COMPUTER AIDED DESIGN GUIDELINES

AND

DRAWING SUBMITTALS

Revised 09/12

COMPUTER AIDED DESIGN GUIDELINES
AND
DRAWING SUBMITTALS

TABLE OF CONTENTS

Computer Aided Design Guidelines and Drawing Submittals

1. General Information

1.1 It is the intent of these Guidelines to establish the minimum standards that must be met in the submission of Computer Aided Design (CAD) files and the Record Drawings for all Division of Facilities Management, Design and Construction (FMDC) and projects. These Standards are to provide uniform methods of archiving and sharing CAD data between the various Owner/State Agencies, as well as Architects and Engineers.

These Guidelines will be reviewed and updated at regular intervals.

1.2 All the following Standards are mandatory, unless noted as "preferred". Preferred Standards are not required to be met, but should be adhered to whenever possible.

1.3 FMDC wishes to comply with the National CAD Standards where feasible. With this in mind, the Division has created drawing file templates for our projects including a Cover Sheet and Sheet Layout. These templates incorporate the layering required by the Division. The use of these templates is mandatory. The Cover Sheet layout may be modified by the Consultant as long as all of the information included on the Cover Sheet template is included on the Consultant's Cover Sheet. The Sheet Layout template may not be modified other than by the Consultant adding your firm name, logo, etc. And those of your sub consultants, in the space provided.

A. Cover Sheet Template
   1) G-001-AE Cover Sheet.dwg

B. Sheet Layout Template
   1) AutoCAD Sheet Layout.dwt

1.4 Contact the Project Manager, FMDC for any clarification regarding these Submittal Requirements.

2. CAD and Record Drawing Definitions

2.1 CAD Deliverables – An electronic representation of drawings required at the initial Design Review Submittal, Construction Document Submittal, Bid Documents Submittal, and Record Drawings in compliance with CAD Guidelines and Drawing Submittals contained in the packet.

2.2 Record Drawings – Every project drawing shall depict all construction features including changes made during the construction process and all buried and concealed utilities accurately located, as required by the State of Missouri Standard General Conditions. All Contract Changes and Designer modifications shall be incorporated in the Record Drawings. These sheets shall be plotted in black and gray tones only and on minimum 24lb Bond.

3. Transmission of Files <u>to</u> the Division of Facilities Management, Design and Construction

3.1 The Design Architect/Engineer shall transmit the CAD Deliverables of the initial Design Review Submittal to the attention of the Project Manager, FMDC. The

Project Manager will forward the CAD Deliverables to the Division's CAD Manager for review of format compliance with the State of Missouri, FMDC CAD Deliverables Guidelines. All CDs must have the Project, Site, and Facility Numbers clearly labeled on them along with the phase the drawings represent.

3.2 Initial Design Review Submittal:
The Division's CAD Manager will notify the Project Manager, FMDC that the CAD Deliverables of the initial Design Review Submittal have or have not been reviewed for format that complies with the CAD Deliverables Guidelines.

3.3 Construction Documents Submittal:
The Drawings will be reviewed again during the Construction Documents phase. The Division's CAD Manager will notify the Project Manager, FMDC that the CAD Deliverables have or have not been approved for format complying with the State of Missouri, FMDC CAD Deliverables Guidelines.

3.4 Bid Documents Submittal:
At this time, the Drawings should now meet the minimum standard requirements of the State of Missouri, FMDC.

3.5 The Design Architect/Engineer shall transmit the following documents to the Construction Representative, FMDC for review prior to the Designer's final payment.

A. Three (3) sets of Record Drawings on minimum 24lb Bond meeting requirements defined in Paragraph 2.2.

B. CAD Deliverables of the Record Drawings in a format previously approved by the CAD Manager, FMDC to include one set of DWG (.dwg) files and one set of PDF (.pdf) files for archiving.

3.6 The Construction Representative shall complete the **Final Payment for Design Consultant Report** form certifying the Design Consultant has transmitted all the documents outlined in 3.5 above.

4. Transmission of Files <u>from</u> the Division of Facilities Management, Design and Construction

4.1 The Project Manager, FMDC will provide any electronic TIF (.tif) file drawings and CAD Deliverables for the project to the A/E at the Pre-Proposal Meeting.

4.2 The A/E shall complete the Drawing File Request form (see attached) when requesting any additional drawings of the project site and facility.

5. CAD Submittal Requirements

5.1 FMDC CAD Systems:

A. Operating System – Windows XP/7

B. Autodesk Architectural 2013

5.2 CAD File Format

A. All files will be submitted in either AutoCAD 2009, or newer, ".dwg" format which is the standard drawing file format. (They must comply with the State of Missouri, FMDC CAD Guidelines.)

B. Any Consultants not using AutoCAD 2009, or a newer version, may produce their work from any desired CAD program. However, before providing Final Bid Submittal and Record Drawings, Consultant must translate, or have translated, their CAD files into AutoCAD 2009, or newer, (.dwg) files. Consultant shall indicate on Professional Services Proposal the fee included in Basic Services for providing theses translations.

C. All data in submitted CAD files for new projects shall be in a Vector format. Raster format data shall be permitted only for existing facilities and location maps, either as stand-alone files or as an underlay for remodeling projects within existing facilities.

5.3 File Naming Conventions

A. FMDC file naming conventions were adapted from the AIA naming convention guidelines. Since the AIA conventions cover a limited number of naming conventions for engineering disciplines, the following naming conventions are adaptable when the need arises. However, the basic format and principle of the AIA naming conventions must be maintained.

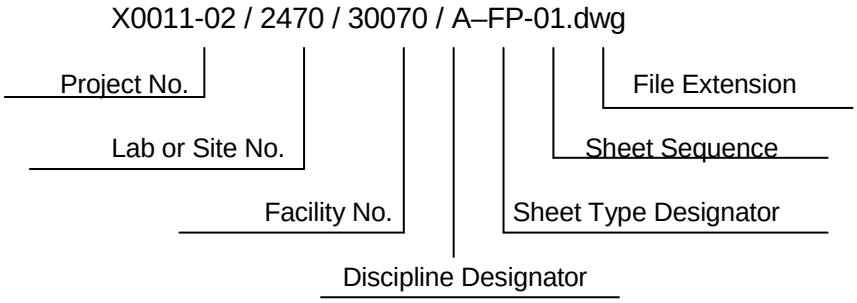
1. Project Working Drawings – Electronic drawings created specifically for a project by the A/E.

2. Base Drawings – Electronic drawings that represent the current conditions of a building or site (model) provided to the A/E by FMDC. All drawings must be field verified for accuracy by the A/E.

