



PARTNERS FOR A CLEANER ENVIRONMENT

**MMSD CAD STANDARDS
MANUAL 2018**

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1. Introduction

This manual is a guide for consultants to use when performing drafting services for Milwaukee Metropolitan Sewerage District (MMSD). Guidelines and examples presented in this manual will help consultants produce drawings that are consistent with MMSD’s format, appearance, and standard. These standards are to be met to help facilitate review, plotting, and automation of drawings, tasks, and data extraction.

The purpose of providing CAD Standards is to standardize drawing information, appearance, structure, and content. All drawing files created within MMSD or by consultants shall conform to the standards and procedures specified by this manual.

1.1 Contacts

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1.2 Distribution

Electronic copies of the current version of these Standards and their supporting documents can be obtained as follows:

Table 1 – Accessing Standards

Users	Method
Internal MMSD users	MMSD SharePoint Site
Consultant/Designer (external) users	CD-ROM distributed at contract pre-proposal meeting. http://www.mmsd.com/GIS/cadstandards.aspx

1.3 Revisions

The CAD/Graphics Standards will be periodically reviewed and updated. Updates will be made available via above distribution methods.

Suggestions for revisions to the CAD/Graphics Standards are welcome, and should be submitted to the MMSD contact referenced in section 1.1. All suggestions received will be considered during the periodic MMSD Standards review.

2. Quality Assurance/Quality Control

MMSD utilizes project documents for long term operations and maintenance of the facility and as a starting point for future projects. As a result, MMSD expects a high level of accuracy in the documents.

At this time, MMSD utilizes 2D drawing formats for procurement of construction services until MMSD is able to better utilize Building Information Modeling (BIM) outputs. Therefore, all drawings generated using BIM software must also follow all CAD standards.

2.1 Review

All drawings shall be thoroughly checked prior to delivering them to MMSD. The drawings are typically checked to verify that all elements are drawn on proper layers and on the correct coordinate system, and that additional requirements covered in this manual are met. MMSD will perform visual and automated quality checks on submitted drawings to verify compliance with MMSD CAD standards. MMSD will reject submittals which are non-compliant with these standards, and will require corrections to be made by the Designer.

The consultant shall provide electronic drawings to MMSD at various stages in the design process.

CAD file standards review by MMSD:

1. When the first drawings are set-up that represent how all the drawings will be provided, send the drawing(s) to the CAD Coordinator. This allows MMSD to provide feedback at the start of the project.
2. At 30 percent and each subsequent submittal prior to the bid stage, submit electronic drawings to the CAD Coordinator to ensure all standards are being met.

2.2 Contract Phases

Pre-Drawing/Design

During this phase, the Project Engineer typically schedules a kickoff meeting with the consultant, S/PM's, and CAD staff. During the meeting, design requirements for the project are discussed, including specific CAD standards and file compatibility.

Pre-Bid

Drawing reviews will take place at the time of each Pre-Bid submittal. Hard copy and electronic drawings will be required to confirm MMSD standards are met. Final in-house review of drawings will be at 100 percent of contract drawing completion. Drawings shall be printed and submitted at full size (11x17). Drawing signatures will not be required at this time unless otherwise requested by the S/PM.

Bid and Construction (Camera Ready)

The bid set is the set of drawings that will be issued for advertisement. The consultant will be responsible for preparing the bid set as follows:

- The drawings shall incorporate all corrections from the review process
- The bid set will not include any revision notes or deltas when issued. Any drawings containing revision notes and deltas will not be accepted and the consultant will be required to resubmit the drawings
- All drawings shall be plotted full size (11x17), stamped, and signed.
- The drawings shall meet the CAD and printing standards in this manual

Record Drawing (As-Built)

The consultant will be responsible for developing the record drawings. MMSD expects the drawings to include all changes made during the construction process.

- MMSD will provide the consultant with redlines and any additional information as necessary to create record drawings
- New sheets may need to be added to the original set to include additional plans or details. These sheets will be added to the end of the record drawing set repeating the same discipline order as the original drawings.
- "A" sheets may only be added if they are an expansion of an existing sheet. For example, an additional detail that would not fit on sheet 22 (258D002) may be added on an additional page as 22A (258D002A).
- All drawings shall be plotted full size (11x17) and submitted for review

A submittal of drawings is required at this time. CAD files shall reflect the record drawing condition. See submittal instructions for required deliverables.

