

REVISIONS

NOTE: The date in the footer of each chapter must correspond to the dates in the revision chart bellow to ensure it is up to date. If there are any discrepancies please contact the Technical Data Centre.

CHAPTER	DATE OF REVISION (D/M/Y)
CAD POLICY	August 30, 2002
FORWARD	August 30, 2002
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16	February 10, 1998
17	February 10, 1998
18	November 24, 1999
19	June 11,1998
20	November 12, 1999
BFSM	September 3, 2002
SFSM	September 3, 2002

FORWARD

This manual is being developed by the Technical Data Centre (TDC), Facilities Operations and Maintenance of the GTAA at Toronto - Lester B. Pearson International Airport.

Comments on the suitability of the contents for the stated purposes are welcomed. Comments should be directed to:

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PROJECT DOCUMENTATION SUBMISSION AND CAD POLICY

1.0 SUBMISSION AND CAD POLICY

It is the policy of the Greater Toronto Airports Authority (GTAA) at Toronto Lester B. Pearson International Airport (LBPIA) that all CAD deliverables submitted to the GTAA's Technical Data Centre (TDC) shall be in a **MicroStation/J (*.dgn) file format** and must be structured **to meet the standards of the Data and Drawing Management Standards Manual (DDMSM)** used therein.

The DDMSM includes, but is not limited to file naming conventions, drawing numbers, file and level structure, fonts, line colours, line weights, symbols, patterns and reference files. It also addresses the management of these files.

The CAD system in use at the GTAA for drawing/data management, as well as management of the facilities at LBPIA is **MicroStation/J** by Bentley Systems, Incorporated.

All digital CAD files shall be supplied to Consultants in MicroStation/J DGN format.

All data submitted to the TDC shall be per the requirements specified within this policy. This includes MicroStation/J, Hardcopy prints and Raster or a combination thereof.

Should a Consultant choose to **use AutoCAD rather than MicroStation/J**, it shall be the responsibility of the Consultant to ensure that all information is provided in MicroStation/J format, to the TDC requirements specified within this policy.

Should a Consultant's Subconsultant use a CAD package other than MicroStation/J, it shall be the responsibility of the Prime Consultant to ensure all CAD data is submitted to the TDC per the requirements specified within this policy.

Contract Documents during Final Design - 30%, 60% and 90% Completion

At the 30% completion stage, the TDC **requires sample DGN files** to ensure the integrity of the DDMSM is being adhered to. This submission is limited only to the 'spatially related' or 'geo-referenced data' per the Data Submission Format as outlined in Section 2.0 of this policy. Should the data not meet the requirements of the DDMSM, the TDC reserves the right to request the submission of additional translated files at the 60% and 90% stages for further review.

NOTE: The TDC reserves the right to request DGN information throughout the design process in order to ensure the integrity of the overall design of the airport is not compromised.

2.0 DIGITAL DATA SUBMISSION FORMAT

2.1 Spatially related' or 'Geo-referenced' Submissions (DGN)

All 'spatially related' or 'geo-referenced' data sets that will be used to update the GTAA's digital graphics database for the design/management of the facility **shall be submitted to the TDC on CD in a MicroStation/J DGN format.** This will include, but may not be limited to the following:

- site plans
- landscaping grading and planting plans
- surveys
- civil layout and removals
- architectural floor plans
- reflected ceiling plans and lighting layouts
- power/systems/communications plans
- fire protection/HVAC/plumbing plans
- any other drawings that are 'spatial' or 'geo-referenced' in nature

NOTE: All above noted data must meet the datum, projection and coordinate system, in addition to the file, layer and file referencing requirements stipulated in the DDMSM.

Please take special note of the number sequence as Tender Documents, Record Drawings and As-Builts have a letter change in the number sequence to represent the appropriate drawing type.

2.2 Drawing Sheet Submissions

MicroStation/J Format (DGN)

A complete CAD replication in **MicroStation/J format** of the hard copy prints submitted. All CAD information must be structured following the DDMSM.

Raster Format Submissions (TIFF)

Drawing sheets: shall be submitted in a TIFF GROUP 4 format (300DPI resolution as a minimum) as well as a mylar set of the as-built signed and stamped.

Manuals and Warranties: shall be submitted in a TIFF GROUP 4 format (300DPI resolution as a minimum).Manufactures Manuals in Acrobat (PDF) format is also acceptable.

3.0 CAD SUBMISSIONS FOR RENOVATIONS

All spatially related or geo-referenced data that is being renovated must be submitted to the TDC on CD in a MicroStation/J DGN format.(ie Site or Floor Plans)

3.1 Spatially related' or 'Geo-referenced' Submissions (DGN)

As-Built drawings that are spatially related or geo-referenced must contain the data that has been revised or deleted. These files should have the original, as supplied graphics, attached as reference files. All new data shall be in its own discipline file, as structured by the DDMSM. These discipline files will show all additions and deletions. (deletions must be on Level 62, Colour 120, Wt 0, Line Code 3) When working in buildings show no dimensions and reference all features to column lines.

3.2 Drawing Sheet Submissions

MicroStation/J Format (DGN)

A complete CAD replication in **MicroStation/J format** of the hard copy prints submitted. All CAD information must be structured following the DDMSM.

Raster Format Submissions (TIFF)

Drawing sheets: shall be submitted in a TIFF GROUP 4 format (300DPI resolution as a minimum) as well as a mylar set of the as-built signed and stamped.

Manuals and Warranties: shall be submitted in a TIFF GROUP 4 format (300DPI resolution as a minimum).Manufactures Manuals in Acrobat (PDF) format is also acceptable.

4.0 AUTOCAD POLICY (DWG)

Should a Consultant choose to **use AutoCAD rather than MicroStation/J**, it shall be the responsibility of the Consultant to ensure that **all information ‘spatially related’ or ‘geo-referenced’ is provided in MicroStation/J format**, to the TDC requirements specified within this policy. (See section 2.0 CAD Data Submission Format)

If the project is done in AutoCAD and converted to MicroStation/J all original AutoCAD files in a DWG format must be submitted as well as the converted MicroStation/J Files.

All ‘ non-spatially related’ or ‘non-geo-referenced’ data sets that will not be used to update the GTAA’s digital graphics database can be submitted to the TDC on CD in a DWG format and need not be converted to MicroStation/J This will include, but may not be limited to the following:

- demolition plans
- sections
- elevations
- profiles
- details
- single line diagrams

NOTE: Although it is not required that the above noted information be provided in DGN format, it would be beneficial to the site if and when available.

5.0 SCHEMATIC DATA SUBMISSION REQUIREMENTS

Schematic Design and Design Development

5.1 Drawing Sheet Submissions

MicroStation/J Format (DGN)

A complete CAD replication in **MicroStation/J format** of the hard copy prints submitted. All MicroStation/J CAD information must be structured following the DDMSM. When data to be created is not found in the DDMSM the Consultant or Contractor shall contact the TDC for direction.

