3: The drawing containing the demolition or existing information can be kept as is and referenced to a new drawing where you use the provided layers for the NEW design items. You have the option in this case to override the display of the item attributes of the reference to suit.

Option 4: Where you have separate drawing files to show different construction conditions or phases, such as having a separate “Demolition Plan” and “New Floor Plan”, all layers with existing items to remain should be appended with the status “_EXST” with their color and weight modified according to the standard. All other content that is new, to be removed, or relocated should be placed on their appropriate layers as provided, allowing them to appear bolder than the existing items to remain in the background.

Existing items to be removed may be marked with an “X”, and existing items for Removal and Relocation with an “R.”

Where all information can be accommodated on one plan, items may be marked as follows:

“X” - Removal

“R” - Removal and Relocate

“E” - Existing to Remain

“N” - New

4.2 LAYER STANDARD

Exceptions to the standard will be accepted only in cases where items cannot be classified into one of the predefined layers. Layer names that are created shall follow the general DND layer name structure, and a description shall be provided.

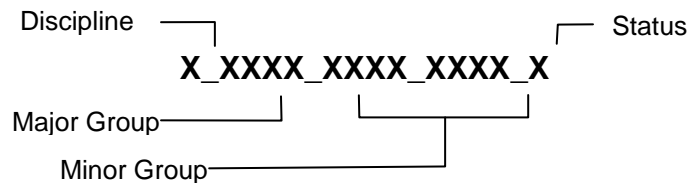
 Refer to **Annex A: Layers** for a list of available predefined layer names.

4.2.1 DND Layer Name Structure

All DND Layer names generally consist of four or more fields separated by underscores (_).



✂ Dashes (“-”) or spaces (“ ”) shall not be used in any DND Layer names.



Discipline Designator

X _XXXX _XXXX _XXXX _X

The discipline designator is the first field indicating the level feature discipline. The discipline designator fields are mandatory except for COMMON layers. See Table 4-1 for a complete list of DND discipline designators.

Table 4-1 : DND Discipline Designator

Discipline Designator			
INSIDE		OUTSIDE	
A	Architectural/Interior	SI	Siting
S	Structural	C	Control
M	Mechanical	E	Environmental
F	Fire Protection	B	Boring Log
P	Plumbing	G	Geotechnical
E	Electrical	H	Hazardous Materials
T	Telecommunications	HI	Historical Plan
		G	General Key Plan
		P	Planimetry - General
		P_AF	Planimetry – Airfield
		P_H	Planimetry – Hydrology
		P_M	Planimetry – Marine
		P_RAP	Planimetry - Paving
		P_V	Planimetry – Vegetation
		T	Topography
		U_A	Utilities – Abandoned
		U	Utilities – General
		U_C	Utilities – Communications
		U_D	Utilities – Drainage/Storm
		U_E	Utilities – Electrical
		U_G	Utilities – Gas
		U_H	Utilities – Heating
		U_M	Utilities – Marine
		U_S	Utilities – Sanitary
		U_W	Utilities – Water
		Z	Zone
		C	Civil
		L	Landscape



Major Group

x_XXXX_xxxx_xxxx_x

The major group is an abbreviation that identifies a grouping of common types of drawing information relevant to each discipline.

Minor Group

x_xxxx_XXXX_XXXX_x

This optional group is to subdivide the major group field to identify each level more precisely.

See **Annex A** for DND layer abbreviations used for the major and minor groups.

Status

x_xxxx_xxxx_xxxx_X

The status is an optional identifier to specify the current state of the layer.

Most DND predefined layers do not include the status identifier. Table 4-2 lists predefined standard statuses and their layer properties that can be appended to any layer.

Table 4-2 : DND Predefined Layer Statuses

Status	Color	Line type	Weight	Description
_HIDE	*	DND_DASHED_MED	*	To identify or display hidden features
_NEW	*	*	0.50mm	To identify new construction or features
_EXST	252	*	0.25mm	To identify existing conditions or features
_ABAN	252	*	0.25mm	To identify abandoned features
_DEMO	6	DND_DASHED_SHORT	0.35mm	To identify features to be demolished

“*” - denotes that the property does not change when the status is appended to the layer.

4.2.2 ByLayer

All features shall be drawn with their properties of colour, line width, and line style set to “ByLayer.” This allows all properties of the objects to be inherited from the settings of the layer in which they are “placed.” The CAD user can change the line width, colour, and line style by simply changing the properties of the entire layer.

4.2.3 Layer Types

The DND Layer name structure differs depending on the type. DND has identified 3 types:

- **INSIDE: Project work that consists only of interior building items**
These Layer names are based on American Institute of Architects’ (AIA) guidelines for layer structure and properties.
- **OUTSIDE: Project work that consists only of exterior items**
These Layer names are based on layer requirements of GIS standards as previously developed by DND.



- ✂ **COMMON:** Layers that are not uniquely **INSIDE** nor **OUTSIDE** or are common to both, such as some text features.

These layers will loosely follow the same structure as **INSIDE**, except the discipline designator is omitted; therefore, the layer starts with an underscore (_).

Table 4-3: DND Layer Samples

DND Layer Samples			
Type	Layer Name	Discipline	Description
INSIDE	A_WALL_FULL_EXTR_EXST	Architectural	Exterior full height walls - Existing
	A_ELEV_CASE	Interior	Wall mounted casework
OUTSIDE	C_Horizontal_Control	Control Plan	Horizontal controls
	T_Contour_Int_Dep_Obsc	Topography Plan	Contour intermediate depressed obstructed
	U_C_UG_Optical_Lines	Utilities - Communication	Underground lines optical fibre
COMMON	_PLT_WHITE *	N/A	Features on this layer / level print white
	_ANNO_NPLT *		Features on this layer / level do NOT print
	_ANNO_DIMS		Dimension features
	_ANNO_TXTE		English text
	_ANNO_TXTF		French text

* These are special layers available.

4.3 LINE WIDTH

Standards for varying widths of lines have been established to improve presentation and readability of drawings. While CAD systems have the capability of showing a wide array of line widths, only a small number of them are required for drawing legibility.

The line widths displayed in the table below shall be used for all drawings unless substantial improvement in readability can be gained through the use of additional widths.

Table 4-4 : DND Preferred Pen Widths

Line Widths	Pen Widths (mm)	Examples of use
Extra Fine	0.09	Grids
Fine	0.18	Hatching, centerlines
Thin	0.25	Light and background features
Medium	0.35	Miscellaneous Features
Wide	0.50	Section lines, Grade line, Rebar
Extra Wide	0.70	Border outline

📖 See [Appendix A: Pen Width & Colour Assignments](#) for a complete list of acceptable DND line widths.



4.4 COLOUR

The following are important notes on the use of colours on DND drawings:

- The **AutoCAD colour table** shall be used as the colour scheme on all DND drawings to improve interoperability between CAD systems.
- Colour is not used to determine printing pen width. Pen width is determined by the line weight attribute.
- A relationship between line weight and colour has been standardized and shall be maintained where possible to improve screen clarity between features and layers.
- Certain colours have been designated to print either screened at a given percentage or at their given colours on monochrome prints with the use of DND plot styles or pen tables.
- Colour 255 in AutoCAD (0 in MicroStation) is not used except for objects placed on layer `_PLT_WHITE`
- All objects shall be placed using the colour attribute set to "BYLAYER" where possible.
- See [Appendix A: Pen Width & Colour Assignments](#) for tables on DND colour assignments.

