Manitoba Hydro

Minimum Standards for Drawings Produced and Submitted by Fabricators, Manufacturers And Construction Companies

Purpose

All drawings submitted to Manitoba Hydro shall conform to these standards to ensure consistency with the corporation's internally produced drawings including numbering, file naming, distribution and archival system which is paperless and cannot process any hardcopies. Preliminary drawings issued for discussion or reviews do not need to conform to these standards.

Definitions

Collaboration Tool – software tool used to collaborate with other people internal and external to the corporation (ie – *SharePoint®)*

Controlled Document – any record that requires a Corporate System Classification Index (SCI) number or sequential number to track revisions of the work

Authentication – The sealing of engineer drawings meeting the requirements of Engineers Geoscientists Manitoba guideline "*Authentication of Hardcopy and Electronic Professional Documents"*

eSealed – electronically authenticated engineering drawing meeting the requirements of the Engineers Geoscientists Manitoba guideline *"Authentication of Hardcopy and Electronic Professional Documents" and clause "1.1.5 Electronic Seal"* therein

PDF/A – standardized version of PDF meeting PDF/A - 1b ISO 19005-1 Level B, required for the preservation of archived electronic document. ConsignO software from Notarius shall be used for verifying compliance.

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

Hardcopy – paper, Mylar, anything physical or printed out

1.0 Drawing Format and Submissions

If drawings are submitted not meeting this specification they will be returned for re-submission at no extra cost to Manitoba Hydro. Hardcopy drawings will not be accepted.

All drawings shall be submitted in PDF/A format meeting requirements under *Definitions* and 2.0 herein along with their associated .dwg files as specified below via email, collaboration tool or disk.

Unless otherwise specified in the tender documents all drawings are to be computer generated in *Autodesk® AutoCAD* .dwg electronic format. They are to meet 3.0 and 4.1 herein with an electronic drawing validation printout as per 4.1.4 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® file*s 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® file*s 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 an appropriate revision description must be added to the title block and the revision number updated.

All submissions must be sent to Manitoba Hydro's contact, as specified in the tender documents, complete with a drawing transmittal containing:

a) The fabricator, manufacturer or construction company Name
b) Project Name
c) Drawing, Sheet and Revision Numbers as per 3.1 herein
d) Drawing Title
e) Date of Submission
f) RFP/RFQ/SPEC Purchase Order Number

2.0 Drawings requiring Engineer Authentication

Engineering drawings requiring authentication as per Engineers Geoscientists Manitoba act http://web2.gov.mb.ca/laws/statutes/ccsm/e120e.php must be eSealed as per *Definitions* herein.PDF/A's must show the image of Engineers Geoscientists Manitoba member seal complete with signature and date, and applicable "*Certificate of Authorization"* or "*Consulting"* stamps. Their authentication must also show on printed or plotted hardcopy of the drawing.

ALTERNATIVELY, temporary licensee's of Engineers Geoscientists Manitoba must eSeal as per *Definitions* herein. However, the drawing must show the image of his or her manual seal issued by their professional association,

validated by signing the document in the vicinity of the seal, marked with his or her 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 hardcopy of the drawing.

As per Engineers Geoscientists Manitoba act, by laws and guidelines noted herein all engineering drawings must have every revision authenticated.

3.0 Drafting standards

All drafting shall conform to the *National CAD Standard* (http://www.nationalcadstandard.org/) unless otherwise specified by Manitoba Hydro.

3.1 Drawing numbering, file naming and revision convention

3.1.1 All drawings submitted must be numbered in accordance with Manitoba Hydro drawing number system (SCI) in order to be compatible with the drawing archival system.

3.1.2 Electronic PDF/A files must be named similar to the drawing number:

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

3.1.3 Electronic .dwg type files must be named similar to the drawing number:

Dwg # 1-00100-DD-99999-0001 Sht. 0001 to be filed as
1-00100-DD-99999-0001 0001.dwg for *Autodesk® AutoCAD* files

3.1.4 Electronic .tif type files for Hybrid Drawings must be named similar to the drawing number:

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

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

3.1.5 Drawing numbers will be supplied by Manitoba Hydro. However, drawing titles must first be submitted as per 1.4 herein to Manitoba Hydro's contact, as specified in the tender documents, for approval and acceptance.

3.1.6 Sheet numbers are to be 4 digits and revision numbers to be 2 digits, both to show at least a zero for each digit. The first issue of drawings ready for construction, fabrication and/or archiving shall show the revision number 00. Alpha digits are **not** acceptable unless specified by Manitoba Hydro's contact as specified in the tender documents.

