



Minimum Standards for Professional Documents Produced and Submitted by Engineering Consultants, Architectural Consultants and Drafting Services

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Purpose

Professional documents shall be submitted, reviewed and revised throughout the course of the Work and shall fully describe the Work and all details contained therein.

All professional documents submitted to the Purchaser shall conform to these standards to ensure consistency with the corporation's internally produced professional documents so that the submitted documents can be archived.

Preliminary professional documents issued for discussion or reviews do not need to conform to these standards.

Definitions

Authentication à The sealing of engineer or geoscientist professional documents meeting the requirements of Engineers Geoscientists Manitoba practice guideline "Authentication of Electronic and Hardcopy Documents" or sealing of architectural drawings meeting Manitoba Architectural Association act and practice guidelines

Collaboration Tool à software tool used to collaborate with other people internal and external to the corporation (i.e. – SharePoint®)

Controlled Document à any record (drawing or document) that requires the Purchaser's System Classification Index (SCI) number or sequential number to track revisions of the work

eSealed à any engineering or geoscientist professional document authenticated with a digital signature AND an electronic version of a manual seal of an Engineers Geoscientists Manitoba member as per the requirements of the Engineers Geoscientists Manitoba practice guideline "Authentication of Electronic and Hardcopy Documents".

Hardcopy à paper, Mylar, anything physical or printed out.

Hybrid AutoCAD drawings à AutoCAD drawings enhanced with digital images imported by Raster Design to create raster/vector drawings.

PDF/A à standardized version of PDF meeting PDF/A – Level B Conformance and associated ISO 19005 standards required for the preservation of archived electronic documents.

Professional Document à any record (drawing or document), written or graphic created for the purpose of transmitting information or instructions based on engineering expertise or judgement that is intended to be relied on by others. Generally, most professional documents are also controlled documents.

1.0 Professional Documents Format and Submissions

All controlled documents shall be submitted in PDF/A format along with associated source files as per requirements listed herein.

Optical Character Recognition (OCR) shall be run on all PDF files prior to conversion to PDF/A

format.

PDF/A file size shall be less than 500MB to accommodate the Purchaser's document archival system. Documents larger than 500MB shall be broken into multiple volumes using the sheet number to indicate volume number.

All PDF/A document submittals shall be verified for PDF/A compliance using ConsignO software from Notarius. Any documents that are deemed to be non-compliant may be returned to the consultant or drafting service for correction and re-submission at no extra cost to the Purchaser.

1.1 Drawings

Unless otherwise specified in the contract documents all drawings are to be computer generated in *Autodesk® AutoCAD .dwg* electronic format. They are to meet Sections 3.0, 4.0, 5.0 and 6.0 herein.

If hybrid AutoCAD drawings containing bitonal/black and white raster data are specified/required they must be produced in *Autodesk® AutoCAD .dwg* format with their *TIFF® files* embedded into the .dwg using *Autodesk® RasterDesign*.

If hybrid AutoCAD drawings containing colour raster data are specified/required they must be produced in *Autodesk® AutoCAD .dwg* format with their *TIFF® files* attached using *Autodesk® AutoCAD*. *Autodesk® RasterDesign* is not required.

The seal box of all .dwg files must be left blank. However, all other title block boxes should show signatures/initials to reflect what is shown on the associated PDF/A.

If drawings are revised after initial submission due to design changes or for record/as-built drawings appropriate revision description must be added to the title block and the revision number updated.

Subject to Purchaser's approval, when creating sets of drawings, the consultant or drafting service may either:

- a) Create a single, multi-page, PDF/A file with one eSeal, or
- b) Create separate PDF/A files, each with its own eSeal, for each drawing sheet.

A single, multi-page PDF/A file allows for the eSeal to be applied once and the set of drawings to be archived as one file. Such a set of drawings shall include:

- a) a completed cover page with the required title block information entered in uppercase lettering
- b) the cover page shall include a revision history
- c) each sheet in the set shall indicate that it is part of a larger set (e.g. sheet 1 of 5)

For supporting information see Engineers Geoscientists Manitoba practice guideline "*Authentication of Electronic and Hardcopy Documents*" and "*Appendix A – Digital Signatures*" therein.

1.2 Other Controlled Documents

All other (non-drawing) controlled documents shall be submitted in PDF/A format, along with their associated source files and a completed cover page with the required title block information entered in uppercase lettering. The cover page shall be included as the first page of the source file before it is converted to PDF/A format and must include a revision history.

