



Computer Aided Drawing (CAD) Standard

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Montana State University Computer Aided Drawing (CAD) Standard

Ownership

Montana State University (MSU) shall at all times have sole ownership of all drawings, documents and specifications, electronic or otherwise, produced by any Consultant or Contractor, intended for use in connection with a project (reference the current *Standard Form of Agreement Between Owner and Architect / Engineer*, paragraph 1.10, Ownership of Documents).

Use of MSU CAD Plans

Upon request, MSU may provide the Consultant with the most currently available drawings deemed to be of use for a project. Drawings will be provided in either the most current version of AutoCAD or the version currently being used by MSU.

The Consultant is solely responsible for verifying that drawings provided do not contain errors that might compromise a project. Field verification of existing conditions is always recommended.

Model Space

All building information is to be drawn in model space at 1:1 scale (actual size). Plan views of buildings will be made with north up.

Paper Space

All drawing borders / title blocks are to be in paper space (Layout View). Drawings in paper space will be oriented for the most effective use of media space. It is recommended that the long axis of the drawing be aligned with the long axis of the plotting media. Assure that the north arrow is present and that it is oriented to true north.

In the absence of a long axis that would dictate orientation on the media, orient the drawing with north at the top of the page.

Drawing Border

Montana State University Campus Planning, Design & Construction provides a standard border / title block that will be used on all Montana State University drawings. The border and associated text will not be altered, except that the Architect / Engineer may add their logo and stamp to the border as required.



An Architectural “D” (MSU_Border_D) or “E” (MSU_Border_E) size standard border / title block will be used for most drawing projects (“D” size recommended for most projects).

An 8-1/2” x 11” (MSU_Border_A) and 11” x 17” (MSU_Border_B) size standard border / title block are provided for special projects only.

The following Table 1 shows the font types and sizes of text for the Architectural “D” standard border / title block.

Table 1 – Architectural D Standard Border / Title Block			
Border / Title Block Area	Font	Height	Rotation
PROJECT	Garamond Bold	7/16”	90°
TITLE	Garamond	1/4”	90°
SHEET	Franklin Gothic Medium w/.8 width factor	1/2”	0°
PRLIMINARY - NOT FOR CONSTRUCTION	Franklin Gothic Medium	7/32”	90°
CAMPUS PLANNING, DESIGN & CONSTRUCTION	Garamond	7/32”	90°
MONTANA STATE UNIVERSITY, BOZEMAN, MT	Garamond	1/8”	90°
DRAWN BY, REVIEWED BY, REV., DESCRIPTION, DATE	Franklin Gothic Book	3/32”	0°
PPA NUMBER	Franklin Gothic Medium	3/16”	0°
A/E NUMBER	Franklin Gothic Medium	3/16”	0°
DATE	Franklin Gothic Medium	3/16”	0°

Drawing Title

The drawing title will reflect the project name used in the log, PPA or State A / E project file.

Electronic Drawing Name

The electronic name of the drawing file will consist of the following:

XXXXXXXXXX_AAN_NN

The project code. For example the log number, PPA number or State A&E number of the project

XXXXXXXXXX_AAN_NN

The sheet number as defined in this document. As an example, sheet A1.01 in PPA project 08-0018, would have the electronic drawing name 08-0018_A1_01.dwg.

Sheet Number

The drawing will use a six character alpha-numeric sheet number as defined in the following sections.

Discipline Designator

AAN_NN

The discipline designator, which consists of one alphabetical character and a hyphen (Level 1 Designator) or two alphabetical characters (Level 2 Designator). The discipline designator will be chosen from the following table:

Level 1 Designator	Level 2 Designator	Description	Content
G-		All General	All or any portion of subjects in the following Level 2 Designators
	GI	General Information	Drawing index, code summary, symbol legend, orientation maps
	GC	General Contractual	Phasing, schedules, contractor staging areas, fencing, haul routes, erosion control, temporary and special requirements
	GR	General Resource	Photographs, soil borings
H-		All Hazardous Materials	All or any portion of subjects in the following Level 2 Designators
	HA	Asbestos	Asbestos abatement, identification, or containment

Table 2 – Discipline Designator			
Level 1 Designator	Level 2 Designator	Description	Content
	HC	Chemicals	Toxic chemicals handling, removal or storage
	HL	Lead	Lead piping or paint removal
	HP	PCB	PCB containment and removal
	HR	Refrigerants	Ozone depleting refrigerants
V-		All Survey / Mapping	All or any portion of subjects in the following Level 2 Designators
	VA	Aerial Survey	
	VF	Field Survey	
	VH	Hydrographic Survey	
	VI	Digital Survey	
	VU	Combined Utilities	
B-		All Geotechnical	
C-		All Civil	All or any portion of subjects in the following Level 2 Designators
	CB	Civil Beach Renourishment	Beach disposal and renourishment
	CD	Civil Demolition	Structural removal and site clearing
	CE	Civil Ecosystem Restoration	Environmental restoration
	CF	Civil Flood Control	Levees, spillways, pump stations
	CG	Civil Grading	Excavation, grading, drainage, erosion control, retention ponds
	CI	Civil Improvements	Pavers, flagstone, exterior tile, furnishings, retaining walls, and water features
	CN	Civil Navigation	Navigation, harbors, dredging
	CO	Civil Operation and Maintenance	Repair and upgrade to O&M structures
	CP	Civil Paving	Roads, driveways, parking lots
	CH	Civil Shore Protection	Erosion protection structures on shoreline
	CR	Civil Recreation	Recreation facilities
	CS	Civil Site	Plats, topographic, dimension control
	CX	Civil Security	Security related work
	CT	Civil Transportation	Waterways, wharves, docks, trams, railways, airfields and people movers
	CU	Civil Utilities	Water, sanitary sewer, storm sewer, power, communications, natural gas and steam systems
L-		All Landscape	All or any portion of subjects in the following Level 2 Designators
	LD	Landscape Demolition	Protection and removal of existing landscape
	LI	Landscape Irrigation	
	LP	Landscape Planting	
A-		All Architectural	All or any portion of subjects in the following Level 2 Designators
	AS	Architectural Site	
	AD	Architectural Demolition	Protection and removal
	AE	Architectural Elements	General architectural
	AI	Architectural Interiors	
	AF	Architectural Finishes	
	AG	Architectural Graphics	

