STATE of ALASKA DEPARTMENT of TRANSPORTATION AND PUBLIC FACILITIES

Statewide Design and Engineering Services

CENTRAL REGION



DRAFTING MANUAL

METRIC

Draft August 18, 1998

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Special note to reviewers.

ALL items that are common to Central Region should be in chapter 1. If you have a very unique situation then this should be covered as an exception in the chapter for your section.

Other thing to cover should be all those items which are particular and unique to your work. This might include additional details for your section to the Layering scheme. The full layer scheme should NOT be restated in your section.

We should always try to keep it simple.

Central Region Drafting Standards

Plan Set Preparation

- Design plans will be prepared on paper size 11"by 17" or 22" by 34". If hand drafting all plan sheets shall be developed on mylar with out exception. Plan sheets submitted for reviews may be paper or velum. All final plans for advertising shall be mylar without exception. Computer plotted mylar shall be plotted on the back of the mylar. All <u>as-advertised</u> plan sets will be mylar. All final drawings shall be plotted so that the front surface of the mylar is inkable and erasable.
- 2. All mylar will be matted on both sides and drafting will be with black india ink. The Title Sheet will be of the standard Regional style. Title blocks, project designations, and revision blocks are stick-ons, and will be supplied by the Department. The Engineer's seal will usually be located to the left of the title block in the lower right-hand corner on detail sheets, and in the lower right-hand corner of the plan part of the P&P Sheet. The engineer's seal shall be 50.8 mm (2 inches) in diameter on the final drawing. <u>????</u>
- 3. If a computer-aided drafting (CAD) system is employed, it should be either AutoCAD, Version 12 (or 13), or a software that is capable of conversion producing DXF file format or AutoCAD DWG files.
- 4. For consultants using a CAD system, all submissions to the Department shall be pen plotted or 600 dpi plotted mylars. The final plan set for advertising will also be mylars, with attached AutoCAD drawing files or DXF files on diskettes (3.5 inch, 1.44MB formatted), on QIC80 tape cartridge, or a CD ROM. A listing of special layers, identification of line width usage and all other data necessary for the Department to reproduce the drawings consistent with Regional standard practice shall also be provided in the transmittal letter. Consultants will be provided AutoCAD Version 12 drawing files on diskettes for blank Title Sheets, Detail Sheets, traffic signs and Regional Standard Drawings. Consultants may make copies, and then return the diskettes to the Project Manager within five working days.

All plots will be on the back of the mylar, with the front side inkable and erasable.

5. Standard line thickness will be:

Type of Line	Line	Thickness	Line Type
Construction Centerline on P&P sheets	0.7	mm	Continuos
Construction Centerline on Traffic sheets	0.35	mm	Continuos
Construction Centerline on R/W sheets	0.5	mm	Continuos
Sectionline	0.18	mm	Continuos
Section line of R/W sheets	0.35	mm	Continuos
Right-of-Way, proposed	1	mm	Continuos
Existing Right-of-way on R/W sheets	0.35	mm	Continuos
Existing property lines on R/W sheets	0.35	mm	Continuos
Edge of Existing pavement	0.25	mm	Dashed
Edge of new pavement	0.45	mm	Continuos
Fill Limits (dots)	0.9	mm	Dots
" " on R/W sheets	0.7	mm	Dots
Cut Limits (dashes)	0.7	mm	Short dashes
" " on R/W sheets	0.35	mm	Short dashes
Dimensional Leaders	0.35	mm	Continuos
" on R/W sheets	0.25	mm	Continuos
Topographical features	0.18	mm	Dashes
Existing Utilities	0.25	mm	Dashes
Scale of Striping			
100 mm	0.45	mm	
200 mm	0.7	mm	
450 mm		Scale	
600 mm		Scale	

All other lines shall be drawn with a .45 mm or .5 mm line thickness. Consistency is to be

maintained throughout the plan set. Existing features will be dashed. CAD drawings will necessarily be plotted on one side of the mylar, but in separate layers.

6. Standard lettering is 3.5 mm (35CL template) with a .5 mm line width. Titles will be 5.0 mm (50CL template) with a .7 mm pen.

The standard computer font is "AusFonts" using Stencil or Steneq fonts.

CAD Drawings

All final Computer Aided Drafting (CAD) drawing files will conform to the following guidelines. CAD sheets shall be pen (with black india ink) or ink jet plotted on sheet size 22" by 34" double matte mylar. Computer final plots shall be done on the back of the mylar. The final submittal will contain the standard plot routine with the .pcp file.

Remember that the field plans used by the most personal are half-sized plans. This size must be readable.

<u>Note to reviewers: Please initial your comments so I can ask you clarification question as necessary. Shaded areas are things that have been changed in this proposed revision or are suggested for possible change.</u>

AutoCAD LAYERING

While it is true that there are a great number of possible layer name combinations shown in the following layering scheme (Appendix A), the number that it makes sense to use together is more limited and the number that will be used in a typical plan set drawing is more likely to be in the fifty to eighty range. This seems to be a small trade-off to reap the benefits of drawing standardization and to enable the use of base information for multiple disciplines and documents.

The following table illustrates the system.

Position 1	Position 2	Position 3	Position 4-7	Existing Features Origin
Status	Entity Type	Logical Group		or Profile Indicator
Detail Existing Future Proposed Sheet As-built	Hatch Line Point Symbol Text	Aviation Building(Arch) Earthwork traFfic Geotech Improvements Project Right-of-way Topography Utility road/runwaY Zone	Mnemonic code	 = Photogrammetric \$ = Digitized _ = As-built X = Cross Section Z = Profile

Any unused position should be filled in with a "-" (dash). Dashes "-" or underlines "_" can be used also as a position holder in place of a space (which can not be used) for readability. The As-Built layers are for use at the project completion for making electronic Red Line sets.

Position 1 - Status:

Use either **E**, **F**, or **P** signifying that the mapped feature is Existing, slated for a Future project, or Proposed for this project. **D** is for **D**etail features that do NOT fit any of the other layers (such as grids in tables). **S** is for **S**heet features such as: borders, North Arrow, grids, titles, masking, etc. **A** is for **A**s-built (Red Lines from construction) for the changes that construction makes while building the project. This will then show what is actually built. This is the last stage of a project. These as-built can then be use as a starting point for future project. Any unused position should be filled with a dash except for the last position if not used.

Position 2 - Entity Type:

Signifies the CAD entity I.D. value. H = Hatching; L = Lines or polylines; P = Points or coordinates; S = Symbol blocks or inserted drawings; T = Text.

It should be noted that "point" is a special case of an inserted block with attributes that incorporates the AutoCAD point entity in its design, and is used to control and create other entities. Also note that in-house surveys and ROW computations are performed with PacSoft software and use its block "COORD" to represent point values; in such cases the layering scheme is altered to include a Position 0 = C for Coordinate and Position 2 is either L or S as appropriate to the feature which the coordinate represents (see attached layering scheme - Appendix A).

Position 3 - Logical Group:

signifies the logical group I.D. value as follows.

- **A** = Aviation plan specific features navigation aids, building restriction lines, etc.
- **B** = Building (architectural only) plan drawings (see attached architectural layering scheme Appendix ???)
- **E** = Earthwork related features slope limits, excavation limits, etc.
- $\mathbf{F} =$ Traffic features such as signals, lighting, signs, and pavement markings.
- **G** = Geotechnical specific features test holes & pits, monitoring wells, etc.
- **I** = Improvements, man-made and not specified in the roadways group structures (houses, bldgs., sheds), retaining walls, fences, private signs, ornamentals, etc.
- **P** = Project specific features baselines, centerlines, horizontal & vertical control
- **R** = Right-of-Way related features Section lines & monuments, property lines & monuments, easements, etc.
- **T** = Natural topographic features brush & tree lines, trails, ditches, wetlands, streams, lakes, rivers, etc.
- **U** = Utility related features storm drainage, electric, natural gas, petroleum/oil, sanitary sewer, telephone/comm., cable television, traffic lighting & signals, and water
- **Y** = Roadway/runway specific features curb & gutter, paved & unpaved surfaces (roads, drives, lots, etc.), sidewalks, traffic signs, etc.
- Z = Zone related features clearing limits, staging areas, seeding limits, topsoil limits, etc.

All standard layers shall utilize positions 1 through 3, thereby allowing the separation and isolation of mapped features to at least the logical group level. In addition, utility layers shall include the fourth position to indicate the utility type (see below).

Positions 4-7:

Positions 4 through 7 consist of a mnemonic code which further identifies and isolates the mapped feature (see attached layering scheme - Appendix A).

These positions are meant to enhance positions 1-3 and should be used accordingly. Care must be taken to prevent unnecessary stratification and the creation of superfluous layers. Most features will fit somewhere in the already defined codes as shown in the attached layering scheme. (Appendix A)

Use of Position 4 is mandatory for utility related features as follows: D =storm Drainage; E =Electric; F =traFfic lighting & signals; G = natural Gas; P =Petroleum/oil; S = sanitary Sewer; T =Telephone/communication; V = cable teleVision; and W =Water.