Raster Format Submissions (TIFF)

Drawing sheets: shall be submitted in a TIFF GROUP 4 format (300DPI resolution as a minimum) as well as a mylar set of the as-built signed and stamped.

Manuals and Warranties: shall be submitted in a TIFF GROUP 4 format (300DPI resolution as a minimum).Manufactures Manuals in Acrobat (PDF) format is also acceptable.

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1 DRIVING FORCE/ BACKGROUND

1.0 DRIVING FORCE/BACKGROUND

The Technical Data Centre manages the Greater Toronto Airports Authority's drawings and digital data. The Data & Drawing Management Standards Manual was developed by the TDC for in-house use and for provision to consultants in order to ensure all drawings and digital CAD data files will meet GTAA CAD standards.

This manual is set up in such a way, that the building specific, site specific and typical topics are separated. For those working on building specific projects they need only refer to the building and typical sections, likewise for those working on site-specific projects.

Any section number that is designated with the letter "B" marks the section as being Building specific information, and the letter "S" marks the section as being Site specific information.

At the beginning of this manual a list of all the chapters is provided listing when each chapter was last updated. When a chapter is updated, the date in the footer is changed to match, and then the change is recorded in the "REVISIONS" sheet, located at the beginning of the DDMSM. Each updated chapter and the revision sheet will be provided to anyone possessing a copy of the DDMSM. If the date of any chapter does not match the revision sheet, this chapter must be updated and can be done so by calling the TDC to request the changes.

The data for the airport is in 2D and 3D MicroStation/J (.DGN) CAD files, structured as per the GTAA's Feature Symbology Manuals; both the BFS (Building Feature Symbology) and SFS (Site Feature Symbology).

In using the standards set forth in this manual, in-house staff and consultants alike can produce planning drawings, tender drawings, as well as change orders and ultimately AS-BUILT drawings and digital data sets. All of, which will be easy to manage, maintain and incorporate into the respective digital graphics database.

1.B SOURCE OF BUILDINGS DIGITAL GRAPHICS DATABASE

Many of the existing airport buildings including; Terminals One and Two, the Administration Building, Central Work Shop, Central Heating Plant, Fire Hall/Maintenance Garage, etc. had architectural floor plans and a combination of reflected ceiling plans, structural, electrical and mechanical information. These hard copy drawings were either digitized or re-drawn to establish a buildings digital graphics database.

These files meet the same coordinate system as the site data, therefore, the buildings and their corresponding data sets fit directly on top of the site information.

Terminal Three has just been acquired by the GTAA and the several megabytes of existing AutoCAD files will be translated to MicroStation/J and reformatted to meet GTAA CAD standards, including both file and level structure and symbology.

Many of the other airport buildings like aircraft hangars, cargo buildings, airline administrative buildings etc. are not included in the database as these tenants manage their own facilities. These hardcopy drawings are either digitized or re-drawn if they are required for a GTAA project, and are ultimately added to the building digital graphics database.

Revisions to the buildings Digital Graphics Database

Any updates made to the buildings digital graphics database are done solely by the TDC. Information made available to carry out this function is submitted in a variety of ways:

As-Built drawings provided by a consultant in a MicroStation/J .dgn format as per GTAA standards (see Chapter 15 As-Built Drawings).

Construction Control Permits (CCP) provided by the Construction Control Office, which details the changes made on a scaled drawing. This option is acceptable for “minor” work only (see Chapter 15, As-Built Drawings).

Field visits by qualified personnel, showing the changes on a scaled drawing.

1.S SOURCE OF SITE DIGITAL GRAPHICS DATABASE

A second order horizontal and vertical control network was established at the site, consisting of approximately 50 survey monuments combined with temporary bench marks. In some areas, above ground features were pre-marked with paint to meet municipal utility colour coding standards to help aid in feature recognition during data capture.

Aerial photography was captured at scales from 1:3000 over the runways and built up areas that had more detail to pick up, to 1:5000 over more general areas attaining an accuracy of 20cm horizontally and 30cm vertically.

Coordinates are based on 6 degree UTM (zone 17, CM 81 degrees west), NAD27, 1974 adjustment.

Elevations are based on GSC Datum, 1978 Southern Ontario Adjustment.

The above ground data was captured using photogrammetry the operators having copies of older hard copy record drawings, AS-BUILTS etc. to help aid them in capturing the data. Once all the above ground data was captured, hard copy record drawings were used again to aid the loading of the underground utility data by the operators as to which utilities were located where, along with invert elevations, pipe sizes, etc. Utility companies also assisted in providing stake out data for loading.

Now that the digital graphics database has been established and in use for several years, AS-BUILT data from construction projects and surveys is captured using a Total Station, formatted to exactly meet GTAA CAD standards and then easily incorporated into the existing database.

Revisions to the site Digital Graphics Database

Any updates made to the site digital graphics database are done solely by the TDC. Information made available to carry out this function is submitted in a variety of ways:

As-Built drawings provided by a consultant in a MicroStation/J .dgn format as per GTAA standards (see Chapter 15 As-Built Drawings).

Construction Control Permits (CCP) provided by the Construction Control Office, which details the changes made on a scaled drawing this option is acceptable for "minor" work only (see Chapter 15, As-Built Drawings).

Topographic and Total Station surveys which maintain a 20 cm horizontal accuracy.

Field visits by qualified personnel, showing the changes on a scaled drawing.

2 FILE NAMING CONVENTIONS

WARNING

The following chapter is a guide to understanding what the GTAA's drawing numbers represent.

Drawing numbers are to be assigned by the GTAA ONLY unless written authorization is given by the Superintendent, CAD Operations.

Any drawings containing numbers not assigned by the Technical Data Centre of the GTAA WILL NOT be accepted.

If there is ambiguity concerning drawing numbers please call: the Superintendent, CAD Operations.

2.0 DRAWING NUMBERING SYSTEM & FILE NAMING CONVENTION

The GTAA's drawing numbering, file naming conventions and project structure, must be adhered to in order for the files to be turned over to the TDC in a format consistent with their standards at the end of a project.

The TDC is responsible for assigning drawing numbers and file names to any organization producing drawings to be turned over to the TDC. This ensures no duplication of file names and numbers as they are provided from a single source.

Please note that the "-" character cannot be used in any file name.

The GTAA drawing numbering system characterizes drawings by 5 criteria, see figure 2.0.1.