Table 2 – Discipline Designator			
Level 1 Designator	Level 2 Designator	Description	Content
S-		All Structural	All or any portion of subjects in the following Level 2 Designators
	SD	Structural Demolition	Protection and removal
	SS	Structural Site	
	SB	Structural Substructure	Foundations, piers, slabs and retaining walls
	SF	Structural Framing	Floors and roofs
I-		All Interiors	All or any portion of subjects in the following Level 2 Designators
	ID	Interior Demolition	
	IN	Interior Design	
	IF	Interior Furnishings	
	IG	Interior Graphics	Murals and visuals
Q-		All Equipment	All or any portion of subjects in the following Level 2 Designators
	QA	Athletic Equipment	Gymnasium, exercise, aquatic and recreational
	QB	Bank Equipment	Vaults, letter units, ATMs, drive-through
	QC	Dry Cleaning Equipment	Washers, dryers, ironing and dry cleaning
	QD	Detention Equipment	Prisons and jails
	QE	Educational Equipment	Chalkboards, library
	QF	Food Service Equipment	Kitchen, bar, service, storage and processing
	QH	Hospital Equipment	Medical, exam and treatment
	QL	Laboratory Equipment	Science labs, planetariums, observatories
	QM	Maintenance Equipment	Housekeeping, window washing and vehicle servicing
	QP	Parking Lot Equipment	Gates, ticket and card access
	QR	Retail Equipment	Display, vending and cash register
	QS	Site Equipment	Bicycle racks, benches, playgrounds
	QT	Theatrical Equipment	Stage, movie, rigging systems
	QV	Video / Photographic Equipment	Television, darkroom and studio
	QY	Security Equipment	Access control and monitoring, surveillance
F-		All Fire Protection	All or any portion of subjects in the following Level 2 Designators
	FA	Fire Detection and Alarm	
	FX	Fire Suppression	Fire extinguishing systems and equipment
P-		All Plumbing	All or any portion of subjects in the following Level 2 Designators
	PS	Plumbing Site	Extensions and connections to civil utilities
	PD	Plumbing Demolition	Protection, termination and removal
	PP	Plumbing Piping	Piping, valves and insulation
	PQ	Plumbing Equipment	Pumps and tanks
	PL	Plumbing	Domestic water, sanitary and storm drainage, fixtures

Table 2 – Discipline Designator			
Level 1 Designator	Level 2 Designator	Description	Content
D-		All Process	All or any portion of subjects in the following Level 2 Designators
	DS	Process Site	Extension and connection to civil utilities
	DD	Process Demolition	Protection, termination and removal
	DL	Process Liquids	Liquid process systems
	DG	Process Gases	Gaseous process systems
	DP	Process Piping	Piping, valves, insulation, tanks, pumps, etc.
	DQ	Process Equipment	Systems and equipment for thermal, electrical, materials handling, assembly and manufacturing, nuclear, power generation, chemical, refrigeration and industrial processes
	DE	Process Electrical	Electrical exclusively associated with a process and not the facility
	DI	Process Instrumentation	Instrumentation, measurement, recorders, devices and controllers (electrical and mechanical)
M-		All Mechanical	All or any portion of subjects in the following Level 2 Designators
	MS	Mechanical Site	Utility tunnels and piping between facilities
	MD	Mechanical Demolition	Protection, termination and removal
	MH	Mechanical HVAC	Ductwork, air devices and equipment
	MP	Mechanical Piping	Chilled and heating water, steam
	MI	Mechanical Instrumentation	Instrumentation and controls
	MY	Mechanical Hydraulic Systems	Pump stations, spillways, slide gates
E-		All Electrical	All or any portion of subjects in the following Level 2 Designators
	EA	Electrical Airfield Lighting and Nav aids	Visual air navigation systems
	ES	Electrical Site	Exterior electrical systems (power, lighting, auxiliary)
	EC	Electrical Cathodic Protection	Cathodic protection systems
	EG	Electrical Grounding	Grounding, lightning protection devices
	ED	Electrical Demolition	Protection, termination and removal
	EP	Electrical Interior Power	Interior power
	EL	Electrical Interior Lighting	Interior lighting
	EI	Electrical Instrumentation	Controls, relays, instrumentation and measurement devices
	EY	Electrical Interior Auxiliary Systems	Alarms, nurse call, security, CCTV, PA, music, clock and program
T-		All Telecommunications	All or any portion of subjects in the following Level 2 Designators
	TD	Telecommunications Demolition	Protection, termination and removal
	TA	Audio Visual	Cable, music and CCTV systems
	TC	Clock and Program	Time generators and bell program systems
	TI	Intercom	Intercom and public address systems
	TM	Monitoring	Monitoring and alarm systems
	TN	Data Networks	Network cabling and equipment

Table 2 – Discipline Designator			
Level 1 Designator	Level 2 Designator	Description	Content
	TS	SCADA	Supervisory Control and Data Acquisition (SCADA) systems and equipment
	TT	Telephone	Telephone systems, wiring and equipment
	TY	Security	Access control and alarm systems
R-		All Resource	All or any portion of subjects in the following Level 2 Designators
	RC	Resource Civil	Surveyor's information and existing civil drawings
	RS	Resource Structural	Existing facility structural drawings
	RA	Resource Architectural	Existing facility architectural drawings
	RM	Resource Mechanical	Existing facility mechanical drawings
	RE	Resource Electrical	Existing facility electrical drawings
X-		Other Disciplines	
Z-		Contractor / Shop Drawings	
O-		Operations	

