



STATE OF ALASKA

DEPARTMENT OF

TRANSPORTATION

and PUBLIC FACILITIES

CENTRAL REGION

DRAFTING MANUAL

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):

<i>Leroy</i>	<i>Line Weight</i>
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 863.6 mm x 558.8 mm mylar without exception. All as-advertised 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 AutoCAD, Version 14, 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 Softdesk point files on PC CD-ROM. NO file compression shall be used. Interim files may be transferred using 1.44mb floppy, 100mb Iomega Zip disk, or PC CD-ROM. Drawings shall have the plotting ratio printed on them. Consultants will be provided AutoCAD drawing files or .DXF drawings files on discs on request 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. 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 in AutoCAD "Romans" vertical upper case except for contour text in which shall be in AutoCAD "Scriptc" and names of water features which shall be in AutoCAD "Romanc" or "Italicc". Contour text shall be in 2.0mm text in color to match contour line.

All text heights stated here are PLOTTED heights on FULL-SIZE sheet. Text shall be written as to be read from the bottom or the right side of the sheet.

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. An ellipse will be used for storm drain pipes and culverts on profile with both width and height to scale.
11. Non-Aviation owned Right-of-way lines are labeled "ROW".
12. Station tic marks are placed every 25-meters. The tic mark is above and below 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.
13. 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 for himself that the drawings are accurate and is satisfactory for his

purposes before signing.

14. 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 863.6 mm x 558.8 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 preapproved 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 **E**xisting, **F**uture, or **P**roposed

Position 2 will be one of the following I.D. values: **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 Appendix A, Central Region D.O.T./P.F. Standard Layering Scheme for additional layers.

Airport Construction Plans

<i>LAYER</i>	<i>LINETYPE</i>	<i>WIDTH</i>	<i>DESCRIPTION</i>
S--1	Continuous	0.20 mm	
S--2	Continuous	0.25 mm	
S--3	Continuous	0.33 mm	
S--4	Continuous	0.43 mm	
S--5	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	
S--10	Continuous	1.70 mm	
S--GRIDH	Continuous	0.20 mm	Highlighted Grid Lines
S--GRIDI	Continuous	0.12 mm	Intermediate Grid Lines
S--GRIDM	Continuous	0.07 mm	Minor Grid Lines
ELABRL	BRL	0.25 mm	Existing BRL Line
PLABRL	BRL	0.33 mm	Proposed BRL Line
ELAL	Parcel2	0.25 mm	Existing Lease Lot Line
PLAL	Parcel	0.25 mm	Proposed Lease Lot 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
ELIST	Continuous	0.33 mm	Existing Structure (Open)
PLIST	Continuous	0.53 mm	Proposed Structure (Solid)
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
ELRP	Boundary	1.09 mm	Existing Property Line
PLRP	Future	1.09 mm	Proposed Property Line
ELTCH	Continuous	0.20 mm	Existing Index (Highlighted) Contour
ELTCN	Continuous	0.07 mm	Existing Normal Contour
ELTW	Continuous	0.25 mm	Existing Waterline
ELYS?	D20	0.43 mm	Existing Surfacing (Aggregate, Unsurfaced, Paved*)
PLYS?	Continuous	0.43 mm	Proposed Surfacing (Aggregate, Unsurfaced, Paved*)

Airport Layout Plans and Property Plans

LAYER	LINE TYPE	WIDTH	DESCRIPTION
S--1	Continuous	0.20 mm	
S--2	Continuous	0.25 mm	
S--3	Continuous	0.33 mm	
S--4	Continuous	0.43 mm	
S--5	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	
S--10	Continuous	1.70 mm	
S--GRIDH	Continuous	0.20 mm	Highlighted Grid Lines
S--GRIDI	Continuous	0.12 mm	Intermediate Grid Lines
S--GRIDM	Continuous	0.07 mm	Minor Grid Lines
ELABRL	BRL	0.25 mm	Existing BRL Line
PLABRL	BRL	0.33 mm	Proposed BRL Line
ELAL	Parcel2	0.25 mm	Existing Lease Lot Line
PLAL	Parcel	0.25 mm	Proposed Lease Lot 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)
PLANO	Continuous	0.33 mm	Proposed Navigation Aid, Other (Open)
ELARP	Sec 1_16	0.33 mm	Existing Runway Protection Zone
PLARP	Sec 1_4	0.33 mm	Proposed Runway Protection Zone
ELIST	Continuous	0.33 mm	Existing Structure (Solid)
PLIST	Continuous	0.53 mm	Proposed Structure (Open)
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
ELRP	Boundary	1.09 mm	Existing Property Line
PLRP	Future	1.09 mm	Proposed Property Line
ELTCH	Continuous	0.20 mm	Existing Index (Highlighted) Contour
ELTCN	Continuous	0.07 mm	Existing Normal Contour
ELTW	Continuous	0.25 mm	Existing Waterline
ELYS?	Continuous	0.43 mm	Existing Surfacing (Aggregate, Unsurfaced, Paved*)
PLYS?	D20	0.43 mm	Proposed Surfacing (Aggregate, Unsurfaced, Paved*)

*Paved surfaces shall be further 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:

AutoCAD Color Number	Size	Examples of Uses
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	
12	3.0	For solid dot haul routes
243	1.30	Layer "S--BORDER" for sheet borders
251	0.08	Highlighted Grid and Contour Lines
252	0.13	Intermediate Grid Lines
253	0.20	Minor Grid Lines and Non-highlighted Contour Lines

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 863.6 mm x 558.8 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 finalling. 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 encountered 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.

Machine # 10085390 daveb d:\dlb\office manuals\ch6_avia.doc