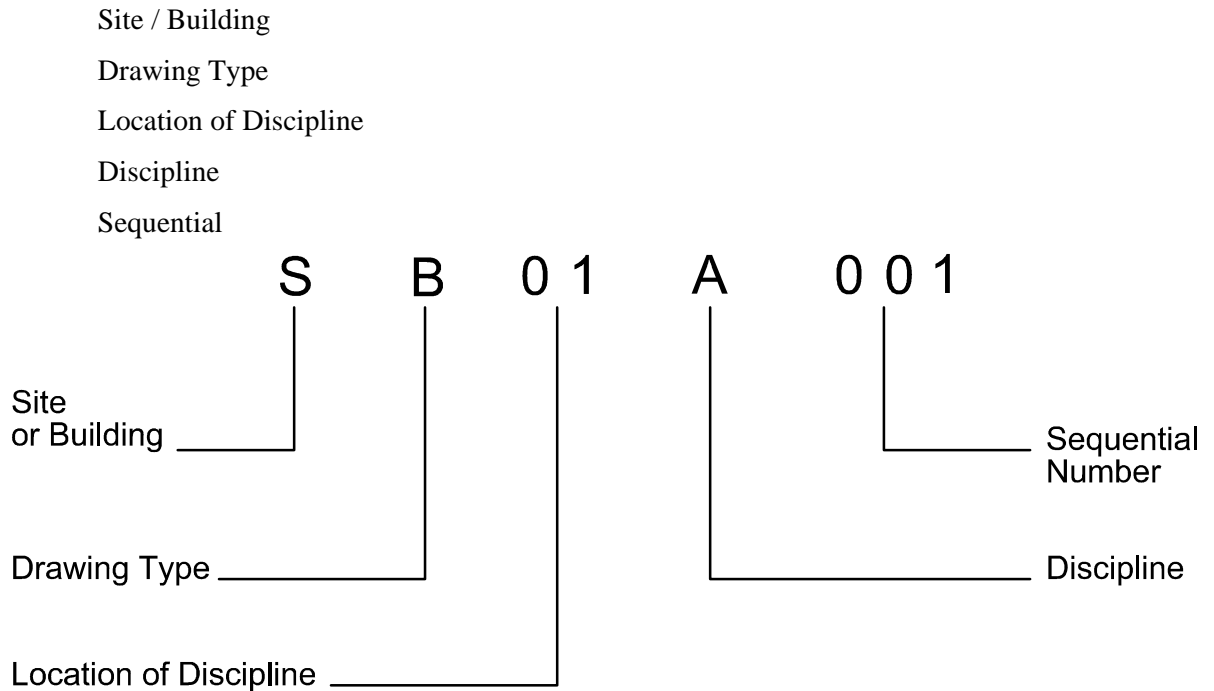


Figure 2.0.1
Drawing Numbering System

PROJECT SPECIFIC ORIGINATORS

The first letter of the drawing number (originator) determines whether a drawing is building or site related. Due to the size of projects now ongoing at LBPIA, it has become necessary for the largest of these projects to be responsible for assigning drawing numbers. All drawing numbers are to be assigned by the project teams listed below. For example, Terminal Development Project will use the letter M for all their site drawings and N for their building drawings. See the following chart for other project specific originators.

ORIGINATOR	DESCRIPTION
Y	Airside Development Project - BUILDING
X	Airside Development Project - SITE
B	Facilities Operations & Maintenance - BUILDING
S	Facilities Operations & Maintenance - SITE
Q	Ground Transportation Hub - GTAGA - BUILDING
P	Ground Transportation Hub - GTAGA - SITE
C	Infield Development Project - BUILDING
D	Infield Development Project - SITE
M	Terminal Development Project - AAC - SITE
N	Terminal Development Project - AAC - BUILDING

DRAWING DESCRIPTION

ABBREV	DESCR
A	AsBuilt
B	Presentation
C	Reports
D	Details
E	Forms
F	Fabrication
G	Slides/Overheads
H	
J	Scanned Manuals
K	
L	Legal
M	
N	
P	Preliminary Design
Q	
R	Record
S	
T	Tender, Contract
U	
V	
W	
X	
Y	
Z	

3 SEED FILES

3.0 SEED FILES

All files created by and/or for the use of the GTAA use 1 of 3 seed files, which have set parameters specific for their use. These three seed files are named:

GTA2DSD.dgn	For the creation of all 2d files (for building and site).
3DARCSD.dgn	For the creation of all Architectural 3D files.
3DSITSD.dgn	For the creation of all Mapping 3D files .

MICROSTATION/J 2D SEED FILE ATTRIBUTES (GTA2DSD.DGN)

The main parameters set are the units of resolution and global origin as follows:

MASTER UNITS:	1 METER
SUB UNITS:	1000MM
POSITIONAL UNITS:	1pu
GLOBAL ORIGIN:	0.000, 4,000,000.000
DESIGN PLANE:	4,294,967 m sq.

The design plane setting utilizing meters as the master unit results in a readout of universal transverse mercator (or "UTM") coordinates.

The colour table attached is the GTACOL.tbl (see section 6.3).

NOTE:

There is a problem opening .dgn files with MicroStation/J SE that were created in MicroStation/J with enhanced precision "turned on". For information on how to "turn off" the enhanced precision in MicroStation/J choose help → contents → click the search tab and type in "enhance precision".

3.B BUILDING SEED FILE

3D BUILDING SEED FILE ATTRIBUTES (3DARCSD.DGN)

MASTER UNITS:	1m
SUB UNITS:	1000mm
POSITIONAL UNITS:	100pu
GLOBAL ORIGIN:	590 000.000, 4,816,000.000, -21,474.836
GO=\$	-590 000.000, -4, 816,000.000, 21,474.836
DESIGN PLANE:	42,949 m sq.

The design plane setting utilizing meters as the master unit results in a readout of universal transverse mercator (or "UTM") coordinates.

The colour table attached is the HP650c.tbl (see section 5.0).

3.S SITE SEED FILE

3D MAPPING SEED FILE ATTRIBUTES (3DSITSD.DGN)

MASTER UNITS:	1m
SUB UNITS:	1000mm
POSITIONAL UNITS:	1pu
GLOBAL ORIGIN:	0.000, 4,000,000.000, -2,147,483.648
GO=\$	0.000, -4,000,000.000, 2,147,483.648
DESIGN PLANE:	4,294,967 m sq.

The METRIC design plane setting utilizing meters as the master unit results in a readout of universal transverse mercator (or "UTM") coordinates.

The colour table attached is the HP650c.tbl (see section 5.0).

4 CELL LIBRARIES

4.0 CELL LIBRARIES

All cells for use at the GTAA are located in two cell libraries. Site specific cells are located in GTASFS.cel and building specific cells are located in GTABFS.cel. All of the GTAA site cells and text in the data are symbolized at a scale of 1:1000. All linear data in the data files are captured at a scale of 1:1, i.e. runways, roads, buildings etc. This data will always be their exact real world dimensions regardless of the scale the data is plotted.

4.B BUILDING CELL LIBRARIES

BUILDING CELLS (GTABFS.cel)

The cells are based on the CSA Computer-Aided Design Drafting Buildings standards but are modified to reflect the symbology in the Building Feature Symbology Manual (BFSM). This would include the following features:

- Cursor will snap only to origin of cell.

- Entire cell will highlight when successfully snapped to.

- Cell rotates with the view.