Last Position:

The end position will signify the origin of the existing mapped feature: - = Photogrammetric information; \$ = digitized information; $_$ = as-built information

Any existing features not tagged as originating from Photogrammetric or digitized data are assumed to have been ground surveyed. All proposed and/or future features are assumed to have been computed.

When a feature is represented in profile view, \mathbf{Z} will be appended to the layer name. This will allow the isolation of profile view features using wild card *Z.

Also use an "X" for layers used in cross section layers (different linetypes are desired).

Aviation

Position 1 Status	Position 2 Entity Type	Position 3 Logical Group	Position 4-7	Existing Features Origin or Profile Indicator
Position 1 Status Detail Existing Future Proposed Sheet	Position 2 Entity Type Hatch Line Point Symbol Text	Position 3 Logical Group Aviation	Position 4-7 $B = Building restriction lineL = Lease lotN = Navigation aidsL = LightsO = OtherOF = Obstacle Free zoneOFA = Object Free AreaPA = ParcelR = RemainRP = Runway Protection zoneRSA = Runway Safety AreaT = TakeTR = TractUSS = U.S. Survey$	Existing Features Origin or Profile Indicator - = Photogrammetric \$ = Digitized _ = As-built X = Cross Section Z = Profile

Buildings

Position 1 Status	Position 2 Entity Type	Position 3 Logical Group	Position 4-7	Existing Features Origin or Profile Indicator
Detail	Hatch	Building (Arch)	Mnemonic code	- = Photogrammetric
Existing	Line			\$ = Digitized
Future	Point			_ = As-built
Proposed	Text			$\mathbf{X} = \text{Cross Section}$ $\mathbf{Z} = \text{Profile}$
Sheet				

Position 1 Status	Position 2 Entity Type	Position 3 Logical Group	Position 4-7	Existing Features Origin or Profile Indicator
Detail	Hatch	- "dash"	P1 = line width for lines or symbols $\{0.18 \text{ mm}\}$	- = Photogrammetric
Evicting	Line		$P2 = line width for lines or symbols {0.25 mm}$	\$ = Digitized
Existing	Point		P3 = line width for lines or symbols $\{0.35 \text{ mm}\}$	– As-built
Future	T Onit		$P4 = line width for lines or symbols {0.45 mm}$	
Proposed	Symbol		P5 = line width for lines or symbols $\{0.50 \text{ mm}\}$	$\mathbf{X} = $ Cross Section
~	Text		$P6 = line width for lines or symbols {0.70 mm}$	$\mathbf{Z} = Profile$
Sheet			$P7 = line width for lines or symbols {0.90 mm}$	
			$P8 = line width for lines or symbols {1.00 mm}$	
			$P9 = line width for lines or symbols {1.40 mm}$	
			P10 = line width for lines or symbols {2.00 mm}	
			P18 = Text size in millimeters $\{1.80 \text{ mm}\}$	
			P25 = Text size in millimeters {2.5 mm}	
			P35 = Text size in millimeters {3.5 mm}	
			P50 = Text size in millimeters $\{5.00 \text{ mm}\}$	
			P70 = Text size in millimeters {7.0 mm}	

These layers are for use on Detail sheets or Summary sheets when no other layer is appropriate.

Earthwork

Position 1 Status	Position 2 Entity Type	Position 3 Logical Group	Position 4-7	Existing Features Origin or Profile Indicator
Detail	Hatch		$\mathbf{B} = \mathbf{B}$ ase	- = Photogrammetric
T • 4	Line		BS = Borrow Site	\$ = Digitized
Existing	Doint	Earthwork	$\mathbf{D} = \mathbf{D}$ igout	- As built
Future	Point		$\mathbf{G} = \mathbf{G}$ eotextile	_ = As-built
Proposed	Symbol		$\mathbf{M}\mathbf{X} = \mathbf{M}$ uck e X ecavation	$\mathbf{X} = $ Cross Section
	Text		$\mathbf{O} = \mathbf{O}$ bliteration	$\mathbf{Z} = Profile$
Sheet			$\mathbf{RP} = \mathbf{R}$ emoval of \mathbf{P} avement limits	
			$\mathbf{R}\mathbf{X} = \mathbf{R}$ ock e X ecavation	
			$\mathbf{S} = \mathbf{s}$ plash basin	
			SC = SubCut	
			SL = Slope Limits	
			$\mathbf{C} = \mathbf{C}$ ut slope limits	
			$\mathbf{F} = \mathbf{Fill}$ slope limits	
			SU = Surcharge	
			SX = Structural eXecavation	
			$\mathbf{E} = \mathbf{E}$ xisting ground	
			-alignment name	
			$\mathbf{X} = \mathbf{e}\mathbf{X}$ cavation	

These layers are not used for existing features.

Position	Position 2	Position 3	Position 4-7	Existing Features
1	Entity	Logical		Origin
Status	Type	Group		or Profile Indicator
Detail Existing Future Proposed Sheet	Hatch Line Point Symbol Text	Geotech	H = Test Hole P = Pentrometer T = Test Pit D = Test Probe	 = Photogrammetric \$ = Digitized _ = As-built X = Cross Section Z = Profile

Improvements)
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Detail ExistingHatch Improveme ntsImproveme nts $B = Boardwalk$ $C = misc. Center of$ $D = bridge Deck or dockF = Fence (all existing)- = Photogrammetric$ = Digitized- = As-builtFutureProposedPointB = BoardwalkC = misc. Center ofD = bridge Deck or dockF = Fence (all existing)- = As-builtX = Cross SectionSheetTextL = bLast fenceZ = Profile$	Position 1 Status	Position 2 Entity Type	Position 3 Logical Group	Position 4-7	Existing Features Origin or Profile Indicator
N = Noise barrier S = Silt fence G = Guardrail, bridgerail M = Mailbox O = Ornamental (tree, shrub, rock, etc.) L = ground Light P = misc. Posts (bollards, reflectors, signs, etc.) RIP = edge of RIPrap RR = RailRoad rail S = end/corner of a private Sign ST = edge of a Structure {i.e. Bridge}(NOT buildings) W = retaining/wing/abutment/head Wall	Detail Existing Future Proposed Sheet	Hatch Line Point Symbol Text	Improveme nts	 B = Boardwalk C = misc. Center of D = bridge Deck or dock F = Fence (all existing) B = Balustrade railing C = Chain link L = bLast fence N = Noise barrier S = Silt fence G = Guardrail, bridgerail M = Mailbox O = Ornamental (tree, shrub, rock, etc.) L = ground Light P = misc. Posts (bollards, reflectors, signs, etc.) RIP = edge of RIPrap RR = RailRoad rail S = end/corner of a private Sign ST = edge of a Structure {i.e. Bridge}(NOT buildings) W = retaining/wing/abutment/head Wall 	 = Photogrammetric \$ = Digitized _ = As-built X = Cross Section Z = Profile

Project

Position	Position 2	Position 3	Position 4-7	Existing Features
1	Entity	Logical		Origin
Status	Type	Group		or Profile Indicator
Detail Existing Future Proposed Sheet	Hatch Line Point Symbol Text	Project	B = Baseline C = Centerline xxxxx = alignment name H = Horizontal control V = Vertical control I = Information {such as roadway names} CD = Curve Data	 = Photogrammetric \$ = Digitized = As-built X = Cross Section Z = Profile

Right-of-Way

Position 1 Status	Position 2 Entity Type	Position 3 Logical Group	Position 4-7	Existing Features Origin or Profile Indicator
Position 1 Status Detail Existing Future Proposed Sheet	Position 2 Entity Type Hatch Line Point Symbol Text	Position 3 Logical Group	Position 4-7 ARR = Alaska Railroad Right-of-Way C = Centerline and Monuments CA = Controlled Access E = Easement I = Interest O = Other P = Property lines and monuments TCP = Temporary Construction Permits GOV = section, ¼, 1/16 and USS lines and monuments, GOVerment SO = Station Offset CON = Temporary CONstruction Permit	Existing Features Origin or Profile Indicator = Photogrammetric \$ = Digitized _ = As-built X = Cross Section Z = Profile

Road and Runway

Position 1 Status	Position 2 Entity Type	Position 3 Logical Group	Position 4-7	Existing Features Origin or Profile Indicator
Detail	Hatch	rood/	BT = B us T urnouts	- = Photogrammetric
Existing	Line	runwa Y	CB = CurB & gutter	\$ = Digitized
Future	Point			_ = As-built
Proposed	Symbol		$\mathbf{P} = \mathbf{P}$ athway	$\mathbf{X} = $ Cross Section
Sheet	Text		SC = edge of Surface of Concrete	$\mathbf{Z} = Profile$
			SP = edge of Surface of asphalt Pavement	
			$\mathbf{S} = \mathbf{S}$ tructural	
			$\mathbf{B} = \mathbf{B}$ last protection	
			SU = edge of Surface Unpaved (gravel)	
			SW = edge of concrete SideWalk	
			HC= Handy Cap Curb Ramp	
			$\mathbf{S} = $ finished Surface	
			$\mathbf{T} = \mathbf{T}$ emplate (in cross sections)	
			$\mathbf{D} = \mathbf{D}$ atum (in cross sections)	

Position 1 Status	Position 2 Entity Type	Position 3 Logical Group	Position 4-7	Existing Features Origin or Profile Indicator
Detail	Hatch	- "dash"	$\mathbf{G} = \text{sheet } \mathbf{G}$ rid	- = Photogrammetric
Existing Future Proposed Sheet	Line Point Symbol Text	- "dash"	P-Profile grid N = North Arrow TM = Tick Mark for coordinates TC = Tick Coordinates B = Border {SSB} E = Engineers stamp {SSE} T = Template MS = Mask O - Odd E = Even V = View + name S = Scale bar BB = buBBle ML = Match Lines	\$ = Digitized _ = As-built X = Cross Section Z = Profile

These are used on sheets for objects that need to be isolated but do not fall with any other layer grouping.