If controlled documents are revised after initial submission due to design an appropriate revision description must be added to the cover page and the revision number updated.

1.3 Cover Pages

To ensure compliance with the Purchasers drawing archival system the consultant or drafting service shall use the template cover pages supplied by the Purchaser.

1.4 Document Submissions and Transmittals

All document submissions and transmittals shall be sent to the Purchaser's designated contact person for the project, via the mutually agreed-upon collaboration tool (or email), as specified in the contract documents.

2.0 Documents Requiring Professional Authentication

Engineering or geoscientist documents requiring authentication as per The Engineering and Geoscientific Professions Act of Manitoba (see <http://web2.gov.mb.ca/laws/statutes/ccsm/e120e.php>) and/or the by-laws and guidelines of Engineers Geoscientists Manitoba (EGM) shall be eSealed as per *Definitions* herein. PDF/A's must show the image of EGM member's manual seal complete with signature and date, and applicable "*Certificate of Authorization*" stamp. Their authentication must show on printed or plotted hardcopy of the document.

ALTERNATIVELY, temporary licensee's of EGM must eSeal as per *Definitions* herein. However, the document must show the image of their manual seal issued by their professional association, validated by signing the document near the seal, marked with their license number and its expiry date directly below the seal, and indicate the date upon which it was affixed. Their authentication must show on printed or plotted hardcopies of the document.

Architectural documents requiring sealing as per The Architects Act (see <https://web2.gov.mb.ca/laws/statutes/ccsm/a130e.php>) shall be sealed as required by this act, MAA bylaws and Practice Bulletins. The manually sealed hardcopy documents must be scanned into PDF format then converted to PDF/A format meeting requirements under *Definitions* herein. Their authentication must show on printed or plotted hardcopy of the document.

3.0 Purchaser Document Numbers (System Classification Index)

Controlled documents submitted shall be numbered in accordance with the Purchaser's corporate document numbering standard, otherwise known as the Manitoba Hydro System Classification Index (SCI). These documents include but are not limited to:

- a) Drawings and datasheets produced by the consultant or drafting service (excluding catalog cutsheets)
- b) Logic and block diagrams
- c) Data communication tables (i.e. I/O lists)
- d) Operations and Maintenance (O&M) Manuals
- e) Factory Acceptance Testing Procedures/Reports
- f) Specifications
- g) Commissioning Procedures/Reports
- h) Design Reports and Studies
- i) Quality Dockets
- j) Model Test Reports

These documents shall be referred to as "SCI numbered documents" or "controlled documents".

An example of a SCI document number is given in Section 4.1 [Document Numbering, File Naming and Revision Convention] herein.

4.0 Professional Document Standards

If professional documents are submitted not meeting the requirements in this document, they will be returned for re-submission at no extra cost to the Purchaser. Hardcopy documents, except when specifically requested, will not be accepted.

4.1 Document Numbering, File Naming and Revision Convention

All controlled documents submitted shall be numbered in accordance with the Purchaser's System Classification Index (SCI) to be compatible with the drawing archival system.

SCI numbers for controlled documents will be supplied by the Purchaser. However, document titles shall first be submitted as per *Section 3.2* herein to the Purchaser for approval and acceptance.

Electronic PDF/A files shall be named as per the SCI number of the document:

Document # 1-00100-DD-99999-0001 Sht. 0001 to be filed as
1-00100-DD-99999-0001 0001_PDF.pdf

Electronic .dwg type files shall be named as per the SCI number of the document:

Dwg # 1-00100-DD-99999-0001 Sht. 0001 to be filed as

1-00100-DD-99999-0001 0001.dwg for *Autodesk® AutoCAD* files

Electronic .tif type files for Hybrid Drawings shall be named as per the SCI number of the document:

Dwg # 1-00100-DD-99999-0001 Sht. 0001 to be filed as

1-00100-DD-99999-0001 0001_REF1.tif for *TIFF®* images

Note that sheet numbers shall be four (4) digits and a space shall be used between the document number and the sheet number in the filename. The first volume of a multiple sheet document shall use sheet '0001' in the filename. The second volume, if applicable, shall use sheet '0002' in the filename and so on.

4.2 Document titles

All document titles shall be approved by the Purchaser's contact, as noted in the contract documents, in writing or by e-mail prior to issuing the documents. They shall be descriptive but concise. The composition of a document title shall usually occupy three lines, but never more than four lines.