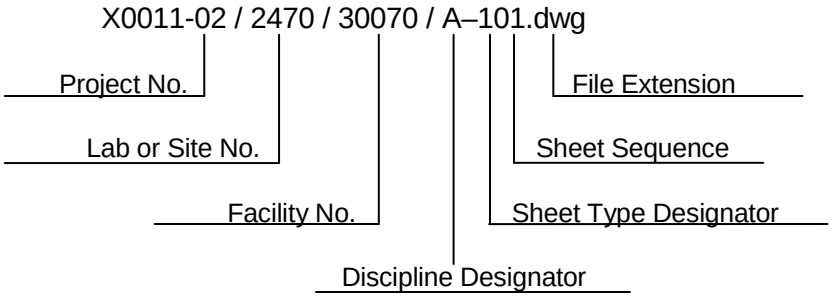
B. All Submitted Files shall conform to the following FMDC file naming convention (based on the CSI Uniform Drawing System ©1997).

FILE NAMING CONVENTIONS

BASE DRAWING FILE: (model)
(Contains the base model drawing only)



DESTINATION DRAWING FILE: (working)
(Contains external references of the model from base drawing file)



Discipline Designator Codes

A	Architectural
C	Civil
E	Electrical
F	Fire Protection
G	General
H	Hazardous Materials
I	Interiors
L	Landscape
M	Mechanical
P	Plumbing
Q	Equipment
R	Resources
S	Structural
T	Telecommunications
X	Other Disciplines
Z	Contractor/Shop Drawings

Model File Types

FP	Floor Plan
SP	Site Plan
RP	Roof Plan
RC	Reflected Ceiling Plan
DP	Demolition Plan
QP	Equipment Plan
XP	Existing Plan
EL	Elevations
SC	Sections
DT	Details
SH	Schedules
DG	Diagrams
3D	Isometrics/#D

Sheet Type Designators

0	General (symbols, legend, maps, notes, etc.)
1	Plans
2	Elevations (vertical views)
3	Sections (sectional views)
4	Large Scale Views (enlarged plans or elevations, wall or stair sections, etc.)
5	Details
6	Schedules and Diagrams
7	Reflected Ceiling Plans
8	User Defined (for types which do not fall in other categories)
9	3D Representations (isometrics, perspectives)

Definitions

Model – is an electronic representation of a building and its features. Elements graphically representing the building or site should always be created at their "real-world" size in their "real-world" units. A model file contains a full or partial full-scale digital model of the building or site. These models may be 2D or 3D, but they must be accurate, complete, and in compliance in regard to layer usage and symbology.

External Reference (x-ref) – is a link from another drawing (model) to the current drawing (destination/working). Unlike a block, the x-ref is automatically updated when the original (model) drawing changes. An x-ref is displayed in the current drawing as a single object and it cannot be exploded. An x-ref ensures that the most recent changes made to the base (model) drawing are reflected on each (working) drawing that the x-ref is attached to.

C. To separate projects, all submitted files will be delivered with directory structure that maintains any external reference links that were created. Directory or folder names shall be composed of project number\site and facility number\project drawing.dwg.

Example:

Project Drawing: X0011-02\2470-30070\A-FP-01.dwg (base dwg)
X0011-02\2470-30070\A-101.dwg (working dwg)

5.4 CAD File Content and Accuracy

A. Accuracy: Accepted professional standards shall be maintained in the production of all CAD Contract Documents.

B. Unused Entities: Before being submitted to FMDC, all CAD files shall be purged of all unused blocks (including nested blocks), symbols, layers, and styles.

C. Floor numbers begin with the lowest level (including basement) listed as 01. The next floor would be listed as 02, 03, 04 respectively.

D. Document Plot Information

1. All CAD files shall be saved in a "ready-to-plot" view, whether in Model Space, Paper Space (layout view) (preferred), or, if using non-Autodesk software, the equivalent. If external reference files are used, the directory structure must be maintained to ensure that x-ref file links are not broken.

2. To eliminate the need for FMDC to maintain multiple lineweight files, the A/E must use the following lineweight schedule:

1 – Red – .008" Width
2 – Yellow – .006" Width
3 – Green – .004" Width
4 – Cyan – .002" Width
5 – Blue – .010" Width
6 – Magenta – .016" Width
7 – Black/White – .012" Width
8 – Gray – .020" Width

CAD files must either use these settings or avoid using color numbers 1–8. Instead, utilize the AutoCAD feature of attaching lineweight to specific layers or graphics. Refer to plot style file State of Missouri.ctb, included with the "Designer's Information Packet" CD for lineweight settings.

E. Layering Naming Conventions

1. All CAD files shall be submitted using a layer naming scheme which complies to FMDC's Layering Convention (with exceptions for names not yet created). FMDC follows AIA CAD Layering Guidelines.

FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION LAYERING CONVENTION

Common Modifiers to all Disciplines

Layer Name	Layer Description
*-TEXT	Text
*-SYMB	Symbols
*-LEGN	Legends & Schedules
*-DIMS	Dimensions
*-NOTE	General notes
*-NPLT	Construction lines, non-plotting information
*-KEYN	Keynotes
*-SECT	Section cut
*-SECT-IDEN	Section identification numbers
*-DETL-IDEN	Detail identification numbers
*-SHBD-TTLB	Project Title block
*-CODE	Code compliance
*-****-EQPM	Miscellaneous equipment
*-****-PATT	Cross-hatching
*-****-IDEN	Identification tags
*-****-ELEV	Elevation (vertical surfaces in 3D)
*-****-NEWW	New work
*-****-EXST	Existing to remain
*-****-DEMO	Demolition
*-****-FUTR	Future work
*-****-TEMP	Temporary work
*-****-MOVE	Items to be moved
*-****-RELO	Relocated items
*-****-NICN	Not in contract
*-****-PHS1-9	Phase numbers (1-9)

NOTE: The modifiers listed above may follow more group descriptions than the asterisk placeholders show here.