Sheet Type Designators

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The sheet type designator, which consists of one numerical character. The sheet type designator will be chosen from the following table:

Table 3 – Sheet Type Designators	
Sheet Type	Designator
General (symbols, legend, notes, etc.)	0
Plans (horizontal views)	1
Elevations (vertical views)	2
Sections (sectional views)	3
Large-Scale Views (plans, elevations, or sections that are not details)	4
Details	5
Schedules and Diagrams	6
User Defined	7
User Defined	8
3D Representations (isometrics, perspectives, photographs)	9

Sheet Sequence Number

AAN₁ NN

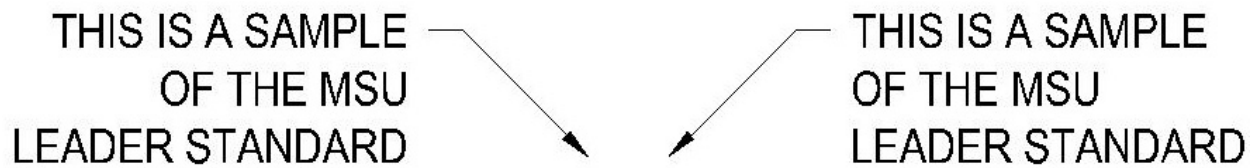
The sheet sequence number, consisting of one to two numerical characters.

Dimensioning

Dimensions will use the standard AutoCAD "Anno Arial" font, and print with 3/32" text size in paper space. The following are standards for MSU dimensioning:

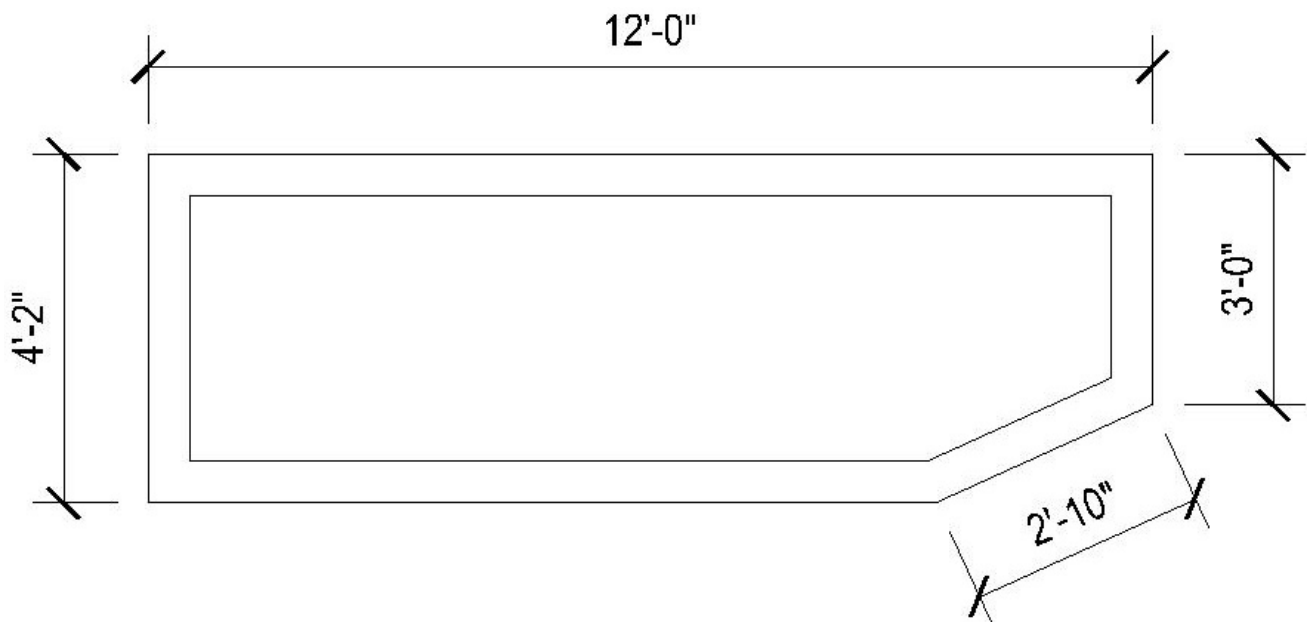
Leaders

Leaders will use the arrow style "closed filled arrow" aligned with the middle of the top line of text. Use the quick leader (qleader) command to insert leaders.



Dimensions

Dimensions will use the arrow style "architectural tick". Text will be printed above the dimension line.



North Arrow

Drawings will use the standard AutoCAD “North Arrow M” to indicate true north.

Drawing Title Block

Drawings will use the standard AutoCAD “Title Mark”.



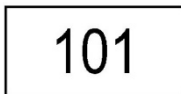
Room Numbers

Room numbers for current buildings shall be provided by the MSU CADD technician.