Topogra	phy
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Position 1 Status	Position 2 Entity Type	Position 3 Logical Group	Position 4-7	Existing Features Origin or Profile Indicator
Detail	Hatch Line	Topograph	$\mathbf{B} = \text{edge of } \mathbf{B}$ rush	- = Photogrammetric
Future	Point Symbol Text	У	$\mathbf{C} = \mathbf{C}$ ontours $\mathbf{H} = \mathbf{H}$ ighlighted $\mathbf{N} = \mathbf{N}$ ormal	\$ = Digitized _ = As-built
Proposed			$\mathbf{I} = \mathbf{I}$ ntermediate	$\mathbf{X} = $ Cross Section
Sheet			$\mathbf{CR} = \mathbf{CR}$ eek, edge of $\mathbf{D} = \mathbf{ditch}$ line	$\mathbf{Z} = Profile$
			$\mathbf{B} = \mathbf{B}$ ottom of ditch	
			$\mathbf{T} = \mathbf{T}$ op of ditch	
			$\mathbf{F} = \text{edge of tur}\mathbf{F}$ (<i>lawn</i> , grassy area)	
			$\mathbf{G} = \mathbf{G}$ arden	
			WL = edge of WetLands (<i>undifferentiated</i>)	
			$\mathbf{L} = \mathbf{L}$ acustrine	
			$\mathbf{P} = \mathbf{P}$ alustrine	
			$\mathbf{R} = \mathbf{R}$ iverine	
			$\mathbf{M} = \mathbf{M}$ iscellaneous - Name of feature	
			$\mathbf{R} = \mathbf{R}$ iver, edge of	
			$\mathbf{S} = \mathbf{c}/\mathbf{l}$ Stream	
			$\mathbf{T} = \text{edge of } \mathbf{T}\text{rees}$	
			$\mathbf{TR} = \mathbf{TR}$ ail	
			$\mathbf{W} =$ edge of Water (<i>lake, pound, etc.</i>)	
			$\mathbf{H} = \mathbf{H}$ igh water mark	

Position 1 Status	Position 2 Entity Type	Position 3 Logical Group	Position 4-7	Existing Features Origin or Profile Indicator
Detail	Hatch	traFfic	$\mathbf{I} = \mathbf{s}\mathbf{I}$ gnals	- = Photogrammetric
Existing	Line	uarne	$\mathbf{C} = \mathbf{C}$ onduit	\$ = Digitized
Future	Point		$\mathbf{J} = \mathbf{J}$ unction box	_ = As-built
Proposed	Symbol		$\mathbf{L} = \mathbf{L}$ oad Center	$\mathbf{X} = \text{Cross Section}$
Sheet	Text		$\mathbf{P} = \mathbf{P}$ ost or \mathbf{P} ole	$\mathbf{Z} = Profile$
			$\mathbf{M} = \mathbf{M}$ arkings	
			$\mathbf{C} = \mathbf{C}$ ontinuos	
			$\mathbf{K} = s\mathbf{K}ip$	
			S = Symbols	
			$\mathbf{S} = \mathbf{Signs}$	
			$\mathbf{T} = \mathbf{T}$ emporary	

Traffic

Utility

Position 1 Status	Position 2 Entity Type	Position 3 Logical Group	Position 4-7	Existing Features Origin or Profile Indicator
Detail	Hatch	T leilier	$\mathbf{A} = \mathbf{A}$ ntenna	- = Photogrammetric
Existing	.	Unity	$\mathbf{D} = \mathbf{D}$ rainage pipes, structures & culverts	\$ = Digitized
Future	Line		$\mathbf{E} = \mathbf{E}$ lectric	- As built
	Point		$\mathbf{F} = \text{tra}\mathbf{F}$ fic	_ = As-built
Proposed	Symbol		$\mathbf{L} = \mathbf{L}$ uminair	$\mathbf{X} = $ Cross Section
Sheet	Text		$\mathbf{G} = $ natural \mathbf{G} as	$\mathbf{Z} = Profile$
			$\mathbf{P} = \mathbf{P}$ etroleum/oil	
			$\mathbf{PR} = \mathbf{P}$ rivate	
			Light	
			S = sanitary Sewer	
			$\mathbf{T} = \mathbf{T}$ elephone/communication	
			$\mathbf{V} = \text{tele} \mathbf{V}$ ision	
			$\mathbf{W} = \mathbf{W}$ ater	
			For all the above	
			$\mathbf{A} = \mathbf{A}$ bove ground	
			$\mathbf{U} = \mathbf{U}$ nderground	
			$\mathbf{O} = \mathbf{O}$ verhead	

Zone

Position 1 Status	Position 2 Entity Type	Position 3 Logical Group	Position 4-7	Existing Features Origin or Profile Indicator
Detail Existing	Hatch	Zone	C = Clearing CG = Clearing & Grubbing	- = Photogrammetric
Future Proposed	Line Point		CR = CleaR zone CS = Contractor Staging area	\$ = Digitized _ = As-built
Sheet	Symbol Text		GN = General Notes O = Obliteration S = Seeding	X = Cross Section Z = Profile
			$\mathbf{T} = \mathbf{T}$ opsoil $\mathbf{W} = \mathbf{W}$ aste area	
			HP = Hydraulic Profile information $N = tiN model$	
			$\mathbf{B} = \mathbf{B} \text{order}$ $\mathbf{F} = \mathbf{F} \text{ault}$	
			P = Points S = Surfaces W = Water drop	
			3D = 3 Dimensional GridX = Cross Sectional Sampling Lines	

Colors

Name	Color example	HP 650C pen no.	AutoCAD number	RGB v	RGB values		Pantone number
				Red value	Green Value	Blue Value	
Black		1		0	0	0	Black
White		0		255	255	255	
Red		2		255	0	0	192
Green		3		0	255	0	347
Blue		5		0	0	255	Blue
Magenta		7		0	255	255	Magenta
Cyan		6		255	0	255	Cyan
Yellow		4		255	255	0	Yellow
Orange		18		255	168	0	164
Brown		66		205	137	0	470

These are the primary colors that are easily distinguished from each other and by themselves.

Plan set will normally be black lines on white paper. For special uses such as displays, utility checks, environmental documents, ______ and _____.

Regional Prototype Drawings

The Region has developed a standard prototype drawing file that will be used as the basis of all drawings submitted. The prototype drawing includes all the elements necessary for adherence to this standard. Aviation, Highway design, and Right of Way each have their own prototype drawing.

Advertising

- 1. At the time of final transmittal to Technical Services for advertising, the DOT&PF Drafter or consultant will insure that all sheets are numbered correctly, stamped, signed and dated.
- 2. All mylars for advertising will be originals. Traffic, Bridge, and Utilities Sections will provide original mylars to the Drafter, without exception.
- 3. Second generation prints of the plan set need not be made before advertising, but Technical Services will be responsible for returning the original mylars to the appropriate Section after bid opening. At that time all returned mylars will have a second generation copy inserted in the mylar set for as-builts.
- 4. After transmittal of the mylars, usually on the same date as the Engineer seals the plans, no other changes may be made except by addendum, and a notation of the change and a corresponding note in the revision block. Each change will be accented by a 5 mm hexagon or triangle, consecutively numbered, matching the revision description. The engineer who authorized the change will initial the revision block.

Revised mylars in addenda will be denoted by a block in the upper right-hand corner with the words "ADDENDUM #____, ATTACHMENT #____" 5 mm (50CL) high using a .7 mm pen. Technical Services will determine the numbers after the addendum has been received. Added mylars will use the preceding sheet number with an alpha suffix.

5. Absolutely no other changes will be made to the mylars after the issuance of the last addendum, except as authorized by construction change document.

As-Built Drawings

After completion of the project, the as-built drawings are often the only records available to indicate what was actually done. Since correspondence and change documents are eventually destroyed along with other project documentation, reference on the as-builts to either is useless. The changes must be shown on the drawings. Reliable and complete as-built drawings are invaluable aids to future maintenance and design work.