Annotation

Layer Name	Layer Description
A-ANNO	General annotation
A-ANNO-BRNG	Bearing and distance labels
A-ANNO-DIMS	Dimensions
A-ANNO-IDEN	Identification tags
A-ANNO-KEYN	Keynotes
A-ANNO-LABL	Labels
A-ANNO-LEGN	Legends, symbol keys
A-ANNO-MARK	Markers, break marks, nodes
A-ANNO-MATC	Match lines
A-ANNO-NOTE	User notes
A-ANNO-NPLT	Non-plotting information
A-ANNO-RDME	Non-plotting read only
A-ANNO-REFR	Reference, external references
A-ANNO-REVC	Revision clouds
A-ANNO-SCHD	Schedules
A-ANNO-SYMB	Reference symbols (plan marks, elevation targets, etc.)
A-ANNO-TEXT	Text
A-ANNO-TABL	Date table
A-ANNO-TTLB	Borders and title blocks

Architecture

Layer Name	Layer Description
A-AREA	Area Calculation
A-CASE	Casework
A-CASE-BASE	Base casework
A-CASE-MOVE	Moveable casework
A-CASE-OVHD	Overhead casework
A-CLNG	Ceiling
A-CLNG-ACCS	Ceiling access
A-CLNG-OPEN	Ceiling and Roof Penetrations
A-CLNG-TEES	Main Tees
A-CLNG-SUSP	Suspended Elements
A-CLNG-GRID	Ceiling Grid
A-COLS	Architectural columns
A-CONV	Conveying systems
A-DOOR	Doors
A-DOOR-FULL	Full Height (to Ceiling) Door Swing and Leaf
A-DOOR-PRHT	Partial Height Door Swing
A-DOOR-IDEN	Door Number, Hardware Group, etc.
A-DOOR-ELEV	Doors (3D View)
A-DOOR-FLDG	Folding doors
A-DOOR-FRAM	Door framing
A-ELEV-EXT	Exterior Elevations
A-ELEV-INT	Interior Elevations
A-ELEV-OTLN	Building Outlines
A-ELEV-FNSH	Finishes, Woodwork and Trim
A-ELEV-CASE	Wall-Mounted Casework
A-ELEV-FIXT	Miscellaneous Fixtures
A-ELEV-SIGN	Signage
A-EQPM	Equipment
A-EQPM-ACCS	Equipment Access
A-EQPM-FIXD	Fixed Equipment
A-EQPM-MOVE	Moveable Equipment
A-EQPM-NICN	Equipment: Not in contract
A-EQPM-OVHD	Overhead Equipment
A-FLOR	Floor
A-FLOR-APPL	Appliances
A-FLOR-CASE	Casework (Manufactured Cabinets)
A-FLOR-EVTR	Elevator cars and equipment
A-FLOR-FIXT	Miscellaneous fixtures
A-FLOR-HRAL	Stair and Balcony Handrails and Guard Rails
A-FLOR-LEVL	Level Changes, Ramps
A-FLOR-OTLN	Floor or Building Outline
A-FLOR-OVHD	Overhead Skylights and Overhangs (usually a dashed line)
A-FLOR-RAIS	Raised Floors
A-FLOR-RISR	Stair Risers
A-FLOR-SIGN	Signage
A-FLOR-SPCL	Architectural Specialties (Toilet Room Accessories, Display Cases)
A-FLOR-STRS	Stair Treads, Escalators and Ladders
A-FLOR-TPTN	Toilet Partitions
A-FLOR-WDWK	Architectural Woodwork
A-FURN	Furnishings
A-FURN-FILE	Furnishings: File Cabinets
A-FURN-FIXD	Fixed in place furnishings
A-FURN-FREE	Freestanding furnishings

A-FURN-PLNT	Plant furnishings
A-FURN-PNLS	System panels
A-FURN-SEAT	Seating
A-FURN-STOR	System storage components
A-FURN-WKSF	System work surface components
A-GLAZ	Glazing
A-GLAZ-FULL	Full-height Glazing
A-GLAZ-PRHT	Partial-height Glazing
A-GLAZ-SILL	Window sills
A-HVAC	HVAC components
A-HVAC-SDFF	Supply diffusers
A-HVAC-RDFF	Return diffusers
A-LITE	Lighting fixtures
A-RCLG	Reflected Ceiling Plan
A-ROOF	Roof
A-ROOF-HRAL	Roof handrails
A-ROOF-LEVL	Level changes
A-ROOF-OTLN	Roof outline
A-ROOF-RISR	Stair risers
A-ROOF-STRS	Stair treads, landing, ladders
A-SEAL	Sealant
A-WALL	Walls
A-WALL-CAVI	Cavity walls
A-WALL-CNTR	Centerlines
A-WALL-FIRE	Fire walls
A-WALL-FULL	Full-height walls
A-WALL-HEAD	Door and window headers
A-WALL-JAMB	Door and window jambs
A-WALL-MOVE	Moveable partitions
A-WALL-PRHT	Partial-height walls
A-WALL-PATT	Texture or hatch patterns for wall components
A-FOTO	Photographs & identification

Civil

Layer Name	Layer Description
C-AFLD	Airfields
C-AFLD-ASPH	Airfields: Asphalt surfaces
C-AFLD-CNTR	Centerlines
C-AFLD-CONC	Airfields: Concrete surfaces
C-AFLD-FLNE	Airfields: Fire lane
C-AFLD-FLNE-MRKG	Airfields: Fire lane: pavement markings
C-AFLD-GRVL	Airfields: gravel surfaces
C-AFLD-STAN	Airfields: Stationing
C-BLDG	Buildings and primary structures
C-BLDG-DECK	Outdoor decks (attached, no roof overhead)
C-BLDG-OTLN	Building outlines
C-BLDG-OVHD	Overhangs and overhead structures
C-BLDG-PRCH	Porches (attached, no roof overhead)
C-BLIN	Baselines
C-BLIN-STAN	Baseline: Stationing
C-BORE	Test borings
C-BRDG	Bridge
C-BRDG-FALT	Bridge: deck fault / break line
C-BRDG-CNTJ	Bridge: construction joint
C-BRDG-CNTR	Bridge: centerline