3. Submittal Instructions

3.1 Delivery Formats

MMSD attempts to minimize printing of documents to the greatest extent possible.

During the preliminary phases, it is acceptable to transfer contract CAD and PDF files via CD/DVD or FTP. However, consultants will be required to coordinate the printing and distribution of documents at the Bid and Construction and Record phase. All drawing files delivered to MMSD shall be produced in accordance with the MMSD CAD Standards version provided to the consultant by MMSD during the bidding process. Files shall be delivered in the formats indicated in the following table:

Table 2 – Delivery Formats

Type	Format	Details
Drawings	Electronic – CAD	Bentley MicroStation V8i SS1 design files (.dgn) AutoCAD 2016 and AutoCAD Civil 3D 2016 (.dwg)
	Hardcopy	Full-size (11"x17") printouts on white paper Oversize (22"x34") printouts on white paper
Rasters	.TIF	Black & White Images TIF Format Group 4 Uncompressed Stripped 300 dpi (minimum) 1,4,8,24 bits/pixel (1 bit/pixel is preferred)
		Grayscale Images (*.tif) TIF Format Group 4 Uncompressed Stripped 300 dpi (minimum) 8,24 bits/pixel (8 bits/pixel is preferred)
	.JPG	Digital photographs
	.PDF	Electronic PDF package

3.2 Submittal Media

3.2.1 Electronic File Deliverable

The Consultant shall deliver all electronic files to MMSD on CD-R or DVD-R media, labeled as follows:

- CD/DVD slim-line jewel case, no label required.
- CD/DVD disc label should include:
 1. Contract number
 2. Contract name
 3. Plan date
 4. Plan status
 5. MMSD logo
 6. MMSD name and address
 7. "Design prepared by:" text
 8. Designer logo/identification

3.3 Directory Structure

Note: Directory Location assumes CD drive is "D" drive

Figure 2 – CD-R File Directory Structure

DVD RW Drive (D:) C02045C01 (CD name shall be contract number)

- Contract Status (e.g., Preliminary, Bid and Construction, Record)
 - CAD
 - DWG, DGN, RVT files
 - REF (Sub-Folder)
 - All referenced images/drawings
 - Vector/Raster Images (Folder name shall be same as file extension)
 - Individual PDF/TIFF files
 - Combined PDF - Bid/Record Contract Drawings
 - Electronic Document Submittal Form

3.3.1 Printout Deliverables

- 22"x34" 20# Brite White paper
- 11"x17" 20# Brite White paper

3.3.2 Review Print Deliverables

- 11"x17" Standard 20# paper

4. CAD Requirements

CAD Requirements apply to all MMSD projects.

4.1 Software – CAD

MMSD uses the following CAD & GIS software:

- AutoCAD
- AutoCAD Civil 3D
- Autodesk Revit
- Autodesk Navisworks
- Autodesk InfraWorks
- MicroStation V8i
- ESRI ArcGIS

Please note:

Actual software version used by MMSD may change. Verify version currently in use by MMSD.

4.2 CAD Configuration

Designer shall use the custom MMSD MicroStation Workspace to ensure all standards are met. When the Workspace is properly installed on your computers or server you will be asked upon opening MicroStation using the MMSD Workspace shortcut to use the MMSD project and user name. A base Map and a seed file is provided for the use on new projects to ensure proper coordinates, layers, text styles and plot styles are used among other MMSD standards. Designer shall only provide original MicroStation and/or AutoCAD files – files converted from another CAD software are not allowed.

4.2.1 Layer Structure

The MMSD standard layer scheme shall be adhered to for all CAD drawing files. MMSD layers are based on the CAD Layer Guidelines included in the National CAD Standards (NCS). Basing the guidelines on the NCS promotes easier drawing exchange and standardization of drafting tools amongst designers.

In the event the Designer wants to modify the MMSD standard layer scheme, they must obtain MMSD approval. New layer names should be modeled using the MMSD layer scheme based on NCS.