4.5 LINE TYPES / STYLES

DND has standardized a set of custom line styles to improve interoperability between CAD systems. DND line styles are separated into 3 groups:

- COMMON – general line styles
- INSIDE – line styles generally used within the interior of building
- OUTSIDE – line styles generally used on the exterior of building

Figure 4-1: Sample DND Line Styles

COMMON		
.....		DND_DOT
-----		DND_DASHED_SHORT
-----		DND_DASHED_MED
-----		DND_DASHED_LONG
-. - . - .		DND_CENTER_DOT
-----		DND_CENTER_DASH
-. - . - .		DND_PHANTOM
INSIDE		
-----	CW	CW CIRCULATING WATER SUPPLY
-----	G	G GAS LINE
-----	OXY	OXY OXYGENE LINE
OUTSIDE		
)=====(<		CULVERT
+++++		RAILWAY
-----	SAN	SAN SANITARY FLOW UNDERGROUND

The following rules shall be followed on DND Drawings:

- Only the available DND line styles shall be used.
- All objects shall be placed using the line style attribute set to “BYLAYER” where possible.
- Line style scale shall be adjusted using the available global system variable such as, “LTScale” in AutoCAD (do not set custom line style scale at the object level).
- See [Appendix B: DND Custom Line Styles](#) for the complete list of DND line styles.

4.6 TEXT STYLES

DND has adopted a number of text styles to ensure that drawing text display and print in a consistent manner. To improve interoperability between CAD systems, true type fonts shall be used throughout all drawings.

Text on DND submitted drawings shall be Arial Narrow, size 2.5 mm for general notes, dimensions, and annotation. Details, titles, sections, etc., shall be Arial, size 5 mm.

Other requirements to consider:

- Full-size drawings are often printed at half-size; therefore, text size shall be scaled appropriately to accommodate this requirement.



- All text presented on the drawing should have a vertical orientation and be **UPPERCASE**.

Table 4-5: DND Test Styles and Font Use

Style Name	Font	Size (mm)	Description	Example Items
General_Text	Arial Narrow	2.5	General text in drawing	General Notes, Dimensions, Annotation, Call-outs
Name_Text	Arial Narrow	3.5	Room Name Text	Room Names or text that require more emphasis
Title_Text	Arial	5	Some Border and Title Cover sheet text	Cover Sheets, Borders, Titles, Headings, Drawing number, Project Location, Discipline names.
ID_Text	Arial Narrow	2.0	To identify an object like a pole, MH, valve, etc.	Pole # or name, MH # or name, valve # or name
Border_Text	Arial Narrow	N/A	Border Text Only	Not for General Use Not to be modified
Canada_Logo	Times New Roman	N/A	Canada Logo Only	Not for General Use Not to be modified
Exceptions: Use of other fonts, heights, and styles shall be minimized. Exceptions only allowed when unusual clarity issues require use of other fonts.				

4.7 DIMENSION STYLES

DND has adopted a number of dimension styles to ensure that drawing dimensions display and print in a consistent manner. To improve interoperability, these dimension styles are available in both CAD systems.

Table 4-6: DND Dimension Styles

Style names	Where to Use	Term. Types	Units	Angle Format
DND_Architectural	INSIDE - architectural discipline only	slash	Millimetres (whole number)	Decimal degrees
DND_MM	INSIDE – buildings and building features	arrow	Millimetres (whole number)	Decimal degrees
DND_Metre	OUTSIDE – Engineering or Siting	arrow	Metres (Three decimal places)	Degrees, minutes and seconds



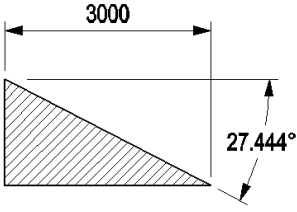
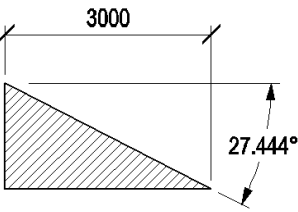
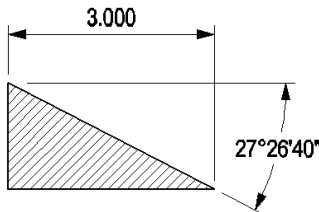
The following rules shall be followed:

- The true dimensions value shall be shown and not be overridden or altered.
- Where part of the drawing is not to scale (NTS) or there is a break in the information, the dimension shown shall be followed by the abbreviation NTS or by using a break symbol in the dimension line.
- Units shall not be designated
- The following note shall be placed on the drawing:

INSIDE millimetre drawings: *All dimensions shown are in millimetres unless otherwise noted*

OUTSIDE metre drawings: *All dimensions shown are in metres unless otherwise noted*

Table 4-7: DND Dimension Style Samples

DND_MM	DND_Architectural	DND_Metre
		



5 Drawing Conventions

5.1 INTRODUCTION

This section addresses the presentation of graphic requirements for lines, text, leaders, dimensions, etc.

5.2 DRAWING BORDER

All DND standard borders that are unique to DND are based on ISO B series sizes and ANSI sizes.

The **B1 1000x707** border shall be used for all project drawings. See Table 5-1.

Table 5-1: DND Standard Border Sizes

DND Name Designation (Layout Name)	Size (mm) (h x w)	Paper Size Standard	Notation
B1 1000 x 707	1000 x 707	ISO B1	DND B1 border (Engineering Title block)
Cover 1000x707			DND Cover Sheet for B1 size

Table 5-2 includes the DND Borders that can be used in special cases approved by the project manager.

Table 5-2: DND Standard Border Sizes

DND Name Designation (Layout Name)	Size (mm) (h x w)	Paper Size Standard	Notation
A0 1189 x 841	1189 x 841	ISO A0	DND A0 border (Engineering Title block)
A1 841 x 594	841 x 594	ISO A1	DND A1 Border (Engineering Title block)
B3 500 x 353	500 x 353	ISO B3	Half-size of B1 Border (Engineering Title block)
Tabloid	431.8 x 279.4	ANSI "B"	17x11 border (Engineering Title block)
11 x 17_L			Landscape (horizontal title block)
11 x 17_DATA			Landscape
11 x 17	279.4 x 431.8		Portrait
Legal	215.9 x 355.6	8.5" x 14" (Legal)	Portrait
Legal_L	355.6 x 215.9		Landscape



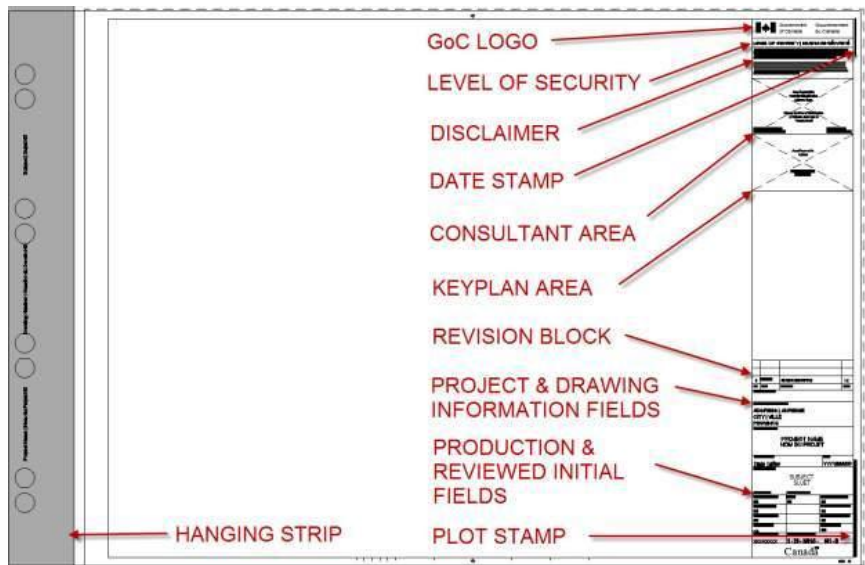
Letter	279.4 x 215.9	ANSI "A"	Portrait
Letter_L	215.9 x 279.4		Landscape

5.2.1 English & French Borders

All borders are bilingual; however, there is an English and French version for each border size. That is, French is the primary language in the French borders. The language version is indicated with a suffix of **_E** for **English** and **_F** for **French** for all layout names. All English and French borders are also stored in separate template files indicated by the suffix **_E** & **_F**. For example, **dnd_layouts_ctb_E.dwg** contains only English borders.

