



City of Santa Ana
Public Works Agency

Microstation
Interagency CAD Standards

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1. Introduction

To improve the efficiency and coordination of electronic drawings within the City of Santa Ana Public Works Agency, computer aided drafting (CAD) standards have been developed. The standards were developed for Microstation 95, but may also be used with Microstation 5.0 although certain features will not work. The standards are intended to create uniformity in drawings and are not intended as a training tool for the Microstation program.

The concept behind these CAD standards is the use of master files. Master files are design files from each of the respective departments. These files are cross referenced to create complete construction drawings. Cross referencing is a powerful feature since it eliminates the need to duplicate drawing information. For example, a centerline master file may be created by the survey department and used as a reference file by every other division. Master file creation and naming is discussed in section 9.

After the master files have been developed, the sheet files are created. The sheet files contain all the necessary reference master files attachments and construction notes. This file is then plotted to scale (i.e. 1"=20'). All sheet files shall be two dimensional (2d).

2. Seed Files

When a drawing is first created, Microstation will ask for a seed file. Seed files are prototype drawings that contain the drawing settings. The seed files include the cell library, level name file, dimension settings, working units, global origin and text settings. A different seed file has been created for each of the master files for 20 scale drawings. They are as follows:

- | | | | |
|----------------|--------------------------|----------------|---------------------------|
| - seed20cl.dgn | (Center Line & R/W Line) | -seed40tr.dgn | (Channelization) |
| - seed20de.dgn | (Street Design File) | -seed10ts.dgn | (Traffic Signal) |
| - seed20pr.dgn | (Profile) | -seed20ts.dgn | (Traffic Signal 20 scale) |
| - seed20sd.dgn | (Storm Drain) | - seed20sh.dgn | (Sheet File) |
| - seed20to.dgn | (Topo) | - seed20se.dgn | (Sewer) |
| - seed20ut.dgn | (Utility) | - seed20wa.dgn | (Water) |

If the scale of the drawing is to be something other than 20 scale, the default text size needs to be changed to the corresponding text height (see section 6).

The working units in the seed files are the following:

Master Units ---- (ft)
Sub Units (SU)----(TN)

Resolution

10 (TN per ft)
1000 (Pos Units per TN)

and the Global Origin is one of the following:

Nad '27: x = 1292251.6353, y = 300251.6353
Nad '83: x = 5853251.6353, y = 1941251.6353

All the seed files for projects using controlled survey use global origin Nad'83 and Nad '27 on occasion. If the project is not survey controlled, a different global origin may be used. Contact your project manager for the selection of a global origin.

3. Cell Libraries

Cell libraries contain commonly used elements or “blocks”. Standard cell libraries have been developed for use by PWA. Care should be taken to avoid creating custom cells in the standard cell libraries since a cell library update will override the custom cells. The name of the standard cell libraries are:

- pwacel.cel (Street Design Cells & Topography)
- pwawatr.cel (Water & Sewer Cells)
- pwatraf.cel (Traffic Cells)

The respective cell library is automatically attached to the standard seed files. Contact your CAD representative for the location of these files, updates or cell additions .

4. Level Files

Drawing levels in Microstation are similar to “layers” in AutoCad. Levels are used to separate the drawing into different groups of elements so editing is simplified. Each of the master files and sheet files have their own range of levels. There is a maximum of 63 levels in each of the files. Similar to Autocad, Microstation levels can be named. These level names can be grouped and saved as level files. The following level files have been created for each of the master files and are automatically attached to the standard seed files:

- | | | | |
|---------------|--------------------------|---------------|---------------|
| - cl.lvl | (Center Line & R/W Line) | - t-sht.lvl | (Title Sheet) |
| - design.lvl | (Design File) | - traffic.lvl | (Traffic) |
| - prfl.lvl | (Profile) | - sewer.lvl | (Sewer) |
| - sd.lvl | (Storm Drain) | | |
| - sheet.lvl | (Sheet File) | | |
| - survey.lvl | (Topo) | | |
| - utility.lvl | (Utility) | | |
| - water.lvl | (Water) | | |

These files are for convenience only and are not essential to a drawing.