All layer names must follow the below format:

X(X)-XXXX-XXXX-XXXX-X

X(X) = Discipline Designation

XXXX = Major Group

XXXX = Minor Group

XXXX = Minor Group

X = User Defined, Optional

If layer groups already exist in the MMSD standards, these must be used in hierarchical order to create the layer, starting with the discipline designation. “X” denotes an optional character to further define the discipline. Layers using additional characters are:

- N – Process Instrumentation
- MN – Mechanical Instrumentation

4.2.2 Element Configuration

To maintain consistency in the appearance of drawings the following configuration settings shall be used on all drawings:

Table 3 – CAD test and color Configuration Requirements

Attribute	General Requirements			
Text	All capitalized and sized for full size drawings			
Font Styles	Font Name	Where Used	Height	Color Name/Number
	Arial	Drawing Text	1/16"	Yellow - 2
		Drawing Titles	1/8"	Yellow - 2
		Drawing Sub-Titles	1/16"	Green - 3
Arial	Cover Sheet	varies	White - 7	
Colors	AutoCAD default color table (acadcolor.tbl)			
Line Weights	Line Weight Name	Where Used	Color Name/Number	
	Grayscale	Existing Facilities	Gray - 252 (118,118,118)	
	Monochrome	New/Proposed Facilities	Yellow - 2	
Line Styles/Types	Default MicroStation/AutoCAD line styles			

4.2.3 Plotting Requirements

The Designer shall use MMSD standard sheet sizes for plotting:

- Oversized - 22"x34"
- Full-size - 11"x17"

The Designer shall use the custom MMSD Printer Driver Configuration files for plotting:

- MMSD-FULL-SCALE.pltcfg – Oversized sheets
- MMSD-HALF-SCALE.pltcfg – Full size sheets

The Designer shall use the custom MMSD CTB pen tables for plotting:

- MMSD-PEN TABLE-FULL.CTB – Oversized Sheets
- MMSD-PEN TABLE-HALF.CTB – Full size sheets

The MMSD CTB file is configured for fifteen colors. The MMSD-PEN TABLE.CTB file assigns lineweights to each color so they print with the desired thickness. The table below shows standard colors and weights associated with the MMSD standards. These colors should be the only colors used on plans.

Table 4 – Standard Plot Lineweights

Plot Style	COLOR	OVERSIZED THICKNESS (in)	FULL SIZE THICKNESS (in)
GRAYSCALE	8 - GRAY	0.040"	0.020"
	9 - GRAY	0.062"	0.031"
	250 - GRAY	0.009"	0.006"
	251 - GRAY	0.009"	0.006"
	252 - GRAY	0.009"	0.006"
	253 - GRAY	0.020"	0.010"
	254 - GRAY	0.030"	0.015"
MONOCHROMATIC	255 - GRAY	0.009"	0.006"
	1 - RED	0.009"	0.006"
	2 - YELLOW	0.015"	0.009"
	3 - GREEN	0.020"	0.010"
	4 - CYAN	0.039"	0.020"
	5 - BLUE	0.028"	0.015"
	6 - MAGENTA	0.062"	0.030"
	7 - WHITE	0.009"	0.006"

The following general requirements also apply:

- Use of NON-MMSD pen tables is not allowed.
- MMSD requires ACADCOLOR.TBL color table for all design files.
- MMSD shall be able to print without making any reference or layer corrections.
- Printouts should exactly match plans submitted by the Designer.
- Use the MMSD plot border contained in the border template files received at the beginning of the project as the plotting fence area.
- Line work will remain in color and shall no longer be overridden as white and gray

The Designer is responsible for non-conforming drawings and will reconfigure where necessary when copied to CD-R for submittal.

4.2.4 Spatial Reference / Units

4.2.4.1 Horizontal Control

All contracts awarded 2017 and earlier shall reference CAD files to Horizontal Datum – North American Datum of 1927 (NAD27) Wisconsin South coordinate system, and units shall be set to US Survey Feet with a resolution of 60,000 per Survey Foot.

All contracts awarded 2018 and later shall reference CAD files to Horizontal Datum – North American Datum of 1983 (NAD83) Wisconsin South coordinate system, and units shall be set to US Survey Feet with a resolution of 60,000 per Survey Foot.

To convert coordinates from the Jones Island plant coordinate system to State Plane NAD27, use the spreadsheet “Jones Island Conversion Formula.xls” available on MMSD.com (see below). To convert coordinates from the South Shore plant coordinate system to State Plane NAD27, use the spreadsheet “South Shore Conversion Formula.xls” available on MMSD.com (see below).