5.2.2 Standard B1 Title block

Figure 5-1: B1 Border



The DND B1 Title block contains the following components:

Table 5-3: Title Block Components

Component Items	Description
GoC Logo	Government of Canada wordmark
Level of Security	Status of current drawing security level
Disclaimer	Copyright information for use of drawings
Consultant Area	Area reserved for consultant identification and logo
Key plan Area	Area reserved for key plan when needed
Date Stamp	Date of last revision made to border drawing
Revision Block	Drawing revision #, date, revision description and initials to



	list history of revisions, addenda, as-built information, etc.
Project & Drawing Information Fields	Project, subject, location, and other drawing information
Production & Reviewed Identification Fields	Various initials fields. Reviewed fields required may vary from base to base.
Plot Stamp	Generated drawing info at printing time. Info includes file name, layout name, user name, date and time.
Hanging Strip	98mm wide trim line for hanging strip.

Level of Security

There are five level of security options to indicate the current drawing's security level:

- TO BE REVIEWED
- UNCLASS
- CONFIDENTIAL
- SECRET
- TOP SECRET

Production & Reviewed Identification Fields

The following describe the initial fields used in the production and reviewed grouping.

Production Initial Fields

Initial fields in the production grouping are predetermined and shall not be changed.

Figure 5-2: Cover Sheet

PRODUCTION	REVIEWED REVU	
DESIGNED ÉTUDIÉ X.X.	XX XX X.X.	DES O AGENT CONC X.X.
DRAWN DESSINÉ X.X.		PROJ MGR GEST PROJ X.X.
CHECKED VÉRIFIÉ X.X.		DES MGR GEST CONC X.X.
COORDINATION X.X.		FIRE INCENDIE X.X.
WBS NO. NO. OTP XXXXXXXXXX	PF NO. NO. DP XXXXXXXXXX	



Table 5-4: Production Fields

Predetermined Fields	Required Content
DESIGNED	Initials of the engineer or architect responsible for the design
DRAWN	Initials of the CAD user responsible for drawing preparation
CHECKED	Initials of the individual responsible for checking drawing accuracy
COORDINATION	Initials of the individual, designated by the (prime) consultant as responsible for overall coordination and delivery of the final design package

Reviewed Field Initials

Some initial fields in the Reviewed grouping have been predetermined. Empty fields have been provided for base specific initials if required.

Figure 5-3: Cover Sheet

PRODUCTION	REVIEWED REVU
DESIGNED ÉTUDIÉ X.X.	XX XX X.X.
DRAWN DESSINÉ X.X.	
CHECKED VÉRIFIÉ X.X.	
COORDINATION X.X.	
DES O AGENT CONC X.X.	
PROJ MGR GEST PROJ X.X.	
DES MGR GEST CONC X.X.	
FIRE INCENDIE X.X.	
WBS NO. NO. OTP XXXXXX	PF NO. NO. DP XXXXXX

Table 5-5: Reviewed Fields

Predetermined Fields	Description
DES O	Design Officer
PROJ MGR	Project Manager
DES MGR	Design Manager
FIRE	Fire Chief

The following table lists other initials that may be used. The empty fields provided shall be used for these or any other additional fields required by the base.

Table 5-6: Field Initials

Fields	Description
ENG O	Engineering Officer



PROJ O	Project Officer
CUSTOMER	Customer or Client
MP/W	Military Police/Wing
SECT OC	Officer Commanding Engineer Services Company
COMMS	Communication
WFC	Wing Fire Chief
REQT/ENG O	Requirements Officer / Engineering Officer
WCEO	Wing Construction Engineering Officer

5.2.3 Cover Sheet

The DND cover sheet is required unless the project manager specifically states otherwise.

Figure 5-4: Cover Sheet

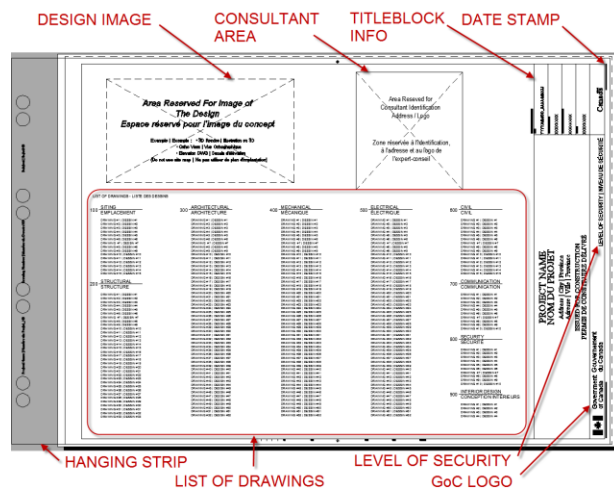


Table 5-7: Cover Sheet Fields

Cover Items	Description
Design Image	Space for the image of the design
Consultant Area	Area reserved for consultant identification and logo
Title block Info	Project, job number, location information, etc.
Date Stamp	Date of last revision made to border drawing
Hanging Strip	98mm wide trim line for hanging strip
List of Drawings	List of drawings by discipline
Level of Security Markings	Status of current drawing security level (<i>default value = to be reviewed</i>)
GoC Logo	Government of Canada wordmark
Plot Stamp Info	Generated drawing info at printing time. Info includes file name, layout name, user name, date and time.

The following items shall be completed on each cover sheet of each drawing set:

- Project Number (WBS - Work Breakdown Structure, issued for Level 1)
- Job Number
- Location
- Project Name
- List of Drawings (by discipline)

5.3 DRAWING SCALES

The proper scales should be selected to avoid overcrowded or ambiguous conditions on the drawings.

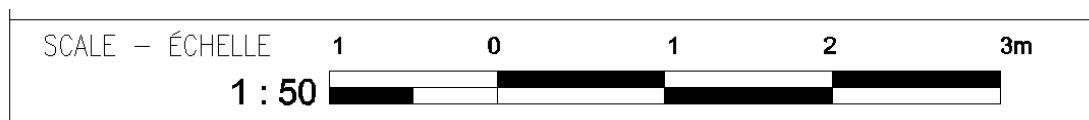
 See [Appendix C: DND Preferred Drawing Scales & Respective Text Size](#)

The selection of scales for supporting drawings of auxiliary and related equipment shall reflect the same considerations.

5.3.1 Graphic Scale

Graphic bar scales shall be used on all drawings to indicate the units of measurement and the ratio. See Figure 5-5.

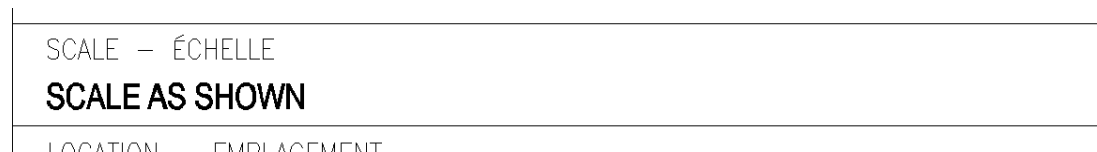
Figure 5-5: Graphic Bar Scale in Title block



5.3.2 Multiple Scale Requirements

When two or more scales are used on the same drawing sheet, each scale shall be clearly indicated below each particular title, and the notation "AS NOTED" or "SCALE AS SHOWN" indicated in the Project /Subject Identification Block. See Figure 5-6.

Figure 5-6: Scale Notation in Title Block



5.4 SECTION AND DETAIL IDENTIFIERS

DND has standard symbols to use for cross-referencing information in drawings. These standard symbols shall be used where possible to identify sections and details, and as labelling titles.

 See [Appendix D: DND Section and Detail Identifiers](#) for samples of DND Identifiers and appropriate uses.

5.5 ABBREVIATIONS

Abbreviations should be kept to a minimum, and when used, a legend should be provided.

5.6 LEGEND

A legend is required for all symbols that are used in the drawing set.



Appendix A: Pen Width & Colour Assignments

Table A-1 contains the complete list of DND Standard pen widths and the colours assigned to each width.