- Cell retains symbology and level structure regardless of active settings.

4.S SITE CELL LIBRARIES

SITE CELLS (GTASFS.cel)

All GTAA site cells were built at, and are to be placed at a scale of 1: 1,000 regardless of the final output scale.

The GTAA's mapping cell library was updated ensuring that all cells and line styles were not only the proper weight, style, colour and on the correct level as per the GTAA's Site Feature Symbology Manual (SFSM), but were created as efficiently as possible. The "Select Settings" files can also be used to ensure the consistency of the attributes given to the cells.

The cells now contain the following characteristics:

Cursor will snap only to origin of cell.

Entire cell will highlight when successfully snapped to.

Cell rotates with the view.

Cell retains symbology and level structure regardless of active settings.

5 FONT LIBRARY

5.0 GTAA'S FONT LIBRARY

It is important to ensure that the fonts used on drawings are consistent with the fonts used by the TDC. The TDC uses GTA FONTS.rsc as a font resource file.

All text within data sets are a standard MicroStation/J font which can be scaled, slanted and weighted, the GTAA uses font 32. All italic text is to be font 32 with a 15% slant. True type fonts are used for presentation drawings and the format sheet only. No text that might be referenced to another drawing may be defined as a true type font.

Fonts not contained within GTA FONTS.rsc may not be used on drawings intended for use by the TDC unless approved by the TDC.

6 STANDARD DIGITAL FILES

6.0 STANDARD DIGITAL FILES

The GTAA uses standard files as a way to insure the consistency of the appearance of all drawings produced. Format sheets, seed files and resource files are used for such a purpose.

FORMAT SHEETS

mstation:b1gtafmt.dgn	Standard B1 surround	1:1000 (1061mm x 708mm)
mstation:gtaascov.dgn	Cover sheet surround	1:1000 (11678 x 17514mm)

See Chapter 8 for an explanation on these files.

GTAA'S SEED FILES

mstation:gta2dsd.dgn	2D mapping design seed file
mstation:3dsitsd.dgn	3D site design seed file
mstation:3darcsd.dgn	3D Architectural design seed file

See sections 3.0 to 3.3 for an explanation on the attributes associated with these files.

GTAA'S STANDARD RESOURCE FILES

gtafonts.rsc	Font Library	Contains all GTAA fonts (see chapter 5)
gtasfslc.rsc	Line Styles Library	Contains all GTAA custom line styles (see chapter 18)
gtafmt.tbl	Pen Table	Used with all A* and L* format sheets (see chapter 8)
gtacol.tbl	Colour Table	Used with all MicroStation/J files
gtabfs.cel	Cell Library	Contains all cells listed in the BFSM
gtasfs.cel	Cell Library	Contains all cells listed in the SFSM

7 DESIGN DATA SETS

7.0 THE USE OF REFERENCE FILES IN MICROSTATION/J

One of the main strengths of MicroStation/J is its REFERENCE FILE capability. A reference file is just a design file that is attached to and viewed simultaneously with the active file. A reference file cannot be edited, but, it's symbology can be (see Chapter 18 Drawing Symbology). Unlike some other CADD packages, this concept allows for facilities to be designed as an entire entity and shown on drawings as desired regardless of scale, content, etc.

This means that drawings do not have to be created as products where everything that is shown in the drawing is in the CAD digital file itself but rather as products where the "drawing" is produced by a number of referenced digital files.

Using reference files allows different drawings to be symbolized as per the drawings purpose, as well as, maintaining consistency with every other file that portrays the same data. The file size also becomes smaller and is easier to transport as the same data is referenced to several other drawings, instead of being copied into the drawings.

THE "DESIGN DATA SET" CONCEPT

All the drawings at the GTAA are structured using "Design Data Sets". A data set is a drawing that contains a specific topic of information for the airport that may be referenced to other files. For example all the airside paint markings are in a file called P1PLAPMA.dgn and it contains nothing but the paint markings.

When a drawing is made that shows Terminal 1 apron, the paint marking file will be reference to it, NOT COPIED INTO IT. The active file will also reference other data set such as; the planimetric data or civil aboveground data, etc. The only thing that will be active in this file will be the title and other labels used to display information that is relative to this particular drawing only. When a similar plot is needed of the Terminal 2 apron area, the same P1PLAPMA.dgn file is referenced, the only difference is that a different portion of the file is being shown.

When the paint marking file is updated, all the drawings that reference P1PLAPMA will automatically reflect the changes made, thus reducing the number of drawings that would need to be edited.

HOW THE "DESIGN" GETS TURNED INTO A "DRAWING"

Copying the project seed file (see Chapter 3) and renaming it to the file name of the drawing (see Chapter 2) creates the ACTIVE file.

In most case there are very few CAD elements in this file itself. There will only be data like the drawing number and the drawing title, the level chart, the revision chart, a north arrow, etc.

This ACTIVE file references MANY other files (Data Sets) in order to display on the screen how the drawing will look when plotted (i.e. clipbound, proper colours, weights, line styles, etc.).

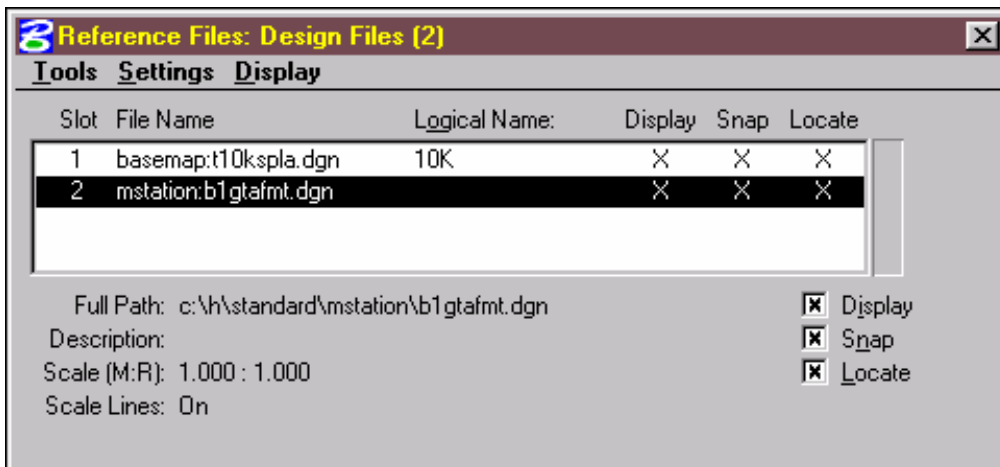
The levels in the active file and the reference files are manipulated until the image is shown on the screen to produce the desired hardcopy drawing.

When a "SAVE SETTINGS" is done, ALL settings are saved as they exist on the screen so that the next time the file is brought up in MicroStation/J everything will come up EXACTLY as they were when the file was exited

USE OF "PROJECT ID's" AND "PROJECT VARIABLES" FOR REFERENCE FILES

PROJECT ID's are just what their name implies, that is, they are an identification to a specific project and under this name is where the digital files for the project are located (see section 7.1 for all PROJECT ID's presently used by the TDC).