Room numbers for new buildings shall be based on the MSU Room Numbering Standard. This document can be found on the MSU Campus Planning, Design & Construction web site at:

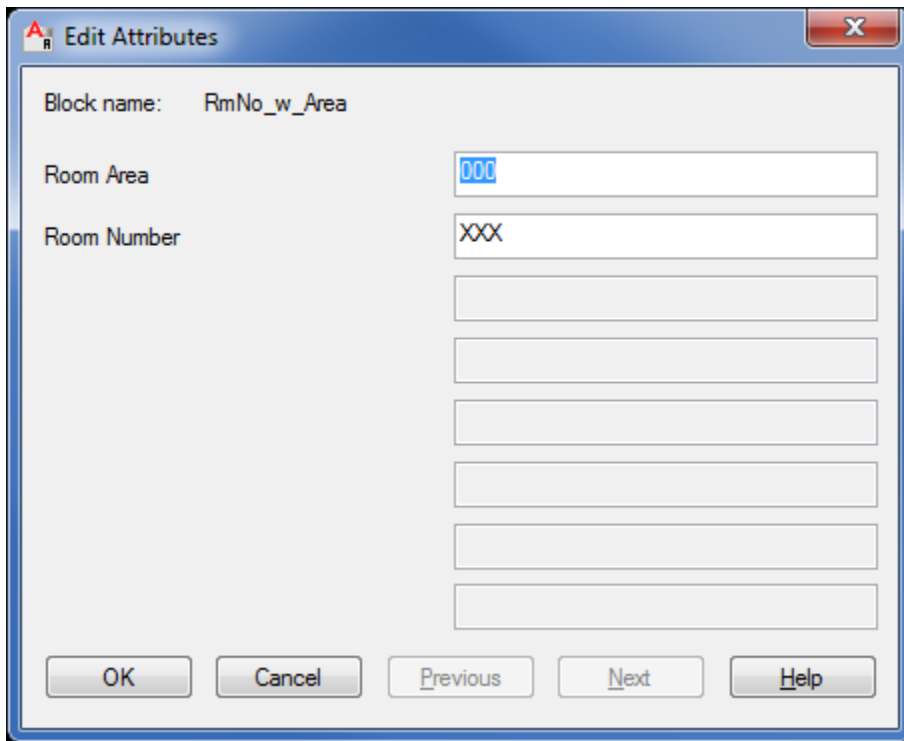
<http://www.montana.edu/pdc/documents/MSURoomNumberingStandard.pdf>

Building room numbers will be added using a standard block like the MSU block RmNo_w_Area. The room number block will be drawn in the A-Area-Iden drawing layer.



The room number block will have extractable attributes that include the room area and room number.

Room area will be calculated using a polyline drawn in the A-Area-Line drawing layer. The polyline will reflect the floor area of the room and extend half way through door openings.



Layers

The following table (Table 4) shows the recommended layers to be used for MSU drawings:

Table 4 – MSU Drawing Layers

Name	On	Freeze	Lock	Color	Linetype	Width (mm)	Plot Style	Plot	New VP Freeze	Description
0	ON	THAW	OFF	white	Continuous	Default	7	ON	THAW	0
A-ANNO-DIMS	ON	THAW	OFF	213	Continuous	.25	213	ON	THAW	Dimensions
A-ANNO-LEGN	ON	THAW	OFF	231	Continuous	.25	231	ON	THAW	Display theme legends
A-ANNO-NOTE	ON	THAW	OFF	231	Continuous	.25	231	ON	THAW	Notes, leaders, etc.
A-ANNO-REVS	ON	THAW	OFF	71	Continuous	.25	71	ON	THAW	Revisions
A-ANNO-SCHD	ON	THAW	OFF	231	Continuous	.25	231	ON	THAW	Schedule tables
A-ANNO-SCRN	ON	THAW	OFF	250	Continuous	.25	250	ON	THAW	A-Anno-Scrn
A-ANNO-SYMB	ON	THAW	OFF	131	Continuous	.25	131	ON	THAW	Annotation marks
A-ANNO-TEXT	ON	THAW	OFF	50	Continuous	.30	50	ON	THAW	A-Anno-Text
A-AREA-IDEN	ON	THAW	OFF	171	Continuous	.30	171	ON	THAW	Room numbers, tenant identifications, area calculations
A-AREA-LINE	ON	THAW	OFF	70	Continuous	.18	70	ON	THAW	Room area polyline
A-AREA-LINE-GROS	ON	FREZ	OFF	60	Continuous	.18	60	ON	FREZ	Building gross area polyline.
A-AREA-LINE-OTBW	ON	FREZ	OFF	80	Continuous	.18	80	ON	FREZ	Open to below area polyline.
A-AREA-MASS	ON	THAW	OFF	70	Continuous	.18	70	ON	THAW	Massing elements
A-AREA-MASS-GRPS	ON	THAW	OFF	213	Continuous	.35	213	ON	THAW	Massing groups
A-AREA-MASS-SLCE	ON	THAW	OFF	51	DASHED2	.25	51	ON	THAW	Massing slices
A-AREA-SPACE	ON	THAW	OFF	32	Continuous	.35	32	ON	THAW	Spaces
A-AREA-SPCE-IDEN	ON	THAW	OFF	171	Continuous	.25	171	ON	THAW	Space numbers
A-AREA-ZONE	ON	THAW	OFF	34	Continuous	.70	34	ON	THAW	Zones
A-AREA-ZONE-IDEN	ON	THAW	OFF	151	Continuous	.25	151	ON	THAW	Zone tags
A-BLDG-OTLN	ON	THAW	OFF	118	Continuous	.20	118	ON	THAW	Building outline
A-CLNG	ON	THAW	OFF	213	Continuous	.35	213	ON	THAW	Ceiling Objects
A-CLNG-GRID	ON	THAW	OFF	72	Continuous	.35	72	ON	THAW	Ceiling grids
A-CLNG-IDEN	ON	THAW	OFF	151	Continuous	.25	151	ON	THAW	Ceiling tags
A-DELT-IDEN	ON	THAW	OFF	150	Continuous	.18	150	ON	THAW	Detail marks
A-DETL-FINE	ON	THAW	OFF	90	Continuous	.18	90	ON	THAW	Detail - fine lines
A-DETL-HIDE	ON	THAW	OFF	242	HIDDEN2	.18	242	ON	THAW	Hidden lines
A-DETL-MEDM	ON	THAW	OFF	31	Continuous	.25	31	ON	THAW	Detail - medium lines
A-DETL-PATT	ON	THAW	OFF	190	Continuous	.18	190	ON	THAW	Detail - hatching
A-DETL-THIN	ON	THAW	OFF	150	Continuous	.18	150	ON	THAW	Detail - thin lines
A-DETL-WIDE	ON	THAW	OFF	212	Continuous	.35	212	ON	THAW	Detail - wide lines
A-DIMENSION	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Dimensions