Note the following:

- All DND colours are based on the AutoCAD colour table.
- AutoCAD line weight and pen width are represented by the same value. MicroStation weight equivalents are expressed in whole numbers.
- Line widths with an asterisk (*) are preferred DND pen widths.
- Colours in Table A-1 are generally designated to print black through the use of DND plot styles or pen tables.



These tables should also be referenced when examining **Annex A: Layers** where a line weight is assigned to each layer utilized in DND drawings.

Table A-1 - DND Pen Widths and Colour Assignments

Line Widths	Pen Width mm (AutoCAD Line weight)	MicroStation WT	Colour-to-Width Assignments								
			Blue	Green	Red	Magenta	Cyan	Yellow	Orange	Grey	White
Extra Fine*	0.09	WT = 0								9, 251	7 (Width Varies)
Fine *	0.18	WT = 1	5, 150	100	10	210	130	50	30	8	
Thin *	0.25	WT = 2	151,1 60,16 1	3, 61, 81, 91	1	201	121 ,13 1	51	11, 21		
	0.30	WT = 3	111, 120								
Medium *	0.35	WT = 4	162,1 72	82, 92, 122	12, 232	6	132	2	22, 31		
	0.40	WT = 5	170, 181								
Wide *	0.50	WT = 6	163,1 73	83, 113, 123	230	203, 213	4	53	23, 40		
	0.60	WT = 7				231, 241					
Extra * Wide	0.70	WT = 8		84		204			24		
	1.00	WT = 9	180	80	244	220					
	1.06	WT = 10		90							
	1.20	WT = 11		93							
	1.4	WT = 12		96	33			52			
	1.58	WT = 13	152	103	240	222					
	2.0	WT = 14	182	110	242	200					



The following tables list colours designated to print either screened at a given percentage or at their given colours on monochrome prints with the use of DND plot styles or pen tables.

Table A-2 - DND Screened Colours Available on Monochrome Prints

Screened Colours Available on Monochrome Prints (Colour Number by Colour Group)						
% Screen	Blue	Green	Red	Magenta	Cyan	Yellow
25%	143	73	13	214	133	54
50%	144	74	14	215	134	55
75%	145	75	15	216	135	56

Table A-3 - DND Black Screen Colours on Monochrome Prints

Black Screened Colours		
Colour Group	Colour Number	% Screened
Shades of Black	245	10 %
	246	20 %
	247	30 %
	248	40 %
	249	60 %
	250	80 %

Table A-4 - DND Colours Available on Monochrome Prints

Colours Available on Monochrome Prints (by colour group)						
(Following colours print with Primary Colours)						
Blue (5)	Green(3)	Red (1)	Magenta (6)	Cyan (4)	Yellow (2)	Grey
170	70	20	211	140	41	-
(Following colours print with colour number)						
Blue	Green	Red	Magenta	Cyan	Yellow	Grey
171, 190	71, 72	32, 243	212, 221	141, 142	42, 43, 60	252, 253, 254



Appendix B: DND Custom Line Styles

Table B-1

Linetype Name	Example	Replacement for: AutoCAD Linetypes	Description
DND CUSTOM LINETYPES - COMMON			
CONTINUOUS	—————	N/A	SOLID
DND_DOT	DOT2	DOT
DND_DASHED_SHORT	-----	HIDDEN2	MEDIUM DASHED
DND_DASHED_MED	-----	DASHED2	LONG DASHED
DND_DASHED_LONG	—— ———	DASHEDX2	DOT DASH
DND_CENTER_DOT	- . - . - . - . - . - .	DASHDOT2	SHORT DASHED
DND_CENTER_DASH	—— ———	CENTER2	DASH DOT DOT
DND_PHANTOM	—— . . ——— . . ——— . .	DIVIDE2	LONG DASH SHORT DASH



Linetype Name	Example	Description
DND CUSTOM LINETYPES - INSIDE		
ACET	————— ACET —————	ACETYLENE LINE
BRINE_RETURN	————— BR —————	BRINE RETURN
BRINE_SUPPLY	————— B ————— B —————	BRINE SUPPLY
CA	————— CA —————	COMPRESSED AIR LINE
CHILL_WTR_FLOW	————— CH —————	CHILLED WATER FLOW
CHILL_WTR_RETURN	————— CHR —————	CHILLED WATER RETURN
CIRC_WTR_FLOW	————— CW —————	CIRCULATING WATER FLOW
CIRC_WTR_RETURN	————— CWR —————	CIRCULATING WATER RETURN
CGS	————— CGS —————	COLD GLYCOL SUPPLY LINE
CGR	————— CGR —————	COLD GLYCOL RETURN LINE
COMP_AIR	————— A ————— A —————	COMPRESSED AIR
COND_WTR_FLOW	————— C ————— C —————	CONDENSER WATER FLOW
COND_WTR_RETURN	————— CR —————	CONDENSER WATER RETURN
DCW	———— - - ————— - - —————	DOMESTIC COLD WATER
DHW	———— - - - ————— - - - —————	DOMESTIC HOT WATER
DHWR	———— - - - - —————	DOMESTIC COLD WATER
DEIONW	————— DEIONW —————	DEIONIZED WATER LINE
DEMIN	————— DEMIN —————	DEMIN WATER LINE
DIST	————— DIST —————	DISTILLED WATER LINE
DRAIN	————— D ————— D —————	DRAIN
FEED_PUMP	————— ○○ —————	FEEDWATER PUMP
FIRE_LINE	————— F ————— F —————	FIRE LINE
FUEL_OIL_FLOW	————— FOF —————	FUEL OIL FLOW
FUEL_OIL_RETURN	————— FOR —————	FUEL OIL RETURN
FUEL_OIL_VENT	————— FOV —————	FUEL OIL TANK VENT
HGS	————— HGS —————	HOT GLYCOL SUPPLY LINE
HGR	————— HGR —————	HOT GLYCOL RETURN LINE
GAS_LINE	————— G ————— G —————	GAS LINE
HP_RETURN	———— — — — // —————	HIGH PRESSURE RETURN
HP_STEAM	———— // —————	HIGH PRESSURE STEAM
HR	————— HR —————	HOT WATER RETURN LINE
HS	————— HS —————	HOT WATER SUPPLY LINE
HUMID_LINE	———— — — — H —————	HUMIDIFICATION LINE
MP_RETURN	———— — — — / —————	MEDIUM PRESSURE RETURN
MP_STEAM	———— / —————	MEDIUM PRESSURE STEAM
OW	————— OW —————	OILY WASTE LINE
OXY	————— OXY —————	OXYGEN LINE
REFR_DISCHARGE	————— RD —————	REFRIGERANT DISCHARGE
REFR_SUCTION	———— — — — RS —————	REFRIGERANT SUCTION
SPRINKLER_BRANCH	————— ○ —————	BRANCH AND HEAD SPRINKLER LINE
SPRINKLER_DRAIN	———— — — — S —————	DRAIN SPRINKLER LINE
SPRINKLER_MAIN	————— S ————— S —————	MAIN SPRINKLER LINE
VAC_CLEAN	————— V ————— V —————	VACUUM CLEANING
VAC_PUMP	———— — — — ○ —————	VACUUM PUMP