Project Variables are used to relate the project ID to the full path where that project is contained on the system. For example, the TDC project variable "MSTATION" will point to the directory C:\e\atd\standard\mstation\ where MSTATION is the project ID. So when the BIGTAFMT.dgn is referenced to a file, the reference dialogue box will show it as MSTATION:BIGTAFMT.dgn (see Figure 7.1.1 for an example reference dialogue box showing the project variable).



Reference Dialogue Box
Figure 7.1.1

IN ALL CASES UTILIZING THE "DESIGN DATA SET" CONCEPT WITH MICROSTATION/J'S REFERENCE FILE CAPABILITY EQUATES MORE ACCURATE AND CONSISTENT DRAWINGS TO SIGNIFICANT TIME AND COST SAVINGS!

8 TITLE BLOCK/SURROUND

8.0 TITLE BLOCK / SURROUND

The GTAA has a number of different format sheets for varying uses (see section 6.0 for a complete listing).

The standard format sheet for any drawing is the B1GTAFMT.dgn All legal, tender and construction and As-Built drawings are to use this format sheet. The "A*" and "L*" (where* represents the size) series were created for the TDC's use for presentation drawings. These format sheets may not be used without consent from the TDC.

B1GTAFMT.dgn TITLE BLOCK

The surround used by the GTAA is B1GTAFMT.DGN

It was created at a scale of 1:1000, therefore, when attaching this into a design file, the reference master scaling units should be reduced by 1000 (e.g. a drawing of 1:500 will have a reference scale of .5:1; a drawing of 1:2000 will have a reference scale of 2:1).

The levels used in B1GTAFMT.DGN reflect all disciplines and most scales used by this and other departments. The B1GTAFMT.dgn contains a level chart and revision chart on levels 60 and 61 in the upper right hand corner.

When entering title block information and the drawing number in the ACTIVE file, level 62 is set to the active level and in the "view attributes" box the enter data fields are turned on.

The appropriate data fields are copied into the current file and edited accordingly. This concept ensures standard text fonts, sizes and proper text symbology.

A block wt=1 and fill is co=120 or 138 with the sheet number cut out is placed on level 62 of the active file in the key plan to indicate the sheet layout for that particular drawing.

ATTACHING THE TITLE BLOCK USING SAVED VIEWS

Most drawings generally require the BIGTAFMT.DGN.

In order to ensure consistency of the contents of the surround file on hard copy drawings (i.e. ensuring that the proper levels are on or off), four SAVED VIEWS were created.

Depending on which department the drawing is being produced for determines which SAVED VIEW to use when attaching the file.

The three SAVED VIEWS are as follows:

- 1.ADP shows Project General Manager, Airside Development in the signature block
 shows proposed runways/taxiways in the location plan
 shows proposed runway designators in the location plan
 shows proposed dual taxiway instead of existing in the location plan

- 2.TDC shows General Manager, Facilities Engineering in the signature block
 shows existing runways/taxiways/apron in the location plan
 shows existing runway designators in the location plan

NOTE: This saved view is used mainly for the "Quick Start" Project

THE GTAASCOV.DGN COVER SHEET

The GTAASCOV.dgn cover sheet is used on contract and tender documents. This cover sheet has a key plan to locate the subject area, and displays the project name and number. It is necessary to use this on all drawing packages for tender and contract.

9 REMOVALS

9.0 HOW TO SHOW REMOVALS ON DRAWINGS

Adding proposed features to a CAD file is not generally a difficult thing to do (i.e. increasing the line weight of the proposed features). Showing removals, however, is not such an easy task.

On the LAYOUT and REMOVALS set of drawings for a project, the removals are shown by using the "/" or "X" characters.

Once these are removed (conceptually in the design), it is desirable to no longer have this data on the drawings as it is now thought to be REMOVED.

As the GTAA's digital graphic database files are referenced to show the existing conditions, it is necessary to manipulate this data to show removals.

It was decided that the data in the digital files representing the items to be removed would be CLIPPED and moved to level 62.

Once the removals are moved to their respective levels, these levels are not turned on for all the subsequent types of drawings where it is assumed that the items are removed (ie. storm, electrical, etc.).

10 TEMPORARY VS. PERMANENT FEATURES / FACILITIES

10.0 TEMPORARY VS. PERMANENT FEATURES/FACILITIES

For certain projects it is necessary to show both temporary and permanent facilities, for example roads, fences, signage, etc.

To differentiate between the two different types of facilities (temporary and permanent) a level application can be devised under the discretion of the TDC. This enables all of the similar data (i.e. roads, fences, signage, etc.) to be put in their own respective files so that producing drawings showing this information is much easier.

The reason that separate files are not used for both temporary and permanent facilities is that often the temporary facilities become permanent. It is therefore, much easier to modify the level application rather than having duplicate data in two files, both of which would have to be updated when a change occurred.

11 DETAILS, CROSS-SECTIONS, ELEVATIONS, PLAN & PROFILE DRAWINGS

11.0 DETAILS, CROSS-SECTIONS, ELEVATIONS, PLAN & PROFILE DRAWINGS

The basis behind the “Design Data Set” concept is that all levels will meet the Feature Symbology Manuals, (BSFM or SFSM) level structure as per the discipline of the file. Two concerns arise at this point:

1. The Feature Symbology Manuals do not address these detail, cross-section and plan & profile type of drawings.
2. As the data will not be referenced, it need not meet a particular level structure.

However, due to the flexibility associated with data on separate levels, it is beneficial to structure these types of files. Examples of this are as follows:

1. Use P500, P1000 and P2000 for 1:500, 1:1000 and 1:2000 plan and profile accordingly. If elevations span more than cells allow, drop it and extend to fit.
2. Fill all data entry fields:
 - Stations every 10 metres for 1:500 or every 20 metres for 1:1000 and 1:2000 scales.
 - Elevations of grid lines on both side of profile cells.
 - Elevations of existing and proposed/finished grades.
 - Title of profile or cross-section (CENTRE LINE PROFILE or STA. 8+460).
3. Existing profile is: LV=5, CO=2, LC=3, WT=0.
4. Proposed profile is: LV=6, CO=5, LC=0, WT=2.
5. For cross-sections, modify profile cell to suit.
6. Plan portions of a drawing are produced using proper map files, data sets and clip bounds.
7. Profile portions of the drawing are generally put in the active file, however, for profiles of long structures such as runways or roads, profiles may be made as one piece and be reference to the active file and clipped. In such a case, levels with grid cells should be off, and matching profile cells are to be placed in the active file, using the proper name for the profile data set.
8. Indicate existing and proposed underground and aboveground linear features such as; centre lines and/or edge of crossing runways, taxiways, etc. Draw these features to scale and label them properly using 3mm text (LV=35, WT=0, CO=0).
9. Put “Leg” cell in the legend area of the format sheet and edit if necessary.