5. Color Table

The following color table should be used in all drawings and is the default to the standard seed files:

- color.tbl.

When a drawing is converted from AutoCad to Microstation, the program assigns the acad.tbl color table. To properly convert a drawing, the color table as well as the color of the elements have to be changed to match standards. Conversion from AutoCad to Microstation is discussed in section 7.

6. Text

The following is a summary of the standard text to be used in the drawings:

Construction Notes and Callouts - "Engineering" (Size 0.09)
Main Street Names - "Bold" (Size 0.3)
Titles, Match Line Text, Headers and Street Names - "Bold" (Size 0.20)
Line Spacing (LS) - ½ of the text height

Note that the size of the text for different scales are calculated by multiplying by the appropriate scale. For example, a 20 scale drawing will have construction notes of $(0.09 \times 20) = 1.80$ and titles of $(0.20 \times 20) = 4.00$.

7. AutoCad File Conversion

All new projects must be done in Microstation, however if an existing Autocad drawing must be converted, one of the following procedures can be utilized:

- a. Open a new drawing in Microstation, attach the corresponding two dimensional (2d) seed file and import the existing Autocad (dwg) drawing.
- b. Open the *dwg* drawing in Microstation. Microstation will convert the drawing to *dgn*. Special care should be taken with this option since Microstation converts to 3d files and assigns a non-standard color table and seed file.

It is very important to work in a 2d files since working in a 3d file may give erroneous measurements if elements are at different elevations. The 2d files will carry the .dgn extension.

8. Plotting

Plotting in Microstation 95 should be done using plotting parameter files. These files are used to magnify line weights at the plotter and have been created for each of the master files. Contact your CAD representative for the location and use of these files.

9. Master File Naming

Master files are created by a representative(s) from each department using a master file creation database maintained by the Water Division. Contact your CAD representative for more information. In general, master files are named using the following convention:

mmmmmTS-DRR.DGN

where: **mmmmm** is the master file group# (obtain from PWA). This number is helpful to group projects based on their geographical location.

T is the Plan Type from the following list

S is the Plan Sub-Type from the following list

D is the division that created file.
(*D* - Design, *S* - Survey, *W* - Water, *T* - Traffic)

RR is the revision number

Plan Type (T)	Master File	Logical Name For Reference Files
A	Survey / Topo	TO
C	Centerline / Right of Way	CL
D	Design	DE
I	Irrigation	IR
L	Landscaping	LA
B	Street Lighting	SL
Q	Storm Drain	SD
S	Sanitary Sewer	SS
T	Channelization (Traffic)	CH
U	Utility	UT
W	Water	WA
X	Signalization	TS
R	Raster	RA

Sub-Type (S)	Master File
A	Alignment
D	Detail
P	Profile

Example: For a new project, the survey department creates a survey/topo file called 10010aa-s00.dgn. Design department then creates a street improvement plan 10010da-d00.dgn and a design profile 10010dp-d00.dgn. Traffic provides channelization by creating 10010ta-t00.dgn. Finally, the water department creates a water main master file named 10010wa-w00.dgn and later has a revision file named 10010wa-w01.dgn

Note that the file name gives the user an indication as to the type and accuracy of the files. For example, Design Engineering could have created the survey file. Since this file may not have been as accurate as the one prepared by the survey department, it would have been named 10010aa-d00.dgn

Sheet File Naming

Sheet Files should be named according to the specifications of each respective division.

10. Drawing Revisions (As-builts)

The drawing revision process is currently under development and will be addressed in a subsequent revision.