C-BRDG-DECK	Bridge: decking
C-BRDG-EXPJ	Bridge: expansion joint
C-BRDG-HIDD	Bridge: objects hidden from view
C-BRDG-OBJT	Bridge: objects
C-BRDG-OBJT-PRIM	Bridge: objects: primary
C-BRDG-OBJT-SECD	Bridge: objects: secondary
C-BRDG-RBAR	Bridge: reinforcing bar
C-CATV	Cable TV
C-CATV-OVHD	Cable TV: overhead lines
C-CATV-POLE	Cable TV: box / pole
C-CATV-UNDR	Cable TV: underground lines
C-CEME	Cemetery
C-CHAN	Navigable Channels
C-CHAN-DACL	Navigable channels: de-authorized channel limits, anchorage
C-CHAN-CNTR	Navigable channels: channel centerline and survey report lines
C-CHAN-NAID	Navigable channels: navigation aids
C-CHAN-DOCK	Navigable channels: decks, docks, floats, piers
C-CHAN-BWTR	Navigable channels: breakwater
C-COMM	Communications
C-COMM-OVHD	Communications: overhead lines
C-COMM-POLE	Communications: box / pole
C-COM-UNDR	Communications: underground lines
C-CTRL	Control points
C-CTRL-BMRK	Control points: benchmarks
C-CTRL-FLYS	Control points: fly station
C-CTRL-GRID	Control points: grid lines
C-CTRL-HCPT	Control points: horizontal
C-CTRL-HVPT	Control points: horizontal / vertical
C-CTRL-PNPT	Control points: panel points
C-CTRL-TRAV	Control points: traverse
C-CTRL-VCPT	Control points: vertical
C-DFLD	Drain fields
C-DFLD-OTLN	Drain fields: outline
C-DFLD-PROF	Drain fields: profile
C-DRIV	Driveways
C-DRIV-ASPH	Driveways: asphalt surface
C-DRIV-CNTR	Driveways: centerline
C-DRIV-CONC	Driveways: concrete surface
C-DRIV-CURB	Driveways: curb
C-DRIV-CURB-FACE	Driveways: curb: face
C-DRIV-CURB-BACK	Driveways: curb: back
C-DRIV-FLNE	Driveways: fire lane
C-DRIV-FLNE-MRKG	Driveways: fire lane: pavement markings
C-DRIV-GRVL	Driveways: gravel surface
C-DRIV-UPVD	Driveways: unpaved surface
C-DTCH	Ditches or washes
C-DTCH-BOTD	Ditches or washes: bottom
C-DTCH-CNTR	Ditches or washes: centerline
C-DTCH-EWAT	Ditches or washes: edge of water
C-DTCH-TOPD	Ditches or washes: top
C-EROS	Erosion and sediment control
C-EROS-CIPR	Erosion: culvert inlet projection
C-EROS-CNTE	Erosion: construction entrance
C-EROS-DDIV	Erosion: drainage divides
C-EROS-INPR	Erosion: inlet protection
C-EROS-SILT	Erosion: silt fence

C-EROS-SSLT	Erosion: super silt fence
C-ESMT	Easements
C-ESMT-ACCS	Easements: pedestrian access
C-ESMT-CATV	Easements: utility – cable television
C-ESMT-CONS	Easements: conservation
C-ESMT-CSTG	Easements: construction / grading
C-ESMT-ELEC	Easement: utility – electrical
C-ESMT-FDPL	Easement: flood plan
C-ESMT-INEG	Easement: ingress / egress (vehicles)
C-ESMT-LSCP	Easement: landscape
C-ESMT-NGAS	Easement: utility – natural gas lines
C-ESMT-PHON	Easement: utility – telephone lines
C-ESMT-ROAD	Easement: roadway
C-ESMT-ROAD-PERM	Easement: roadway: permanent
C-ESMT-ROAD-TEMP	Easement: roadway: temporary
C-ESMT-RWAY	Easement: right-of-way (public access)
C-ESMT-SGHT	Easement: sight distance
C-ESMT-SSWR	Easement: utility – sanitary sewer
C-ESMT-STRM	Easement: storm sewer
C-ESMT-TRAL	Easement: trail or path (public access)
C-ESMT-UTIL	Easement: utilities
C-ESMT-WATR	Easement: utility – water supply
C-FENC	Fences
C-FENC-GRAL	Fences: guard rail
C-FENC-POST	Fences: posts
C-FENC-STEL	Fences: steel (barbed wire or chain link)
C-FENC-WOOD	Fences: wood
C-FIRE	Fire protection system
C-FIRE-HYDR	Fire protection system: hydrants and connections
C-FIRE-PIPE	Fire protection system: piping
C-FIRE-UNDR	Fire protection system: underground piping
C-FLHA	Flood hazard area
C-FLHA-025Y	Flood hazard area: 25 year mark
C-FLHA-050Y	Flood hazard area: 50 year mark
C-FLHA-100Y	Flood hazard area: 100 year mark
C-FLHA-200Y	Flood hazard area: 200 year mark
C-FUEL	Fuel gas
C-FUEL-DQPM	Fuel gas: equipment
C-FUEL-INST	Fuel gas: instrumentation (meters, valves, etc.)
C-FUEL-MHOL	Fuel gas: manhole
C-FUEL-PIPE	Fuel gas: piping
C-FUEL-TANK	Fuel gas: storage tanks
C-FUEL-UNDR	Fuel gas: underground piping
C-LOCN	Limits of construction – boundaries
C-NGAS	Natural gas
C-NGAS-EQPM	Natural gas: equipment
C-NGAS-INST	Natural gas: instrumentation (meters, valves9 etc.)
C-NGAS-MHOL	Natural gas: manhole
C-NGAS-PIPE	Natural gas: piping
C-NGAS-TANK	Natural gas: storage tanks
C-NGAS-UNDR	Natural gas: underground piping
C-PERC	Perc testing
C-PERC-HOLE	Perc testing: test hole
C-PRKG	Parking lots
C-PRKG-ASPH	Parking lots: asphalt surface
C-PRKG-CARS	Parking lots: cars and vehicles