A-DOOR	ON	THAW	OFF	31	Continuous	.20	31	ON	THAW	Doors
A-DOOR-IDEN	ON	THAW	OFF	132	Continuous	.35	132	ON	THAW	Door tags
A-ELEV	ON	THAW	OFF	111	Continuous	.25	111	ON	THAW	Elevations
A-ELEV-IDEN	ON	THAW	OFF	151	Continuous	.25	151	ON	THAW	Elevations marks
A-ELEV-LINE	ON	THAW	OFF	141	Continuous	.18	141	ON	THAW	Elevation definition lines
A-ELEV-PEPL	ON	THAW	OFF	40	Continuous	.18	40	ON	THAW	People
A-EQPM	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Equipment
A-EQPM-IDEN	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Equipment tags
A-FLOR-APPL	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Appliances
A-FLOR-CASE	ON	THAW	OFF	31	Continuous	.25	31	ON	THAW	Casework
A-FLOR-CASE-IDEN	ON	THAW	OFF	191	Continuous	.25	191	ON	THAW	Casework tags
A-FLOR-EVTR	ON	THAW	OFF	172	Continuous	.35	172	ON	THAW	Elevators
A-FLOR-HRAL	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Stair handrails
A-FLOR-IDEN	ON	THAW	OFF	171	Continuous	.25	171	ON	THAW	Finish tags
A-FLOR-STRS	ON	THAW	OFF	31	Continuous	.25	31	ON	THAW	Stairs
A-FLOR-TPTN	ON	THAW	OFF	110	Continuous	.18	110	ON	THAW	Toilet partitions
A-GLAZ	ON	THAW	OFF	151	Continuous	.20	151	ON	THAW	Windows
A-GLAZ-ASSM	ON	THAW	OFF	71	Continuous	.20	71	ON	THAW	Window assemblies
A-GLAZ-CURT	ON	THAW	OFF	52	Continuous	.35	52	ON	THAW	Curtain walls
A-GLAZ-CURT-UNIT	ON	THAW	OFF	51	Continuous	.25	51	ON	THAW	Curtain wall units
A-GLAZ-IDEN	ON	THAW	OFF	151	Continuous	.35	151	ON	THAW	Window tags
A-LEADER	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Leader lines
A-POLY	ON	THAW	OFF	110	Continuous	.18	110	ON	THAW	AEC polygons
A-ROOF	ON	THAW	OFF	132	Continuous	.35	132	ON	THAW	Rooflines
A-ROOF-LEVL	ON	THAW	OFF	150	Continuous	.20	150	ON	THAW	Roof level
A-ROOF-SLAB	ON	THAW	OFF	12	Continuous	.35	12	ON	THAW	Roof slabs
A-ROOF-SPCL	ON	THAW	OFF	96	Continuous	.18	96	ON	THAW	Roof specialties
A-SECT	ON	THAW	OFF	73	Continuous	.35	73	ON	THAW	Miscellaneous sections
A-SECT-IDEN	ON	THAW	OFF	191	Continuous	.25	191	ON	THAW	Section marks
A-SECT-LINE	ON	THAW	OFF	181	Continuous	.18	181	ON	THAW	Section lines
A-SLAB	ON	THAW	OFF	192	Continuous	.35	192	ON	THAW	Slabs
A-WALL	ON	THAW	OFF	113	Continuous	.35	113	ON	THAW	Walls
A-WALL-CHAS	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Chases
A-WALL-FULL-EXTR	ON	THAW	OFF	113	Continuous	.35	113	ON	THAW	Walls - exterior
A-WALL-FULL-INTR	ON	THAW	OFF	53	Continuous	.30	53	ON	THAW	Walls - interior
A-WALL-IDEN	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Wall tags
A-WALL-OPEN	ON	THAW	OFF	31	Continuous	.25	31	ON	THAW	Wall openings