INSETS/MATCHLINE TOP AND BOTTOM IN SAME DRAWING

The method by which these types of drawings are produced is very similar to the “plan” portion of the plan and profile drawings. The inset to be shown is created by referencing all required design data set files and applying CLIP BOUND to them. The border around the inset drawing and associated text (i.e. title, scale, etc.) go on specified levels in the ACTIVE file.

12 DATA EXCHANGE & MANAGEMENT

12.0 DATA EXCHANGE & MANAGEMENT

PROVISION OF DATA TO CONSULTANTS

The Consultant shall be provided with the following information:

1. All GTAA Resource Files.
2. The BIGTAFMT.dgn Format Sheet and the GTAASCOV.dgn cover sheet.
3. The appropriate seed file(s).
4. The necessary Data Sets
5. The pertinent Feature Symbology Manual, BFSM (for buildings) or SFSM (for Site).

SHARING DATA TO ELIMINATE DESIGN "SURPRISES"

An important aspects of a project is that of providing outside agencies with digital data associated with the preliminary design.

Throughout the project, when different facilities are being designed by different offices, it is essential that the data sets associated with these facilities are shared by all the offices involved to ensure that the facilities are designed with the other facilities in mind.

The sharing of data ensures that there will not be any “**surprises**” when all of the designs are put together on a composite plan showing the work to be done for the entire project. For example, no road designed over top of the final grade of a glide path, or a forward scatter being located in the middle of a taxiway.

It is of the utmost importance to ensure that all parties involved follow the GTAA standards. This ensures that all parties involved are producing and working with digital data structured as per the Feature Symbology Manuals, therefore, ensuring consistent file structure and level application.

DESIGNING WITH THE MOST UP-TO-DATE DATA

Sharing data also ensures that all offices involved in the design of the facilities have the most current digital data from each other.

This office acts as the central source for data sharing for the consultants and the regional office doing the design.

It is the responsibility of this office to ensure that all parties involved in the design are working with the latest data, as discussed in Section 14.0 Digital Revision Block for a discussion on the use of REVISION BLOCK.

DATA EXCHANGE

The GTAA exchanges data with outside agencies and consultants via the TDC.

The TDC uses various methods to transfer data.

CD	The TDC is able to write data to CDs. For large amounts of data, such as the GTAA's Site data or Architectural files, this will be the norm.
DISKETTE (3.5)	The information is archived and compressed using the PKZIP utility, reducing the number of diskettes required to store the files.
INTERNET	If the compressed (PKZIP) file is small enough, it is advantageous to send it by e-mail to address tdc@gtaa.com.
IOMEGA ZIP	The TDC has an Iomega Zip Drive with a 100 mb capacity. This alternative will be used when appropriate (e.g. read/write access).

NOTE: The pkunzip.exe utility is included any time files are zipped, to ensure the data can be extracted.

DOCUMENTATION OF DIGITAL DATA TRANSFER

It is very important that all data sent to or received by the TDC is properly documented. All data must be correctly labeled and be accompanied by a hard copy transmittal sheet. If the data is being sent digitally both a hard copy and digital version of the transmittal must be provided. The digital transmittal can be submitted in any word processor format (e.g. Word, Word Perfect, ASCII etc.). All digital transmittals must be named according the TDC's transmittal naming convention. This convention is used so that the TDC can refer to the transmittals and find what data has been sent out or received, the date the data was transferred, and by whom. If the data provided is not documented properly as per the directions below, the submission will be refused.

LABELS

Regardless how data is sent, whether it is via 3.5 inch floppy, CD, or any other means used by the TDC, it must be properly labeled. All labels must contain the following information;

Name of company or agency

Name and number of contact in case of problems

Department and name of the recipient of the data

Name of file(s) on the disk (in cases where there are too many files to list refer to the digital transmittal)

Name of digital transmittal file

Number of disks or packages in set

Date

TRANSMITTALS

Anytime any data whatsoever is exchanged with/provided to another agency, be it hard copy plans, plots, manuals, etc. or digital data like the T-LBPIA engineering database it is necessary to provide or receive a transmittal slip detailing the data exchanged.

This is very useful in three ways:

It makes the person preparing the package to double check the contents and ensure everything listed is provided.

It acts as a checklist for the recipient of the package.

It acts as a record of the exchange of data that can be used later for confirmation by the TDC and the consultant.

All Transmittals must contain the following information;

The Organization, Name and phone number of the person who prepared the package

Department and name of the recipient of the data

Date

Complete list of the contents of the package

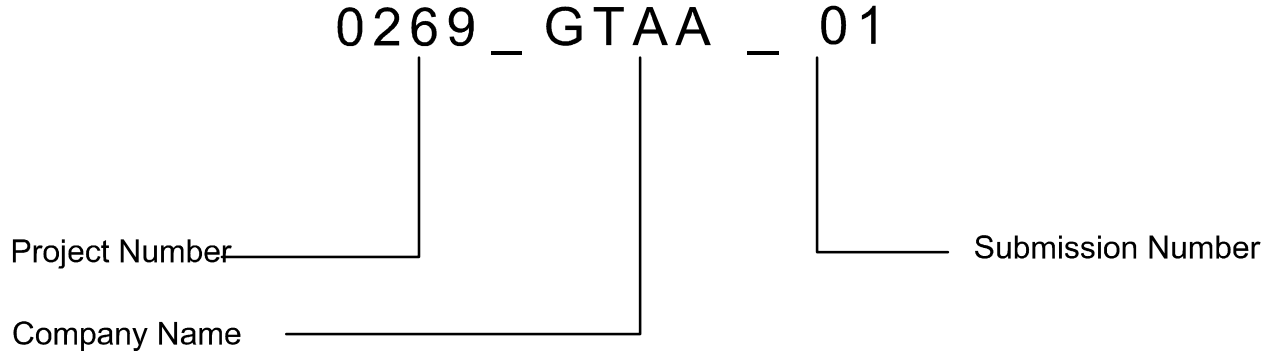
Number of disks or packages in set

If digital files are sent, a list of all files including sizes

Any instructions that are necessary to use the information provided

GTAA TRANSMITTAL NAMING CONVENTION

All Transmittals are given a unique name based on; the project the data is for, the company sending the data, and what provision/submission it is.



Please contact the TDC if there are any questions as to what the project number or company codes should be.

DATA MANAGEMENT TECHNIQUES

There are a number of data management techniques that are utilized in this office to promote the smooth flow of information and data both in and out of the TDC. For further information:

See Chapter 7 for the "Use of PROJECT ID'S for File Management"

See Chapter 18 for the "Use of Level Charts"

DIGITAL REVISION BLOCK

On hardcopy drawings there is a revision block in the drawing surround that is used to show when a drawing has been updated. This is the same idea that is used at the TDC for the digital CADD drawings. The digital drawing surround that is referenced to each drawing includes a revision block. The operator updates level 62 of the ACTIVE FILE to reflect the changes made to the drawing. When the drawing is re-plotted, these notations in the revision block are visible on the drawing.