C-PRKG-CONC	Parking lots: concrete surfaces
C-PRKG-CURB	Parking lots: curbs
C-PRKG-CURB-FACE	Parking lots: curb: face
C-PRKG-CURB-BACK	Parking lots: curb: back
C-PRKG-DRAN	Parking lots: drainage slope indicators
C-PRKG-FIXT	Parking lots: fixtures (wheel stops, meters, etc.)
C-PRKG-FLNE	Parking lots: fire lane
C-PRKG-MRKG	Parking lots: pavement markings
C-PRKG-UPVD	Parking lots: unpaved surfaces
C-POND	Ponds
C-POND-EDGE	Ponds: edge
C-POND-SWAY	Ponds: spillway
C-POND-TOPB	Ponds: top of banks
C-POWR	Power
C-POWR-FENC	Power: enclosure fence
C-POWR-INST	Power: instrumentation (meters, transformers, etc.)
C-POWR-MHOL	Power: manhole
C-POWR-OVHED	Power: overhead lines
C-POWR-OLE	Power: box / pole
C-POWR-STRC	Power: structures
C-POWR-UNDR	Power: underground lines
C-PROP	Property
C-PROP-LINE	Property: lines, survey, benchmarks, property corners
C-PROP-SBCK	Property: setback lines
C-PVMT	Pavement
C-PVMT-ASPH	Pavement: asphalt surface
C-PVMT-CONC	Pavement: concrete surface
C-PVMT-GRVL	Pavement: gravel surface
C-RAIL	Railroad
C-RAIL-CNTR	Railroad: centerline
C-RAIL-EQPM	Railroad: equipment (gates, signals, etc.)
C-RAIL-TRAK	Railroad: track
C-RIVR	River
C-RIVR-BOTM	River: bottom
C-RIVR-CNTR	River: centerline
C-RIVR-EDGE	River: edge
C-RIVR-TOPB	River: top of banks
C-ROAD	Roadways
C-ROAD-ASPH	Roadways: asphalt surface
C-ROAD-CNTR	Roadways: centerline
C-ROAD-CURB	Roadways: curb
C-ROAD-CURB-FACE	Roadways: curb: face
C-ROAD-CURB-BACK	Roadways: curb: back
C-ROAD-FLINE	Roadways: fire lane
C-ROAD-GRVL	Roadways: gravel surface
C-ROAD-MRKG	Roadways: pavement markings
C-ROAD-PROF	Roadways: profile
C-ROAD-SHLD	Roadways: shoulders
C-ROAD-STAN	Roadways: stationing
C-ROAD-UPVD	Roadways: unpaved surface
C-RRAP	Riprap
C-SGHT	Sight distance
C-SGHT-PROF	Sight distance: profile
C-SIGN	Signage
C-SOIL	Soils
C-SSWR	Sanitary Sewer

C-SSWR-DIAG	Sanitary Sewer: plan diagram
C-SSWR-FORC	Sanitary Sewer: force main
C-SSWR-LATL	Sanitary Sewer: level line
C-SSWR-MHOL	Sanitary Sewer: manhole
C-SSWR-PIPE	Sanitary Sewer: piping
C-SSWR-PIPE-RCON	Sanitary Sewer: piping: reinforced concrete
C-SSWR-PIPE-STEL	Sanitary Sewer: piping: steel
C-SSWR-PROF	Sanitary Sewer: profile
C-SSWR-STAN	Sanitary Sewer: stationing
C-SSWR-STRC	Sanitary Sewer: structures
C-SSWR-UNDR	Sanitary Sewer: underground piping
C-STEM	Steam
C-STEM-INST	Steam: instrumentation (meters, valves, etc.)
C-STEM-MHOL	Steam: manhole
C-STEM-PIPE	Steam: piping
C-STEM-STRC	Steam: structure
C-STEM-UNDR	Steam: underground piping
C-STRM	Storm Sewer
C-STRM-CNTR	Storm Sewer: centerline
C-STRM-DIAG	Storm Sewer: plan diagram
C-STRM-HWAL	Storm Sewer: headwall
C-STRM-MHOL	Storm Sewer: manhole
C-STRM-PIPE	Storm Sewer: piping
C-STRM-PUPE-RCON	Storm Sewer: piping: reinforced concrete
C-STRM-PUPE-CMTL	Storm Sewer: piping: corrugated metal
C-STRM-PROF	Storm Sewer: profile
C-STRM-STAN	Storm Sewer: stationing
C-STRM-STRC	Storm Sewer: structures
C-STRM-UNDR	Storm Sewer: underground piping
C-SWLK	Sidewalk
C-SWLK-ASPH	Sidewalk: asphalt surface
C-SWLK-CONC	Sidewalk: concrete surface
C-TINN	Triangulated irregular network
C-TINNPBNDY	Triangulated irregular network: boundary
C-TINN-FALT	Triangulated irregular network: fault / break lines
C-TINN-VIEW	Triangulated irregular network: triangulation
C-TINN-VOID	Triangulated irregular network: void regions
C-TOPO	Topography
C-TOPO-BORE	Topography: test borings
C-TOPO-DEPR	Topography: depression contours
C-TOPO-MAJR	Topography: major contours
C-TOPO-MINR	Topography: minor contours
C-TOPO-SPOT	Topography: spot elevations
C-TOPO-TPIT	Topography: test pits
C-TRAL	Trails or paths
C-TRAL-ASPH	Trails or paths: asphalt surface
C-TRAL-CONC	Trails or paths: concrete surface
C-TRAL-GRVL	Trails or paths: gravel surface
C-TRAL-MRKG	Trails or paths: pavement markings
C-TRAL-UPVD	Trails or paths: unpaved surface
C-WALL	Walls
C-WALL-SHEA	Walls: structural bearing or shear walls
C-WALL-CTLJ	Walls: control joints
C-WALL-NSBR	Walls: noise barrier
C-WALL-RTWL	Walls: retaining wall
C-WATR	Water Supply

C-WATR-DIAG	Water Supply: plan diagram
C-WATR-INST	Water Supply: instrumentation (meters, valves, etc.)
C-WATR-PIPE	Water Supply: piping
C-WATR-PROF	Water Supply: profile
C-WATR-STAN	Water Supply: stationing
C-WATR-STRC	Water Supply: structures
C-WATR-UNDR	Water Supply: underground piping
C-WATR-WELL	Water Supply: well
C-WETL	Wetlands

Electrical

Layer Name	Layer Description
E-1LIN	One line diagrams
E-RISR	Riser diagrams
E-ALRM	Alarm systems
E-AUXL	Auxiliary systems
E-BELL	Bell system
E-CCTV	Closed-circuit TV
E-CLOK	Clock system
E-COMM	Telephone, communication outlets
E-CTRL	Control systems
E-CTRL-DEVC	Control systems: devices
E-CTRL-WIRE	Control system: wiring
E-DATA	Data outlets
E-DICT	Central dictation systems
E-FIRE	Fire alarm, fire extinguishers
E-GRND	Ground systems
E-GRND-CIRC	Ground systems: circuits
E-GRND-DIAG	Ground systems: diagram
E-GRND-REFR	Ground systems: reference
E-GRND-EQUI	Ground systems: equipotential
E-INTC	Intercom system
E-LEGN	Legend of symbols
E-LITE	Lighting:
E-LITE-CIRC	Lighting: circuits
E-LITE-CIRC-NUMB	Lighting: circuits: numbers
E-LITE-CLNG	Lighting: Ceiling-mounted
E-LITE-EMER	Lighting: Emergency
E-LITE-EXIT	Lighting: Exit
E-LITE-EXTR	Lighting: Exterior and site
E-LITE-FLOR	Lighting :Floor-mounted
E-LITE-IDEN	Lighting: identification and text
E-LITE-JBOX	Lighting: junction box
E-LITE-SPCL	Lighting: special
E-LITE-ROOF	Lighting: roof
E-LITE-SWCH	Lighting: switches
E-LITE-WALL	Lighting: wall-mounted
E-LTNG	Lighting protection system
E-NURS	Nurse call system
E-PGNG	Paging system
E-POWR	Power
E-POWR-BUSW	Power: busways
E-POWR-CABL	Power: cable trays
E-POWR-CIRC	Power: circuits
E-POWR-CIRC-NUMB	Power: circuits: numbers