- **Jones Island Conversion Formula**
<http://v3.mmsd.com/assetsclient/documents/procurement/Cad/Jones%20Island%20Conversion%20Formula.xls>
- **South Shore Conversion Formula**
http://v3.mmsd.com/AssetsClient/Documents/Conversion%20Formula_South_Shore.xlsx

4.2.4.2 Vertical Control

All CAD files shall be referenced to National Geodetic Vertical Datum of 1929 (NGVD29). To convert MMSD Datum to NGVD29, add 580.60 ft.

Please note: Elevations on pre-PMO drawings are 0.26' higher than the present MMSD Datum. Original drawings should contain an ink stamp indicating the datum change.

4.2.4.3 Drawing Elevations

All piping above grade shall be called out with centerline elevations, and piping below grade will be called out with invert elevations (e.g., “INVT EL 586.20” or “CL EL 586.20”). All elevations shall be shown to the nearest hundredth.

4.2.4.4 Elevation Symbol

In plan view, the abbreviation “EL” shall not be used when the elevation symbol is used. In section view, the abbreviation “EL” shall be used; e.g., “EL 590.10”.

4.2.5 File Configuration for Delivery

- Deliverable CAD files shall be saved at full extents.
- Designer shall compress all CAD files prior to delivery.
- The drawing background should be set to black.
- Deliverable CAD files shall be saved with all used layers turned ON for printing as appropriate using the Layer Manager (all empty layers should be off).

4.3 Graphic Standards

Table 5 – Project Appearance Requirements

Attribute	General Requirements	
Drawing Orientation	Drawing Type	Orientation of North
	Site Plan	Drawing oriented with north arrow pointing up, left, or right
	Plan and Profile	Left to Right
Stationing	Drawing Type	Orientation of Stationing
	Site Plan	Left to Right
	Plan and Profile	Increases from left to right travelling down stream
Schedules		
Legends	Each discipline has a legend drawing that will be provided by MMSD which shows symbols and styles to be used on construction drawings. These are located in the “Symbols” subdirectory of the Standards directory.	

4.3.1 Notes

When creating notes in the drawing, the title of the notes (i.e., PROJECT NOTE) shall use the MMSD standard text style Arial, be left justified, have a text height of .0938", and underlined. The remaining text shall be left justified, have a text height of 0.625.

MMSD uses several different types of notes as seen below:

- Project Note
 - Used to add contract information relating to multiple drawings in the project. Typical placement is upper right corner of plans. Identify notes numerically and list first if used.

- General Note
 - Used to add contract specific notes to a drawing or multiple drawings within a discipline. Typical placement is upper right corner of plans. Identify notes numerically and list after Project note, if used.

- Drawing Note
 - Used to add information relating to other drawings, reference drawings, or contracts pertinent to the drawings where shown. Typical placement is upper right corner of plans. Identify notes with Alpha characters.

- Plan Note
 - Same as an object note but shown as a list of notes where drawing space is limited. Plan notes are numbered sequentially using a diamond symbol with plan note number inside. Use leader line connected to diamond to locate object of the note. Typical placement is upper right corner of plans. Identify notes numerically.

- Object Note (i.e., Callout)
 - Refers to an individual object on the same drawing located with a leader line to the object. Appears anywhere on the drawing. Not numbered