11. Master File Element Parameters

A. TOPOGRAPHY

Level #	Level Name	Color	Line type	Weight
1	Monument (Symb.)	Gray (9)	0	1
2	Control (Symb.)	White (0)	0	1
3	Water (Symb.)	Gray (144)	0	1
4	Sewer (Symb.)	Gray (144)	0	1
5	Traffic (Symb.)	Gray (144)	0	1
6	Electrical (Symb.)	Gray (144)	0	1
7	Phone (Symb.)	Gray (144)	0	1
8	CATV (Symb.)	Gray (144)	0	1
9	Gas (Symb.)	Gray (144)	0	1
10	Irrigation (Symb.)	Gray (144)	0	1
11	Street Light (Symb.)	Gray (144)	0	1
12	Signs (Symb.)	Gray (144)	0	1
13	Street Furniture (Symb.)	Gray (144)	0	1
14	Misc. Utility (Symb.)	Gray (144)	0	1

15	Post (Symb.)	Gray (144)	0	1
16	Tree Well (Symb.)	Gray (144)	0	1
17	Symbol (Elev.)	Orange (6)	0	1
18	AC (Elev.)	Red (3)	0	1
19	PCC (Elev.)	Magenta (5)	0	1
20	Back of Walk (Elev.)	Magenta (5)	0	1
21	Fence (Elev.)	*Varies	0	1
22	Driveway (Elev.)	Cyan (7)	0	1
23	Edge of Pavement (Elev.)	Red (3)	0	1
24	Flowline (Elev.)	Yellow (4)	0	1
25	Top of Curb (Elev.)	Cyan (7)	0	1
26	Lip of Gutter (Elev.)	Magenta (5)	0	1
27	Natural Ground (Elev.)	Blue (1)	0	1
28	Vegetation (Elev.)	*Varies	0	1
29	Centerline (Elev.)	*Varies	0	1
30	Misc. (Elev.)	Green (2)	0	1
31	Retaining Wall (Elev.)	Cyan (7)	0	1
32	Railroad (Elev.)	Cyan (7)	0	1
33	Building (Elev.)	*Varies	0	1
34	Brick Pavement (Elev.)	Magenta (5)	0	1
35	Post (Elev.)	*Varies	0	1
36	Berm (Elev.)	Cyan (7)	0	1
37	Tree Well (Elev.)	Magenta (5)	0	1
38	BW	Gray (144)	3	1
39	Fence	Gray (144)	custom	1
40	Driveway	Gray (144)	3	1
41	EP	Gray (144)	3	1
42	FL	Gray (144)	3	1
43	TC	Gray (144)	3	2
44	LG	Gray (144)	3	1
45	NG	Gray (144)	3	1
46	Vegetation	Gray (144)	3	0
47	Wheel Chair Ramp	Gray (144)	3	1
48	Retaining Wall	Gray (144)	custom	1
49	Railroad	Gray (144)	custom	1
50	Building	Gray (144)	0	1
51	Brick Pavement	Gray (144)	3	1
52	Berm	Gray (144)	3	1
53	Misc.	Gray (144)	3	1
54	Misc.	Gray (144)	3	1
55	Control	Gray (144)	0	1
56	Misc. Existing Man-Made Plature	Gray (144)	3	1
57	Road Features (Striping)	Gray (144)	cont.	1

58	Misc.	Gray (144)	3	1
59	Exist Utility Features	Gray(144)	3	1
60	Coordinate Grid	Gray(144)	1	1

*Varies: Elevations at these points should have the color of the adjacent surface AC=Red, PCC=Magenta, NG=Blue.

Bold items represent all the line work in the topography file. The final plot of the topography file shall be “screened” using black thin lines (no grayscales).

B. CENTERLINE / RIGHT OF WAY

Level #	Level Name	Color	Line type	Weight
1	Survey Centerline	White (0)	custom (Centerline)	1
2	Construction Centerline	White (0)	custom (Centerline)	1
3	Centerline Annotation	White (0)	0	1
4	Centerline Ticks and Text	Cyan (7)	0	1
5	Existing Street R/W	Lt. Red (99)	custom (R/W)	2
6	Proposed Street R/W	Red (3)	custom (R/W)	2
7	Existing P/L and Easements	Lt. Brown (94)	6	1
8	Proposed P/L and Easements	Red (3)	6	2
9	Addresses	Red (3)	0	1
10	City Boundary	Red (3)	6	4
11	Boundary Annotation	Red (3)	0	1