E-POWR-DEVC	Power: devices
E-POWR-EQPM	Power: equipment
E-POWR-FEED	Power: feeders
E-POWR-JBOX	Power: junction box
E-POWR-PANL	Power: panel
E-POWR-SWBD	Power: switchboards
E-POWR-RCPT	Power: outlets and receptacles
E-POWR-ROOF	Power: roof
E-POWR-URAC	Power: under-floor raceways
E-SERT	Security
E-SITE	Site service
E-SITE-POLE	Site service: poles
E-SITE-UNDR	Site service: underground electrical lines
E-SITE-UVHD	Site service: overhead electrical lines
E-SOUN	Sound / PA system
E-TVAN	TV antenna system

Fire Protection

Layer Name	Layer Description
F-AFFF	Aqueous film forming foam system
F-AFFF-EQPM	Aqueous film forming foam system: equipment
F-AFFF-PIPE	Aqueous film forming foam system: piping
F-CO2S	CO2 system
F-CO2S-EQPM	CO2 system: equipment
F-CO2S-PIPE	CO2 system: piping
F-EVAC	Evacuation route
F-HALN	Halon
F-HALN-EQPM	Halon: equipment
F-HALN-PIPE	Halon: piping
F-IGAS	Inert gas
F-IGAS-EQPM	Inert gas: equipment
F-IGAS-PIPE	Inert gas: piping
F-PROT	Fire protections systems
F-PROT-ALRM	Fire protections systems: alarm
F-PROT-EQPM	Fire protections systems: equipment
F-PROT-SMOK	Fire protections systems: smoke detectors / heat sensors
F-PROT-STAN	Fire protections systems: standpipe
F-SPRN	Sprinkler system
F-SPRN-CLHD	Sprinkler system: ceiling heads
F-SPRN-OTHD	Sprinkler system: other heads
F-SPRN-PIPE	Sprinkler system: piping
F-SPRN-STAN	Sprinkler system: standpipe

Interior

Layer Name	Layer Description
I-AREA	Area
I-AREA-OCCP	Area: occupant or employee names
I-CLNG	Ceiling
I-CLNG-ACCS	Ceiling: access
I-CLNG-OPEN	Ceiling: openings
I-CLNG-SUSP	Ceiling: suspended elements
I-CLNG-TEES	Ceiling: main tees
I-CASE	Casework
I-CASE-BASE	Base casework

I-CASE-MOVE	Moveable casework
I-CASE-OVHD	Overhead casework
I-COLS	Interior columns
I-DOOR	Doors
I-DOOR-FULL	Full Height (to Ceiling) Door Swing and Leaf
I-DOOR-PRHT	Partial Height Door Swing
I-EQPM	Equipment
I-EQPM-ACCS	Equipment: Access
I-EQPM-FIXD	Fixed equipment
I-EQPM-MOVE	Moveable equipment
I-EQPM-NICN	Equipment: Not in contract
I-EQPM-STOR	Equipment: Storage
I-EQPM-OVHD	Overhead Equipment
I-FLOR	Floor
I-FLOR-APPL	Appliances
I-FLOR-CASE	Casework (Manufactured Cabinets)
I-FLOR-EVTR	Elevator cars and equipment
I-FLOR-FIXT	Miscellaneous fixtures
I-FLOR-HRAL	Stair and Balcony Handrails and Guard Rails
I-FLOR-LEVL	Level Changes, Ramps,
I-FLOR-OTLN	Floor or Building Outline
I-FLOR-OVHD	Overhead Skylights and Overhangs (usually a dashed line)
I-FLOR-RAIS	Raised Floors
I-FLOR-RISR	Stair Risers
I-FLOR-SIGN	Signage
I-FLOR-SPCL	Architectural Specialties (Toilet Room Accessories, Display Cases)
I-FLOR-STRS	Stairs Treads, Escalators and Ladders
I-FLOR-TPTN	Toilet Partitions
I-FLOR-WDWK	Architectural Woodwork
I-FURN	Furnishings
I-FRUN-FILE	Furnishings: File Cabinets
I-FURN-FIXD	Fixed in place furnishings
I-FURN-FREE	Freestanding furnishings
I-FURN-PLNT	Plant Furnishings
I-FURN-PNLS	System panels
I-FURN-SEAT	Seating
I-FURN-STOR	System storage components
I-FURN-WKSF	System work surface components
I-GLAZ	Glazing
I-GLAZ-FULL	Full-height Glazing
I-GLAZ-PRHT	Partial-height Glazing
I-GLAZ-SILL	Window sills
I-LITE	Lighting fixtures
I-RCLG	Reflected Ceiling Plan
I-WALL	Walls
I-WALL-FIRE	Fire walls
I-WALL-FULL	Full-height walls
I-WALL-HEAD	Door and window headers
I-WALL-JAMB	Door and window jambs
I-WALL-MOVE	Moveable partitions
I-WALL-PRHT	Partial-height walls

Landscaping

Layer Name	**Layer Description**
L-FENC	Fencing

L-FENC-CLNK	Fencing: Chain link
L-FENC-WIRE	Fencing: barbed, mesh or decorative wire
L-FENC-WOOD	Fencing: wood
L-IRRG	Irrigation
L-IRRG-COVR	Irrigation: coverage
L-IRRG-EQPM	Irrigation: equipment
L-IRRG-PIPE	Irrigation: piping
L-IRRG-SPKL	Irrigation: sprinklers
L-PLNT	Plant & landscape materials
L-PLNT-BEDS	Plant & landscape: Rock, bark & other beds
L-PLNT-BUSH	Plant & landscape: bushes and shrubs
L-PLNT-CNTR	Plant & landscape: containers or planters
L-PLNT-GRND	Plant & landscape: ground covers and vines
L-PLNT-EXST-REMN	Plant & landscape: existing: materials to remain
L-PLNT-EXST-REMV	Plant & landscape: existing: materials to be removed
L-PLNT-SHAD	Plant & landscape: shadow area
L-PLNT-TREE	Plant & landscape: trees
L-PLNT-TURF	Plant & landscape: lawn areas
L-SITE	Site improvements
L-SITE-BRDG	Site improvements: bridge
L-SITE-BRDG-FOOT	Site improvements: bridge: pedestrian
L-SITE-DECK	Site improvements: decks
L-SITE-FENC	Site improvements: fences
L-SITE-FURN	Site improvements: furniture
L-SITE-PLAY	Site improvements: play structures
L-SITE-POOL	Site improvements: swimming pools and spas
L-SITE-SPRT	Sports fields
L-STEP	Steps
L-STEP-ROCK	Steps: rocks or stone
L-STEP-CONC	Steps: concrete
L-STEP-WOOD	Steps: wood
L-WALL	Wall
L-WALL-ROCK	Wall: Rock landscaping wall
L-WALL-CONC	Wall: Concrete landscaping wall