Until such time as electronic storage arrangements have been implemented the following will apply:

1. In the field office during construction, the as-built drawings will be prepared under the

supervision of the Resident Engineer on full-size blackline prints. Corrections will be made with red pencil or red ink.

- 2. The red-lined paper as-built drawings must be carefully and accurately prepared. They should be clean and neat. All applicable field changes should be immediately recorded thereon, by the Resident Engineer or inspector. It is stressed that they are the most current set of plans and should always be kept up to date. All corrections and revisions, including additional sketches, are to be shown on these plans. Corrections will be limited to the specific sections where the work is shown, i.e.: electrical additions should not be shown on the grading sheets.
- 3. All changes shall be corrected on the sheet where the work appears, but on occasion, new sheets need to be added by Construction to the as-built drawings, documenting additional work. These sheets will be size 22" by 34" clear tracing paper, and the drawing and lettering will be clear, concise, and reproducible. Reference will be made as to where this work fits into the plan set, and the sheet it modifies will also reference the new sheet. The new sheet will be numbered the same as the modified sheet except with an alpha suffix.

Since this work usually is attached to change documents, the Resident Engineer may want the original design Drafter to perform the work at the time of the change, in which case it will be prepared in red ink on the original mylars.

- 9. The following information shall be included on as-built drawings.
 - All changes accomplished by change documents
 - Corrected typical sections, including base and surfacing details
 - Estimate
 - Summary tables
 - Subgrade or slope stabilization areas
 - Vertical and horizontal alignment revisions, including curve data
 - Location, dimensions, and materials of all drainage features, including revised invert elevations
 - Exact changes in guardrail locations
 - All new approaches with new permit number
 - Established or reestablished monuments, right-of-way markers, and property corners
 - New, replaced, removed, or abandoned utilities, especially underground (including size and type of lines)
 - Traffic control and illumination circuits (both layout and schematic)
 - Locations and dimensions of all new structures
 - Pile lengths, foundation elevations and other subsurface details, especially any objects encountered and not removed
 - Actual location of anchors, construction and control joints, in concrete
 - Verification of all other details constructed as originally planned
 - Actual locations and dimensions for traffic striping and signing changes

It is not necessary to make revisions for:

- Temporary traffic control measures removed upon completion
- Stage construction sheets
- 10. The as-built mylars shall be maintained by Technical Services in perpetuity. Public information copies are available in Central Files, and are made available for design, maintenance, local government personnel and all other interested parties. The use of microfilm or other reduced recording systems result in the lose of essential details on the more complicated drawings and shall not be a substitute for maintaining the original mylars.

Archiving

It is the intent that all design plan sets will be stored electronically. To that end, all plans will be downloaded to disc or tape and stored in the safe. Original mylars will continue to be kept for the foreseeable future.

Highway Design

Engineering Drawing Preparation

The function of an engineering drawing is to illustrate and describe the project in sufficient detail and clarity to insure correct interpretation by contractors and construction personnel. To achieve this purpose, a drawing must be prepared according to practices that are universally recognized.

The plan set should contain delineation, dimensions, notes, and references as required, in sufficient clarity and detail, consistent with the skills and trade practices involved, to insure correct interpretation by any organization that may have occasion to use it. The following are the Regional Standard practices for all Highway Design drafting.

Plan Set Preparation

- 1. Design plans will be prepared on paper size 22" by 34" mylar without exception. All asadvertised plan sets will be mylar. All final drawings shall be plotted so that the front surface of the mylar is inkable and erasable.
- 2. All mylar will be matted on both sides and drafting will be with black india ink. The Title Sheet will be of the standard Regional style. Title blocks, project designations and revision blocks are stick-ons, and will be supplied by the Department. The Engineer's seal will usually be located to the left of the title block in the lower right-hand corner on detail sheets, and in the lower right-hand corner of the plan part of the P&P Sheet.
- 3. If a computer-aided drafting (CAD) system is employed, it should be either AutoCAD, Version 12, or a software that is capable of conversion producing DXF file format or AutoCAD DWG files.
- 4. For consultants using a CAD system, all submissions to the Department shall be pen plotted or 600 dpi plotted mylars. The final plan set for advertising will also be mylars, with attached AutoCAD drawing files or DXF files on diskettes (3.5 inch, 1.44MB formatted) or on QIC80 tape cartridge. A listing of special layers, identification of line width usage and all other data necessary for the Department to reproduce the drawings consistent with

Regional standard practice shall also be provided in the transmittal letter. Consultants will be provided AutoCAD Version 12 drawing files on diskettes for blank Title Sheets, Detail Sheets, traffic signs and Regional Standard Drawings. Consultants may make copies, and then return the diskettes to the Project Manager within five working days.

All plots will be on the back of the mylar, with the front side inkable and erasable.

5. All other lines not listed in chapter 1, shall be drawn with a .45 mm or .5 mm line thickness. Consistency is to be maintained throughout the plan set. Existing features will be dashed. CAD drawings will necessarily be plotted on one side of the mylar, but in separate layers.

Horizontal and vertical PC's and PT's will be 3 mm diameter circles. The PI triangle is 5 mm tall and points towards the center of the curve.

6. Standard lettering is 3.5 mm (35CL template) with a .5 mm line width. Titles will be 5.0 mm (50CL template) with a .7 mm pen. On P&P Sheets, 3.5 mm (35CL template) with a .5 mm pen is used for stationing along centerline and match lines along the plan view, and for stations and elevations on the profile.

All Leroy lettering or computer equivalent is vertical upper case. Hand lettering is performed in slanted upper and lower case. A #5 guide is used with a .5 mm pen.

The standard computer font is "Romansm" This font shows a difference for "I", "I" and "1".

7. The preferred ratio (scale) for rural projects will be 1:1000 or 1:500. The rural scales are similar to the old 1"=100' or 1"=50' that was used for rural plan sets. The proper ratio shows all the details needed for the contractor to see the picture.

Urban projects with their inherent complexity the preferred ratio is 1:250 or 1:200. These scales are comparable to the old scale of 1'=20'.

8. The plan set shall be assembled in the following order:

PLAN SHEETS	SHEET PREFIX
Title Sheet, Survey and General Layout	А
Typical Sections	В
Estimate of Quantities	С
Summary Sheets	D
Detail Sheets	Е
P&P Sheets	F
Intersection Grading Plans	G
Driveways and Approaches	Н
Traffic Sheets	J
Traffic Control Plans	K
Traffic Counters	L
Retaining Wall Sheets	М
Bridge Sheets	Ν
Utility Sheets(AWWU, electric, telephone, cable, gas, ARRC)	Р
Right-of-Way Maps	R
Standard Drawings	None

Alpha-numeric sheet numbering of the plan set is preferred, but sequential numbering on small plan sets is acceptable. Sheet prefixed shall always follow the above list and gaps in the letter prefixes is all right.

- 9. Abbreviations shall be limited to crowded areas only and avoided in the Notes unless absolutely necessary. Periods are not required, i.e.: BOP, MP, AC, PC, PT, FHWA, etc.
- 10. In 1996, the Federal Highway Administration will require conversion to the metric system of measurement. All projects will include a metric conversion table found in Appendix D on the first summary sheet of the plan set.
- 11. Station equations shall be noted on the Title Sheet. On the P&P Sheets, "AHD" and "BK" shall be used.

- 12. An ellipse will be used for storm drain pipes and culverts on profile with both width and height to scale.
- 13. Right-of-way lines are labeled "R/W" and the controlled-access lines are "C/A".
- 14. Centerline ticks shall extend above the centerline 3 mm and be located every 10, 20, or 25 meters. At the 50 or 100 meter interval the tick shall extend from 3 mm above to 3 mm below the centerline and be annotated. All drawing that show a centerline shall show at least two annotated ticks.
- 15. At each plan set review stage, the engineer or drafter must ensure that the set has the most current Regional Standard Drawings. These are updated periodically by the Region.
- 16. All of the Department's Standard Drawings and Regional Standard Drawings are public property, and can be used as long as the professional engineering seals are removed. The engineer must assure himself/herself that the drawings are accurate and satisfy his purposes before signing.
- 17. Drawing layout, scale and proportion is usually at the discretion of the Drafter. Remember, Highway Design plans are printed half-size for reviews, at advertising, and for the Contractor. It might be clear on a full size mylar, but details must not be lost when plan sheets are half-sized.

CAD Drawings

All final Computer Aided Drafting (CAD) drawing files will conform to the following guidelines. CAD sheets shall be pen or ink jet plotted on sheet size 22" by 34" double matte mylar. The final submittal will contain the standard plot routine with the .pcp file.

Regional Prototype Drawings

The Region has developed a standard prototype drawing file that will be used as the basis of all drawings submitted. The prototype drawing includes all the elements necessary for adherence to this standard.

Advertising

- 1. At the time of final transmittal to Technical Services for advertising, the DOT&PF Drafter or consultant will insure that all sheets are numbered correctly, stamped, signed and dated.
- 2. All mylars for advertising will be originals. Traffic, Bridge, and Utilities Sections will

provide original mylars to the Drafter, without exception.