Note: See MMSD template borders for more info

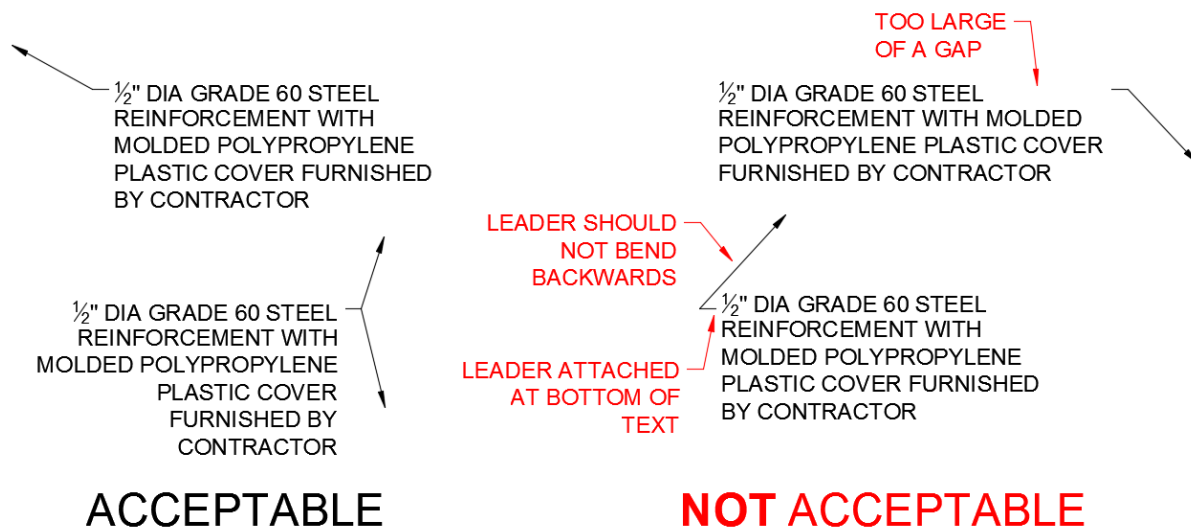
4.3.2 Dimensioning

MMSD standard dimension styles shall be used for all dimensioning. Standard MMSD dimension styles can be found in the template drawing, as well as border files. Any dimensions created using lines and hatched/filled arrows will not be accepted. Dimensions and callouts should not conflict with each other. In certain situations, this may be unavoidable - which will be determined by the CAD Coordinator during the review process.

4.3.3 Drawing Callouts

MMSD requires the use of multileaders in CAD. A standard MMSD multileader style can be found in the template drawing, as well as border files. Leaders from callouts are typically placed at the middle of top line of text. If it is not practical to place the leader at said position, then it is acceptable to place the leader in the most convenient place available, while maintaining MMSD standards:

- Text height = 0.0625"
- Justification = Top Left, top right if top left not practical
- Z W Arrowhead size = 0.0625"
- Landing distance = 0.0625"
- Landing gap = 0.0300"
- Leader extension = NO



4.4 Standard Symbols

The Designer will use the symbols as depicted in the discipline-specific CAD files. The MMSD General CAD files provided for the cover sheet, border, index and general legend sheets will contain the specific symbols, layout, text styles and line styles required.

The Designer shall conform to the symbology depicted on the legend sheets. If the Designer needs to use a symbol that MMSD does not have included in the legend sheets, they must submit a request to the MMSD Project Manager that includes the proposed symbol which the Designer intends to use. MMSD Project Manager may approve the proposed symbol, or provide an alternate.

North Arrow and Bar Scale

MMSD has a standard block for the north arrow and bar scale. These blocks will be used for all projects requiring a north arrow and or scale. Bar scale should be placed under the north arrow when used together. If the bar scale is used independently it should be placed as close as possible to the detail title. See table 5 for more standards.

4.5 Plant-Specific Requirements

4.5.1 Facility Key Plans

Facility Key Plans are required on all plan drawings where the floor plan is divided into multiple segments. The Designer shall only use the pre-determined MMSD Matchline grid for segmented building plans and is not allowed to sub-divide the facility floor plans into custom views without prior approval by the MMSD Project Manager.

Facility Key Plans shall be a simple vector building outline without much detail and located in the lower right corner of the drawing sheet. The building outline is to be shown as Color 7. Key Matchlines are to match building floor plan segments (and shown as Color 7). Grayscale hatching shall be used to identify the Facility Key Plan area shown on the drawing.

4.5.2 Site Key Maps

Site Key Maps are required for all site plans using the site grid, and must show adjacent grid / numbers as related to the master Site Key Grid. *(use same drafting/graphics principals as Facility Key Grid above)*

5. Directory and File Naming Requirements

The Designer may utilize his/her own directory structure while working on the CAD files, but must submit the data as required for review by MMSD that conforms to these standards.

5.1 Drawing Set Organization

5.1.1 Plant Projects

5.1.1.1 Discipline and order of drawings

Drawings will be organized by facility and then by respective disciplines and hierarchy as stated in Table 7. Not all disciplines or discipline drawings will be necessary for each Contract.