Mechanical

Layer Name	**Layer Description**
M-BRIN	Brine systems
M-BRIN-EQPM	Brine systems: equipment
M-BRIN-PIPE	Brine systems: piping
M-CHIM	Chimneys and stacks
M-CMPA	Compressed / processed air system
M-CMPA-CEQP	Compressed air system: equipment
M-CMPA-CPIP	Compressed air system: piping
M-CMPA-PEQP	Compressed air system: process air equipment
M-CMPA-PPIP	Compressed air system: process air piping
M-CNDW	Condenser water systems
M-CNDW-EQPM	Condenser water systems: equipment
M-CNDW-PIPE	Condenser water systems: piping
M-CONT	Control & instrumentation
M-CONT-THER	Controls: thermostats
M-CONT-WIRE	Controls: low voltage wiring
M-CWTR	Chilled water systems
M-CWTR-EQPM	Chilled water: equipment
M-CWTR-PIPE	Chilled water: piping

M-DUST	Dust & fume collection system
M-DUST-DUCT	Dust & fume: duct
M-DUST-EQPM	Dust & fume: equipment
M-ELHT	Electric heat
M-ELHT-EQPM	Electric heat: equipment
M-ENER	Energy management system
M-ENER-EQPM	Energy management: equipment
M-ENER-WIRE	Energy management: wiring
M-EXHS	Exhaust system
M-EXHS-DUCT	Exhaust system: ductwork
M-EXHS-RFEQ	Exhaust system: rooftop equipment
M-FUEL	Fuel System
M-FUEL-EQPM	Fuel System: equipment
M-FUEL-GGEP	Fuel System: gas general piping
M-FUEL-GPRP	Fuel System: gas process piping
M-FUEL-OGEP	Fuel System: oil general piping
M-FUEL-OPRP	Fuel System: oil process piping
M-FUME	Fume hood
M-FUME-EQPM	Fume hood: equipment
M-HOTW	Hot water heating system
M-HOTW-EQPM	Hot water heating: equipment
M-HOTW-PIPE	Hot water heating: piping
M-HVAC	HVAC system
M-HVAC-CDFF	HVAC: ceiling diffusers
M-HVAC-ODFF	HVAC: other diffusers
M-HVAC-EQPM	HVAC: equipment
M-HVAC-DUCT	HVAC: ductwork
M-HVAC-RETN	HVAC: return ductwork
M-HVAC-SDFF	HVAC: supply diffusers
M-HVAC-RDFF	HVAC: return air diffusers
M-LGAS	Laboratory gas system
M-LGAS-EQPM	Laboratory gas: equipment
M-LGAS-PIPE	Laboratory gas: piping
M-MACH	Machine shop equipment
M-MDGS	Medical gas system
M-MDGS-CAIR	Medical gas: compressed air
M-MDGS-EQPM	Medical gas: equipment
M-MDGS-NITG	Medical gas: nitrogen
M-MDGS-MOXG	Medical gas: nitrous oxide
M-MDGS-OXYG	Medical gas: oxygen
M-MDGS-PIPE	Medical gas: piping
M-MDGS-SAIR	Medical gas: scavenge air
M-MDGS-VACU	Medical gas: medical vacuum
M-MKUP	Make-up air system
M-MKUP-CDFF	Make-up air: ceiling diffusers
M-MKUP-DUCT	Make-up air: ductwork
M-MKUP-EQPM	Make-up air: equipment
M-NGAS	Natural gas system
M-NGAS-EQPM	Natural gas: equipment
M-NGAS-PIPE	Natural gas: piping
M-PROC	Process system
M-PROC-EQPM	Process: equipment
M-PROC-PIPE	Process: piping
M-RAIR	Relief air system
M-RCOV	Energy recovery
M-RCOV-EQPM	Energy recovery: equipment

M-RCOV-PIPE	Energy recovery: piping
M-REFG	Refrigeration system
M-REFG-EQPM	Refrigeration: equipment
M-REFG-PIPE	Refrigeration: piping
M-SMOK	Smoke extraction system
M-SMOK-CDFF	Smoke extraction: ceiling diffusers
M-SMOK-DUCT	Smoke extraction: ductwork
M-SMOK-EQPM	Smoke extraction: equipment
M-SPCL	Special systems
M-SPCL-EQPM	Special systems: equipment
M-SPCL-PIPE	Special systems: piping
M-STEM	Steam systems
M-STEM-CONP	Steam systems: condensate piping
M-STEM-EQPM	Steam systems: equipment
M-STEM-LPIP	Steam systems: Low pressure piping
M-STEM-HPIP	Steam systems: High pressure piping
M-STEM-MPIP	Steam systems: Medium pressure piping
M-TEST	Test equipment

Plumbing

Layer Name	Layer Description
P-ACID	Acid, alkaline, oil waste systems
P-ACID-PIPE	Acid, alkaline, oil waste piping
P-DOMW	Domestic water system
P-DOMW-CPIP	Domestic: cold water piping
P-DOMW-HPIP	Domestic: hot water piping
P-DOMW-EQPM	Domestic: equipment
P-DOMW-RISR	Domestic: hot & cold water risers
P-DOMW-RPIP	Domestic: recirculation piping
P-FIXT	General plumbing fixtures
P-MDGS	Medical gas system
P-MDGS-CAIR	Medical gas: compressed air
P-MDGS-EQPM	Medical gas: equipment
P-MDGS-NITG	Medical gas: nitrogen
P-MDGS-NOXG	Medical gas: nitrous oxide
P-MSGS-OXYG	Medical gas: oxygen
P-MDGS-PUPE	Medical gas: piping
P-MDGSP-SAIR	Medical gas: scavenge air
P-MDGS-VACU	Medical gas: medical vacuum
P-SANR	Sanitary drainage
P-SANR-PIPE	Sanitary: piping
P-SANR-FIXT	Sanitary: plumbing fixtures
P-SANR-FLDR	Sanitary: floor drains
P-SANR-RISR	Sanitary: risers
P-STRM	Storm drainage systems
P-STRM-PIPE	Storm drain: piping
P-STRM-RISR	Storm drain: risers
P-STRM-RFDR	Storm drain: roof drains