Linetype Name	Example	Description
DND CUSTOM LINETYPES - OUTSIDE		
ACID_L		SEWER LINE FOR ACID
ACID_R		SEWER LINE FOR ACID
AM_OH		SEWER LINE FOR ACID
AM_UG		SEWER LINE FOR ACID
AVIATOR_FUEL		AVIATOR FUEL
BANK		EMBANKMENT
BERM		BERM
CAC_OH		CRASH ALARM OVERHEAD LINE
CAC_UG		CRASH ALARM UNDERGROUND LINE
CEILO_OH		CEILOMETER OVERHEAD LINE
CEILO_UG		CEILOMETER UNDERGROUND LINE
COMM_OH		COMMUNICATION OVERHEAD LINE
COMM_UG		COMMUNICATION UNDERGROUND LINE
COMM_UG_ENCASED		COMMUNICATION UNDERGROUND LINE ENCASED
CONID		CONTOUR INTERMEDIATE DEPRESSED
CONIDO		CONTOUR INTERMEDIATE DEPRESSED OBSC
CONXD		CONTOUR INDEX DEPRESSED
CONXDO		CONTOUR INDEX DEPRESSED OBSC
CTV_OH		CABLE TV OVERHEAD
CTV_UG		CABLE TV UNDERGROUND
DITCH		WATER DIRECTIONAL FLOW IN BOTTOM OF DITCH
EXP_JOINT_BELLOW		EXPANSION JOINT BELLOWS TYPE
EXP_JOINT_SLIDING		EXPANSION JOINT SLIDING TYPE
FENCE_1		STATE NUMBER AND SIZE OF DUCT
FENCE_2		STATE NUMBER AND SIZE OF DUCT
FENCE_3		STATE NUMBER AND SIZE OF DUCT
FENCE_4		STATE NUMBER AND SIZE OF DUCT
FIRE_OH		FIRE ALARM OVERHEAD LINE
FIRE_UG		FIRE ALARM UNDERGROUND LINE
GAS_OH		GAS OVERHEAD LINE
GAS_UG		GAS UNDERGROUND LINE
GAS_UTIL		GAS UTILITY LINE
GUIDE		GUIDE RAIL
HEAT_FUEL		HEATING FUEL
HPS		HIGH PRESSURE STEAM
HPS_UG		HIGH PRESSURE STEAM UNDERGROUND
HTW		HIGH TEMP WATER
HTW_UG		HIGH TEMP WATER UNDERGROUND
ICC		INSULATING CONCRETE CONDUIT
ICC_UG		INSULATING CONCRETE CONDUIT UGND

Linetype Name	Example	Description
DND CUSTOM LINETYPES - OUTSIDE (...cont.)		
IHC	———— IHC —————	INSULATING HYDROCARBON
IHC_UG	—— — — — — IHC ——	INSULATING HYDROCARBON UNDERGROUND
INT_OH	————— INT —————	INTERCOM OVERHEAD
INT_UG	—— — — — — INT ——	INTERCOM UNDERGROUND
IR_WAT	————— IW —————	IRRIGATION WATER UNDERGROUND LINES
LPS	————— LPS —————	LOW PRESSURE STEAM
LPS_UG	—— — — — — LPS ——	LOW PRESSURE STEAM UNDERGROUND
LTW	————— LTW —————	LOW TEMP WATER
LTW_UG	—— — — — — LTW ——	LOW TEMP WATER UNDERGROUND
MET_OH	————— MET —————	METEOROLOGICAL OVERHEAD LINE
MET_UG	—— — — — — MET ——	METEOROLOGICAL UNDERGROUND LINE
MTW	————— MTW —————	MEDIUM TEMP WATER
MTW_UG	—— — — — — MTW ——	MEDIUM TEMP WATER UNDERGROUND
OPT_OH	————— O —————	OPTICAL FIBRE OVERHEAD
OPT_UG	—— — — — — O ——	OPTICAL FIBRE UNDERGROUND
PMC	————— PMC —————	PREFABRICATED METALLIC CONDUIT
PMC_UG	—— — — — — PMC ——	PREFABRICATED METALLIC CONDUIT UGND
PRI_OH_2400V_1	————— P3 —————	PRIMARY OVERHEAD 2400V 1 PHASE
PRI_OH_2400V_3	————— P2 —————	PRIMARY OVERHEAD 2400V 3 PHASE
PRI_OH_25000V	————— P1 —————	PRIMARY OVERHEAD 25000V
PRI_UG_2400V_1	—— — — — — P3 ——	PRIMARY UNDERGROUND 2400V 1PHASE
PRI_UG_2400V_3	—— — — — — P2 ——	PRIMARY UNDERGROUND 2400V 3 PHASE
PRI_UG_25000V	—— — — — — P1 ——	PRIMARY UNDERGROUND 25000V
PRIM_OH	————— P —————	PRIMARY OVERHEAD LINE
PRIM_UG	—— — — — — P ——	PRIMARY UNDERGROUND LINE
RAILWAY	—+—+—+—+—+—+—	RAILWAY
RAIL_ABDN	-+—+—+—+—+—+—	RAILWAY ABANDONED
RETURN_OH	————— R —————	RETURN, CONDENSATE OR WATER
RETURN_UG	—— — — — — R ——	RETURN, CONDENSATE OR WATER UGND
SAN	————— SAN —————	SANITARY UNDERGROUND LINE
SAN_R	————— SAN ▸—————	SANITARY FLOW UNDERGROUND LINE
SAN_L	————— NYS ▸—————	SANITARY FLOW UNDERGROUND LINE
SCC_OH	————— SC —————	SIREN CONTROL OVERHEAD LINE
SCC_UG	—— — — — — SC ——	SIREN CONTROL UNDERGROUND LINE
SEC_OH_120/208V	————— S1 —————	SECONDARY OVERHEAD 120/208V
SEC_OH_120/240V	————— S2 —————	SECONDARY OVERHEAD 120/240V
SEC_OH_220V	————— S4 —————	SECONDARY OVERHEAD 220V
SEC_OH_550V	————— S3 —————	SECONDARY OVERHEAD 550V
SEC_OH_600/347V	————— S5 —————	SECONDARY OVERHEAD 600/347V
SEC_UG_120/208V	—— — — — — S1 ——	SECONDARY UNDERGROUND 120/208V

[illegible]



Appendix C: DND Preferred Drawing Scales & Respective Text Size

Table C-1

OUTSIDE				
Drawing Type	Metric Scale Factor	2.5 mm plotted text size (mm)	3.5 mm plotted text size (mm)	5 mm plotted text size (mm)
Site Plans	1:1	2.5	3.5	5
	1:200	500	700	1000
	1:250	625	875	1250
	1:500	1250	1750	2500
	1:750	1875	2625	3750
	1:1000	2500	3500	5000
	1:2000	5000	7000	10000
	1:2500	6250	8750	12500
	1:3000	7500	10500	15000
	1:4000	10000	14000	20000
	1:5000	12500	17500	25000
	1:10000	25000	35000	50000
	1:15000	37500	52500	75000
	1:20000	50000	70000	100000
	1:50000	125000	175000	250000
	1:100000	250000	350000	500000
	1:200000	500000	700000	1000000
	1:250000	625000	875000	1250000
	1:500000	1250000	1750000	2500000
Elevations	1:100	250	350	500
Sections	1:200	500	700	1000
	1:50	125	175	250
Details	1:100	250	350	500
	1:200	500	700	1000
	1:5	12.5	17.5	25
	1:10	25	35	50
	1:25	62.5	87.5	125

INSIDE				
Drawing Type	Metric Scale Factor	2.5 mm plotted text size (mm)	3.5 mm plotted text size (mm)	5 mm plotted text size (mm)
Floor Plans	1:1	2.5	3.5	5
	1:50	125	175	250
	1:75	187.5	262.5	375
	1:100	250	350	500
	1:200	500	700	1000
	1:250	625	875	1250
	1:500	1250	1750	2500
Roof Plan	1:200	500	700	1000
Exterior Elevations	1:100	250	350	500
	1:200	500	700	1000
Interior Elevations	1:50	125	175	250
	1:100	250	350	500
Cross Sections	1:50	125	175	250
	1:100	250	350	500
	1:200	500	700	1000
Wall Sections	1:20	50	70	100
	1:25	62.5	87.5	125
Stair Details	1:10	25	35	50
Details	1:5	12.5	17.5	25
	1:10	25	35	50
	1:25	62.5	87.5	125

Appendix D: DND Section & Detail Identifiers

DND standard symbols shall be used for all cross-referencing identifiers. Refer to Annex B: Symbols for a list of available symbols.

✂ Details and Elevations are identified by a number; Sections are identified by a letter.