General sheets

MMSD will provide templates containing all general sheets necessary for the contract. A list of said general sheets can be found in Table 6 below. With approval from MMSD S/PM some general sheets may be left out of the contract plan set. With approval from S/PM and CAD Coordinator general sheets may be combined.

- Cover Sheet:
 - Cover sheet is provided and shall be updated to reflect contract information
- Drawing Index:
 - The index will consist of four columns
 - MMSD File Number
 - Sheet Number
 - Drawing Number
 - Drawing Title
 - The index can be placed on the cover sheet for contracts containing 15 or less sheets
- Legend Sheets:
 - Legend sheets provided by MMSD shall be used
- Design Data:
 - Asset tables provided by MMSD shall be placed on general borders and added to plan sets as necessary

Table 6 – Discipline Hierarchy

Discipline Hierarchy	Discipline Designation	Discipline Drawings
General Sheet	G	<ul style="list-style-type: none"> ▪ Cover/Title Sheet ▪ Index to Drawings and approvals ▪ Area Project Vicinity Maps ▪ Project Plant Site Map ▪ Legends ▪ Survey Control (followed by Project Drawing Sheets)
Design Data	K	<ul style="list-style-type: none"> ▪ Design Data
Instrumentation and Control	N	<ul style="list-style-type: none"> ▪ Schedules
	N99Z	<ul style="list-style-type: none"> ▪ P&ID Unit Process (Master P&ID's only)
	NN	<ul style="list-style-type: none"> ▪ Digital Network
Site	CJ	<ul style="list-style-type: none"> ▪ Site Demolition or Removal
	C	<ul style="list-style-type: none"> ▪ Site Development
	C_base	<ul style="list-style-type: none"> ▪ Site Base (e.g., 201<u>CU</u>base18r00.dgn)
	CB	<ul style="list-style-type: none"> ▪ Site Subsurface / GeoTech
	CE	<ul style="list-style-type: none"> ▪ Site Electrical
	CF	<ul style="list-style-type: none"> ▪ Site Fencing
	CG	<ul style="list-style-type: none"> ▪ Site Grading or Paving
	CH	<ul style="list-style-type: none"> ▪ Site HVAC
		<ul style="list-style-type: none"> ▪
	CL	<ul style="list-style-type: none"> ▪ Site Landscaping
	CR	<ul style="list-style-type: none"> ▪ Site Railroad
	CRE	<ul style="list-style-type: none"> ▪ Site Real Estate
	CS	<ul style="list-style-type: none"> ▪ Site Structural
	CT	<ul style="list-style-type: none"> ▪ Site Signage / Traffic Control
CU	<ul style="list-style-type: none"> ▪ Site Yard Piping 	
Siphons	Q	<ul style="list-style-type: none"> ▪ Siphons
Architectural	AJ	<ul style="list-style-type: none"> ▪ Architectural Demolition/Removal
	A	<ul style="list-style-type: none"> ▪ Floor/Roof Plan ▪ Exterior Elevations ▪ Interior Elevations ▪ Sections ▪ Schedules ▪ Discipline Details
Structural	SJ	<ul style="list-style-type: none"> ▪ Structural Demolition/Removal