Structural

Layer Name	Layer Description
S-ABLT	Anchor Bolts
S-BEAM	Beams
S-BEAM-ALUM	Beams: aluminum

S-BEAM-CONC	Beams: concrete
S-BEAM-STEL	Beams: steel
S-BEAM-WOOD	Beams: wood
S-BRAC	Bracing
S-BRAC-ALUM	Bracing: aluminum
S-BRAC-ALUM-HORZ	Bracing: aluminum: horizontal
S-BRAC-ALUM-VERT	Bracing: aluminum: vertical
S-BRAC-STEL	Bracing: steel
S-BRAC-STEL-HORZ	Bracing: steel: horizontal
S-BRAC-STEL-VERT	Bracing: steel: vertical
S-BRAC-WOOD	Bracing: wood
S-BRAC-WOOD-HORZ	Bracing: wood: horizontal
S-BRAC-WOOD-VERT	Bracing: wood: vertical
S-COLS	Columns
S-COLS-ALUM	Columns: aluminum
S-COLS-CONC	Columns: concrete
S-COLS-STEL	Columns: steel
S-COLS-WOOD	Columns: wood
S-DECK	Structural decking
S-DECK-FLOR	Structural decking: floor
S-DECK-FLOR-OPNG	Structural decking: floor: opening
S-DECK-ROOF	Structural decking: roof
S-DECK-ROOF-OPNG	Structural decking: roof: opening
S-FNDN	Foundation
S-FNDN-FTNG	Foundation: footing
S-FNDN-GRBM	Foundation: grade beam
S-FNDN-PCAP	Foundation: pile cap
S-FNDN-PIER	Foundation: drilled piers
S-FNDN-PILE	Foundation: piles
S-FNDN-RBAR	Foundation: reinforcing
S-GRAT	Grates
S-GRAT-OVHD	Grates: overhead
S-GRID	Column grid
S-GRID-EXTR	Column grid: exterior columns
S-GRID-INTR	Column grid: interior columns
S-JNTS	Joints
S-JNTS-CNTJ	Joints: construction
S-JNTS-CTLJ	Joints: controls
S-JNTS-EXPJ	Joints: expansion
S-JOIS	Joists
S-JOIS-BRDG	Joists: bridging
S-RBAR	Reinforcing bar
S-SLAB	Slab
S-SLAB-CONC	Slab: concrete
S-SLAB-OPNG	Slab: openings and depressions
S-SLAB-EDGE	Slab: edge
S-SLAB-STEL	Slab: steel
S-SLAB-RBAR	Slab: reinforcing
S-STRS	Stairs
S-STRS-LADD	Stairs: ladders and assemblies
S-TRUS	Trusses
S-WALL	Walls
S-WALL-CMUW	Walls: concrete masonry unit
S-WALL-CONC	Walls: cast-in-place concrete
S-WALL-MSNW	Walls: masonry
S-WALL-PCST	Walls: pre-cast concrete

S-WALL-SHEA	Walls: structural shear wall
S-WALL-STEL	Walls: steel stud
S-WALL-WOOD	Walls: wood stud

Communication

Layer Name	Layer Description
T-1LIN	One-line diagrams
T-DIAG	Diagrams
T-EQPM	Equipment
T-JACK	Jacks
T-JBOX	Junction Box
T-RISR	Riser diagrams
T-ALRM	Alarm system
T-BELL	Bell system
T-CABL	Cable system
T-CABL-COAX	Cable system: coax cable
T-CABL-FIBR	Cable system: fiber optic cable
T-CABL-MULT	Cable system: multi-conductor cable
T-CABL-TRAY	Cable system: cable tray and wireway
T-CATV	Cable television system
T-CLOK	Clock system
T-CCTV	Closed-circuit television system
T-DATA	Data / LAN system
T-DICT	Dictation system
T-ELEC	Electrical system, telecom plan
T-EMCS	Energy monitoring control system
T-FIRE	Fire alarm system
T-INTC	Intercom / PA system
T-NURS	Nurse call system
T-PGNG	Paging system
T-PHON	Telephone system
T-SERT	Security system
T-SOUN	Sound system
T-TVAN	Television antenna system

F. Do not put multiple sheets in one drawing file. All sheets shall show the site and facility number, associated with said project, within the title block. All sheets should have their own drawing file name and follow the FMDC working drawing naming convention. The drawings used as external references shall follow the FMDC base drawing naming convention.

G. CAD Fonts

No custom CAD fonts are to be used. Use only standard fonts that are supplied with Autodesk, Arial font is preferred. If using a different CAD package, use a common font known to transfer.

Do not use a specially purchased font.

H. CAD File Scale

1. Drawing models shall be created and maintained in model space at a 1” = 1” scale, known as full scale. This may be accomplished most

easily on sheets with mixed scales by using Paper Space viewports to scale the plotted image of multiple scale drawings/details.

I. Any Consultant furnishing sealed Record Drawings shall issue the drawings per the FMDC Drawing Set Organization Chart, see attachment within this document (based on the CSI Uniform Drawing System © 1997).

6. Document Transmittal

6.1 CAD File Compression

A. CAD file(s) and specifications may be submitted to FMDC by the following means:

Preferred: CAD file(s) shall be submitted in an uncompressed format on CD-ROM.

1. CD-ROM – CAD file(s) submitted on CD-ROM must not be compressed.

B. FMDC permits electronic transfer of the CAD Deliverables files through email or the Internet with the permission of the Project Manager, FMDC. CAD Deliverables files sent via email must utilize a file compression program, such as WinZip (preferred) to avoid corruption of drawing files during transfer.

6.2 Media Labeling

A. CD-ROMs shall be labeled with the following information: phase, project identification number, title, and site and facility number. Project Manager, FMDC, will provide site and facility numbers. If more than one diskette or CD-ROM is submitted; label the disk number of total number submitted (i.e. “Disk 1 of 3”).

B. The Consultant furnishing the CAD Deliverables to FMDC will not be held liable for the CAD files after approved submittal. They are to be used for archiving As-Built conditions of State facilities. The liability will remain with the sealed Record Drawings.

Drawing Set Organization Chart