PROCEDURE FOR SUPERSEDING HARD COPY DRAWINGS

Before the days of CAD, the process of updating a drawing and documenting any updates was quite straight forward, updates to the mylar original were done and the revision block in the title block was updated to reflect any changes.

Now that CAD technology is being used to produce hardcopy DRAWINGS, the update procedure has become more complicated.

When the original DRAWING is plotted on mylar or cronaflex in black and white there is no discrepancy, this DRAWING is signed and dated just as is if it were produced manually.

If, however, the DRAWING is plotted in colour on bond paper, the administrative issue arises. Due to the fact that it is possible to plot a DRAWING using a plotfile a limitless number of times, it is also possible to have a limitless number of ORIGINAL DRAWINGS. One thing, however, that is common between the two drawing production periods is that the “original” DRAWING must be signed.

To account for this in the CAD world, the first plot is signed and dated and all subsequent plots (although ALL copies are EXACTLY the same) receive a transparent sticky note in place of the signature stating that the original was signed by “so-and-so” on “such-and-such” a date.

Also as with the pre CAD days, the revision block is updated on the DRAWING except it is done so, digitally in the CAD files.

The “REVISION BLOCK” is updated as well to maintain a current digital record of the currency of the data.

13 AS-BUILTS DRAWINGS

13.0 AS-BUILT DRAWINGS

One of the main roles of the TDC is to maintain and manage the GTAA's Digital Graphics Database. Accurate and detailed As-Built drawings are a crucial requirement to ensure that the TDC is able to keep records up-to-date.

Every structural or facility change, however minor or major must be properly documented while meeting the TDC standards, set forth in the Data and Drawing Management Standards Manual (DDMSM).

This section is intended to explain what the TDC requires upon completion of any project, in accordance with the Construction Control Code.

Records of the GTAA's facilities are maintained in a 2D MicroStation/J .dgn format. All digital As-Built files provided to the TDC must be in a 2D .dgn MicroStation/J format that adheres to the standards set forth in the DDMSM. The TDC is not responsible for the quality control of any data provided, but will review it for acceptance.

The scope of a specific project will dictate what the TDC requires back, to accurately document the changes made. The type of work is categorized by either being **Building** or **Site** related and is divided into 2 categories; Major, or Minor work.

Major Work	Major construction or reconstruction of new or existing airport facilities. e.g. Construction of new building.
Minor Work	Minor changes to new or existing airport facilities. e.g. Wall being moved, added or removed.

NOTE: All hard copy As-Built must be to a scale that allows all data to be displayed clearly as well as stamped with the engineers signature.

13.B BUILDING RELATED PROJECTS

MAJOR WORK

The TDC will provide a copy of its DDMSM along with any required digital site data and settings file. See Chapter 6 for a listing of typical building .dgn files and resource files.

The TDC requires digital and hard copy As-Built originals of all work including;

- Site Plans

- Structural Drawings

- Mechanical Drawings

- Architectural Drawings

- Electrical Drawings

- All Sections, Elevations, Reflected Ceiling Plans and Supporting Details.

See chapter 7 “The Design Data Set” for the drawing assembly processes. All of the above requirements are to be in accordance with the outlines of the Construction Control Code.

MINOR WORK

The TDC will provide a Scaled Drawing of the area the project encompasses. The As-Built data is not required to be given back in a digital format. As-Built Data may be provided on a scaled Drawing if the following conditions are met:

- All changes and dimensions are ensured to be accurate and clearly show the area and scope of work.

- All drawings are legible.

- All measurements are provided metric.

13.S SITE RELATED PROJECTS

MAJOR PROJECTS

The TDC will provide a copy of its DDMSM along with any required digital site data and settings file. See Chapter 6 for a listing of typical building .dgn files and resource files.

The TDC requires digital and hard copy As-Built originals of all work including;

- Site Plans

- Electrical Drawings

- Civil Drawings

- Planimetric Drawings

- Supporting Details

See chapter 7 “The Design Data Set” for the drawing assembly processes. All of the above requirements are to be in accordance with the outlines of the Construction Control Code.

MINOR WORK

The TDC will provide a Scaled drawing of the area the project encompasses. The As-Built data is not required to be given back in a digital format. As-Built Data may be provided on a scaled Drawing if the following conditions are met:

- All changes and dimensions are ensured to be accurate and clearly show the area and scope of work.

- All drawings are legible.

- All measurements are provided in metric.

14 QUALITY CONTROL

14.0 QUALITY CONTROL

It is the responsibility of any organization to ensure the quality of the As-Built drawings and digital data provided at the end of a project, meet the TDC's standards as set forth in this manual.

The TDC will review all data received for accuracy adherence with these standards, but reserves the right to reject a submission.

15 DRAWING SYMBOLOGY

15.0 DRAWING SYMBOLOGY

The TDC has created two manuals (BFSM & SFSM) to be used to determine the symbology of any given feature shown on a drawing. One or both of these manuals will be provided depending on the work that is being done. All files created for the GTAA must follow the settings outlined in these manuals.

LEVEL SYMBOLOGY

When creating a drawing sometimes it is necessary to apply level symbology to a reference file in order to display features properly. This may be because the feature was symbolized differently when it was created then it is now or a number of features need to be screened to a grey. The use of level symbology allows features on drawings to be displayed as per the drawing needs, without changing any other drawing that data is referenced to and maintains consistency and accuracy between drawings.

CUSTOM LINE STYLES

The TDC has developed custom line styles to replace existing “patterned lines”. The Feature Symbology manuals have been updated to reflect the changes made. The custom lines styles are located in a resource file named gtasfslc.rsc. All new features added to any design data set must use these new line styles.

15.B BUILDING FEATURE SYMBOLOGY MANUAL (BFSM)

The BFSM is used to ensure that all features are placed on the correct level with proper attributes. The “Building Feature Symbology Manual” (BFSM) is used for the main building disciplines:

ARC	ARCHITECTURAL
FUR	FURNITURE
HVA	HVAC
HVZ	HVAC ZONES
PIP	PLUMBING
STR	STRUCTURAL
FIR	FIRE ALARM
FIZ	FIRE ALARM ZONES
SPK	FIRE SUPPRESSION
SPZ	FIRE SUPPRESSION ZONES
GPD	GENERAL POWER DISTRIBUTION
COM	COMMUNICATION
RFL	REFLECTIVE CEILING & LIGHTING
RFZ	REFLECTIVE CEILING & LIGHTING ZONES

For each feature listed in the BFSM the following information is given:

LV=	Level
CO=	Colour
LC=	Line Code
WT=	Weight
FT=	Font
TX=	Text Size

15.S SITE FEATURE SYMBOLOGY MANUAL (SFSM)