Discipline Hierarchy	Discipline Designation	Discipline Drawings
	S	<ul style="list-style-type: none"> ▪ Foundation/Piling Plan ▪ Floor/Roof Framing Plan ▪ Sections ▪ Schedules ▪ Discipline Details
Mechanical	MJ	<ul style="list-style-type: none"> ▪ Mechanical Demolition/Removal
	M	<ul style="list-style-type: none"> ▪ Floor Plan ▪ Sections ▪ Schedules ▪ Discipline Details
	MFP	<ul style="list-style-type: none"> ▪ Mechanical Fire Protection
Building Services	PJ	<ul style="list-style-type: none"> ▪ Building Services Demolition/Removal
	P	<ul style="list-style-type: none"> ▪ Piping Plan ▪ Plumbing Plan ▪ Riser/Waste Diagrams ▪ Sections ▪ Schedules ▪ Discipline Details
HVAC	HJ	<ul style="list-style-type: none"> ▪ HVAC Demolition/Removal
	H	<ul style="list-style-type: none"> ▪ Plan ▪ Sections ▪ Schedules ▪ Discipline Details
Electrical	EJ	<ul style="list-style-type: none"> ▪ Electrical Demolition/Removal
	E	<ul style="list-style-type: none"> ▪ Electrical
	EFP	<ul style="list-style-type: none"> ▪ Electrical Fire Protection
	ED	<ul style="list-style-type: none"> ▪ Electrical Diagrams
	EP	<ul style="list-style-type: none"> ▪ Electrical Process Power
	EPN	<ul style="list-style-type: none"> ▪ Electrical Process Instrumentation
	EF	<ul style="list-style-type: none"> ▪ Electrical Facility Power
	EL	<ul style="list-style-type: none"> ▪ Electrical Facility Lighting
	ET	<ul style="list-style-type: none"> ▪ Electrical Closed Circuit Television
	EV	<ul style="list-style-type: none"> ▪ Electrical Voice Communication System
Schedules	Z	<ul style="list-style-type: none"> ▪ Schedules
Project Details	D	<ul style="list-style-type: none"> ▪ Project Details
Facility Base	F_base	<ul style="list-style-type: none"> ▪ E.g., 203Abase01r00.dgn (<i>similar to Site Base</i>)
Reference Drawing	RD	<ul style="list-style-type: none"> ▪ Reference Drawing (filenames only)

5.1.2 Conveyance and Watercourse Projects

Plan and Profile	PP	▪ Plan and Profile by Stationing
Real Estate (Watercourse, Conveyance)	RE	▪ Real Estate Acquisition Plats
		▪

5.2 Design Drawing Identification

5.2.1 Design Drawing Numbers

The drawing number is assigned by the Designer, except for the I&C drawing numbers which are pre-assigned by MMSD. The drawing number does not contain leading zeros, contract number, file extensions and should include dashes to separate field codes.

Example Drawing Number:

294-S-1 (include dashes)

294 = Facility Identification

S = Discipline Code

1 = Drawing Identifier # (sequential)

5.2.2 Contract Sheet Number (sequential)

The Designer will assign sequential Contract Sheet Numbers to design drawings. Sheet Numbers establish the order of the drawings and will also be shown on the Index to Drawings.

Format: Sheet # 1-9999 (line 2 of the MMSD Title Block)

5.2.3 MMSD Filenames

Each sheet in the plan set will have a CAD file titled with the MMSD Filename, consisting of the MMSD File Number plus .dgn (MicroStation) or .dwg (AutoCAD) file extension.

MMSD will assign the File Numbers for Conveyance and Watercourse contracts during the Design Drawing Review.

MMSD utilizes 200 numbers for Jones Island WRF facilities and 300 numbers for South Shore WRF facilities. MMSD File Numbers for plant contracts shall follow below standards.

Example MMSD File Number for general sheets: 201G001.dgn / 201G001.dwg

201 = Jones Island

301 = South Shore

G = General Sheet Discipline Code

001 = 3-character Drawing Identifier #

.dgn = MicroStation File Extension (lower case)

.dwg = AutoCAD File Extension (lower case)

.rvt = Revit

Example Plant MMSD File Number: 294S001.dgn / 294S001.dwg

294	=	Facility Identification
S	=	Plant Discipline Code Structural
001	=	3-character Drawing Identifier #
.dgn	=	MicroStation File Extension (lower case)
.dwg	=	AutoCAD File Extension (lower case)
.rvt	=	Revit

5.2.4 Master Base Files

5.2.4.1 Vector Base

CAD vector base files produced by the Designer as MicroStation or AutoCAD reference attached files to deliverable drawings shall be titled using the following scheme:

Example Master Base Filename:**258Mbase25.dgn / 258Mbase25.dwg**

258	=	Drawing Group or Facility Identification
M	=	Plant Discipline Code Mechanical
base	=	Master Base File Name
25	=	Drawing Identifier # (e.g., Facility Plan floor elevation)
.dgn	=	MicroStation File Extension (lower case)
.dwg	=	AutoCAD File Extension (lower case)
.rvt	=	Revit (lower case)

5.2.4.2 Raster Base

All CAD raster base files produced by the Designer shall be titled using the source MMSD Filename + "base". For example, the raster file used for background on drawing 258M083baser01.dgn should be titled "258M083baser01.tif".