- 3. Second generation prints of the plan set need not be made before advertising, but Technical Services will be responsible for returning the original mylars to the appropriate Section after bid opening. At that time all returned mylars will have a second generation copy inserted in the mylar set for as-builts.
- 4. After transmittal of the mylars, usually on the same date as the Engineer seals the plans, no other changes may be made except by addendum, and a notation of the change and a corresponding note in the revision block. Each change will be accented by a 5 mm hexagon or triangle, consecutively numbered, matching the revision description. The engineer who authorized the change will initial the revision block.

Revised mylars in addenda will be denoted by a block in the upper right-hand corner with the words "ADDENDUM #____, ATTACHMENT #____" 5 mm (50CL) high using a .7 mm pen. Technical Services will determine the numbers after the addendum has been received. Added mylars will use the preceding sheet number with an alpha suffix.

5. Absolutely no other changes will be made to the mylars after the issuance of the last addendum, except as authorized by construction change document.

As-Built Drawings

After completion of the project, the as-built drawings are often the only records available to indicate what was actually done. Since correspondence and change documents are eventually destroyed along with other project documentation, reference on the as-builts to either is useless. The changes must be shown on the drawings. Reliable and complete as-built drawings are invaluable aids to future maintenance and design work.

Until such time as electronic storage arrangements have been implemented the following will apply:

- 1. In the field office during construction, the as-built drawings will be prepared under the supervision of the Resident Engineer on full-size blackline prints. Corrections will be made with red pencil or red ink.
- 2. The red-lined paper as-built drawings must be carefully and accurately prepared. They should be clean and neat. All applicable field changes should be immediately recorded thereon, by the Resident Engineer or inspector. It is stressed that they are the most current set of plans and should always be kept up to date. All corrections and revisions, including additional sketches, are to be shown on these plans. Corrections will be limited to the specific sections where the work is shown, i.e.: electrical additions should not be shown on the grading sheets.
- 3. All changes shall be corrected on the sheet where the work appears, but on occasion, new sheets need to be added by Construction to the as-built drawings, documenting additional work. These sheets will be size 22" by 34" clear tracing paper, and the drawing and lettering will be clear, concise, and reproducible. Reference will be made as to where this work fits into the plan set, and the sheet it modifies will also reference the new sheet. The new sheet will be numbered the same as the modified sheet except with an alpha suffix.

Since this work usually is attached to change documents, the Resident Engineer may want the original design Drafter to perform the work at the time of the change, in which case it will be prepared in red ink on the original mylars.

4. Upon completion of the project, the Resident Engineer will submit the project files, including the as-builts, to Internal Review to finalize. Construction will be responsible for insuring that the paper as-built information is transferred to the original mylars. In most cases they will contract with Design to perform this service. Technical Services will monitor the progress with the As-Built Tracking Document.

The Resident Engineer will also transmit one corrected set of Special Provisions. Complete verbiage of rewrites shall be taped in at the appropriate locations and marked accordingly.

5. Corrections are normally made to the original mylars by lining out with .5 mm pen all dimensions or features which were changed during construction, and placing the correction in red ink. This work will be in accordance with the preceding sections. Special care

must be taken to insure that any change is entered on all sheets affected by the change. Both the original detail and the correction must be legible upon completion, and remain clear once half-sized.

6. The Title Sheet of both the plans and Special Provisions shall contain the words "AS-BUILT" in 50 mm letters, and the following completed block in 6 mm letters.

|--|

RESIDENT ENGINEER:

DATE BEGIN: _____

DATE COMPLETED: _____

Below this block will be the seal and certification, if not already on the title block:

CERTIFIED TRUE AND CORRECT AS-BUILT OF ACTUAL FIELD CONDITIONS

(SEAL)

CONSTRUCTION PROJECT MANAGER DATE

- 7. The Resident Engineer shall initial and date each sheet of the red-lined paper as-built drawings to indicate that each was accurately completed and checked.
- 8. Design, either Highway or Traffic as appropriate, will transfer the information to the original mylars within 60 days of submittal, insofar as possible. This work is chargeable to the project. Upon completion, the Drafter will then schedule a time and place for the Resident Engineer and Construction Project Manager to review the drawings. If correct, the Resident Engineer will initial each mylar in the title block, and the Construction Project Manager will sign and date his stamp on the Title Sheet. Design will then return the mylars to Technical Services for microfilming, reproduction and storage, and the red-lined paper as-builts will be sent to Maintenance & Operations for their permanent records.

For projects that include bridges, the bridge construction red-lines will be routed to Bridge Design after Technical Services has corrected the second generation copies. Technical Services will also be responsible for forwarding Traffic, Right-of-Way and Utility as-built drawings prepared by the Contractor.

- 9. The following information shall be included on as-built drawings.
 - All changes accomplished by change documents
 - Corrected typical sections, including base and surfacing details
 - Estimate

- Summary tables
- Subgrade or slope stabilization areas
- Vertical and horizontal alignment revisions, including curve data
- Location, dimensions, and materials of all drainage features, including revised invert elevations
- Exact changes in guardrail locations
- All new approaches with new permit number
- Established or reestablished monuments, right-of-way markers, and property corners
- New, replaced, removed, or abandoned utilities, especially underground (including size and type of lines)
- Traffic control and illumination circuits (both layout and schematic)
- Locations and dimensions of all new structures
- Pile lengths, foundation elevations and other subsurface details, especially any objects encountered and not removed
- Actual location of anchors, construction and control joints, in concrete
- Verification of all other details constructed as originally planned
- Actual locations and dimensions for traffic striping and signing changes

It is not necessary to make revisions for:

- Temporary traffic control measures removed upon completion
- Stage construction sheets
- 10. The as-built mylars shall be maintained by Technical Services in perpetuity. Public information copies are available in Central Files, and are made available for design, maintenance, local government personnel and all other interested parties. The use of microfilm or other reduced recording systems result in the lose of essential details on the more complicated drawings and shall not be a substitute for maintaining the original mylars.

Archiving

It is the intent that all design plan sets will be stored electronically. To that end, all plans will be downloaded to disc or tape and stored in the safe. Original mylars will continue to be kept for the foreseeable future.

References:

Standard Practice for Use of the International System of Units, ASTM E380-93.

Guide to Metric Conversions, AASHTO

Survey

STATE of ALASKA DEPARTMENT of TRANSPORTATION AND PUBLIC FACILITIES

CENTRAL REGION

RIGHT OF WAY DRAFTING MANUAL

METRIC

November 15, 1994

DRAFT

Chapter 4:

Right of Way Plan Preparation

Right of Way Plans illustrate existing right of way, project centerline, proposed right of way limits, parcels to be acquired, necessary title information, mathematical data and topography as set out in the Title and Plans Chapter of the Department's Right of Way Manual and as may be required by municipal subdivision ordinances. The purpose of right of way plans are three fold:

- 1. To serve as a vehicle for the acquisition of property for right of way. The plans are used for appraisals, negotiations and condemnation if necessary for the project.
- 2. To accompany project design plans for the primary purpose of providing information to accurately locate the right of way limits.
- 3. To meet municipal right of way acquisition plat standards relative to monumentation and platting for the purpose of recording.

Plan Set Preparation

- 1. Right of Way plans will be prepared on paper size 22" by 34" without exception. All asadvertised plan sets will be first generation vellum or better. The final Right of Way plans after monumentation, and final review and approval by the municipality or borough will be on mylar. All final mylar drawings shall be plotted so that the front surface of the mylar is inkable and erasable.
- 2. The Title Sheet will be the standard Regional Right of Way style.. Signature blocks for the Surveyor's, Director of Design & Construction, and Plat Approval are required on this sheet. The Legend Sheet will be the standard Regional A-1, no signatures are required. The Control Sheet will normally be prepared by the Location Section and will require the location or consultant Surveyor's seal. The Tract Maps don't require a seal. The Right of Way Plan Sheets and Monument Summary Sheets require the location or consultant Surveyor's seal, the right of way or consultant Surveyor's seal and the contractor's Surveyor's seal.
- 3. Computer-aided drafting (CAD) system is required, it should be either AutoCAD, Version 12, or a software that is capable of conversion producing AutoCAD DWG files (preferred) or DXF file format.
- 4. For consultants using a CAD system, all submissions to the Department shall be pen plotted

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or 600 dpi minimum plotted mylars. The Right of Way Plan set for advertising will also be first generation vellum, with attached AutoCAD drawing files or DXF files on diskettes (3.5 inch, 1.44MB formatted) or on QIC80 tape cartridge. A listing of special layers, identification of line width usage and all other data necessary for the Department to reproduce the drawings consistent with Regional standard practice shall also be provided in the transmittal letter. Consultants will be provided AutoCAD Version 12 drawing files on diskettes for blank Title Sheets, Legend Sheets, Border Sheet and Menu.. Consultants may make copies, and then return the diskettes to the Right of Way consultant coordinator within five working days.

- 5. Standard line thickness will be as shown in Chapter 1
- 6. Standard lettering see Right of Way plan Exhibits.