3.2 Drawing titles

3.2.1 All drawing titles shall be approved by Manitoba Hydro's contact, as noted in the tender documents, in writing or by e-mail prior to issuing the drawings. They shall be descriptive but concise. The composition of a

drawing title shall usually occupy three lines, but never more than four lines.

Example:

POWERHOUSE
13.8 kV GENERATOR CIRCUIT BREAKER
CONTROL PANEL
WIRING DIAGRAM

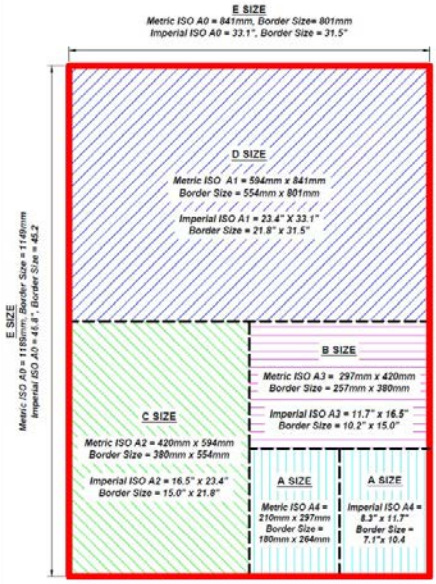
Line 1 ... Area of the Work
Line 2 ... Specific subject
Line 3 ... Name of equipment or system (if necessary)
Line 4 ... Type of drawing

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

3.3 Drawing sizes

3.3.1 Drawing sizes shall be selected from the following table:

MANITOBA HYDRO DRAWING SHEET SIZES & PLOT SETTINGS FOR NEW BORDERS



PLOT SETTINGS FOR BORDERS IN MODEL SPACE
Note: N.T.S. (1:1) Scale

METRIC DRAWINGS			IMPERIAL DRAWINGS		
Border Size	Paper Size	Plot Scale	Border Size	Paper Size	Plot Scale
A SIZE	ISO A4 - 210 x 297	1:1, 1 mm = 1 unit	A SIZE	ISO A4 - 210 x 297	1:1, 1 Inches = 1 unit
B SIZE	ISO A3 - 297 x 420	1:1, 1 mm = 1 unit	B SIZE	ISO A3 - 297 x 420	1:1, 1 Inches = 1 unit
C SIZE	ISO A2 - 420 x 594	1:1, 1 mm = 1 unit	C SIZE	ISO A2 - 420 x 594	1:1, 1 Inches = 1 unit
D SIZE	ISO A1 - 594 x 841	1:1, 1 mm = 1 unit	D SIZE	ISO A1 - 594 x 841	1:1, 1 Inches = 1 unit
E SIZE	ISO AO - 841 x 1189	1:1, 1 mm = 1 unit	E SIZE	ISO AO - 841 x 1189	1:1, 1 Inches = 1 unit

PLOT SETTINGS FOR BORDERS IN PAPER SPACE
Note: N.T.S. (1:1) Scale

METRIC DRAWINGS			IMPERIAL DRAWINGS		
Border Size	Paper Size	Plot Scale	Border Size	Paper Size	Plot Scale
A SIZE	ISO A4 - 210 x 297	1:1, 1 mm = 1 unit	A SIZE	ISO A4 - 210 x 297	1:1, 1 Inches = 1 unit Custom, 1 mm = .03937 unit
B SIZE	ISO A3 - 297 x 420	1:1, 1 mm = 1 unit	B SIZE	ISO A3 - 297 x 420	1:1, 1 Inches = 1 unit Custom, 1 mm = .03937 unit
C SIZE	ISO A2 - 420 x 594	1:1, 1 mm = 1 unit	C SIZE	ISO A2 - 420 x 594	1:1, 1 Inches = 1 unit Custom, 1 mm = .03937 unit
D SIZE	ISO A1 - 594 x 841	1:1, 1 mm = 1 unit	D SIZE	ISO A1 - 594 x 841	1:1, 1 Inches = 1 unit Custom, 1 mm = .03937 unit
E SIZE	ISO AO - 841 x 1189	1:1, 1 mm = 1 unit	E SIZE	ISO AO - 841 x 1189	1:1, 1 Inches = 1 unit Custom, 1 mm = .03937 unit

3.4 Drawing limits

3.4.1 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.