The SFSM is used to ensure that all features are placed on the correct level with proper attributes. The “Site Airport Symbolology Manual” (SFSM) is used for the main site disciplines:

PLA	PLANIMETRIC
	<i>AVS – Avitation Surfaces</i>
	<i>BLD – Building</i>
	<i>FNC – Fence</i>
	<i>PMG – Paint Markings Groundside</i>
	<i>PMA – Paint Markings Airside</i>
	<i>RDS – Roads</i>
	<i>SGN – Signs</i>
	<i>SLB – Slab Pattern</i>
DRN	DRAINAGE
	<i>HYM – Hdrography (Rivers, Creeks, Ditches, Storage Ponds, etc.)</i>
	<i>STM – Storm (Pipes, Manholes, Catch Basins)</i>
PAC	POWER & COMMUNICATION
	<i>CBL – Cables, Duct Banks, Manholes, Pullpits, etc.</i>
	<i>EQU – Equipment</i>
	<i>LGT - Lights</i>
TOP	TOPOGRAPHY
	<i>CTR – Contours</i>
	<i>SPT – Spot Heights</i>
CTB	CONTROL AND BOUNDARY
	<i>LSE – Lease Lines</i>

UTL	UTILITIES
	<i>FUL – Fuel</i>
	<i>GAS – Gas</i>
	<i>SAN – Sanitary</i>
	<i>WTR – Water & Fire Mains</i>
ENV	ENVIRONMENTAL
	<i>TST – Testing Stations</i>
GEO	GEOTECHNICAL
	<i>BOR – Borehole Locations</i>

For each feature listed in the SFSM the following information is given:

LV=	Level
CO=	Colour
LC=	Line Code
WT=	Weight
FT=	Font
TX=	Text Size

16 SUBMISSION OF SURVEY DATA

16.0 SUBMISSION OF SURVEY DATA

At the beginning of any project, the TDC will provide to the surveyor all necessary digital files in a MicroStation/J .DGN format along with a copy of the DDMSM. A plot of existing data within the area to be surveyed will also be provided by the TDC if required by the project specifications.

The TDC requires that all survey data returns are provided in both a hard copy and digital MicroStation/J .DGN format following the file breakdown and standards as set out in the DDMSM.

If the returns are to be done in a progressive manner, each subsequent submission after the first shall contain only those features not included in any previous delivery. In other words, submission number three would contain only those features that have not been previously included in either the first and/or second deliveries provided to the TDC. Each digital submission shall be accompanied by a hard copy plot of the corresponding data found within the digital files. Do not include any of the survey point file data on the hard copy plots submitted to the TDC. For a description of the survey point data .DGN file please see point vi. on the following page.

An interim report should accompany each submission made to the TDC. This report will give the current status of the project along with a listing of the unidentified features and/or feature representations that need to be resolved within that submission.

Upon completion of the project a comprehensive survey report must be submitted. This report must include all information necessary to confirm the integrity of the survey and an outline of all processes involved and used to collect the surveyed data. Any outstanding or unresolved problems, for example unopened manholes/catchbasins or features still unidentified, should also be noted in the final report, so that appropriate action can be taken by the GTAA.

If the project has been done using a series of submissions, the final report is to be accompanied with a complete set of final digital .DGN files, including a final survey point data file, and a hard copy plot showing all features contained within these digital files. Do not include any of the survey point data on the final plot. For a description of the survey point data .DGN file please see point vi on the following page. The final digital files should contain all features collected during the project and reflect any changes/updates made during the project (ie. features that were identified and/or symbology determined during the course of the project - points iv and v listed on the following page).

When collecting and submitting the survey data to the TDC, the following guidelines are to be followed:

- i. proper orientation of point features should be maintained wherever possible.
- ii. underground services should be connected wherever possible.

- iii. when required by the project, inverts should be obtained wherever possible for all storm catchbasins, manholes and sanitary manholes. When any of these features cannot be opened to obtain the inverts, the TDC representative should be notified so that further action can be taken by the GTAA.
 - iv. for any feature that cannot be identified by the field crew, enter the point into the digital file as an unidentified feature, cell ID from the GTAA GTASFS.CEL library. At the same time, the TDC representative should be notified of the point in question so that an investigation can be started by the GTAA to obtain an identification for the feature. A photograph taken by the field crew of the unidentifiable point and forwarded to the TDC will aid in the identification process. When identification has been obtained, the surveyor will be notified by the TDC representative so that the proper symbology for the point can be input into the digital file. *
 - v. if a new feature has been collected that does not match any existing feature within the DDMSM, notify the TDC representative. The representative will then determine the proper symbology and feature number to be used and forward this to the surveyor for input in the digital file. *
 - vi. accompanying each digital file submission is a *MicroStation/J Survey Point File (.DGN)*. This survey point file will contain all the survey points collected during the project including all point features and all points which were used to create line strings, for example a road edge. Each point in the file will be represented by a cross indicated the x,y location, the point collection number, a description of what that point represents and the elevation of the point.
 - vii. survey plans submitted to the TDC should be aesthetically pleasing, meaning, all text must be legible at the plotted scale with the spot elevations not appearing too dense in nature.
 - viii. digital spot elevations are to be structured so the elevations of a specified interval are on level 22 of the topographic file, with the remaining elevations placed on level 20 as set out in the DDMSM. This will allow for spot heights to be shown on any drawing without being too dense in appearance, yet still contain all collected spot elevations within the file which can be used for design, planning, etc. purposes.
 - ix. each submission file, when called up, should have the window open, all levels on and the view fitted to the screen.
- * for ease of handling, when doing a project of significant size, have at least three items for clarification before contacting the TDC. This will prevent any duplication of research in the same area.

17 SUBMISSION OF BOREHOLE DATA

SUBMISSION OF BOREHOLE DATA

DATA SUBMISSION REQUIREMENTS

All borehole locations are to be submitted geo-referenced using the standards set forth in the DDMSM. The Technical Data Centre will then use this data to update the GTAA's digital graphics database for the design and management of the facility.

DELIVERABLES:

Hard copy of the geo-technical report describing project findings and test results including borehole logs and the corresponding hard copy site plan drawings.

ASCII file with x,y and z coordinates and number of each borehole on 3.5" diskette (see chapter 1.S for coordinates and elevation information).

Note: Although it is not a requirement, it would be preferable to be given all:

Site plan drawings in a MicroStation/J.dgn formats.

Reports in MS Word or in Word Perfect as a second choice.

BOREHOLE NUMBERING CONVENTION POLICY

Each borehole must be numbered consisting of the **Project Number** and a sequential **log number**. If a borehole is not associated with a project, the number 999 will be assigned as the project number.

Note: Contractor/Consultant is not to number boreholes under any circumstances. The Technical Data Centre, Superintendent, CAD Operations will be the sole provider of these numbers.



Figure 21.1
An example borehole where GTA265 represents the project number and 001 represents the sequential number.