AS-CTRL	ON	THAW	OFF	white	Continuous	.18	7	ON	THAW	Control points
AS-PROP	ON	THAW	OFF	white	Continuous	.18	7	ON	THAW	Property
AS-TINN	ON	THAW	OFF	white	Continuous	.18	7	ON	THAW	Triangulated irregular network
AS-TOPO	ON	THAW	OFF	white	Continuous	.18	7	ON	THAW	Topography
C-SITE	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Site
C-SITE-PKNG	ON	THAW	OFF	70	Continuous	.18	70	ON	THAW	Parking symbols
C-SITE-UTIL	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Site utilities
C-SITE-VHCL	ON	THAW	OFF	40	Continuous	.18	40	ON	THAW	Vehicles
C-STRM	ON	THAW	OFF	150	Continuous	.25	150	ON	THAW	Drainage
DEFPOINTS	ON	THAW	OFF	white	Continuous	Default	7	OFF	THAW	Default Non-Plotting Layer
E-ELEC	ON	THAW	OFF	71	Continuous	.25	71	ON	THAW	Electrical
E-ELEC-IDEN	ON	THAW	OFF	91	Continuous	.25	91	ON	THAW	Electrical tags
E-ELEC-SWCH	ON	THAW	OFF	110	Continuous	.18	110	ON	THAW	Electrical switches
E-LITE-CLNG	ON	THAW	OFF	33	Continuous	.35	33	ON	THAW	Ceiling lights
E-LITE-WALL	ON	THAW	OFF	53	Continuous	.35	53	ON	THAW	Wall lights
E-PATT	ON	THAW	OFF	134	Continuous	.18	134	ON	THAW	Electrical hatching
E-POWR-DEMO	ON	THAW	OFF	230	Continuous	.35	134	ON	THAW	Electrical demolition
E-POWR-EXST	ON	THAW	OFF	62	Continuous	.25	134	ON	THAW	Electrical existing
E-POWR-NEW	ON	THAW	OFF	210	Continuous	.35	134	ON	THAW	Electrical new
E-WALL-POWR	ON	THAW	OFF	130	Continuous	.18	130	ON	THAW	Electrical power
G-ANNO-MASK	ON	THAW	OFF	170	Continuous	.18	170	ON	THAW	AEC Masking objects
G-ANNO-MATC	ON	THAW	OFF	214	Continuous	.70	214	ON	THAW	Match lines
G-ANNO-NPLT	ON	THAW	OFF	140	Continuous	.18	140	OFF	THAW	Sheet view viewports
G-ANNO-TITL	ON	THAW	OFF	233	Continuous	.35	233	ON	THAW	Drawing title text
G-ANNO-TITL-SCAL	ON	THAW	OFF	231	Continuous	.25	231	ON	THAW	Graphical scales
G-ANNO-TTLB	ON	THAW	OFF	213	Continuous	.35	213	ON	THAW	Border and title block
G-ANNO-VIEW	ON	THAW	OFF	161	Continuous	.18	161	OFF	THAW	G-Anno-View
G-GRID-NPLT	ON	THAW	OFF	200	DASHED2	.18	200	ON	THAW	Layout grids
I-FURN	ON	THAW	OFF	40	Continuous	.18	40	ON	THAW	Furniture
I-FURN-IDEN	ON	THAW	OFF	211	Continuous	.25	211	ON	THAW	Furniture tags
M-PATT	ON	THAW	OFF	134	Continuous	.18	211	ON	THAW	Mechanical hatching
M-DUCT-DEMO	ON	THAW	OFF	240	Continuous	.35	211	ON	THAW	Mechanical demolition
M-DUCT-EXST	ON	THAW	OFF	51	Continuous	.25	211	ON	THAW	Mechanical existing
M-DUCT-NEW	ON	THAW	OFF	80	Continuous	.35	211	ON	THAW	Mechanical new
P-FLOR-FIXT	ON	THAW	OFF	131	Continuous	.20	131	ON	THAW	Plumbing fixtures
P-FLOR-FIXT-IDEN	ON	THAW	OFF	231	Continuous	.20	231	ON	THAW	Plumbing fixture tags
P-FLOR-SPCL	ON	THAW	OFF	90	Continuous	.18	90	ON	THAW	Plumbing specialties

P-PATT	ON	THAW	OFF	134	Continuous	.18	90	ON	THAW	Plumbing hatching
P-PIPE-DEMO	ON	THAW	OFF	191	Continuous	.35	90	ON	THAW	Plumbing demolition
P-PIPE-EXST	ON	THAW	OFF	32	Continuous	.25	90	ON	THAW	Plumbing existing
P-PIPE-NEW	ON	THAW	OFF	130	Continuous	.35	90	ON	THAW	Plumbing new
S-BEAM	ON	THAW	OFF	240	Continuous	.20	240	ON	THAW	Structural beams
S-BEAM-IDEN	ON	THAW	OFF	131	Continuous	.25	131	ON	THAW	Structural beam tags
S-COLS	ON	THAW	OFF	52	Continuous	.35	52	ON	THAW	Columns
S-COLS-BRCE	ON	THAW	OFF	32	DASHED	.70	32	ON	THAW	Structural braces
S-COLS-IDEN	ON	THAW	OFF	171	Continuous	.25	171	ON	THAW	Structural column tags
S-GRID	ON	THAW	OFF	191	CENTER2	.25	191	ON	THAW	Column grids
S-GRID-IDEN	ON	THAW	OFF	191	CENTER2	.25	191	ON	THAW	Plan grid bubbles
T-COMM	ON	THAW	OFF	130	Continuous	.18	130	ON	THAW	Communications
T-CTRL	ON	THAW	OFF	230	Continuous	.18	230	ON	THAW	Control systems

Note: Other layers may be added as required. Refer to the complete National Cad Standard (NCS) for appropriate layer names. When adding layers, select a color number above 30 and set the appropriate line weight.

Plotting

Starting with AutoCAD Architecture 2010, drawings will be plotted using the Plot Style Table “MSU 1-30 AIA 31-255 LWT by Object”. This plot style uses legacy line weights by color for colors 1 through 30 (see Table 5). Colors 31 through 249 will plot black at the line weight of the object (usually specified in the layer properties). Colors 250 (60%), 251 (50%), 252 (40%), 253 (30%), 254 (20%) will plot black at the screening level indicated.

In order to plot in color, a layer color must be selected from the True Color or Color Books tab in the Layer Properties Manager.

Table 5 – Legacy Line Weights			
Color Number	Color Name	Line Weight (mm)	Screening
1	Red	.45	100%
2	Yellow	.25	100%
3	Green	.60	100%
4	Cyan	.70	100%
5	Blue	.50	100%
6	Magenta	.35	100%
7	Black (White)	.80	100%
8	Gray	.40	100%
9	White (Black)	.15	100%
10	-	.13	100%
11	-	.025	100%
12	-	.09	100%
13	-	.13	10%
14	-	.05	100%
15	-	.025	100%
16	-	.05	100%
17	-	.25	100%
18	-	.25	100%
19	-	.25	100%
20	-	.05	20%
21	-	.25	100%
22	-	.025	100%
23	-	.25	100%
24	-	.25	100%
25	-	.25	100%
26	-	.25	100%
27	-	.25	100%
28	-	.25	100%
29	-	.25	100%
30	-	.25	30%

Plans Providing Survey Information

All surveys drawings will be prepared using the spatial reference, *Montana State Plane, NAD 83, CORS 96, Lambert Conformal Conic*. The National Geodetic Survey publishes NAD 83 coordinates in the metric system (i.e., meters). The conversion factor that should be used to convert between English and metric systems is the international conversion factor of 1 ft. = 0.3048 m.