C. STREET IMPROVEMENT DESIGN

Level #	Level Name	Color	Line type	Weight
10	Curb Face	Yellow (4)	0	1
11	Back of Curb Face	Lt. Yellow (116)	0	0
12	Gutter Lip	Cyan (7)	0	1
13	Median Curb Face	Yellow (4)	0	1
14	Back of Walk	Yellow (4)	0	1
15	Sidewalk, Tree well	Yellow (4)	0	1
16	Pavement Line	Orange (6)	0	1
17	Driveway	Yellow (4)	0	1
18	Center Line of Driveway	White (0)	custom (Centerline)	1
19	Hatch PCC	Lt. Yellow (156)	0	1
20	Hatch CM	Lt. Yellow (116)	0	1

21	Hatch RMVL	Lt. Yellow (116)	0	1
22	WCR	varies	0	1
23	Traffic Loops	Blue (1)	0	1
24	Parkway Culvert	Blue (1)	0	1
25	Prop. Fence	Yellow (4)	custom	1

D. STORM DRAIN

Level #	Level Name	Color	Line type	Weight
25	Mainline/Lateral, Manhole Junction, CatchBasin, Collars	Blue (1)	0	2
26	Centerline (SD)	Magenta (5)	7	1
27	Station Text	Cyan (7)	0	1

E. STREET LIGHTING

Level #	Level Name	Color	Line type	Weight
29	Conduit	Magenta (5)	0	2
30	Light, Pull Box	Magenta (5)	0	2

F. CHANNELIZATION (TRAFFIC)

Level #	Level Name	Color	Line type	Weight
30	Curb	Blue (1)	0	2
31	Prop. Striping	Red (3)	custom*	2
32	Exist. Striping	Gray (9)	custom*	1
33	Relocated Equip.	Yellow (4)	0	1

* There are different linetypes for existing, proposed and sandblasted striping.

G. SIGNALIZATION

Level #	Level Name	Color	Line type	Weight
35	Exist. Conduit	White (0)	custom	1
36	Exist. Equip.	White (0)	custom	1
37	Prop. Conduit	Blue (1)	custom	3
38	Prop. Equip.	Blue (1)	0	2
39	Prop. Loops	Blue (1)	0	2

H. WATER

Level #	Level Name	Color	Line type	Weight
41	Prop. Water Line	Red (3)	0	3
42	Prop. Hydrants, Valves, Reducers, Caps	Yellow (4)	0	2
43	Prop. Casing	Yellow (4)	0	2
44	Prop. Hatch Casing	Yellow (4)	0	2
45	Exist. Water Line	Dk. Cyan (103)	custom	2
46	Exist. Hydrants, Valves, Reducers, Caps	Must. (68)	0	1
47	Exist. Casing	Must. (68)	dashed	1
48	Exist. Hatch Casing	Must. (68)	dashed	1

I. SANITARY SEWER

Level #	Level Name	Color	Line type	Weight
50	Exist. Sewer	Dk. Orange (70)	custom	2
51	Exist. Manhole, Cleanout, Caps	Must. (68)	0	1
52	Exist. Laterals	Dk. Orange (70)	dashed	1
53	Exist. Casing	Gray (9)	dashed	1
54	Exist. Hatch Casing	Brown (160)	dashed	1
55	Prop. Sewer	Orange (6)	0	3
56	Prop. Manhole, Cleanout, Caps	Yellow (4)	0	2
57	Prop. Laterals	Orange (6)	0	2
58	Prop. Casing	White (0)	0	2
59	Prop. Hatch Casing	Brown (160)	0	2
60	Reserved	Cyan (7)	0	1
61	Center Line	White (0)	C/L	1

J. IRRIGATION














Level #	Level Name	Color	Line type	Weight
1	Existing Irrigation System	White (0)	3	0
2	Heads	Cyan (7)	0	1
3	Text	Cyan (7)	0	1
4	Mainline	Blue (1)	0	2
5	Lateral Lines & Annotation	Green (2)	0	1
6	Equipment	Cyan (7)	0	1
7	Spray Pattern	White (0)	0	0