Example:

UNIT 1

13.8 kV GENERATOR CIRCUIT BREAKER

CONTROL PANEL

WIRING DIAGRAM

Line 1 ... Area of the Work

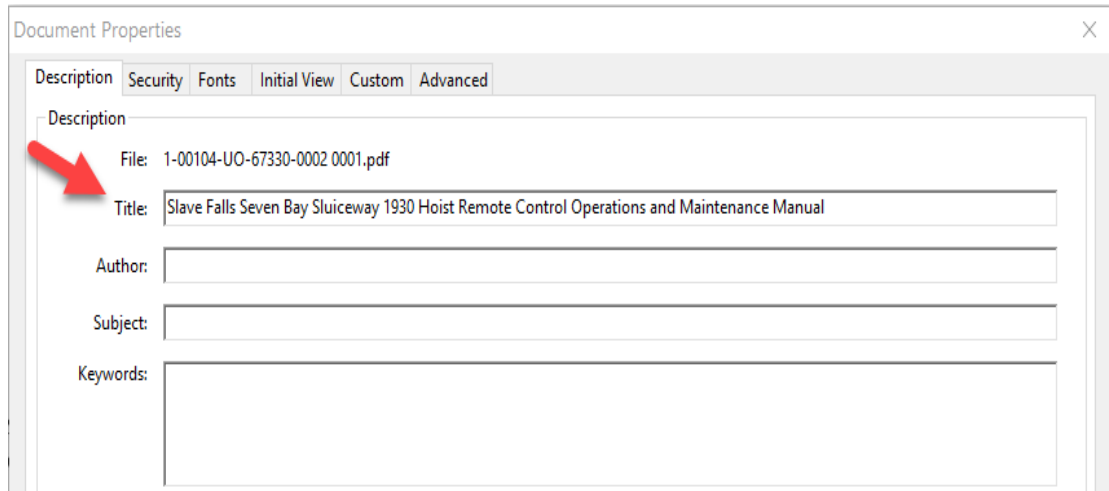
Line 2 ... Specific subject

Line 3 ... Name of equipment or system (if necessary)

Line 4 ... Type of drawing

The name of the facility must appear in the box directly above the title box.

Document title shall be added to the PDF file's title field, located under File à Properties à Description tab, **before converting to PDF/A.**



4.3 Singular Representation

All drawings shall represent only one instance of a particular system. Drawings shall not represent multiple instances of one system.

Systems identical amongst generating units shall have their own unique drawing set clearly labeled with the generating unit number(s) within the title block as per *Section 3.4 Drawing Title Block*.

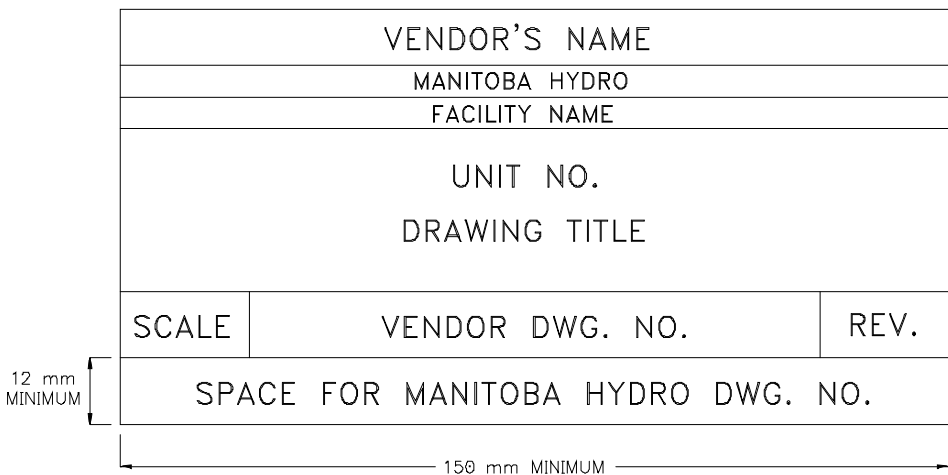
4.4 Drawing Title Block

The title block shall be located in the bottom right-hand corner or across the bottom of the drawing. All text shall be in Uppercase.