All Leroy lettering or computer equivalent is vertical upper case. Hand lettering is performed in slanted upper and lower case. A #5 guide is used with a .5 mm pen.

The standard computer font is "AusFonts" using Stencil or Steneq fonts.

- 7. The preferred ratio (scale) for rural and urban Right of Way projects will be 1:1000 or 1:500 respectively. The Right of Way Engineering Supervisor will make the final decision on the plan scale.
- 8. The Right of Way plan set shall be assembled in the following order:

PLAN SHEETS	SHEET PREFIX
Title Sheet, Survey and General Layout	R
Legend Sheet	R
Control Sheet	R
Tract Maps	R
Plan Sheets	R
Monument Summary Sheets	R

Sequential sheet numbering of the plan set is required.

- 9. Abbreviations shall be limited to crowded areas only and avoided in the Notes unless absolutely necessary. Periods are not required, i.e.: BOP, MP, AC, PC, PT, FHWA, etc.
- 10. In 1996, the Federal Highway Administration will require conversion to the metric system of measurement. All projects will include a metric conversion table found in Appendix D on the first summary sheet of the plan set.
- 11. Station equations shall be noted on the Plan Sheets, "AHD" and "BK" shall be used.
- 12. Right-of-way lines are labeled "R/W" and the controlled-access lines are "C/A".
- 13. Centerline ticks shall extend above the centerline 3 mm and be located every 10, 20, or 25 meters. At the 50 or 100 meter interval the tick shall extend from 3 mm above to 3 mm below the centerline and be annotated. All drawing that show a centerline shall show at least two annotated ticks.
- 14. Drawing layout, scale and proportion is usually recommended by the Drafter. Remember, Highway Right of Way plans are printed half-size for reviews, at advertising, and for the Contractor. It might be clear on a full size mylar, but details must not be lost when plan sheets are half-sized.

CAD Drawings

All final Computer Aided Drafting (CAD) drawing files will conform to the following guidelines. CAD sheets shall be pen or ink jet plotted on sheet size 22" by 34" double matte mylar. The final submittal will contain the standard plot routine with the .pcp file.

Layer Naming Conventions

See Appendix A for the current layering scheme.

Regional Prototype Drawings

The Region is in the process of developing a standard prototype drawing file that will be used as the basis of all drawings submitted. The prototype drawing will includes most of the elements necessary for adherence to this standard. Keep in mind that Right of Way Plans in addition to meeting the requirements for acquisition and construction must also meet platting requirements found in municipal subdivision ordinances. There is no exact standard that can be set.

Environmental





CHAPTER SIX

AVIATION DESIGN

The function of an engineering drawing is to illustrate and describe the project in sufficient detail and clarity to insure correct interpretation by Contractors and construction personnel. To achieve this purpose, a drawing must be made according to practices that are recognized in the State of Alaska.

The plan set should contain delineation, dimensions, notes, and references as required, in sufficient clarity and detail, consistent with the skills and trade practices involved, to insure correct interpretation by any organization that may have occasion to use it. The following are the Regional standard practices for all Aviation Design drafting.

In this document the pen weights refer to K&E Leroy pen numbers unless otherwise stated. Use this table for translating from Leroy pen sizes into metric line weights (plotter pen widths):

<u>Leroy</u>	<u>Line Weight</u>
0000	0.20 mm
000	0.25 mm
00	0.33 mm
0	0.43 mm
1	0.53 mm
2	0.66 mm
3	0.89 mm
4	1.09 mm
5	1.40 mm
6	1.70 mm

Plan Set Preparation

1. Design plans will be prepared on 841 mm x 594 mm mylar without exception. All asadvertised plan sets will be mylar.



- 2. All mylar will be matted on both sides and drafting will be with black india ink. The Title Sheet, Quantity and Index Sheet, and a standard border will be of the standard Central Region Aviation Design style. See Item #4 and attachments.
- 3. If a computer-aided drafting (CAD) system is employed, it should be either Auto CAD, Version 12, or a software that is capable of conversion to DFX format.
- 4. For consultants using a CAD system, all preliminary submissions to the Department shall be plotted on vellum. The final plan set for advertising will be mylars, with attached AutoCAD drawing files or DFX files, .PCP plotter configuration files and Adcadd point files on 3?-inch, 1.44mb discs or Bernoulli Multidisk in Iomega PC-DOS format. Consultants will be provided Auto CAD Version 12 drawing files or .DXF drawings file son 3?-inch discs for blank Title Sheets, Quantity and Index Sheet, and a standard border sheet. Consultants may make copies, and then return the discs to the Project Manager within five working days.
- 5. Standard pen widths will be:

-	<u>Line Weight</u>
Construction Centerline on P&P Sheets	0.25 mm
Section line	0.25 mm
Property Line	1.09 mm
Edge of Surfacing	0.43 mm
Edge of Embankment	0.53 mm
Dimensional Leaders	0.33 mm
Highlighted Contours & Grid Lines	0.20 mm
Intermediate Grid Lines	0.13 mm
Minor Contours and Grid Lines	0.08 mm
Existing Utilities	0.33 mm

Entity Linetypes and colors shall be set to [BYLAYER]. Linetypes vary with the scale of the drawing and type of drawing. See the attached Standard Drawings. Make the line types in proportion to the scale. Plotter fade back (grayscale) lines shall not be used.

6. Standard lettering is 2.5 mm in color 3 (K&E Leroy 100 template in a #00 pen). Titles will be 4.5 mm in color 6 (K&E Leroy 175 template in a #2 pen). Subtitles will be 3.5 mm in color 4 (K&E Leroy 140 template in a #1 pen). On P&P Sheets, 3.5 mm in color 4 (K&E Leroy 140 template in a #1 pen) is used for stations and grid elevations on the profile. 2.5 mm in color 3 (K&E Leroy 100 template in a #00 pen) is used for plan stationing along centerline & profile grade elevations. 4.5 mm in color 6 (K&E Leroy 175 template in a #2 pen) is used for match lines.

All lettering is vertical upper case except for contour text and names of water features which shall be at a 15 degree slant.

7. Drawing layout, scale and proportion is usually at the discretion of the Drafter within the common civil engineering scales. The preferred scale for Runway Plan and Profile will be



1:1000. Access Roads and Taxiways with their inherent complexity will be 1:500. Profiles drawn with a 1 to 10 (V:H) ratio are preferred.

On Airport Layout Plans the scale shall be sized as per F.A.A. Advisory Circular 150/5300-13, Appendix 7. The runway profile horizontal scale shall equal the plan scale. On airports that have more than one runway you may put the profiles on a separate sheet. The plan view shall show the airport property in it's entirety.

8. The plan set shall be assembled in the following order:

Title Sheet Vicinity Map, Conversion Factors, Quantities, And Index Project Layout Plan Plan & Profile Sheets Typical Sections Intersection Grading Plans Building Plans Detail Sheets Electrical and Lighting Plans Standard Drawings

Sequential numbering is required for the drawings.

- 9. Abbreviations shall be limited to crowded areas only and avoided in the Notes unless absolutely necessary. Periods are not required, i.e.: BRL, OHE, FAA etc.
- 10. In 1996, the Federal Aviation Administration will be requiring the conversion to the metric system of measuring. All new projects will include the following conversion table:

CONVERSION FROM THE SI INTERNATIONAL SYSTEM OF UNITS				
To convert from	to	Multiply by		
STATION (100 METERS (M))	FEET	328.084		
KILOMETER (KM)	MILE	0.6214		
METER (M)	MILE	0.00062137		
METER (M)	FOOT	3.28084		
METER (M)	U.S. SURVEY FOOT	USS ft=M/(12/39.37)		
SQUAPE METER (M?)	SQUARE FOOT	10.76391042		
SQUARE METER (M?)	SQUARE YARD	1.19599		
SQUARE METER (M?)	ACRE	0.00024711		
CUBIC METER (M?)	CUBIC FOOT	35.3146667		
CUBIC METER (M?)	CUBIC YARD	1.3079506		
CUBIC METER (M?)	GALLON (US LIQUID)	264.17204		
CUBIC METER (M?)	M. GALLON	0.26417204		
KILOGRAM (KG)	POUND-MASS (LBF)	2.2046225		
KILOGRAM (KG)	TON (SHORT)	0.00110231		
NEWTON (N)	POUND-FORCE (LBF)	0.2248089		
LUX (LX)	FOOTCANDLE	0.092903		
DEGREE CELSIUS (EC)	DEGREE FAHRENHEIT	TEF=(1.8 X TEC)+32		

- 11. An ellipse will be used for storm drain pipes and culverts on profile with both width and height to scale.
- 12. Non-Aviation owned Right-of-way lines are labeled "ROW".
- 13. Station tic marks are placed every 100-meters. At the 100-meter station, the tic mark is above and below centerline 2.5 mm plotted. It will be further divided every 25 meters with tic marks above centerline 2.5 mm plotted. The station is lettered every 500-meters or often enough to show at least 3 labeled stations and centered vertically on the tic mark.
- 14. All of the Department's Standard Drawings and Regional Standard Drawings are pubic

property, and can be used as long as the professional engineering seals are removed. The engineer must assure for himself that the drawings are accurate and is satisfactory for his purposes before signing.