3.5 Scanning of manually drafted drawings

3.5.1 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.

3.6 Drawing borders and setup

3.6.1 The fabricator, manufacturer or construction company shall use the drawing borders and AutoLISP setup programs supplied by Manitoba Hydro. An application program for installing the drawing borders and the AutoLISP program for setting up the drawing in Manitoba Hydro format will be provided.

3.6.2 The drawing borders may not be modified in any way. The addition of the fabricator, manufacturer or construction company name, company logo and approval block should never affect the title block in any way.

3.7 Line widths

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

3.8 Lettering

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

3.9 Scale

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

3.10 Hatching

3.10.1 In order to reduce the size of drawing files, AutoCAD hatching shall be used sparingly.

3.11 Time/Date stamps

3.11.1 If the fabricator, manufacturer or construction company 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 Manitoba Hydro in electronic format.

3.12 Electronic drawing transmittal

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

3.13 Multiple layouts

3.13.1 All electronic drawings submitted to Manitoba Hydro shall have only one layout per *Autodesk® AutoCAD* .dwg.

3.14 Binding XRef's

3.14.1 All electronic drawings submitted to Manitoba Hydro 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.

4.0 Software

Unless otherwise requested, all electronic drawings submitted to Manitoba Hydro shall be in *Autodesk® AutoCAD* .dwg format. All raster images shall be submitted in .tif format. If the fabricator, manufacturer or construction company uses software other than AutoCAD then the drawings shall be translated to AutoCAD .dwg format prior to submission. The fabricator, manufacturer or construction company shall use a version of AutoCAD software that provides 100% bi-directional compatibility with the version in use at Manitoba Hydro. If, during the course of the project, Manitoba Hydro or the fabricator, manufacturer or construction company 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.

The fabricator, manufacturer or construction company shall also check the electronic drawings prior to submission with the Manitoba Hydro Title Block

Validator program supplied by Manitoba Hydro. A printout of the program's output file *Validation Results.log* shall be forwarded to Manitoba Hydro.

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

4.1 Autodesk® AutoCAD

4.1.1 The latest version of *Autodesk® AutoCAD* as communicated by Manitoba Hydro in use at the time of initiating the Work shall be used unless otherwise specified.

4.1.2 Drawing installation software setup complete with drawing borders, title block and ***Title Block Validator*** program will be supplied by Manitoba Hydro on request. A selection of standard drawing sizes and attributes are provided in this setup. Manitoba Hydro will provide assistance in complying with its standard setup as required.

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

4.1.3 The fabricator, manufacturer or construction company's name, company logo, approval block, drawing number and miscellaneous information shall be inserted as separate text or blocks.

4.1.4 All final electronic drawing files submitted for archiving must be checked by Manitoba Hydro's ***Title Block Validator*** program prior to submission to ensure compatibility with Manitoba Hydro's drawing archival system. This program will output a file *validation results.log* which must be printed and submitted as per 1.0 herein. Drawings issued for final submission not complying with this program will be returned for the appropriate revisions.

4.1.5 All drawings submitted shall be zoomed to extents in 2D plan view, limits and all layers turned on. *Autodesk® AutoCAD* .shx format files, with the exception of the lettering fonts mentioned herein, must **not** be used.

4.1.6 All lettering shall be done using fonts as provided by *Autodesk® AutoCAD* or the fonts supplied by Manitoba Hydro as part of the drawing installation software.

4.2 Autodesk® Raster Design

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

4.3 Autodesk® Inventor

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

4.3.2 The fabricator, manufacturer or construction company 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 fabricator, manufacturer or construction company shall submit individual drawings in hard copy and *Autodesk®* Inventor .idw format that are exact replicas of the sheets generated from the *Autodesk® Inventor* Project Model.

4.4 GE® Smallworld GIS

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

4.5 ESRI® ArcGIS

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

4.6 Bentley® AutoPLANT

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

4.7 Autodesk ®AutoCAD MEP

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

4.7.2 The fabricator, manufacturer or construction company 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 fabricator, manufacturer or construction company shall submit individual drawings in hard copy and *Autodesk® AutoCAD* .dwg format that are exact replicas of the sheets generated from the *Autodesk® AutoCAD MEP* Project Model.

5.0 DRAFTING STANDARDS FOR SPECIFIC PROJECTS

Additional or revised drawing and drafting specifications related to specific projects or disciplines may be provided by Manitoba Hydro as required for specific projects.