Each drawing shall have a title block with the following information presented:

- (a) Vendor's name
- (b) "MANITOBA HYDRO"
- (c) Manitoba Hydro facility name and generating unit number(s)
- (d) Drawing title
- (e) Drawing scale, otherwise indicated as "Not To Scale" or "N.T.S." where scale does not exist
- (f) Vendor's drawing number
- (g) Revision number (always two digits)
- (h) The Purchaser's SCI drawing number (sheet number can be included here or in a separate box if required)

Suggested minimum title block format:

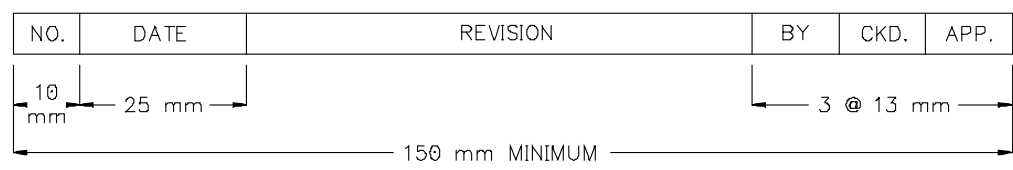


NOTE: Facility name denotes the generating station, transmission line, transmission station, etc. for which the product will be used.

4.5 Drawing Revision Block

A revision block shall be located either directly above or to the immediate left of the title block. All text shall be in Uppercase.

The format shall be as follows:



Each drawing shall have a revision block with the following information presented for each revision:

- (a) Revision number (always two digits)
- (b) Revision date
- (c) Revision statement
- (d) Initials of individual who revised the drawing
- (e) Initials of individual who checked the drawing
- (f) Initials of individual who approved the drawing

A clear space at least 50 mm in height shall be left above this block. An additional clear space at least 80 mm square shall be left near the title block to accommodate the Purchaser's review stamp.

5.0 Drafting Standards

All drafting shall conform to the National CAD Standard <http://www.nationalcadstandard.org/> unless otherwise specified by the Purchaser.

5.1 Drawing Sizes

Drawing sizes for each type of drawing produced shall be approved by the Purchaser. Drawings sizes may be chosen from the following sizes, following the ISO or ANSI standard:

- ISO A0 or ANSI E
- ISO A1 or ANSI D
- ISO A2 or ANSI C
- ISO A3 or ANSI B
- ISO A4 or ANSI A

Drawing size shall remain consistent amongst all sheets within a drawing number.

All PDF/A's shall be created at full size of the drawings (i.e. an ISO A0 size drawing shall be an ISO A0 size PDF/A) and cropped accordingly. The drawings shall be provided in either the applicable landscape or portrait orientation. The Purchaser reserves the right to reject any drawing submissions with a PDF page size that does not match the drawing size indicated by the drawing title block or SCI drawing number.

5.2 Drawing Limits

Drawing limits must be set as follows. The lower limit must be set to 0,0 and the upper limits to the plotting scale factor multiplied by the coordinates shown below for the particular drawing border size and by a metric conversion factor (25.4), if applicable.

- A (A4) - 8.3, 11.8
- B (A3) - 11.7, 16.5
- C (A2) - 23.4, 16.5
- D (A1) - 33.1, 23.4
- E (A0) - 46.8, 33.1

All information in the drawing shall be within these limits.

5.3 Scanning of Manually Drafted Drawings

When creating hybrid drawings, manually drafted drawings shall be scanned at maximum 300 DPI. They shall be saved as tiff images and numbered as per 3.1 herein.

5.4 Drawing Setup and Validation

The consultant or drafting service shall use the drawing borders and title blocks supplied by the Purchaser. An application program for setting up the drawings with the Purchaser's format will be provided. The Purchaser will provide assistance in complying with its standard setup as required.

PURCHASER'S DRAWING BORDERS AND TITLE BLOCKS MUST NOT BE MODIFIED, EXPLODED, RENAMED OR, OTHERWISE; THE PURCHASER'S DRAWING SETUP WILL NOT FUNCTION PROPERLY.

The consultant or drafting service company name, company logo, approval block, drawing number and miscellaneous information shall be inserted as separate text or blocks and should never affect the title block in any way.

To ensure compatibility with the Purchaser's drawing archival system the consultant or drafting service shall check all final electronic drawings prior to submission with the **Manitoba Hydro Title Block Validator** program supplied by the Purchaser. This program will output a file *Validation Results.log* which shall be submitted as per 1.3 herein. Drawings issued for final submission not complying with this program will be returned for the appropriate revisions.