Figure D-1 Identifiers: Section, Details, and Elevations

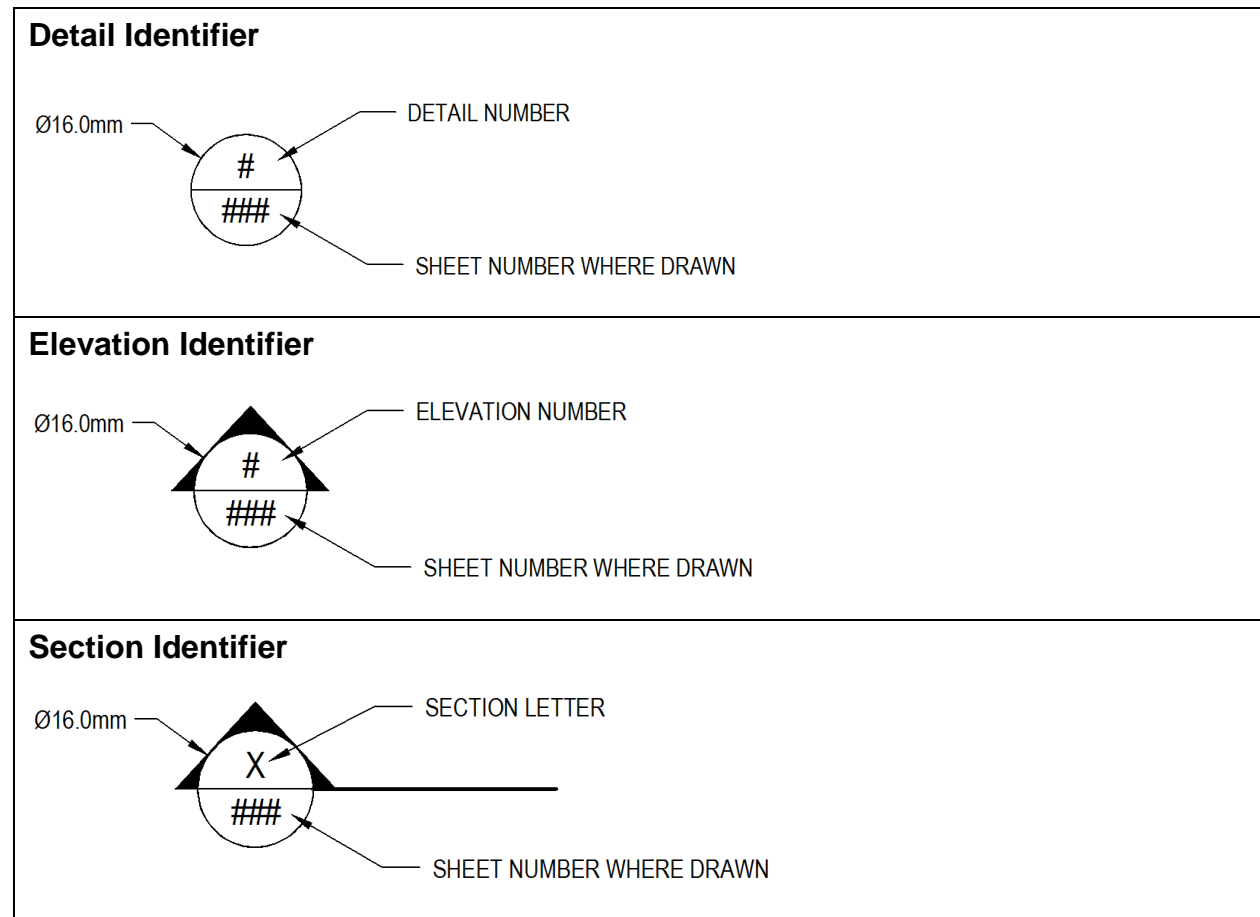
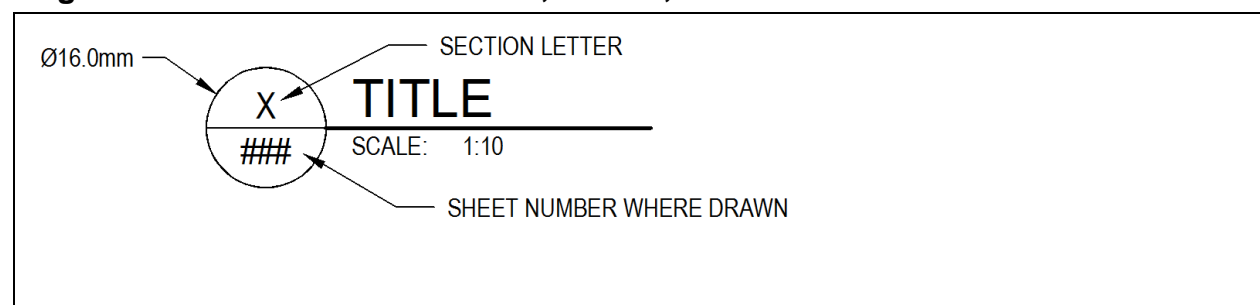


Figure D-2 Title Identifier: Section, Details, and Elevations

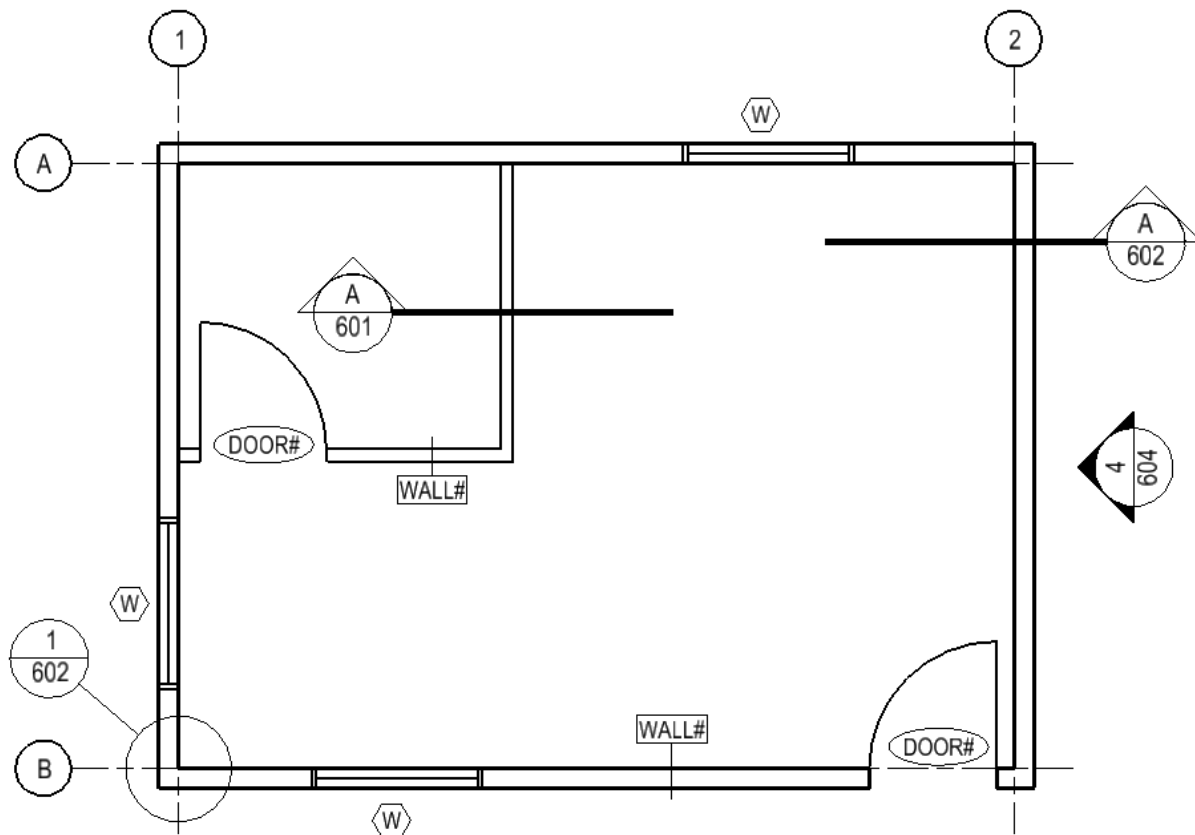




Sample Use of DND Identifiers

- ✂ It is acceptable practice to have 2 identifiers with the same detail numbers or section letters, provided that the sheet numbers are different. For example, this sample Floor Plan shows 2 Section “A” identifiers for 2 different section details, which is acceptable since one section is drawn on sheet 601 and the other on sheet 602.