Raw data collected during surveys will be provided to MSU upon request.

MSU Utility Information

Upon request, MSU may provide the Consultant with the most currently available utility drawings deemed to be of use for a project. Drawings will be provided in either the most current version of AutoCAD or the version currently being used by MSU.

It is the responsibility of the Consultant to confirm all utility information.

Prior to digging on the MSU campus it is mandatory that underground utilities be located. See Appendix A of this document for the MSU utility locating policy.

Consultants will document the location of underground utility features before they are covered up. This information will be provided in the as-built / record document set at project closeout.

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**Campus Planning, Design & Construction
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6th Avenue and Grant Street
Bozeman, MT 59717-2760**

To make additions or corrections:

**CADD Technician
406-994-7089**

Information contained in this manual is based in part from:

**United States National CAD Standard - Version 4.0
National Institute of Building Sciences 1999-2007
1090 Vermont Avenue, NW, Suite 700
Washington, DC 20005-4905**

Appendix A

Utility Locating Policy

Requesting a Locate-University Staff and Students

University Staff and Students should request locates of utilities within Montana State University property within city of Bozeman by completing the [Request for Locates form](#) found on the Campus Planning Design & Construction website.

The request must be submitted at least 72 hours before the scheduled start time (not including weekends and holidays). CPDC will contact [Montana One Call](#) for all University Staff and Student generated locate requests. [Montana One Call](#) will be provided with the requestors name and phone number to assist non MSU utilities with completion of locates.

Upon receipt of a [Montana One Call](#) request or dig number per Montana Code, a 48 hour time period to complete locates will commence. CPDC will notify the requestor via email or phone that the locate request has been received and provide the start time of the 48 hour time period. The locate will then be scheduled to be completed. **No excavation work can commence until after the 48 hour time-period has transpired.**

Locate requests received with less than 72 hours before the scheduled start time may not be completed by the requested time.

Verbal requests for locates will only be taken if the locate is required due to an emergency and will be submitted by CPDC to [Montana One Call](#) as an emergency locate request.

Call 994-7301 for emergency locate requests during normal work hours. Emergency locate requests outside of normal work hours should be directed to MSU Police at 994-2121. Emergency locates will generally be completed in less than two hours.

All locate requests outside of the city of Bozeman are to be completed by contacting [Montana One Call](#) at 800-424-5555 or 811.

Requesting a Locate-Contractors

Contractors completing any excavation work are required by law to notify [Montana One Call](#) at 800-424-5555 or 811 for locates of utilities at least 48 hours prior to ALL excavations (not including weekends and University and legal holidays). **No excavation work can commence until after this 48 hour time period commencing with the issuance of a locate request or dig number from Montana One Call has transpired.** Contractors shall be responsible for scheduling joint locating meetings as their project requires. Emergency locate requests shall also be made by contacting [Montana One Call](#).

When contacting [Montana One Call](#) the contractor shall provide the following project location information to the operator for every locate requested: Montana State University, Project Name, closest street, intersection, or existing building, GPS coordinates and/or

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other descriptions that define the work site. Locating Authority MSU Campus Planning Design and Construction Department will locate all underground utilities owned and operated by the university in Bozeman and Gallatin County. All non-MSU utilities in these areas and outside of Bozeman and Gallatin County will be located by the utility owner.

What Types of Work Require a Locate?

A locate is required prior to commencing work for almost any excavation and per [Montana law](#) an excavation is defined as the following:

"...an operation in which earth, rock, or other material in the ground is moved, removed, or otherwise displaced by means or use of any tools, equipment, or explosives. The term includes but is not limited to grading, trenching, digging, ditching, drilling, augering, tunneling, scraping, and cable or pipe plowing and driving.

Excavation does not include surface road grading maintenance or road or ditch maintenance that does not change the original road or ditch grade or flow line.

Unless the work falls under the exceptions listed above a request for locates must be submitted and sufficient time allowed for locates of the underground utilities to be completed before commencing any work.

White-Lining of Proposed work

White-lining is the process of utilizing white paint and/or white flags to indicate the area included in the proposed work or excavation covered in the locate request. The requestor should white-line or flag the work area sufficiently to allow the locator to easily identify the area prior to submitting the locate request. If the locate request includes multiple sites and work areas each location should be white-lined or flagged.

Utility Locates

Locates of University owned and operated utilities will be made between the hours of 8:00 am to 4:30 pm Monday to Friday except during University Holidays.

All affected utilities in the work area will be located. The markings extend approximately 20 feet outside of the indicated work area.