5.5 Line Widths

The plotted line widths most commonly used shall be 0.25 mm, 0.35 mm, 0.50 mm, and 0.70 mm. The Purchaser requires that polylines, rather than plotter pen mapping, be used to obtain line weights. **Drawings that require custom CTB files will not be accepted.**

5.6 Lettering

All lettering shall be done using the ARIAL and ARIAL (using the bold font style) as distributed with AutoCAD and Inventor. Required fonts are supplied with the Manitoba Hydro Electronic Standards (MHEDS). AutoCAD .shx format files, with the exception of the aforementioned lettering fonts, shall not be used. The minimum plotted height for sheet sizes 'C' and less shall be 2.5 mm (0.10"), and for sheet sizes 'D' and greater shall be 3.0 mm (0.12").

5.7 Scale

In general, all dimensioned drawings shall be drawn to scale. However, the title block shall only show the scale as "NTS".

5.8 Hatching

To reduce the size of drawing files, AutoCAD hatching shall be used sparingly.

5.9 Time/Date Stamps

If the consultant or drafting service uses a system that inserts a time or date stamp anywhere on the drawing to record the last time that the drawing was edited or plotted, the stamp shall be removed before the final drawing is submission to the Purchaser in electronic format.

5.10 Electronic Drawing Transmittal

All electronic drawings shall be submitted to the Purchaser zoomed to extents, limits and all layers turned on. As well, all unused blocks in the drawing shall be purged.

5.11 Multiple Layouts

All electronic drawings submitted to the Purchaser shall have only one layout per *Autodesk® AutoCAD .dwg*.

5.12 Binding XRef's

All electronic drawings submitted to the Purchaser shall have any xref'ed drawing bound into the current drawing file using the **INSERT** type of the XBIND command within the *Autodesk®* drafting application.

6.0 Software

Unless otherwise requested, all electronic drawings submitted to the Purchaser shall be in *Autodesk® AutoCAD .dwg* format. All raster images shall be submitted in .tif format.

If the consultant or drafting service uses software other than AutoCAD then the drawings shall be translated to AutoCAD .dwg format prior to submission.

The consultant or drafting service shall use a version of AutoCAD software that provides 100% bi-directional compatibility with the version currently in use by the Purchaser. If, during the course of the project, the Purchaser, consultant or drafting service upgrades to a newer release of the software, the external agency shall ensure that 100% bi-directional compatibility is maintained.

Bi-directional compatible shall mean that electronic drawings shall be achievable and manipulatable, in the Purchaser's computerized drawing system without any modification by

the Purchaser.

Other formats, if specified, shall follow the standards as outlined herein.

6.1 Autodesk® Raster Design

The latest version of *Autodesk® Raster Design* as communicated by the Purchaser in use at the time of initiating the work shall be used unless otherwise specified.

6.2 Autodesk® Inventor

The latest version of *Autodesk® Inventor* as communicated by the Purchaser in use at the time of initiating the work shall be used unless otherwise specified.

The consultant or drafting service shall submit the electronic *Autodesk® Inventor* Project file (i.e. three-dimensional model) created during the design such that it may be edited by others. In addition, the consultant or drafting service shall submit individual drawings in *Autodesk® Inventor .idw* format.

6.3 GE® Smallworld GIS

The latest version of *GE® Smallworld eGIS Distribution Product* or the *GE® Smallworld eGIS Communication Product* as communicated by the Purchaser in use at the time of initiating the Work shall be used unless otherwise specified. The Work shall be performed through the Purchaser's network.

6.4 ESRI® ArcGIS

The latest version of *ESRI® ArcGIS* as communicated by the Purchaser in use at the time of initiating the Work shall be used unless otherwise specified. Work to be done through the Purchaser's network shall be performed using the Purchaser's *ESRI® ArcGIS* software

6.5 Bentley® AutoPLANT

The latest version of *Bentley® AutoPLANT* as communicated by the Purchaser in use at the time of initiating the Work shall be used unless otherwise specified.

6.6 Autodesk® AutoCAD MEP

The latest version of *Autodesk® AutoCAD MEP* as communicated by the Purchaser in use at the time of initiating the work shall be used unless otherwise specified.

The consultant or drafting service shall submit the electronic *AutoCAD MEP* Project file (i.e. three-dimensional model) created during the design such that it may be edited by others. In addition, the consultant or drafting service shall submit individual drawings in *Autodesk® AutoCAD .dwg* format.

7.0 Professional Document Standards For Specific Projects

Additional or revised professional document and drafting specifications related to specific projects or disciplines may be provided by the Purchaser as required.