Figure D-3





Appendix E: Types of Work and Buildings

Codes indicated with “shading” are used by National Defence Headquarters.

Table E-1

0100		Administration Buildings
0200		Airfields including Parking Aprons, Runways, Lighting, VASIS
	0201	Parking Aprons, Runways
	0202	Apron concrete (hangar)
	0203	Airfield lighting
	0204	Arrest barrier
	0205	Taxi lighting
	0206	Runway lighting
	0207	Radar dome lighting
	0208	Helicopter landing pad
	0209	Exterior flight lighting
	0210	Substation (airfield)
	0211	
	0212	
	0213	VASIS
	0220	Noise exposure
	0221	Airport zoning
	0222	Electromagnetic interference
0300		Armouries and Drill Halls
0400		
0500		Air Transport Terminal Facilities
0600		Band Buildings
0700		Bridges
0800		
0900		Cemeteries
1000		Chapels
1100		Control Towers
1200		Cranes and Lifting Appliances
1300		Multiple-use Building
1400		Detention Barracks, Guard Houses
1500		Standard Detail Drawings
1600		Drydocks
1700		Security Systems (Intrusion Alarms, Access Control, CCTV, etc)
1750		Shielded Enclosure
1760		Surveillance and Security
1800		
1900		Exposition Buildings and Structures (including Museums)
2000		Miscellaneous Exterior Installations
2100		
2200		
2300		Fire Halls
2400		
2500		Garages
2600		Gate Houses
2700		
2800		
2900		
3000		Hangars – Aircraft



3030		Hangars – Tank
3050		Hangars – Gun (including gun sheds)
3100		
3200		Hospitals and Dental Clinic
3300		Residence
3400		
3500		Junior Ranks Clubs and Canteens
3600		
3700		
3800		Kitchen Installations
3900		
4000		Laboratory Buildings
4100		
4200		Magazines
4300		Masts and Towers Except for Telecommunications
4400		
4500		Messes – Cadets
4600		Messes – Officers
4700		Messes – WOs and Sgts
4800		Messes – Men's
4900		Messes – Combined
5000		
5100		Meteorological Structures
5200		
5300		
5400		
5500		Operations Buildings
5600		
5700		
5800		Plants
	5800	Central Heating Plants (including non-standard CHPs)
	5810	Water Treatment Plants
	5820	Sewage Treatment Plants
	5830	Power Generating Plants
	5840	Detached heating plants (serving one building only)
	5870	
	5880	
	5890	
5900		POL Storage Installations (including propane)
6000		Post Office Buildings
6100		Prefabricated Buildings
6200		Property Survey – Legal
6300		
6400		Photographic Buildings
6500		Quarters – Type 1, Trainees
6600		Quarters – Type 4, Single Officers
6700		Quarters – Type 3, Single NCOs
6800		Quarters – Type 2, Ordinary Ranks
6900		Quarters – Combined Single
7000		Quarters – Married Quarters
7050		Formally PMQ's
7001		Garages for PMQ
7100		Deployed Camp (e.g., Bosnia)
	7101	Grounds including fencing, grading, Camp Layout
	7104	Water Distribution Systems
	7105	Exterior Sewage Systems
	7106	Exterior Electrical Systems



	7107	Exterior Lighting
	7112	Exterior Fire Protection Systems
	7115	Communications
7200		Deployable Structures Weather Events
7210		Generic Camp Design
7220		Generic Bunker Design
7300		Recruiting and Sub Recruiting Centres
7400		Ablution for Cadet and or Militia Camps
7450		Ablution Buildings and Structures
7500		Ranges and Training Areas
7550		Training Area (Drop Zone)
7600		
7700		Service Facilities (barber shops, beauty parlours, libraries, NPF shops, etc, not integral to other building types)
7800		
7900		Space Detection Installations
8000		Schools – Dependents
8100		Sea Plane Stations – Shipways
8200		Supply and Store Buildings
8300		Survival Buildings and Structures (excluding those under the 8730 series)
8400		Site Record Drawings
8500		Siting Multiple Buildings/Works
8600		Seedling Nurseries
8700		
8710		Radar Buildings and Towers (including SAGE and BUIC)
8730		Radio Buildings and Structures (including TX, RX, ADCOM, GATR, REGHQs, EASE, TELCO Buildings, and Antenna Farms)
8750	8750	Air Navigation Buildings
	8751	Ground Control Approach (GCA)
	8757	Precision Approach Radar (PAR)
	8760	Instrument Flight Rules Control Centre (IFRCC)
	8761	Area Surveillance Radar (ASR)
8800		Training Buildings and Structures
8900		Training/Recreation Facilities
9000		Decommissioning
9100		Environmental Project
9200		Land/ Property Procurement
9250		Reserve (Indian)
9300		Outside Services (including Pumping Stations)
	9301	Grounds including Fencing, Culverts, Retaining Walls, Grading and Seeding but excluding Airfields, Sports Ranges and Training Areas Fields
	9302	Pavements except Airfield Pavements
	9303	Exterior Heating Distribution Systems
	9304	Water Distribution Systems, including Pumping Stations
	9305	Exterior Sewage Systems, Storm and Sanitary
	9306	Exterior Electrical Distribution Systems including Sub Stations
	9307	Exterior Lighting Systems except Airfield Lighting
	9308	Exterior Gas Supply and Distribution Systems
	9309	Exterior Compressed Air Systems
	9310	Exterior Liquid Fuel Distribution Systems
	9311	POL Distribution Systems – Pipelines
	9312	Exterior Fire Protection Systems
	9313	Exterior Lighting Protection Systems
	9314	Exterior Communications Loop System (Telephone, Intercom, Data)
	9315	Communication Ducts – underground construction
	9330	Excavating Ext.
	9340	Underwater Exc. & Dredging



	9360	Y2K (opabacus)
9400		Water Storage Structures
9500		Wharves, Piers, and Jetties
9600		Workshops
9700		Geotechnical Soils Records
9800		Hydrographic
9900		Multiple Buildings/Works Projects

1. Unassigned numbers for types of works and buildings shall not be used without prior approval of — and/or promulgation of — an amendment by NDHQ.

Please report any new codes to the Keeper of the Standard.

2. With the exception of the 5800 series (plants), the 7000 series (Married Quarters), the 9300 series (Outside Services) and the 9900 series (Multiple Building/Works Projects), the first two digits represent the type of works or building and the last two digits represent particular works or building. For example, the first garage at a base is identified as “2501,” the second “2502” etc. When five garages already exist at a base, a new garage would be identified as “2506.”
3. The drawings for work integral to a building shall bear the basic third series number of the building. Thus, a drawing to install a sprinkler system in the second garage at a base will have the basic third series number “2502.”
4. Subsequent projects involving the same works or building shall have the basic third series number extended in numerical and chronological sequence by the addition of /1, /2, /3, etc. Thus to continue the above example, if the installation of a sprinkler system in the second garage at a base was the first subsequent project after completion of the garage, the third series number would be 2502/1.
5. The 5800 series (Plants) has been subdivided to provide identification for the type of plant involved, i.e., water treatment (5810), sewage treatment (5820), power generating (5830), etc. The first three digits represent the type of plant while the fourth digit identifies a particular plant. For example the first sewage treatment plant at a base is identified as “5821” and the second, as “5822.”
6. It is not feasible to identify each married quarters with a number from the 7000 series (Quarters – Married Quarters). Therefore, for a project involving married quarters, the third series number “7000” shall be used and extended by the addition of /1, /2, /3, etc. Thus, a project showing the third series number “7000/2” signifies the second project involving any married quarters at that location.
7. The 9300 series (Outside Services) has also been subdivided to provide identification for particular groups of outside services. For example, all projects involving pavements (excluding airfield pavements defined specifically under the 0200 series) will use the basic third series number “9302.” Before selecting a 9300-series number, it is important to ensure that the outside service or installation in question is not more adequately defined under another series. For subsequent projects the 9300 series number is extended in the same manner as for the 7000 series. Thus, a project showing the third series number “9302/5” signifies the fifth project involving pavements at that location.
8. The 9900 series (Multiple Buildings/Works Projects) shall be used for the third series number when a project involves similar maintenance, repairs or additions to more than one building or facility. Thus a project showing the third series number “9900/6” signifies the sixth multiple building/works project at that location. It should be noted that the sixth multiple building/works project is correctly identified as above and not as “9906.”
9. In each case it shall be the responsibility of the design authority to obtain the facility identification portion of the third series in the drawing number from the Base Construction Engineering Officer (BCEO)