8	Electrical Wiring	Cyan (7)	0	1
9	Conduit Sleeves	Orange (6)	3	1

K. LANDSCAPING

Level #	Level Name	Color	Line type	Weight
10	Shrubs or Groundcover	Green (2)	0	1
11	Plants	Green (2)	0	1
12	Trees	Green (2)	0	1
13	Mound Contours.	Red (3)	3	2

L. UTILITY

Level #	Level Name	Color	Line type	Weight
1	Water Exist.	Dk. Green (162)		1
2	Water Lateral	Dk. Green (162)		1
3	Sewer Exist.	Dk. Green (162)		1
4	Sewer Lateral	Dk. Green (162)		1
5	Edison	Dk. Green (162)		1
6	Gas Main	Dk. Green (162)		1
7	Gas Lateral	Dk. Green (162)		1
8	Reclaimed Water	Dk. Green (162)		1
9	CATV	Dk. Green (162)		1
10	Phone	Dk. Green (162)		1
11	OCSD	Dk. Green (162)		1
12	MWD	Dk. Green (162)		1
13	Irrigation	Dk. Green (162)		1

14	IRWD	Dk. Green (162)		1
15	Mesa Consolidated Water District	Dk. Green (162)		1
16	Traffic Conduit	Dk. Green (162)		1
17	Stormdrain	Dk. Green (162)		1
18	Exist. Loops	Dk. Green (162)		1
19	Exist. Interconnect	Dk. Green (162)		1
20	Navy	Dk. Green (162)		1
21	Fiber Optic	Dk. Green (162)		1
22	Reserved	Cyan (7)	cont.	1
23	Lighting Conduit	Dk. Green (162)	dashed	1

M. SANITARY SEWER PROFILE

Level #	Level Name	Color	Line type	Weight
1	Grid	Gray (9)	0	
2	Sewer Exist.	White (0)	hidden	
3	Sewer Prop.	Blue (1)	0	
4	Sewer Text	Orange (6)	0	
5	Station Text	Cyan (7)	0	
6	Exist. Grade	White (0)	hidden	
7	Finished Grade	Red (3)	0	
8	Manhole Exist.	White (0)	hidden	
9	Manhole Prop.	Blue (1)	0	
10	Cleanout Exist.	White (0)	hidden	
11	Cleanout Prop.	Blue (1)	0	
12	Casing Exist.	White (0)	hidden	
13	Casing Prop.	Blue (1)	0	
14	Utility Exist.	White (0)	hidden	
15	Utility Prop.	Yellow (4)	0	

N. STORM DRAIN PROFILE

Level #	Level Name	Color	Line type	Weight
1	Mainline/Lateral, Manhole (Junction), CatchBasin	Blue (1)	0	2
2	Text	Cyan (7)	0	1
3	Exist. Ground	White (0)	3	1
4	Grid	Gray (9)	0	0
5	Exist. Utility	White (0)	3	1
6	Station Text	Cyan (7)	0	1
7	Finished Grade	Red (3)	0	1

O. STREET IMPROVEMENT PROFILE

Level #	Level Name	Color	Line type	Weight
1	Exist Text	White (0)	0	1
2	Prop. Text	Cyan (7)	0	1
3	Exist. Ground	White (0)	3	1
4	Grid	Gray (9)	0	0
5	Exist. Utility	White (0)	3	1

P. SHEET FILE

Level #	Level Name	Color	Line type	Weight
1	Not Used			
2	Text	Cyan (7)	0	1
2	Construction Note	Cyan (7)	0	1
3	Street Name	Cyan (7)	0	1
3	Match Line	Red (3)	0	4
4	Bubble Note	Cyan (7)	0	1
4-7	Not Used			
8	Exist. Dimensions	White (0)	0	1
9	Prop. Dimensions	Cyan (7)	0	1
10	North Arrow	Cyan (7)	0	1
11	Detail	Cyan (7)	0	1
12	X-Section	Cyan (7)	0	1
13	Clip Boundary	Cyan (7)	0	1
14	Plan Boundary	Cyan (7)	0	1