5.3 Drawing Revision Process

Any drawing revisions made to the drawings after being issued For Bidding and Construction, shall be indicated with a revision number inside a triangle. Also, the Revision section of the Title Block shall include the corresponding revision number with the revision date, description, and the Designer's initials.

5.4 Border/Title Block

Title Blocks

MMSD standard title blocks ensures consistency and aids in drawing storage and retrieval. All drawings submitted to MMSD for review must have the title blocks completed using the following guidelines.

5.4.1 Drawing - Title Format

5.4.1.1 Title Block format (4 lines) - General Discipline Drawings

- Line 1: Plant Location
- Line 2: Project Name (Must match index and specification book covers)
- Line 3: Blank
- Line 4: Drawing Discipline (refer to section 3.2)
- Line 5: Plan Title

5.4.1.2 Title Block format (5 lines) - I&C Discipline Drawings

- Line 1: Plant Location
- Line 2: Project Name (Must match index and specification book covers)
- Line 3: I&C Discipline
- Line 4: Unit Process Name (use MMSD Master Unit Process List)
- Line 5: Unit Sub-Process Name (match Sub-Process name from MMSD Master Unit Process List)

5.4.1.3 Title Block format (5 lines) - Facility Drawings

- Line 1: Plant Location
- Line 2: Project Name (Must match index and specification book covers)
- Line 3: Facility Identification (i.e., FACILITY 291: POWER HOUSE FACILITY)
- Line 4: Drawing Discipline (refer to section 3.2)
- Line 5: Plan Title

5.4.2 Drawing – Design By / Approved By Format

Names in the title blocks shall use the first initial followed by the last name; for example, J.DOE. The checked by and approved by names shall be added after the “Essentially Complete” submittal, and should be left blank on the Preliminary Design submittal documents.

Image Requirements

5.5 Scanned Drawings Used as Base

If a Designer needs to use a historical drawing as a base, the following sections provide guidelines for the rasterization of such drawings.

5.5.1 Format and Resolution

Hardcopy drawings needing to be scanned shall be rasterized into Tagged Image File format (.TIF) format with the following properties:

- Black & white images:
 - Resolution – 300 DPI
 - Bit-depth – 1 bit/pixel
- Grayscale images:
 - Resolution – 300 DPI
 - Bit-depth - 8 bits/pixel

5.5.2 File Naming

Raster images of scanned drawings should be named according to the rules described in Section 3.3.2.

5.6 Images of Deliverable CAD Drawings

The Designer shall create PDF or TIFF images of each CAD drawing using the following specifications:

5.6.1 Format and Resolution

Deliverable drawings shall be printed to PDF or TIFF image format with the following properties:

- Black & white images:
 - Resolution – 300 DPI
 - Bit-depth – 1 bit/pixel
- Grayscale images:
 - Resolution – 300 DPI
 - Bit-depth - 8 bits/pixel

5.6.2 File Naming

Each PDF/TIFF created from a CAD drawing shall use the assigned MMSD File Number as the PDF/TIFF file name.

5.7 Metadata

To facilitate loading raster images into MMSD's document management system OnBase, the Electronic Document Submittal Form (EDSF) containing raster image filenames and associated attributes (keywords) applicable to each file shall be populated by the Designer. The EDSF will be provided by MMSD, and should reference keywords found in the keyword dictionary provided by MMSD.

6. Glossary

The following table provides an explanation for technical terms referenced in this document:

Table 8 – Glossary

Term	Description
Base File	Existing MMSD drawings included as base data
Drawing status	Deliverable stage in Contract lifespan. The typical stages include: Preliminary Design Review Essentially Complete Camera-Ready for Bidding and Construction Record Drawing
Filename	Digital CAD file name; derived from MMSD file number and file extension
File Number	Unique number assigned by MMSD for each drawing
Over-sized	22"x34"
Full-size	11"x17"
MMSD	Milwaukee Metropolitan Sewerage District
Plan	
Print	Photocopy reproduction of a drawing
Printout	Hardcopy output of a digital drawing file to a laser printer or ink jet plotter on 20# white paper
Reference Drawing	Drawings attached as reference to contract drawings by the Contractor to be included at the end of the contract document set. Includes CIT and TIF Raster files.
Resource File	MicroStation files used for appearance, not content (i.e. libraries)