15. Remember, Aviation design plans are printed half-size for reviews, at advertising, and for the contractor. Details legible on full size mylar must not be lost when plan sheets are half-sized.

CAD Drawings

All final CAD drawing files shall conform to the following guidelines. Sheets shall be ink on 841 mm x 594 mm double matte mylar. The front matte shall be erasable and inkable with standard India ink. The CAD plot shall be plotted on the back of the mylar. The mylar shall be preappro = for transparency before plotting.

Layer Naming Conventions

A layering system has been adopted that is comprehensive enough to allow the placement of common features together while allowing the rapid isolation of drawing elements for manipulation by the drafter or engineer. The system is also flexible enough as to adapt as time shows other needs with little disruption.

The object being to enable differentiation, in a logical manner, between the various types of features expected to be located and mapped, the following method of naming the corresponding layers in AutoCAD drawing files will be used. This system will be used whether performed by in-house or consultant drafters.

Position 1 will be either **E**, **F**, or **P**, signifying that the mapped feature is Existing, Future, or **P**roposed

Position 2 will be one of the following I.D. values: C=Coordinate layers; L=Line layers; H=Hatch layers; S=Symbol layers; T=Text layers

Position 3-8 will consist of a mnemonic code which identifies the mapped feature as per the Central Region D.O.T./P.F. Standard Layering Scheme.

The following tables have the most common layers. See pages 9 -26, Central Region D.O.T./P.F. Standard Layering Scheme for additional layers.

Construction Plans

<u>LAYER</u>	LINETYPE	WIDT	TH DESCRIPTION
S1	Continuous	0.20 mm	
S2	Continuous	0.25 mm	
S3	Continuous	0.33 mm	
S4	Continuous	0.43 mm	
S5	Continuous	0.53 mm	
S6	Continuous	0.66 mm	
S7	Continuous	0.89 mm	
S8	Continuous	1.09 mm	
S9	Continuous	1.40 mm	
S10	Continuous	1.70 mm	
SGRIDH	Continuous	0.20 mm	Highlighted Grid Lines
SGRIDI	Continuous	0.12 mm	Intermediate Grid Lines
SGRIDM	Continuous	0.07 mm	Minor Grid Lines
ELAB	D100	0.33 mm	Existing BRL Line
PLAB	D200	0.33 mm	Proposed BRL Line
ELANL 🗗	Continuous	0.33 mm	Existing Navigation Aid, Lights (Open)
PLANL	Continuous	0.43 mm	Proposed Navigation Aid, Lights (Solid)
ELANO	Continuous	0.33 mm	Existing Navigation Aid, Other (Open)
PLANO	Continuous	0.43 mm	Proposed Navigation Aid, Other (Solid)
ELARP	Sec 1_16	0.25 mm	Existing Runway Protection Zone
PLARP	Sec 1_4	0.25 mm	Proposed Runway Protection Zone
ELARSA	D20	0.53 mm	Existing Runway Safety Area
PLARSA	Continuous	0.53 mm	Proposed Runway Safety Area
ELYS?D20	0.43 mm	Ex	isting Surfacing (Unpaved, Paved*)
PLYS? Continu	uous 0.43 mm	Pro	pposed Surfacing (Unpaved, Paved*)
ELPCRD	Center2	0.25 mm	Existing Road Centerline
PLPCRD	Center	0.25 mm	Proposed Road Centerline
ELPCRW	Center2	0.25 mm	Existing Runway Centerline
PLPCRW	Center	0.25 mm	Proposed Runway Centerline
ELPCTW	Center2	0.25 mm	Existing Taxiway Centerline
PLPCTW	Center	0.25 mm	Proposed Taxiway Centerline
ELIST	Continuous	0.33 mm	Existing Structure (Open)
PLIST	Continuous	0.53 mm	Proposed Structure (Solid)
ELTCH	Continuous	0.20 mm	Existing Highlighted Contour
ELTCN	Continuous	0.07 mm	Existing Intermediate Contour
ELTW Contin	uous 0.25 mm	Ex	isting Waterline
ELAL	Parcel2	0.33 mm	Existing Lease Lot Line
PLAL	Parcel	0.33 mm	Proposed Lease Lot Line
ELRP	Boundary	1.09 mm	Existing Property Line
PLRP	Future	1.09 mm	Proposed Property Line
	<u>Airp</u>	ort Layou	<u>it Plans and Property Plans</u>
<u>LAYER</u>	<i>LINETYPE</i>	WID	TH DESCRIPTION

S 1	Continuous	0.20 mm	
S2	Continuous	0.25 mm	
S 3	Continuous	0.33 mm	
S 4	Continuous	0.43 mm	
S5	Continuous	0.53 mm	
S 6	Continuous	0.66 mm	
S 7	Continuous	0.89 mm	
S 8	Continuous	1.09 mm	
S 9	Continuous	1.40 mm	
S10	Continuous	1.70 mm	
SGRIDH	Continuous	0.20 mm	Highlighted Grid Lines
SGRIDI	Continuous	0.12 mm	Intermediate Grid Lines
SGRIDM	Continuous	0.07 mm	Minor Grid Lines
ELAB	D100	0.33 mm	Existing BRL Line
PLAB	D200	0.33 mm	Proposed BRL Line
ELANL	Continuous	0.43 mm	Existing Navigation Aid, Lights (Solid)
PLANL	Continuous	0.33 mm	Proposed Navigation Aid, Lights (Open)
ELANO	Continuous	0.43 mm	Existing Navigation Aid, Other (Solid)
PLAN	Continuous	0.33 mm	Proposed Navigation Aid, Other (Open)
ELAR	Sec 1_16	0.33 mm	Existing Runway Protection Zone
PLARP	Sec 1_4	0.33 mm	Proposed Runway Protection Zone
ELARSA	Continuous	0.53 mm	Existing Runway Safety Area
PLARSA	D20	0.53 mm	Proposed Runway Safety Area
ELYS? Contin	uous 0.43 mm	Ex	isting Surfacing (Unpaved, Paved*)
PLYS? D20	0.43 mm	Pre	oposed Surfacing (Unpaved, Paved*)
ELPCRD	Center2	0.25 mm	Existing Road Centerline
PLPCRD	Center	0.25 mm	Proposed Road Centerline
ELPCRW	Center2	0.25 mm	Existing Runway Centerline
PLPCRW	Center	0.25 mm	Proposed Runway Centerline
ELPCTW	Center2	0.25 mm	Existing Taxiway Centerline
PLPCTW	Center	0.25 mm	Proposed Taxiway Centerline
ELIST	Continuous	0.33 mm	Existing Structure (Solid)
PLIST	Continuous	0.53 mm	Proposed Structure (Open)
ELTCH	Continuous	0.20 mm	Existing Highlighted Contour
ELTCN	Continuous	0.07 mm	Existing Intermediate Contour
ELTW Contin	uous 0.25 mm	Ex	isting Waterline
ELAL	Parcel2	0.33 mm	Existing Lease Lot Line
PLAL	Parcel	0.33 mm	Proposed Lease Lot Line
ELRP	Boundary	1.09 mm	Existing Property Line
PLRP	Future	1.09 mm	Proposed Property Line

*Paved surfaces shall be future broken down to Structural (?LYSPS) and Blast protection (?LYSPB) if there is blast protection pavement in use or proposed.

Pen codes and line weights shall conform to the following:

AutoCADSizeExamples of Uses

Color Number		
1 (Red)	0.20	Centerlines on small scale drawings
2 (Yellow)	0.25	2.0 mm Text, Centerlines, Shoreline
3 (Green)	0.33	Dimensions, 2.5 mm Text, Existing Road Edges, Existing Buildings
4 (Cyan)	0.43	3.0 mm Text, Surfacing Edges
5 (Blue)	0.53	3.5 mm Text, Embankment Edges
6 (Magenta)	0.66	4.5 mm Text
7 (White)	0.89	
8	1.09	Property Lines
9	1.40	
10	1.70	
251	0.20	Highlighted Grid and Contour Lines
252	0.13	Intermediate Grid Lines
253	0.08	Minor Grid Lines and Non-highlighted Contour Lines



Prototype Drawings

A prototype drawing has been assembled which includes the most common elements necessary for adherence to this manual.

Advertising

- 1. At the time of final transmittal to Contracts for advertising, the Drafter will insure that all sheets are numbered correctly, stamped, signed and dated.
- 2. All mylars for advertising will be originals.
- 3. Contracts will be responsible for returning the original mylars to Aviation Design Section after bid opening.
- 4. After transmittal of the mylars, usually the same date as the Director's signature, no other changes may be made except by addendum, and a notation of the change and a corresponding note in the revision block. Each change will be accented by a 2.5 mm hexagon, consecutively numbered, matching the revision description. The person who authorized the change will initial the revision block.