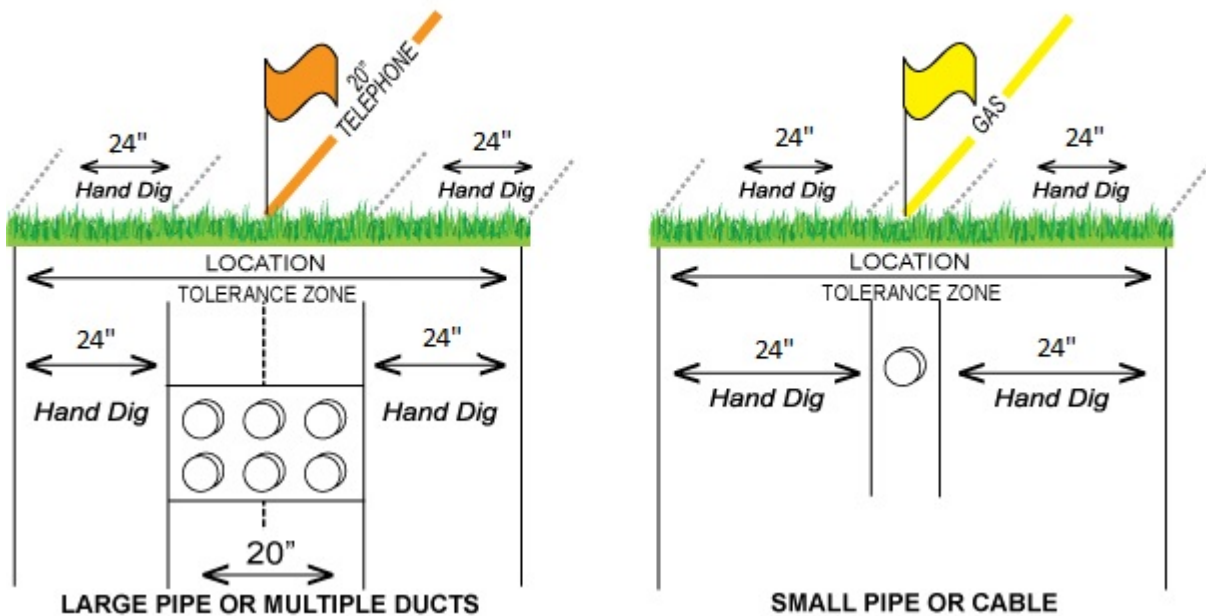
Abandoned utilities will not be located. Locate markings shall be accomplished by color-coding in accordance with the Uniform Color Code of the American Public Works Association as shown below. Locate markings should last five days on any non-permanent surface (i.e. grass) and ten days on any permanent surface (i.e. pavement).

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Utility	Flags	Whisker Line Marker	Ground Painting
Electric and Lighting	Red with MSU logo	Red	Red dots and lines
Telephone & Fiber Optic	Orange with MSU logo	Orange	Orange dots and lines
Natural Gas	Yellow with yellow lettering	Yellow	Yellow dots and lines
Steam, Steam Tunnels, and Condensate	Yellow with Blue lettering	Yellow	Yellow lines blue dots
Domestic Water	Blue with blue lettering	Blue	Blue dots and lines
Chilled Water	Blue with white lettering	Blue	Blue lines and white dots
Geothermal	Blue with yellow lettering	Blue	Blue lines and yellow dots
Sanitary Sewer	Green	Green	Green lines and dots
Storm Sewer	Green	Green	Green lines and dots
Irrigation	Purple	Purple	Purple Lines and dots

The accuracy of the locates or tolerance zone shall be eighteen (18) inches on either side of the underground utility outside edge as shown below. On single pipes less than six (6) inches in diameter or direct buried cables the tolerance zone shall be eighteen (18) inches on either side of the center line. Depth of buried lines vary and will not be marked.

TOLERANCE ZONE



Appendix A

Montana One Call

The [Montana One Call](#) center provides statewide coverage for notification to Utility Companies to complete locates of their utilities as requested. MSU is a member of [Montana One Call](#) and is notified of any locate request on MSU property in Bozeman or Gallatin County. The following utilities are known to have facilities on university property:

Utility	Company	Ground Painting
Electric	Northwestern Energy	Red
Street Lights	City of Bozeman	Red
Telephone and Fiber Optic	Century Link	Orange
Cable TV and Fiber Optic	Charter	Orange
Fiber Optic	Montana Opticom	Orange
Fiber Optic	Zayo Networks	Orange
Fiber Optic	Bozeman Fiber	Orange
Natural Gas	Northwestern Energy	Yellow
Water	City of Bozeman	Blue
Sanitary/Storm	City of Bozeman	Green

[Montana One Call](#) phone number is 1-800-424-5555 or 811, twenty-four hours a day.

Completion of Locates

When the locate of University owned and operated utilities is finished the MSU locator will place a white flag marked "Locates Complete" and paint "OK" near the flag in white paint. The flag will be placed near the center of the locate area on small jobs. On larger jobs (over 1000 square feet) multiple flags will be placed. Upon completion of the locate Campus Planning Design and Construction will contact the requestor either by email or phone confirming that the Montana State University utilities have been located.

Proceeding with Proposed Excavation

Upon notification by Campus Planning Design and Construction that locates are complete and after the Montana One Call required 48-hour time period has expired (excluding weekends and University and legal holidays), work may commence. Excavators have an obligation to dig in a reasonable and prudent manner at all times, taking all necessary and required measures to avoid damaging underground facilities.

Maintaining Locate Information

The requesting party should maintain the locate marks by appropriate methods to minimize locate recall. If markings will be destroyed or otherwise altered during the excavation or work, the requesting party must establish suitable reference points which enable the excavator to locate the underground facilities at all times during the work. It

Appendix A

shall be the responsibility of the requesting party to remove and dispose of the flags and bristle line markers upon completion of the work.

Protection of Existing Utilities

Excavation adjacent to underground utilities shall be done with care, and then only after determining the exact location of them. Hand digging or pot-holing with acceptable methods shall be utilized to expose the affected utility to prevent rupture or breaking of the line. Extra caution shall be utilized when working around direct buried electric lines, fiber optic cables and gas mains. Where the excavation undermines an existing utility, an owner approved method of support shall be utilized.

Damages to Existing Utilities

Cost of repairing any damages to existing utilities within the tolerance zone or work performed without requesting locates shall be the responsibility of the requester. Cost of repairing damages caused by missed locates (actual utility found outside the tolerance zone) shall be the responsibility of MSU.