concerned. It shall be the responsibility of the BCEO to respond immediately by message or telephone to such requests. The third series number assigned by the BCEO shall be used to identify the works or building in perpetuity except when a permanent change in the function of a works or building occurs.

STANDARD DESIGN DRAWINGS AND SPECIFICATIONS

Using “S-2501-312” as an example, drawings within a standard design package depicting a particular works or building shall be numbered as follows:

- a. **First Series.** The first series, “S”, indicates a standard design. As the design agency for development, preparation and promulgation of all standard design drawing and specification packages is NDHQ, there is no requirement to further identify the responsible design agency in the manner followed for contract/project drawings.
- b. **Second Series.** The second series consists of four digits in which the first two digits indicate the type of works or building, and the second two digits represent a specified standard design for a works or building.
- c. **Third Series.** The third series consists mostly of three digits in which the first digit represents the discipline shown on the drawing and the remaining digits indicate the drawing sheet number.
- d. The standard number to be shown on the specifications and standard design drawing package cover sheet shall consist of the first and second series of the drawing numbers. Referring to the above example, a standard design drawing number, “S-2501-312” results from a standard number for the package of “S-2501”.

SKETCH DRAWINGS

Using as an example “SK-C40-2501-2,” sketch drawings shall be numbered in series as follows:

- a. **First Series.** The first series, “SK,” indicates a sketch or preliminary drawing.
- b. **Second Series.** The second series, a combined letter and number system, represents the site, establishment or base as detailed under Contract and Non-Standard Drawings. If the sketch has been prepared for development of a standard design, the second series shall consist solely of the letter “S.”
- c. **Third Series.** The third series numbers for sketch drawings are assigned as described for Contract and Non-Standard Drawings.
- d. **Fourth Series.** The fourth series indicates the drawing sheet number of the sketch.

SITE RECORD DRAWINGS

Using “H-C40-8410-101” as an example, site record drawings shall be numbered in series as follows:

- a. **First Series.** The first series is a letter signifying the agency responsible for drawing preparation. The first series letter codes for site record drawings are the same as described earlier for contract and non-standard drawings.
- b. **Second Series.** The first series is a combined letter and number system, which represents the site, establishment or base as previously detailed for contract and non-standard drawings.
- c. **Third Series.** The third series consists of four digits. The first two digits identify the “8400” series, from the list of standard numbers for types of works and buildings, and are standard for all site record drawings. The third digit indicates the scale of the drawing as follows:

1 Overall site drawing

2 1:2000 (*1:2400)

5 1:500 (*1:600)

* Metric equivalent of previous imperial scales



The fourth digit may be a letter or a number. Letters indicate a “base drawing” and identify each component overlay and composite as follows:

- A Base drawing showing buildings, roads, runways, manholes, poles, light standards and related plant.
- B A clear film overlay showing contours, wooded areas, road classification and related planimetry.
- C A composite reproduction of the two previous components reproduced in register.

The numbers identify a base or composite drawing to which pertinent details regarding specific services and facilities have been added:

1:2000 scale drawing

- 0 overall site drawing
- 1 utility drawing – water
- 2 utility drawing – sanitary sewer
- 3 utility drawing – storm sewer
- 4 utility drawing – heat distribution
- 5 utility drawing – gas, POL, compressed air
- 6 utility drawing – electrical, primary
- 7 utility drawing – fire alarm circuits
- 8 utility drawing – services beyond built-up area of site

1:500 scale drawings

- 0 overall site drawing
- 1 building and utilities drawing
- 2 building and electrical primary circuit drawing
- 3 building and electrical secondary circuit
- 4 building and electrical miscellaneous circuit drawing

- d. **Fourth Series.** The fourth series consists of three digits. The first digit indicates the generation or satellite drawing as follows:

- 1 First generation (property and survey control)
- 2 Second generation (miniature site drawing)
- 3 Satellite drawing (scale 1:50 000)
- 4 Soils information

The last two digits indicate the drawing’s position in the series and are consecutive from “01.” A letter following the third digit, for example “101A, B, C, etc.” indicates that the sheet is back-up or related information to the sheet concerned, in this case, “101.” An example of related information would be borehole logs supplying information in addition to the borehole location drawing.

- e. Although specifications may not always form part of the preparation of site record drawings, it is necessary to identify a job number for record purposes. The job number for site record drawings from which the drawing number quoted above was extracted would be H-C40-84.



STANDARD DETAIL DRAWING

Standard detail drawings are those prepared for miscellaneous items such as catch basins, manholes, fences, roads, transformer vaults, kiosks, fuel storage, etc. The standard details can be used for individual installations or incorporated within a set of contract drawings. Standard detail drawings shall be numbered in series as follows, using as an example, S-1506-401.

- a. **First Series.** The first series, “S”, indicates a standard design.
- b. **Second Series.** The second series consists of four digits. The first two digits identify the “1500” series from the list of standard numbers for types of works and buildings. The last two digits represent the numerical/chronological sequence of development and promulgation.
- c. **Third Series.** The third series consists of three digits. The first digit represents the discipline shown on the drawing and the last two represent the consecutive drawing sheet number.
- d. When a standard detail drawing is incorporated within a package of drawings for a specific project, it shall bear a drawing number identified with the project.

SCHEDULES

Schedules for delineating structural steel and reinforced concrete as well as room finish, door and hardware schedules shall be incorporated into the contract drawing package as warranted by the magnitude of the works and facilities being designed. All pertinent data, consistent with current professional engineering and architectural practice, shall be clearly indicated in a format approved for use by the responsible design agency or its delegated officers.



NUMBERING OF DRAWINGS

EXAMPLE – STANDARD DRAWINGS

STANDARD NUMBER

S-2501-312

STANDARD DRAWING INDICATOR _____

TYPE OF WORKS OR BUILDING _____

PARTICULAR DESIGN WITHIN ABOVE GROUP _____

TRADE _____

DRAWING SHEET NUMBER _____

EXAMPLE – SKETCH DRAWINGS

JOB / STANDARD NUMBER

SK - C40 - 2501 - 2

SKETCH DRAWING INDICATOR _____

SITE _____

TYPE OF WORKS OR BUILDING _____

PARTICULAR WORKS OR BUILDING _____

DRAWING SHEET NUMBER _____

Figure E-1 (Sheet 1 of 2) Numbering of Drawings



NUMBERING OF DRAWINGS (Cont'd)

EXAMPLE – SITE RECORD DRAWINGS

JOB NUMBER

H - C40 - 8410 - 101(A)

FORMATION RESPONSIBLE FOR DRAWING _____

SITE _____

CODE FOR SITE RECORD DRAWINGS _____

SCALE OF DRAWINGS _____

TYPE OF SITE RECORD DRAWING _____

GENERATION OR SATELLITE DRAWING _____

DRAWING SHEET NUMBER _____

DENOTES SHEET CONTAINS AUXILIARY INFORMATION _____

Figure E-1 (Sheet 2 of 2) Numbering of Drawings