Revised mylars in addenda will be denoted by a block in the upperight-hand corner with the words "ADDENDUM # ____, ATTACHMENT # ____" 4.5 mm in color 6. Contracts will determine the numbers after the addendum has been received. Added mylars will use the preceding sheet number with an "A" suffix. Revised mylars will use the SAME sheet number with an "R" suffix.

5. Absolutely no other changes will be made to the mylars after the issuance of the last addendum, except as authorized by construction change document.

As-Built Drawings

After completion of the project, the as-built drawings are often the only records available to indicate what was actually done. Since correspondence and change documents are eventually destroyed along with other project documentation, reference on the as-built to either is useless. **The changes must be shown on the drawings.** Reliable and complete as-built drawings are invaluable aids to future maintenance and design work.

Until such time as electronic storage arrangements have been implemented the following will apply:

- 1. In the field office during construction, the as-built drawings will be prepared under the supervision of the Resident Engineer on full-size blackline prints. Corrections will be made with red pencil or red ink.
- 2. The red-lined paper as-built must be carefully and accurately prepared. They should be clean and neat. All applicable field changes should be immediately recorded thereon, and

not at a later date, by the Resident Engineer or inspector. It is stressed that they are the most current set of plans and should always be kept up to date. All corrections and revisions, including additional sketches, are to be shown on these plans. Corrections will be limited to the specific sections where the work is shown, i.e.: electrical additions should not be shown on the grading sheets.

3. All changes shall be corrected on the sheet where the work appears, but on occasion, new sheets need to be added by Construction to the as-built drawings documenting additional work. These sheets will be 841 mm x 594 mm clear tracing paper, and the drawing and lettering will be clear, concise, and reproducible. Reference will be made as to where this work fits into the plan set, and the sheet it modifies will also reference the new sheet. The new sheet will be numbered the same as the modified sheet except with an alpha suffix.

Since this work usually is attached to change orders, the Resident Engineer may want the original design Drafter to perform the work at the time of the change, in which case it will be prepared in black ink on second generation mylars.

4. Upon completion of the project, the Resident Engineer will submit the project files, including the as-built, to Internal Review for finalizing. Construction will be responsible for insuring that the paper as-built information is transferred to the original mylars. In most cases they will contract with Design to perform this service. Contracts will monitor the progress with the As-Built Tracking Document.

The Resident Engineer will also transmit one corrected set of Special Provisions. Complete verbiage of rewrites shall be taped in at the appropriate locations and marked accordingly.

- 5. Corrections are normally made to the original mylars by erasing all dimensions or features which were changed during construction, and placing the correction in black ink. This work will be in accordance with the preceding sections. Special care must be taken to insure that any change is entered on all sheets affected by the change. Both the original detail and the correction must be legible upon completion, and capable of being half-sized.
- 6. The Title Sheet of both the plans and Special Provisions shall contain the words "AS-BUILT" in 50 mm letters, and the following added to the signature block in 3.0 mm letters in color 5.

AVIATION CONSTRUCTION GROUP CHIEF DATE

- 7. The Resident Engineer shall initial and date each sheet of the red-lined paper as-built drawings to indicate that each was accurately completed and checked. Added sheets will be signed in the signature block by the Resident engineer and by the Aviation Construction Group Chief.
- 8. The party contracted to do the updating of the mylars (i.e. Aviation Design) will transfer the information to the original mylars within 60 days of submittal, insofar as possible, chargeable to the project. Upon completion, the Drafter will then transmit of prints to the

Resident Engineer set to review the drawings. If correct, the Resident Engineer will initial each mylar in the title block, and the Construction Project Manager will sign and date the Title Sheet. Design will then make prints of the signed sheets for microfilming then put originals in storage.

9. The following information shall be shown on as-built drawings.

-All changes accomplished by change documents -Corrected typical sections, including base and surfacing details -Subgrade or slope stabilization areas -Vertical and horizontal alignment revisions, including curve data -Location, dimensions, and materials of all drainage features, including revised invert elevations -Exact changes in guardrail locations -All new approaches with new permit number -Established or reestablished monuments, right-of-way markers, and property corners -New, replaced, removed, or abandoned utilities, especially underground (including size, number and type of lines) -Lighting control and illumination circuits (both layout and schematic) -Locations and dimensions of all new structures -Pile lengths, foundation elevations and other subsurface details, especially any objects encour \equiv d and not removed -Actual location of anchors, construction and control joints, in concrete -Verification of all other details constructed as originally planned

- 10. The as-built mylars shall be maintained by Aviation Design in perpetuity. Public information copies are available in Central Files, and are made available for design, maintenance, local government personnel and all other interested parties. The use of microfilm or other reduced recording systems loses essential detail on the more complicated drawings and shall not be a substitute for maintaining the original mylars.
- 11. For further instructions refer to the Statewide Construction Manual.

Archiving

It is the intent that all design plan sets will be stored electronically. To that end, all plans will be downloaded to disc or tape and stored in the safe. Original mylars will continue to be kept for the foreseeable future.

Figures Attached: 9 sample plan sheets

Buildings

Materials

Harbors

Utilities

Drafting standards shall be the same as the regular plan sheets for that project.

When plan and profile sheets or detail sheets are produced for utility review of existing facilities the following color shall be used for lines representing that utility.

RED	Electric	
YELLOW	Oil - Gas	
ORANGE	Telephone	
PURPLE	Television	use magenta
BLUE	Water	
GREEN	Sewer	
BROWN	Lighting	

The colors shall comply with the following AutoCAD color definitions.

Utility Relocation Agreement (URA)

Reimbursable Service Agreement (RSA)

	Color	
Existing Facilities to Remain		
Existing Facilities to be Retired		
New Facilities		
Betterment's		
Non-Participation by State/F.H.W.A./F.A.A.		
Temporary Facilities		
Notes as Required		
Existing Facilities to be Adjusted		

Appendix A

Layering Scheme

See Pages 9 through 26.

Appendix B

ISO PAPER SIZES.

ISO Paper Size	Metric in mm	English in inches	Remarks
A0	1189 x 841	46.81 x 33.11	
A1	841 x 594	33.11 x 23.38	Full sized plan sheet.
A2	594 x 420	23.28 x 16.54	
A3	420 x 297	16.54 x 11.69	Half-sized plan sheet.
A4	210 x 297	8.27 x 11.69	Old 8.5 by 11 paper.



Appendix C

ENGINEERING SCALES

METRIC SCALE	ENGLISH EQUIVALENT	
1:100 000	? " = 1 mile	
1:50 000	1" = 1 mile	
1:25 000	3" = 1 mile 1" = 2000 ft	
1:10 000	6" = 1 mile 1" = 1000 ft	
1:5000	1" = 400' 1" = 417' 1" = 500'	
1:2000	1'' = 200'	
1:1000	1" = 80' 1" = 83.3' 1" = 100'	
1:500	1'' = 40' 1'' = 41.7' 1'' = 50'	
1:400	1" = 33.3'	
1:300	1" = 25.0'	
1:250	1" = 20.8'	
1:200	1" = 16.7'	
1:100	1" = 8.3'	
1:50	? " = 1'0"	
1:20	? " = 1'0" ? " = 1'0"	
1:10	1?" = 1'0" 1" = 1'0"	
1:5	3" = 1'0"	

f:\desgnman\drafting

Appendix D

Conversion Factors for SI Units

FROM	ТО	SYMBOL	MULTIPLY BY	
LENGTH				
Inch	Millimeter	mm	25.4 *	
Foot	Meter	m	0.304 8 *	
Yard	Meter	m	0.914 4 *	
Mile	Kilometer	km	1.609 344 *	
Foot (U.S. Survey)	Meter	m	12 / 39.37	
AREA				
Square Inch	Square Millimeter	mm ²	645.15 *	
Square Foot	Square Meter	m ²	0.092 903 04 *	
Square Yard	Square Meter	m ²	0.836 127 36 *	
Square Mile	Square kilometer	km ²	2.590 00	
Acre	Meter	m ²	4 046.856	
Acre	Hectare (10 000 m ²)	ha	0.404 685 6	
Volume				
Cubic Inch	Cubic Millimeter	mm ³	16.387 064 *	
Cubic Foot	Meter	m ³	0.028 316 8	
Cubic Yard	Meter	m ³	0.764 555	
Acre Foot	Meter	m ³	1 233.49	
100 board feet	Cubic Meter	m ³	0.235 974	
Cubic Foot	Liter	L	28.316 85	
Gallon	Liter	L	3.785 41	
TEMPERATURE				
Degree Fahrenheit	Degree Celsius EC	EC	TEC=(TEF-32)/1.8	
MASS				
Pound-mass (lbm)	Kilogram	kg	0.453 592	
Ton (Short, 2,000	Megagram	Mg	0.907 184 7	
Ton (Short, 2,000	Kilogram	kg	907.184 7	

NOTE: * denotes an exact number.

Appendix E

Pen Thickness/assignments

Appendix F

Metric Linetypes

Appendix G

Sample Font Sizes & Line Weights

Appendix H

Symbols

Appendix I

Example Sheets